Ecosystem Marketplace
A FOREST TRENDS INITIATIVE

ECOSYSTEM MARKETPLACE
INSIGHTS REPORT

A Green Growth Spurt

STATE OF FOREST CARBON FINANCE 2021

JUNE 2021

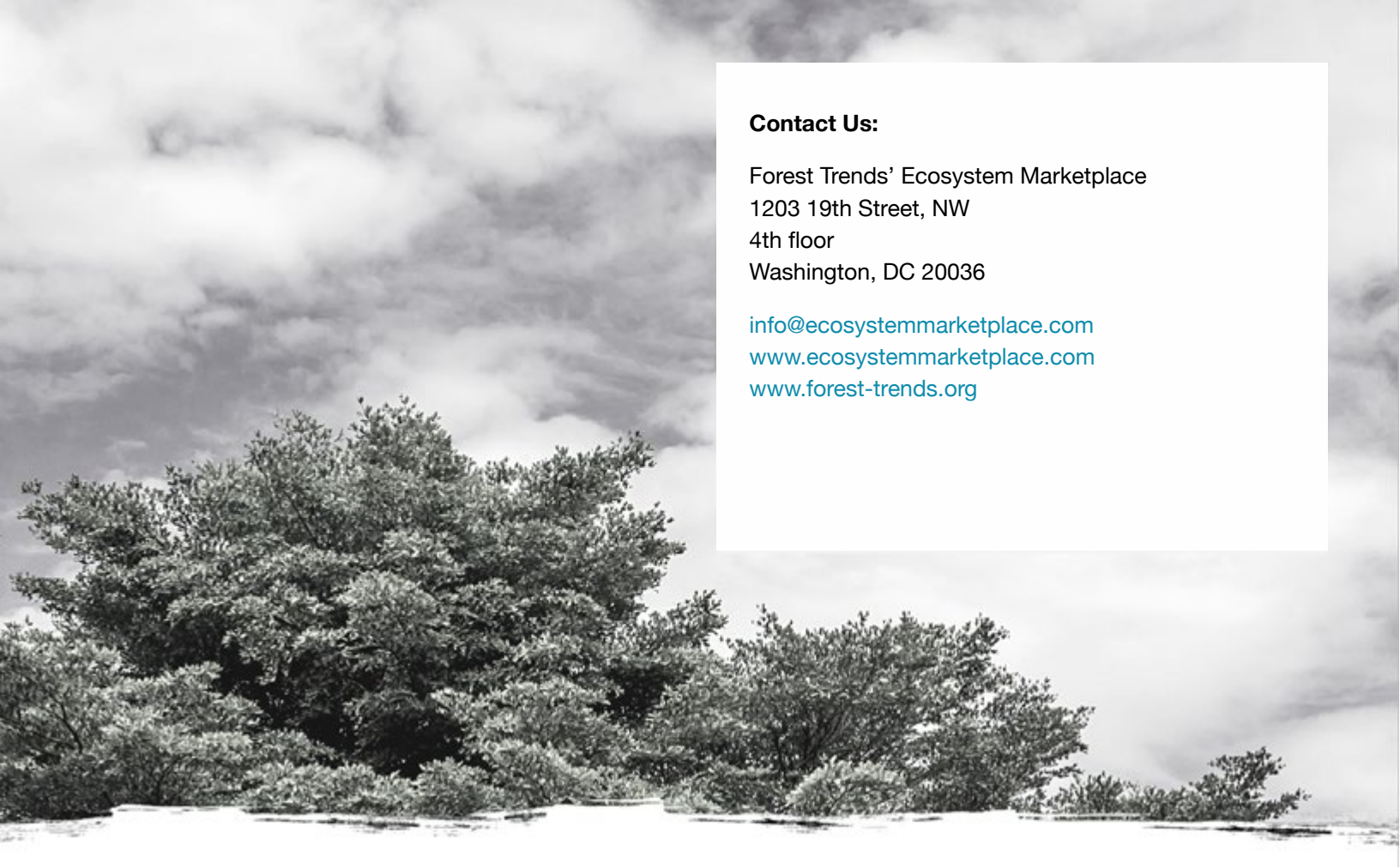
In collaboration with

FOREST CARBON PARTNERSHIP FACILITY

With additional support provided by

Arbor Day Foundation

NewForests



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ABOUT FOREST TRENDS AND ECOSYSTEM MARKETPLACE

Ecosystem Marketplace, an initiative of the non-profit organization Forest Trends, is a leading global source of information on environmental finance, markets, and payments for ecosystem services. As a web-based service, Ecosystem Marketplace (EM) publishes newsletters, breaking news, original feature articles, and annual reports about market-based approaches to valuing and financing ecosystem services. Ecosystem Marketplace believes that transparency is a hallmark of robust markets. Launched in 2005, the EM Global Carbon Hub is the world's first and only independent international voluntary and compliance carbon offsets tracking, reporting, and knowledge-sharing mechanism. Globally recognized, EM drives market transparency, price discovery, and market participants' understanding of supply, demand, and credit quality, including through recognition of core carbon and additional attributes including social, environmental, and biodiversity co-benefits that are "beyond carbon."

Forest Trends Association is a a 501(c)(3) organization founded in 1998. Forest Trends works to conserve forests and other ecosystems through the creation and wide adoption of a broad range of environmental finance, markets, and other payment and incentive mechanisms. Forest Trends does so by 1) providing transparent information on ecosystem values, finance, and markets through knowledge acquisition, analysis, and dissemination; 2) convening diverse coalitions, partners, and communities of practice to promote environmental values and advance development of new markets and payment mechanisms; and 3) demonstrating successful tools, standards, and models of innovative finance for conservation.

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ATTRIBUTION

Please cite this work as follows: Forest Trends' Ecosystem Marketplace. 2021. State of Forest Carbon Finance 2021. Washington DC: Forest Trends Association.

ACKNOWLEDGMENTS

This report is a compilation of the insights of a wide range of individuals across several continents. It would not be possible without the hundreds of individuals who shared critical information about their organizations.

This report is publicly available thanks to the generous financial and institutional contributions from the World Bank's Forest Carbon Partnership Facility, with additional support provided by Arbor Day Foundation and New Forests.

A number of people offered insights on market dynamics and regional trends through draft report review and conversations with our team. We extend our grateful thanks to: Dave Brand, Rama Chandra Reddy, Juan Chang, John Earhart, Rupert Edwards, Manuel Estrada, Mary Grady, Jason Gray, Kelley Hamrick, Stephanie Harris, Simon Henry, Luke Howard, Yu Huan, Katerina Kolaciova, Gabriel Labatte, Donna Lee, Ellen Lourie, Ruben Lubowski, Siet Meijer, Claire Mitzuani, Dan Nepsted, Ken Newcombe, Marissa Santikarn, Frances Seymour, Munir Soares, Charlotte Streck, Naomi Swickard, Matt Warren, Chris Webb, and Simon Whitehouse. The views presented here do not necessarily reflect those of the reviewers.

FOREWORD

We began work on this report in the middle of the global COVID-19 pandemic. Flights were being grounded, economies stumbled, and the attention of global leaders was fully occupied by the coronavirus response. Meanwhile, something remarkable happened. Instead of using the moment to step away from climate ambition, companies and their investors doubled down. So did many countries and cities. Net zero commitments soared in 2020. Such commitments now cover an estimated 50% of global GDP.

As we release this report in the summer of 2021, we are still watching this new wave of private sector ambition build, spurred on by increasing societal expectations for climate action. We are witness to Exxon being pushed toward facing its climate risks by shareholder activists, and Shell ordered by the courts to cut its emissions. We see the Glasgow Financial Alliance for Net Zero mobilizing net zero finance initiatives representing assets totaling more than $70 trillion. As I said to a friend the other day, this is what we've been working towards at Forest Trends for twenty years: the day when the value of a stable climate is part of everyday economic decision-making, rather being taken for granted. The challenge of course will be ensuring that companies and countries follow through on their commitments. Forest Trends stands ready as a partner in the transition to a low carbon economy.

Forest carbon finance flows have more than doubled since we last published a State of Forest Carbon Finance report in 2017. As we've heard so often in the last year, there is really no way to meet the Paris goals without protecting tropical forests in this decade. We need to keep our foot on the pedal when it comes to ratcheting up ambition.

With COP26 in Glasgow quickly approaching this November, there is potential for scale an order of magnitude larger, especially if negotiators agree on integrating climate cooperation through carbon markets into Article 6 of the Paris Agreement. Doing so gives the world an opportunity to increase its climate ambition because carbon markets allow us to lower the cost of cutting emissions. And with these savings, we can "buy" even more emissions cuts, putting the world on a path to stabilizing the climate below 1.5°C of warming.

Success also depends on a high level of transparency and integrity in forest carbon finance and markets. As the space grows, there's consensus that better data and high quality standards must come hand-in-hand if we are to de-risk such investments and unlock private capital. This means we need new forms of tracking and transparency and earlier this year we doubled down on our carbon offsets market tracking work with the launch of the new EM Global Carbon Hub. Our enhanced online survey system and data intelligence tools will be put to use to confirm results are real and that we are equipped to cover expansions of the market such as the implementation of environmental and social safeguards under jurisdictional REDD+. As this additional finance flows, successful implementation will depend on our ensuring that benefits accrue to the indigenous and local communities who have been our best defenders of forests for so many years.

This report is one of many pieces we'll be producing in the months ahead to provide reliable, up-to-date, and readily available information to private and public decision-makers. The State of Forest Carbon Finance 2021 is the reference you need on your desk to understand the landscape; forthcoming intelligence from Ecosystem Marketplace will offer deeper looks at key topics and growth areas. I encourage you to visit our website at www.ecosystemmarketplace.com; we are offering an incredibly exciting new set of data intelligence tools and analysis that responds to the new information needs in carbon markets and finance.

Michael Jenkins
Founding President and CEO
Forest Trends

ACRONYMS

ACCU	Australian Carbon Credit Unit
ACR	American Carbon Registry
ART	Architecture for REDD+ Transactions
BioCF	BioCarbon Fund
CAEP	Committee on Aviation Environmental Protection
CAR	Climate Action Reserve
CARB	California Air Resources Board
CCER	China Certified Emissions Reduction
CDM	Clean Development Mechanism
COP	Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
EM	Ecosystem Marketplace
ER	Emission Reduction
ERPA	Emission Reduction Payment Agreement
ETS	Emission Trading System (or Scheme)
FAO	Food and Agriculture Organization
FCPF	Forest Carbon Partnership Facility
FLR	Forest Landscape Restoration
FREL	Forest Reference Level
GCF	Green Climate Fund
GFANZ	Glasgow Financial Alliance for Net Zero
GGC	Green Gigaton Challenge
GHG	Greenhouse Gas
HAC	High Ambition Coalition
HFLD	High Forest Low Deforestation
ICAO	International Civil Aviation Organization
ICAP	International Carbon Action Partnership
IETA	International Emissions Trading Association
IIGCC	Institutional Investors Group on Climate Change
IPCC	Intergovernmental Panel on Climate Change
ISFL	Initiative for Sustainable Forest Landscapes
ITMO	Internationally Transferred Mitigation Outcome
IUCN	International Union for Conservation of Nature
JCM	Joint Crediting Mechanism
JNR	Jurisdictional and Nest REDD
LEAF	Lowering Emissions by Accelerating Forest finance Coalition
NBS	Nature-Based Solutions
NCS	Natural Climate Solutions
NDC	Nationally Determined Contribution
NICFI	Norway's International Climate and Forest Initiative
NZBA	Net Zero Banking Alliance
ODA	Official Development Assistance
OTC	Over the Counter
PFSI	Permanent Forest Sink Initiative
REDD	Reduced Emissions from Deforestation and Degradation
RGGI	Regional Greenhouse Gas Initiative
SBTi	Science Based Targets Initiative
SDGs	Sustainable Development Goals
TFS	Tropical Forest Standard
TREES	The REDD+ Environmental Excellence Standard
UNFCCC	United Nations Framework Convention on Climate Change
VCM	Voluntary Carbon Markets
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit
WCC	Woodland Carbon Code
WWF	World Wildlife Fund

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STATE OF FOREST CARBON FINANCE IN 2021: AN OVERVIEW

It's been 30 years since Applied Energy Services teamed up with the World Resources Institute and the humanitarian aid organization CARE to pilot the first known use of carbon finance to slow climate change by saving forests.[1] That project, dubbed "Mi Bosque" ("My Forest"), reversed deforestation by helping Guatemalan farmers implement agroforestry practices that increased their yields and reduced the need to expand into forests. The project's carbon accounting was rudimentary by today's standards, but it launched a cycle of experimentation, adaptation, and negotiation that continues to this day.

The argument for deploying forest carbon finance is a simple one. A staggering 23% of all human-caused greenhouse gas (GHG) emissions still come from inefficient management and destructive use of the Earth's forests, farms, and fields,[2] and healthy forests sequester carbon dioxide by the gigaton in an extremely cost-effective manner. The financial flows and carbon accounting, however, can be complex.

This report, the latest in our State of Forest Carbon Finance series that began in 2009, provides an update on the three major categories of forest carbon finance: compliance offset markets, voluntary offset markets, and the rapidly evolving landscape of national and subnational REDD+ funding mechanisms (Box 1). Table 1 summarizes the types and amounts of forest carbon finance that Ecosystem Marketplace (EM) has identified for the 2017-2019 period and since it began reporting.

Table 1. Major Categories of Forest Carbon Finance, Value Transacted or Disbursed for 2017-2019 and All Years*

Type of Finance	Name of Finance	2017-2019	All Years
Market	Voluntary forest carbon offset transactions**	$397.2M	$1,393.6M
	Compliance forest carbon offsets***	$2,333.6M	$3,907.5M
Non-Market	Payments disbursed for REDD+****	$1,717M (of which $401M is results-based finance)	$1,935M (of which $619M is results-based finance)
Total		**$4,447.8M**	**$7,236.1M**

* Ecosystem Marketplace has been tracking forest carbon finance in these annual reports since 2009 but the data goes back as far as the early 2000s, when payments for forest-based emissions reductions were just beginning. "All years" refers to the total finance known to EM to date.

** Voluntary market figures capture market transactions, in which an offset can be re-sold multiple times before retirement.

*** This compliance market value includes Australia's Emissions Reduction Fund's payments for land-use offsets, worth an estimated $1.45B across all years. We counted this finance as market-based because contracts are awarded through a competitive auction; however, there is currently only one buyer: the government.

*** 2017-2019 compliance figures are based on issuances and average prices.

**** REDD+ program disbursements include payments into 2020 in most cases. See Table 6 for more detail.

[1] Steve Zwick, "REDD Dawn: the Birth of Forest Carbon," Ecosystem Marketplace, June 3, 2015, https://www.ecosystemmarketplace.com/articles/redd-dawn/

[2] V. Masson-Delmotte et al., Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, (Geneva: Intergovernmental Panel on Climate Change (IPCC), 2019). The IPCC found that roughly 13% of carbon dioxide (CO2), 44% of methane (CH4), and 81% of nitrous oxide (N2O) emissions from human activities globally during 2007–2016 were associated with Agriculture, Forestry and Other Land Use (AFOLU).

Box 1. Forest Carbon Finance: A Brief Summary

Categories of Forest Carbon Finance

Carbon markets transact quantified units known as carbon offsets (or "credits"),[3] which represent one metric ton of carbon dioxide emissions or its greenhouse gas (GHG) equivalent that has been reduced, avoided, or sequestered by an entity to compensate for emitting that ton elsewhere.

> ***Compliance offset markets*** are the result of government regulations to reduce GHG emissions, which set the rules for regulated entities to obtain and surrender offsets to meet regulatory targets. Offset buyers are entities with regulatory obligations. An example is California's cap-and-trade program.
>
> ***Voluntary offset markets*** refer to the collective global offset transactions that are not driven by regulatory obligations. Anyone can buy an offset: a local government, a company, an individual, a university, etc. No single "marketplace" exists, but rather a diverse and growing landscape of exchanges and over the counter (i.e., bilateral) transactions. Ecosystem Marketplace figures capture market transactions, an important distinction since a credit can be re-sold multiple times before retirement. Transactions are not the same as REDD+ program payments or issuances, which are the final offset project stage after third-party auditors have guaranteed a project has avoided or sequestered carbon dioxide or its equivalent.

REDD+ stands for Reducing Emissions from Deforestation and Forest Degradation plus conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries. It is a framework created by the United Nations Framework Convention on Climate Change (UNFCCC) – although many elements evolved first in the voluntary markets for implementing activities to reduce emissions from forests. These activities proceed in three main phases: 1) **Readiness,** including the development of national strategies, plans, policies, and measures, and capacity-building; 2) **Implementation** of those strategies, policies, plans, and measures, as well as ongoing capacity-building, demonstration, and technology development/transfer; and 3) **Results-based payments** contingent on verified emissions reductions. Funding for results-based payments has historically come primarily from developed-country governments and multilateral institutions, although project-based REDD+ offsets are also transacted in the voluntary markets to companies and other buyers, and private sector funding for REDD+ offsets is likely to increase in coming years.

Project-level vs. Jurisdictional Carbon Finance

Forest carbon finance flows from different sources with different goals. At the project level, payments are usually driven by an emitting entity's desire to reduce its own carbon footprint, either voluntarily or to meet a compliance obligation. The buyer purchases an offset or credit (measured in metric tons of carbon dioxide equivalent) from a project developer sold on a carbon market (referred to in this report as a "market-based" payment).

In an effort to scale up the mitigation potential of forest carbon and address the UNFCCC framework to ensure results, governments, and funding agencies have also been developing approaches at much larger geographic scales, called "jurisdictional" approaches. At the jurisdictional scale, payments have historically been driven by a donor country's desire to address deforestation and reduce global emissions, rather than a desire to reduce its own carbon footprint. For the most part, these payments have not been a part of market systems in which buyers "claim" emission reductions as their own. Such payments to date typically do not involve the creation of a tradable offset or credit and are considered "non-market-based" payments (even though they involve a performance component). These payments are referred to as "results-based payments" (Figure 1). They have tended to be between governments, resembling performance-based development assistance.[4] Independent standards bodies have also developed jurisdictional approaches to support a private-sector market.

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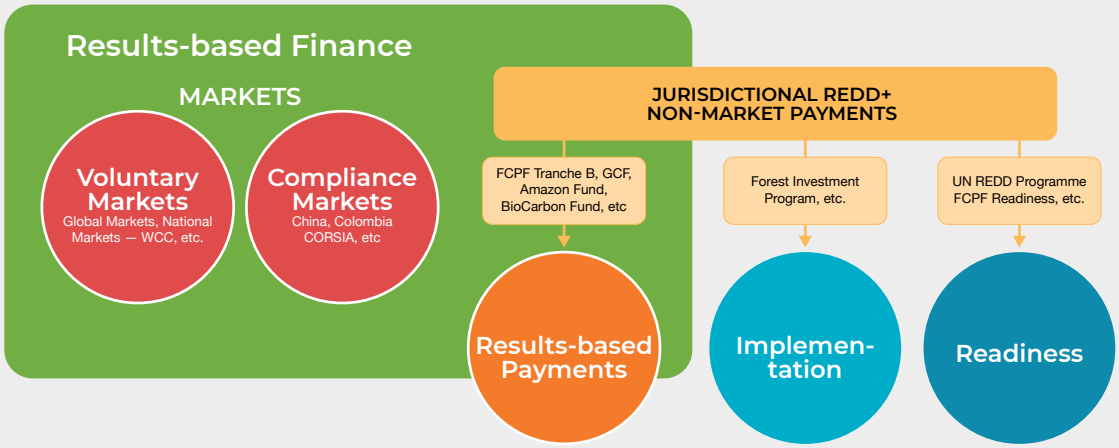
[3] In this report, the term "offset" when referring to a tradable carbon unit of a project or program is used interchangeably with the term "credit."

[4] Although some results-based payments, such as the Forest Carbon Partnership Facility's "Tranche A," are market-based.

When considering all types of forest carbon finance, most results-based finance has been market-based, while most of the disbursed public-sector funding to date has flowed into readiness activities.[5] That, however, might be changing as readiness funding gives way to results-based payments at the jurisdictional level – some market-based (such as FCPF Tranche A) and non-market based, and some introducing exciting new hybrid models that enable scaling and targeted finance. It should be noted that these jurisdictional REDD+ approaches are still being developed and credits are not yet available for sale in the market.

Figure 1. Landscape of Forest Carbon Finance Markets, Non-Market Payments, and Results-based Finance



Key Findings

Forest Carbon Finance: Current Status and Trends

- Between 2017 and 2019, EM tracked almost $400 million (M)[6] generated in global voluntary carbon market transactions through the buying and selling of 105 million metric tons of carbon credits (MtCO2e)[7] from forestry and land use. Voluntary carbon markets have generated nearly $1.4 billion (B) through 2019 in demand for forest carbon offsets.
- Yet these voluntary market transactions are less than half the value of compliance-driven forest carbon markets, which have driven more than $3.9B to forests and sustainable land use through 2019 through a growing number of national and subnational cap-and-trade programs.
- Additionally, EM identified at least $5.4B in REDD+ "Readiness, Implementation and Results-based Payments" funding committed through a number of Development Finance Institutions, of which more than $1.9B has already been disbursed to jurisdictions in developing countries.[8] Much of this funding through 2020 has been for Readiness, which has paved the way for new performance-based payments designed to roll back deforestation across entire jurisdictions, in part by targeting activities inside jurisdictions that support reducing deforestation. The Forest Carbon Partnership Facility Carbon Fund and the Green Climate Fund have recently signed more than $1B in results-based payments contracts for jurisdictional REDD+. The new LEAF Coalition, a public-private initiative backed by the Norwegian, United Kingdom (UK), and United States (US) governments and nine initial companies, has also pledged at least $1B for results-based jurisdictional REDD+.

[5] See summary figures in Table 1 and a detailed breakdown of REDD+ programs in Table 6 in this report.
[6] All currency in USD unless otherwise specified.
[7] MtCO2e refers to millions of metric tons of carbon dioxide equivalent throughout this report. A metric ton is also often referred to as a "tonne" in the literature.
[8] These figures at least partially overlap with broader funding committed to the Green Climate Fund ($17.8B) and Norway's International Climate and Forest Initiative ($1.6B) some of which supports REDD+ funding via DFIs.

Looking Ahead

- Forest carbon, particularly tropical forests, offers one of the most significant and cost-effective solutions for climate action in the coming decade. Research indicates that forests and other natural climate solutions (NCS) are capable of providing up to one-third of climate mitigation needed by 2030, yet receive less than 3% of climate mitigation funding.[9]
- But climate finance is catching on to this disparity: the volume of forest carbon finance has increased significantly since EM's last report in 2017. Meanwhile jurisdictional finance and funding for nested[10] projects are both expected to surge in the coming decade as the world seeks to reduce emissions and then achieve zero net emissions by 2050. The gap between the finance needed versus what is currently flowing remains massive, but it is beginning to narrow.
- The world is at an inflection point for jurisdictional REDD+, as Readiness investments made over the past decade by various funding mechanisms have set the stage for results-based payments arrangements and new public-private coalitions. But more needs to be done to address concerns that funding provided to governments through jurisdictional mechanisms reaches its intended targets, providing real benefits for forests and indigenous and local communities.
- Forest carbon credit prices will need to be much higher in order to unlock the supply needed to achieve Paris Agreement targets. Currently REDD+ credits sell for $3-$4 per ton in voluntary markets and $5 per ton in some compliance markets. The Emergent Forest Finance Facilitator offers a $10 floor price of Emergent. Yet recent analysis suggests that a global carbon price of $50-$100 per ton is needed by 2030 to achieve the Paris Agreement targets. EM finds evidence of increasing private financing to offset developers and jurisdictions. More broadly, the finance sector is playing an influential role by driving the transition to a net-zero economy, with knock-on benefits for forest carbon projects.
- Some in the environmental and business communities are concerned that a private-sector emphasis on removals (e.g., afforestation and reforestation projects) over reductions (e.g., avoided emissions via forest protections) could discourage a focus on stopping tropical deforestation, which currently generates five gigatons of GHG emissions every year, more than all the industries of either France or the UK. Looking ahead, the environmental community needs to do more to address conflicting advice regarding the legitimacy of reduction-based credits in order to increase confidence and reduce uncertainty that could inhibit private sector investment in REDD+.
- The potential of forests within Nationally Determined Contributions (NDCs) to meet Paris Agreement targets remains largely untapped. One potential pathway is through Article 6 of the Paris Agreement; analysis shows that integrating climate cooperation through carbon markets into Article 6 and including REDD+ could result in almost doubling emissions reductions for the same total cost as a non-cooperative scenario for NDCs. As of June 2021, draft Article 6 text indicates inclusion of REDD+ is certainly on the table.

Compliance Carbon Markets Highlights

- Forestry credits in the **California-Québec** offsets market surged with more than 83 MtCO2e of forest carbon issuances from 2017-2019, valued at almost $1.2B. However, a 2017 law to extend the cap-and-trade policy through 2030 included provisions that are expected to significantly reduce the use of forest carbon offsets in the years ahead.
- The **Chinese National Emissions Trading Scheme** (ETS) launched on February 1, 2021, instantly becoming the world's largest compliance market. Per year, it regulates 4,000 MtCO2e of China's total annual carbon emissions of 10,000 MtCO2e. Domestic forestry offsets are eligible, but likely to be a small component if allowance prices and renewable energy credit prices are low.
- The aviation industry's **Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)** pilot phase launched in 2021. Although some types of forestry offsets are barred or limited, jurisdictional REDD+ credits verified under the Architecture for REDD+ Transactions' The REDD+ Environmental Excellence Standard

[9] Bronsom Griscom, "How Nature can get us 37 Percent of the Way to the Paris Climate Target," Ecosystem Marketplace, October 19, 2017, https://www.ecosystemmarketplace.com/articles/nature-can-get-us-37-percent-way-paris-climate-target/

[10] Nesting enables the integration of project emission reductions into jurisdictional frameworks while avoiding double counting of emission reductions at different scales and will be discussed later in this report.

(TREES) and the Verified Carbon Standard's Jurisdictional and Nested REDD+ (VCS-JNR) are eligible, while Forest Carbon Partnership Facility credits are "conditionally eligible." This marks the first international compliance market to include REDD+, and sends a strong signal to the market regarding the potential opportunity of jurisdictional REDD+. However, given the impact of COVID-19 on aviation emissions, combined with a revised baseline year of 2019, most analysts expect offset demand during the 2021-2023 pilot phase will be negligible.

- **Colombia** was the first national compliance market to allow the use of REDD+ project-based credits (surrendered in lieu of its carbon tax), and REDD+ is now the predominant credit type in that market. As of January 2021, REDD+ credits comprised more than 97% of Verified Carbon Unit issuances from AFOLU projects in Colombia. As demand for credits exceeds supply, the price of REDD+ credits within the carbon tax offset regime has approached $5 per ton.
- The **South Korean** offsets program has established methodologies for afforestation, reforestation, and forest restoration, and has been piloting REDD+ initiatives. Through 2019, more than 10 million offsets have been registered in South Korea's Forest Carbon Registry, eligible for use in the Korean emissions trading systems, as well as for voluntary compliance. The South Korean system has been transitioning to allow more international credits since 2018. Beginning in 2021, there is no limit for international credits, potentially opening the door to REDD+ and other new project types.

Voluntary Carbon Markets Highlights

- Net-zero corporate commitments surged as more than 1,500 companies joined coalitions focused on climate action. The challenge going forward will be to translate those commitments into near-term action. It is yet to be determined how many of these commitments will rely on offsetting, let alone forest carbon offsets.
- Forestry and land-use credit transactions tracked by EM have grown significantly since 2016, peaking in 2018 at 51.1 MtCO2e, then dropping 28% to 36.7 MtCO2e in 2019.[11]
- Anecdotal evidence from 2020 indicates forest carbon credit transactions stalled in March and April 2020 due to the COVID-19 pandemic, but quickly rebounded. This mirrors global market dynamics in compliance systems.
- Despite lower volumes in 2019 relative to renewable energy, forestry and land-use credits remained by far the market leader in terms of value, with $159.1M transacted that year. The average global price for forestry and land-use offsets tracked by EM in 2019 was $4.33 per ton, an increase of 28% from 2018.
- The lines between voluntary and compliance markets continue to blur. Carbon credits increasingly have options to be sold in either voluntary or compliance markets. Compliance systems, such as Colombia and South Africa, accept forestry credits verified under the independent standards VCS and Gold Standard. CORSIA is also influencing this process, recognizing credits from what were once thought of as "voluntary" standards, including from jurisdictional approaches for REDD+.
- Carbon standards, such as VCS and Gold Standard, have begun to phase out their recognition of offsets generated through the provision of renewable energy. This could drive greater demand for forestry credits.
- VCS expanded market share, accounting for almost 90% of forestry and land-use offsets transacted in 2019, reflecting further consolidation.
- Latin America maintained its place in 2019 as the region from which the most forestry and land-use credits transacted originated, accounting for 38% of market share.
- Recent analysis by EM of six registries showed that forestry offsets (as a category) led both issuances and retirements in Quarter 1 (Q1) 2021 with 20M offsets retired and 24.9M issued, approximately half the total of all issuances and retirements during that period. Notably, demand for forestry credits is rapidly closing the gap with supply (i.e., issuances). Forestry offset retirements more than doubled in Q1 2021 compared to Q1 2020 and more than quadrupled compared to Q1 2019.

[11] The process of collecting 2020 voluntary markets data had only just begun at the time of publication of this report. Ecosystem Marketplace recently upgraded its data collection process and will begin sharing data via an online platform on a more frequent basis with more rapid turnaround times.

Jurisdictional REDD+ Funding Mechanisms

- Donor emphasis on REDD+ Readiness programs, although still necessary in many cases, is beginning to shift to results-based payments. To date, the Green Climate Fund has approved $496.75M in REDD+ results-based payments to Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Indonesia, and Paraguay. The FCPF Carbon Fund has signed more than $668M in Emission Reduction Payment Agreements (ERPAs) as of April 2021.
- Results-based payments are increasingly intertwined with market-based approaches. For example, FCPF is pursuing acceptance of its REDD+ credits within the CORSIA market (and VCS JNR and ART-TREES already accepted). Under Tranche A of the FCPF Carbon Fund (~5% of total funding), emission reductions can transfer to the buyers and are therefore considered a market-based transaction.
- The supply of REDD+ credits is positioned to evolve from projects driven by private investments to a mix that includes jurisdictional scale credits driven by public investments in coordination with the private sector. Jurisdictional REDD+ credits are moving closer to becoming available in the market. VCS-JNR has released its Version 4 in April 2021 and TREES will release an update by mid-2021.
- The LEAF Coalition, announced on Earth Day 2021, is a milestone for private-sector participation in jurisdictional REDD+. With the initial support of the governments of the US, UK, Norway, and nine companies, the LEAF coalition has an initial $1B commitment to pay for 100M tons at a minimum price of $10 per ton. The Emergent Forest Finance Accelerator will provide the platform and coordinate LEAF. LEAF's goals are aligned with the Green Gigaton Challenge (GGC), which aims to secure public and private commitments to transact one gigaton of REDD+ emissions reductions annually by 2025.

Sustainable Sourcing

- Despite the clear link between deforestation and climate change, and the financial risk posed by these issues, just 6% of companies researched by EM and its counterpart Forest Trends initiative, *Supply Change*, have integrated emissions reduction strategies with their deforestation commitments.

Structure of this Report

For fifteen years, Forest Trends' EM has tracked the innovative mechanisms and markets that direct finance towards improving forests and natural landscapes' ability to reduce emissions and sequester carbon from the atmosphere. This report, the first since 2017, begins with a brief overview of the evolution of forest carbon finance. As in previous work, this report then dives deeper into the data and trends of three established forest carbon finance mechanisms: compliance carbon markets, voluntary carbon markets, and funding mechanisms for REDD+ programs. For the market-based transactions, EM documents volumes and values of offsets transacted, providing updated figures through 2019 for voluntary markets, and through 2020 for compliance markets. The report then examines non-market jurisdictional approaches to REDD+, with a particular focus on the status of four evolving jurisdictional REDD+ standards. Given the important role of commodity agriculture as the main driver of deforestation and the rise of corporate commitments to address that challenge, a new section has been added entitled "Corporate Engagement: from Credits to Sustainable Sourcing." The "Looking Ahead" section concludes by focusing on emerging issues and trends and anticipated developments in the coming year.

Box 2. Scope and Methodology

This report aims to provide information about the current state of global finance for sequestering carbon or reducing and avoiding GHG emissions from forestry and land-use activities. Within this report, "forestry" and "forestry and land-use" are used interchangeably; "forest carbon," also refers to broader "land-use carbon."

Forestry and land-use carbon projects include both forestry projects (e.g., tree-planting, avoided deforestation, improved forest management) and other land-use projects that increase carbon sequestration in non-forest landscapes, including wetlands, grasslands, agriculture, etc. Specifically for voluntary markets, EM tracked the following types of projects and programs: afforestation/reforestation, agro-forestry, grassland/rangeland management, improved forest management, regenerative agriculture, REDD+ (both avoided planned deforestation and avoided unplanned deforestation), urban forestry, and wetland restoration/management.

Data and information were collected through a combination of desk research, interviews with professionals in the field, and surveys to forest carbon project developers and intermediary organizations that buy and sell forest carbon offsets. For more information about scope and methodology, please refer to Appendix 2.

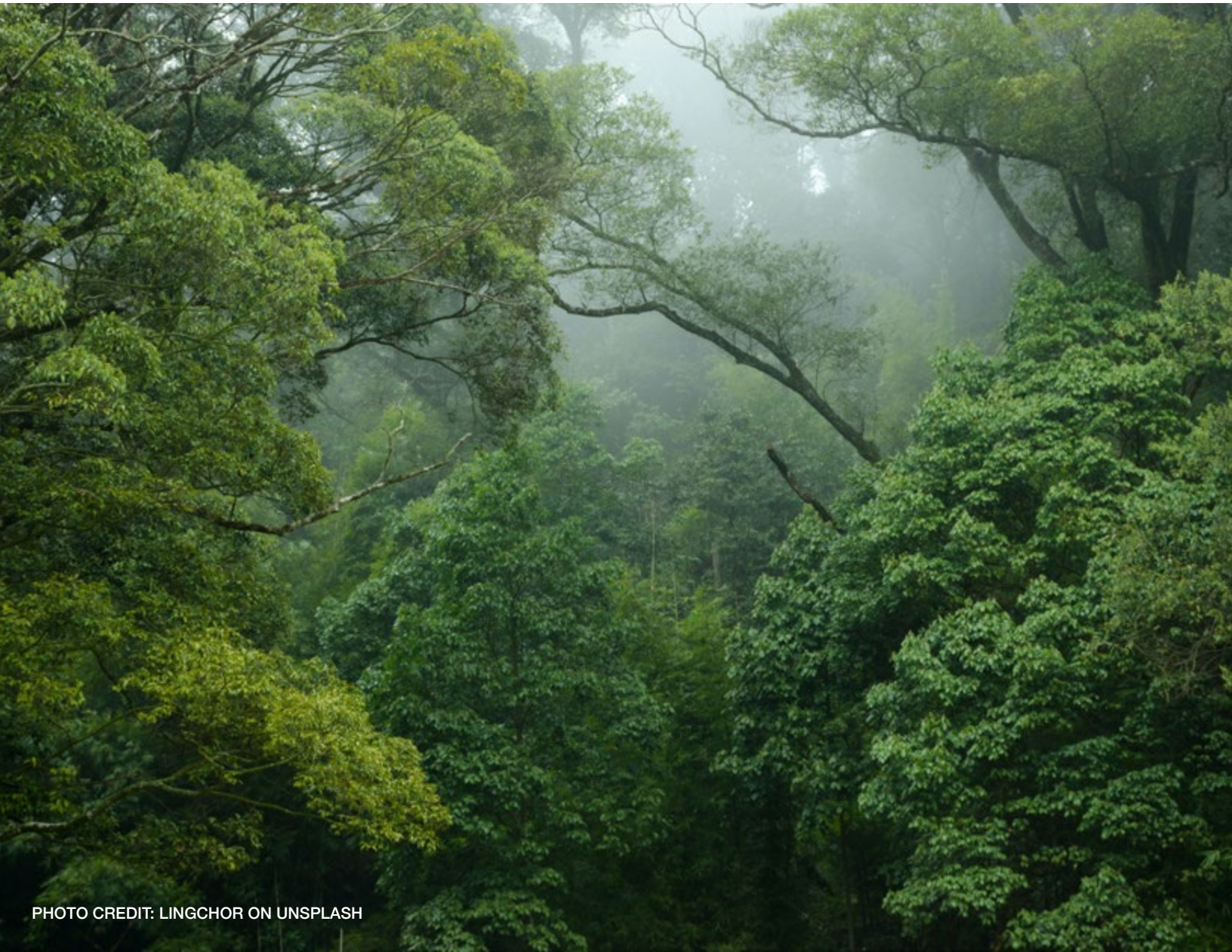


PHOTO CREDIT: LINGCHOR ON UNSPLASH

THE EVOLUTION OF FOREST CARBON FINANCE

Early Science, the Kyoto Protocol, & Forest Carbon in Voluntary Markets

The science behind forest carbon dates to the late 1800s, when Norwegian scientist Svante Arrhenius first identified the "hothouse effect" that excess carbon dioxide (CO_2) causes. It accelerated in the 1960s, when US scientist Charles Keeling charted the seasonal fluctuations in atmospheric CO_2 associated with northern forests, which have been central to IPCC reports since their inception in 1990.

Despite deforestation's significant contribution to GHG concentrations, forest conservation was not recognized under the Kyoto Protocol's Clean Development Mechanism (CDM), which focused almost exclusively on reducing fossil fuel emissions by supporting individual development projects. Within the forestry and land-use sector, only afforestation/reforestation projects were recognized under Kyoto, but implemented on very limited scale.

As a result, activities designed to reduce forest loss through "avoided deforestation" took place in voluntary markets using methodologies developed under emerging independent standards. Some of these projects began as conservation initiatives that used REDD+ as a more reliable income stream than traditional philanthropy, while others were initiated in response to REDD+ to address specific drivers of deforestation. All used a blend of land-use modeling and recent history to quantify the risk of deforestation and forest degradation and develop strategies for addressing them. Carbon offsets were generated based on the anticipated reduction in deforestation subject to a deduction for "leakage," (i.e., deforestation activities that potentially shifted elsewhere as a consequence of the project activities). Forest carbon offsets are also expected to be additional, meaning they would not result from "business as usual" activities, and "permanent," meaning credited carbon stocks would remain intact for a minimum predefined number of years.

The Seeds of Jurisdictional REDD+ & "Nesting"

In 2005, at year-end climate talks in Montreal (COP11), Papua New Guinea and Costa Rica formally introduced the creation of jurisdictional finance for avoided deforestation into the UNFCCC agenda under the acronym "RED" for "Reducing Emissions from Deforestation." This was expanded to include avoided degradation (the second 'D'). Conservation, afforestation, reforestation, and other enhancement activities (the "+") were added at subsequent talks in Nairobi and Bali.[12]

As the UNFCCC moved towards a jurisdictional approach, project developers were designing projects with an eye on eventually "nesting" their projects in broader jurisdictional programs,[13,14] although this remained theoretical until quite recently.

[12] Steve Zwick, "Forests in the Paris Climate Agreement, Parts 1, 2, and 3," Bionic Planet podcast, 2019, https://bionic-planet.com/episodes/049-or-forests-in-the-paris-climate-agreement-s1!55961; https://bionic-planet.com/episodes/050or-forests-in-the-paris-climate-agreement-part-s1!62e2e, and https://bionic-planet.com/episodes/051-or-forests-in-the-paris-agreement-part-3-a-s1!0fa0a

[13] Simeon Tegel, "Peruvians Hope Nested Approach Today Will Halt Deforestation Tomorrow," Ecosystem Marketplace, August 11, 2010, https://www.ecosystemmarketplace.com/articles/peruvians-hope-nested-approach-today-will-halt-deforestation-tomorrow/

[14] C. Streck et al., Nested Approaches to REDD+: an Overview of Issues and Options, (Amsterdam: Climate Focus; Washington, DC: Forest Trends, 2011), www.forest-trends.org/wp-content/uploads/imported/nested-redd-briefing_final-draft_2-may-11_rev-pdf.

The Warsaw Framework for Jurisdictional Finance

In 2013, negotiators agreed on the Warsaw Framework for REDD+. Also called the "REDD Rulebook," the framework is a collection of seven decisions[15] that define the criteria a developing country must meet to qualify for results-based finance. Briefly, these decisions set expectations on: national action plans; governance and institutional arrangements; national forest monitoring systems; reporting on REDD+ safeguards; forest reference emission levels; measuring, reporting and verifying forest-related emissions; and addressing the drivers of deforestation and forest degradation.[16]

The Rulebook formalized a sequential, three-phased approach to implementing REDD+ that had been evolving within the World Bank and other multilateral efforts:

- **Phase One:** Developing countries receive "readiness" funding to build up forest accounting and governing structures that can handle results-based payments
- **Phase Two:** Developing countries receive investments to demonstrate policies and actions targeted to reduce emissions and enhance removals from REDD+
- **Phase Three:** Developing countries qualify for results-based payments tied to achieving emission reductions from REDD+

Figure 2: The Three Phases of REDD+ Finance[17]

The Paris Agreement: Articles 5 & 6

In 2015, REDD+ formally became part of Articles 5 of the Paris Agreement, with Article 5 recognizing the need to conserve forests. Article 6 recognizes the validity of "Internationally-Transferred Mitigation Outcomes" (ITMOs).[18] Article 6 is the only article in the Paris Agreement for which Parties have not yet agreed the rules. If agreed at COP26 in November 2021, it could serve as a basis for carbon trading between Parties or private entities within the jurisdiction of the Parties.

Emissions from international aviation (see CORSIA, pg. 22) and international shipping were dealt with outside of the Paris Agreement framework.

Developments Since 2017

Since the last *State of Forest Carbon Finance Report*, a spate of new initiatives and reports have brought forest carbon into focus for a broader public, beginning with the 2017 paper entitled "Natural Climate Solutions (NCS)."[19] Published on the eve of global climate talks in Bonn, the paper showed that NCS could potentially deliver around one-third of the mitigation needed to meet the Paris Agreement's primary target of limiting global warming to 2°C (3.6°F)

[15] UNFCCC, "Warsaw Framework for REDD-plus" Accessed at https://unfccc.int/topics/land-use/resources/warsaw-framework-for-redd-plus
[16] Steve Zwick, "Unpacking Warsaw, Part One: The Institutional Arrangements," Ecosystem Marketplace, November 26, 2013, https://www.ecosystemmarketplace.com/articles/em-unpacking-warsaw-part-one-em-the-institutional-arrangements/
[17] Beatriz Granziera, Hamrick K., Comstock, M., Eligibility Requirements for REDD+ Standards and Financing, April 2021.
[18] Steve Zwick, "REDD+ in the Paris Climate Accord: a Summary," Ecosystem Marketplace, December 15, 2015, https://www.ecosystemmarketplace.com/articles/redd-in-the-paris-climate-accord-a-summary/
[19] Bronsom Griscom, "How Nature can get us 37 Percent of the Way to the Paris Climate Target," Ecosystem Marketplace, October 19, 2017, https://www.ecosystemmarketplace.com/articles/nature-can-get-us-37-percent-way-paris-climate-target/

above preindustrial levels. The paper spurred a campaign designed to raise awareness around the ways nature can be used to reduce and reverse GHG emissions from Agriculture, Forestry, and Other Land Use (AFOLU).

A year later, the Intergovernmental Panel on Climate Change (IPCC) built support around the Paris Agreement's more ambitious limit of 1.5°C (2.7 °F), which requires net-zero emissions by 2050 and a roughly 50% reduction in emissions by 2030. This translates into a clear global interim target of 28B tons less CO2e annually within ten years.[20]

In 2019, the IPCC published its "Special Report on Climate and Lands," which made clear the need to immediately end deforestation while, over the longer term, reviving lost forests.[21]

The Public-Sector Response

Countries' commitments under the Paris Agreement, known as Nationally Determined Contributions (NDCs), define their priorities and approach to addressing climate change. An analysis of the initial round of NDC submissions determined that although 137 out of 165 NDCs referred to forests, only 45 included quantitative targets for forest mitigation or adaptation, and that the potential of forests to address climate change was still largely untapped.[22,23] The Paris Agreement includes an expectation of increasing ambition amongst the signatory countries, to be reflected in regular updates to their NDCs. However, of 130 countries that promised to submit updated NDCs for 2020, only 70 countries (including the 27 EU member states and the UK) submitted updated national contributions by 31 December 2020, and 81 countries as of May 2, 2021.[24] A WWF analysis of the 12 countries that had submitted updated NDCs as of August 2020 found that ten out of 12 improved with respect to forestry. However the same analysis found that details were lacking on implementation. The WWF study offers a framework for improved NDCs covering five key areas and underlying criteria, with specific examples for the forest sector.[25] Another tool, the NCS World Atlas, displays the emissions reduction potential of various NCS at the national level, and enables users to filter for specific NCS actions within NDCs and see the NCS mitigation potential at national and global levels.

The Private-Sector Response

Sustainability has moved to the top of business agendas, with corporate net-zero and carbon neutral commitments increasing by the week. Initiatives such as the Natural Climate Solutions Alliance,[26] hosted by the World Economic Forum and the World Business Council for Sustainable Development, bring together public, private, and civil society stakeholders to unlock large-scale carbon finance for NCS credits, sending a strong price signal to suppliers. IETA's Markets for Natural Climate Solutions[27] is a private-sector led initiative working to maximize investment in forests and other natural systems to manage land-use emissions and harness the power of NCS to play the fullest role possible in meeting Paris Agreement targets.

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[20] V. Masson-Delmotte et al., Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, (Geneva: Intergovernmental Panel on Climate Change (IPCC), 2019), https://www.ipcc.ch/sr15/

[21] ibid.

[22] "Increasing ambition and action on NDCs through Forest Landscape Restoration (FLR)," International Union for Conservation of Nature (IUCN), 2018, https://www.iucn.org/theme/forests/our-work/forest-landscape-restoration/increasing-ambition-action-ndcs-through-flr

[23] Haseeb, Bakhtary et al., #NDCsWeWant: Enhancing Forest Targets and Measures in Nationally Determined Contributions (NDCs), (WWF Forest and Climate, WWF International Forest Practice, November 2020), https://wwf.panda.org/discover/our_focus/forests_practice/?1064466/NDCsWeWant-Enhancing-forest-targets-and-measures-in-Nationally-Determined-Contributions-NDCs

[24] For current status, see WRI's ClimateWatch: https://www.climatewatchdata.org/2020-ndc-tracker

[25] Haseeb, Bakhtary et al., #NDCsWeWant: Enhancing Forest Targets and Measures in Nationally Determined Contributions (NDCs), (WWF Forest and Climate, WWF International Forest Practice, November 2020), https://wwf.panda.org/discover/our_focus/forests_practice/?1064466/NDCsWeWant-Enhancing-forest-targets-and-measures-in-Nationally-Determined-Contributions-NDCs

[26] See Natural Climate Solutions Alliance: https://www.weforum.org/natural-climate-solutions-alliance

[27] See Markets for Natural Climate Solutions: https://ncs.ieta.org/

Net-zero commitments have surged as more than 1,500 companies have joined coalitions focused on climate action and pledged to reduce their own GHG emissions by 2050, sometimes as early as 2020.[28] In carbon markets, demand for NCS-based credits has grown significantly despite the COVID-19 pandemic, as reflected in EM's annual State of Voluntary Carbon Markets (SOVCM) reports.[29] Meanwhile some companies have made significant progress towards eliminating deforestation from their agricultural supply chains, even as overall deforestation rates increased.[30] While impressive, the response is still insufficient and fragmented and has a long way to go to achieve the scale needed to meet the climate challenge.

Seeing the accelerating pace of climate commitments emerging from the private-sector and sensing the need to scale the carbon markets to meet the growing demand, the Taskforce on Scaling Voluntary Carbon Markets, a private-sector initiative with members representing buyers and sellers of credits, the finance sector and market infrastructure providers, has defined several bottlenecks to address.[31] Six key topics were identified, including the need for core carbon principles, improved market infrastructure, and reference contracts to drive liquidity. This all needs to be achieved while still recognizing the importance of the co-benefits that many forestry projects offer, driving prices for high quality projects on exchanges and over the counter markets. The Taskforce estimates that voluntary carbon markets may grow up to 15-fold by 2030.

How Higher Prices & Finance are Needed to Support Scale

To meet this demand, particularly from high quality forestry credits, prices will need to rise. Although many factors influence supply, there is evidence that increased prices for forest carbon can drive the supply needed to take voluntary carbon markets to scale. Research by Busch et al. (2019)[32] estimated that at a price of $20 per metric ton, forest carbon supply of 61B tons could be attainable over the next 30 years. At $20 per ton, an estimated 5.7B tons from reforestation and 55.1B tons from avoided deforestation would become available. At a cost of $50 per ton, it's estimated forest carbon could increase 123B tons (of which 15.1B tons would come from reforestation and 108.3B tons from avoided deforestation). But cost-effectiveness and composition of offsets varies widely by country. In 21 countries, 17 of which are in Africa, reforestation offers more low-cost abatement than avoided deforestation. Additional analysis, partly building on the Busch et al. (2019) study, looked at the mitigation potential of a broader range of NCS, and filtered outcomes for their "practical potential," taking economic feasibility, amongst other factors into account. The result was a practical abatement potential of 6.7 GtCO2e per year by 2030, of which 3.6 GtCO2e per year came from avoided deforestation and peatland impact and 1 GtCO2e per year from reforestation. Costs ranged by country, but in most cases were between $10 and $40 per ton.[33]

In many cases, forest carbon projects and programs must operate for years before credits can be verified and sold, making up-front financing necessary to support these efforts. On the one hand, there has been a shortage of financing for climate solutions in general, especially NCS offsets. In particular, high expectations of private-sector finance for REDD+ have not been met in reality. This reflects a broader climate finance gap: a recent survey by Standard Chartered Bank of senior business leaders and investors found that companies are investing approximately 2% of annual turnover towards a net-zero transition, and 97% of those respondents believe that will need to increase. But there are signs that the winds are changing. Asset managers with $37 trillion in assets under management (36%

[28] Data-Driven EnviroLab & NewClimate Institute, Accelerating Net Zero Exploring Cities, Regions, and Companies' Pledges to Decarbonise, September 2020, http://datadrivenlab.org/wp-content/uploads/2020/09/Accelerating_Net_Zero_Report_Sept2020.pdf

[29] "Ecosystem Marketplace Carbon Hub," Ecosystem Marketplace, https://www.ecosystemmarketplace.com/carbon-markets/

[30] Steve Zwick, "Natural Forests Still In Decline Despite Global Coordination Behind New York Declaration On Forests," Ecosystem Marketplace, 2018, https://www.ecosystemmarketplace.com/articles/natural-forests-still-in-decline-despite-global-coordination-behind-new-york-declaration-on-forests/

[31] Institute of International Finance, "Taskforce on Scaling Voluntary Carbon Markets, Final Report," January 2021

[32] Jonah Busch et al., "Potential for low-cost carbon dioxide removal through tropical reforestation," Nature Climate Change, 9 (2019), 463–466, https://doi.org/10.1038/s41558-019-0485-x

[33] It is worth noting that the two countries with highest forestry NCS potential, Brazil and Indonesia, appear to have cost per ton estimates of approximately $35 and $50 respectively. World Economic Forum and McKinsey & Company, Nature and Net Zero, (Cologny, Switzerland: World Economic Forum, January 25, 2021), http://www3.weforum.org/docs/WEF_Consultation_Nature_and_Net_Zero_2021.pdf.

of global total) have endorsed net-zero climate pledges, supporting investments aligned with achieving net-zero emissions by 2050 or sooner.[34] Signatories also pledged to prioritize emission reductions in companies in which they invest. If offsets are part of the net-zero strategy, investors will push companies to invest in long-term carbon sinks, meaning afforestation and reforestation projects will be acceptable, but not forest conservation (currently).

Other financial intermediaries are beginning to enter the offset markets at scale. JPMorgan Chase plans to target $1 trillion for green initiatives like renewable energy and clean technologies over the next ten years. HSBC Pollination Climate Asset Management aims to launch a carbon credit fund of up to $600M in 2021 that will only invest in nature-based projects.

On the non-market side, upfront finance is likewise crucial if forest countries are to exceed their NDC targets related to forests and land use, and thereby generate surplus REDD+ credits that could be sold to private and public buyers. Forest Trends has elsewhere argued that a massive demand signal for REDD+ from the international community, on the order of the Green Gigaton Challenge, can help to unlock upfront capital investment in NCS, as well as to give forest countries the fiscal space and confidence to implement more ambitious strategies.[35] As detailed earlier in this report, signs of increased demand for results-based REDD+ suggest that there are reasons for cautious optimism.

[34] "Net Zero Asset Managers Initiative," accessed 2021, https://www.netzeroassetmanagers.org/

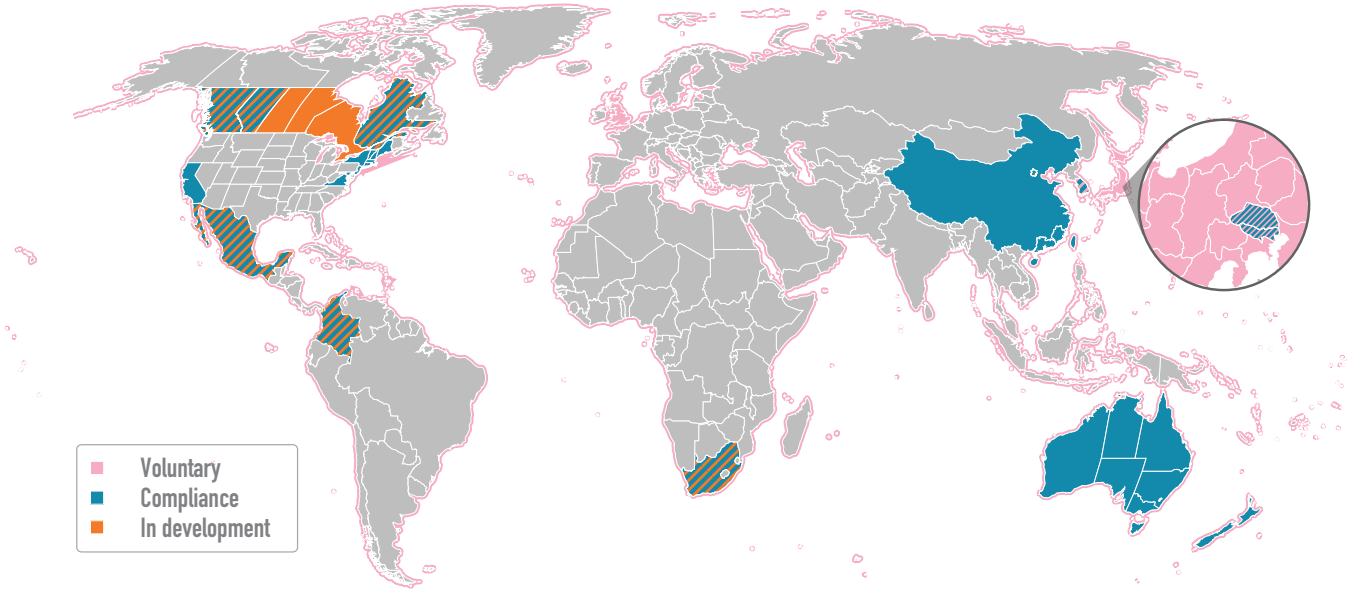
[35] Rupert Edwards. A Gigaton REDD+ Bid Strategy. Washington DC: Forest Trends Association, 2020. https://www.forest-trends.org/publications/a-gigaton-redd-bid-strategy/

FOREST CARBON IN OFFSET MARKETS

This section reviews national and subnational government-driven markets for forest carbon offsets, both compliance and voluntary systems. Compliance markets, for the most part, only accept "domestic" credits developed in that jurisdiction, unless otherwise noted. Emerging compliance markets that aim to permit trading of forest carbon offsets are also discussed. Many compliance markets, such as the EU Emission Trading System, do not allow forest carbon offsets[36] and are therefore not covered in this report.

Government-driven compliance and voluntary markets are a significant source of forest carbon funding. Compliance programs in California, New Zealand, Australia, and Colombia, as well as several smaller scale national and subnational schemes, drive hundreds of millions of dollars to forest carbon projects each year. Table 2 and Figures 4 and 5 show the volume and value of forest carbon offset issuances in compliance programs from 2017 to 2019. Newly launched compliance markets with forest carbon opportunities in China and CORSIA, as well as forthcoming national compliance systems in South Africa, Mexico, and Canada, offer the potential for even greater forest carbon offset market transactions, although China may well be limited by allowance prices and low renewable energy credit prices and CORSIA demand is expected to be negligible in the 2021-2023 pilot phase given the impact of COVID-19 on aviation emissions.

Figure 3. Map of Policy Programs that Include Forestry and/or Land-Use Offsets



[36] EU ETS does not allow any offset project types starting in 2021.

Table 2. Forest Carbon Offsets in National and Sub-national Markets, by Issuance, Price, and Value, 2017-2019

Market	Forest Carbon Issuances MtCO2e			Avg Price / tCO2e			Value ($M)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
COMPLIANCE — NATIONAL									
New Zealand ETS	9.45	11.7	17.2	$15.81	$20.04	$21.74	$149.4	$234.5	$373.9
Australian Emissions Reduction Fund	9.17	8.54	10.7	$7.63	$9.08	$9.98	$69.9	$77.5	$106.8
Colombian Carbon Tax	1.8	9.4	6.6	$5	$5.6	$5.17	$9	$52	$34.1
Korean ETS	1.4	1	0.6	N/A	N/A	N/A	UNKNOWN	UNKNOWN	UNKNOWN
COMPLIANCE — REGIONAL									
California – Quebec ETS	23.6	42.1	17.6	~$13	~$14.5	~$15.5	~$309	~$610	~$273
Alberta ETS	0.78	0.75	0.71	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE
British ETS	0.44	0.46	0.47	$8.42	$9.18	$8.77	$3.7	$4.2	$4.1
China Sub-national Programs	<1	<1	<1	~$7.5	~$7.5	~$7.5	~$7.5	~$7.5	~$7.5
VOLUNTARY— NATIONAL									
United Kingdom Woodlands Program	2.38	1.79	2.33	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE	CANNOT DISCLOSE

Figure 4. Value of Forest Carbon Issuances (National and Subnational Markets)

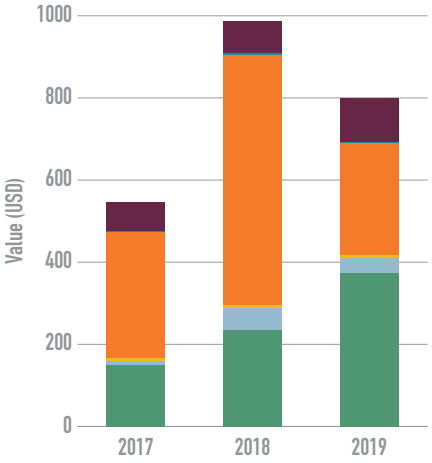
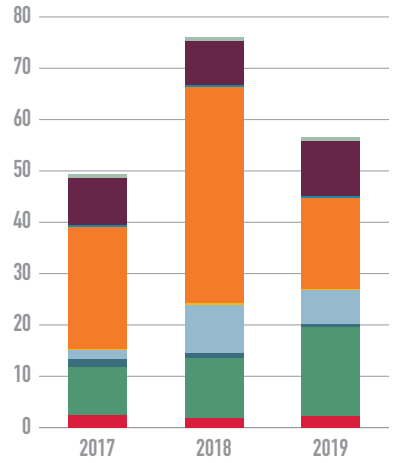


Figure 5. Volume of Forest Carbon Issuances (National and Subnational Markets)



Note:These graphs exclude markets for which forest volume/value data could not be identified.

Compliance Offset Markets

Alberta Cap-and-Trade System COMPLIANCE

The province of Alberta, Canada established an emissions reduction policy in 2007 that regulates GHG emissions from large operations. Regulated entities may fulfill up to 60% of their compliance obligations by purchasing carbon offsets. The 2020 price of carbon allowances in Alberta's cap-and-trade system is approximately $30 CAD per metric ton ($23 USD)[37] and increased to $40 CAD on 1 April 2021. The Alberta offset system has accepted a wide variety of offset protocols, including agricultural conservation cropping and tillage system management. Approximately 64MtCO2e offsets have been issued into the Alberta offset system to date. This includes 17.8 MtCO2e of forestry and agriculture related offsets, of which approximately 16.8 MtCO2e have been retired. The vast majority of forestry and agricultural offsets in the Alberta system have been issued to tillage system management (57%) and conservation cropping (30%). Less than 1 MtCO2e of forest carbon credits were issued per year between 2017 and 2019 (Table 2).

British Columbia Carbon Neutral Government Regulation COMPLIANCE

British Columbia, Canada has implemented a carbon tax ($40 CAD of 1 April 2021), as well as an ETS which allows forest offset credits. In the British Columbian ETS system, offsets are purchased by the provincial government to comply with their Carbon Neutral Government Regulation, which requires that emissions from government operations be measured and offset.[38] The program allows offsets to be generated through forestry, agriculture, fuel switching, and waste management. The majority of British Columbia's offset portfolio (70%) is comprised of forest carbon offsets. 1.38 MtCO2e of forest carbon offsets have been purchased by the provincial government between 2017 and 2019 at an average price of CAD $11-12 (USD $8.5-9.5 USD) per metric ton. Version 2.0 of BC's Forest Carbon Offset Protocol was out for public consultation (until 31 May 2021) and proposes some significant changes which may reduce the volume of forest credits. The final protocol will be released in Q4 2021.

Québec Cap-and-Trade System COMPLIANCE

The province of Québec, Canada's cap-and-trade system established a linkage with the California cap-and-trade system and associated offset market, effective January 2014. Emissions allowances issued in the Québec and California cap-and-trade markets can be used by companies in either jurisdiction. Similarly, carbon offsets eligible for compliance in the California cap-and-trade system may also be used for compliance in the Québec system. Companies in the Québec cap-and-trade system have retired 4.9M tons of forest carbon offsets for regulatory compliance. The Québec system also maintains a separate compliance offset system that entities regulated in the Québec cap-and-trade system may use but is not part of the California market. No forestry or land-use protocols have been integrated into the Québec-exclusive offset market to date; however a protocol for afforestation and reforestation projects is currently being developed for use in the program.

The province of Ontario briefly linked itself to the California and Québec cap-and-trade systems in 2017, before terminating the policy in 2018.[39]

[37] "Alberta Emission Offset System," Alberta Climate Implementation and Compliance, accessed Mary 25, 2021, https://www.alberta.ca/alberta-emission-offset-system.asp

[38] British Columbia Offset Portfolio," British Columbia Climate Investment Branch, accessed May 25, 2021, https://www2.gov.bc.ca/gov/content/environment/climate-change/public-sector/offset-portfolio#:~:text=B.C.'s%20carbon%20offset%20portfolio,growth%20and%20stimulates%20the%20economy.

[39] D. Hajjaji, "Canada's Ontario Government Scraps Cap-and-Trade Program," Reuters, July 3, 2018, www.reuters.com/article/canada-us-canada-politics-ontario-idCAKBN1JT234-OCADN

California Compliance Market COMPLIANCE

California's cap-and-trade policy is a key component of the state's strategy to achieve carbon neutrality and carbon emission-free energy by 2045.[40] The cap-and-trade system, which was recently approved to extend to 2030 with support from more than two-thirds of the state legislature, allows for carbon offsets to be used to fulfill a portion of regulated entities' compliance obligations. Regulated entities, including oil and gas companies, manufacturers, and public and private utilities, may use carbon offsets to fulfill up to 4% of their total compliance obligation. This offset provision allows companies to reduce their cap-and-trade compliance costs by purchasing carbon offsets in the private market, rather than emissions allowances in quarterly public auctions.

US forest and urban forest offsets are accepted as compliance units. Since the launch of California's cap-and-trade program in 2013, more than 168 MtCO2e forest carbon offsets have been issued for compliance use (mostly Improved Forest Management), and approximately 62 MtCO2e forest carbon offsets have been retired. Approximately five million acres of forested land in the US have been enrolled in the California carbon offset program: equal to roughly 1% of all privately owned forest land in the country.[41] However, a 2017 law to extend the cap-and-trade policy through 2030 included provisions that are expected to significantly reduce the use of forest carbon offsets in the compliance program. The law requires that 50% of offsets used for compliance in the 2021-2025 period demonstrate direct environmental benefits to California. This direct environmental benefits provision (DEBS) recognizes that if a forestry project is located within the state of California, it is automatically considered to provide DEBS, but requires that forest carbon projects located outside of the state of California submit an application for DEBS designation. As of March 2021, only two forest carbon projects located outside of California have been awarded this designation: the Klamath West Improved Forest Management Project in Oregon and the Spokane Tribe of Indians Improved Forest Management Project in Washington state.[42,43]

The 2017 law also establishes that from 2021-2025, companies may fulfill up to 4% of their compliance obligation through carbon offsets (down from 8% in the previous period). After 2025, this ceiling increases to 6%.

In 2019, the California Air Resources Board (CARB) endorsed the Tropical Forest Standard protocol (see Jurisdictional Standards, pg. 44), which, if accepted into the cap-and-trade system, would allow offset credits to be developed through jurisdiction-scale programs to reduce deforestation in tropical forests. If the TFS is formally adopted by the CARB and implementing regulations are approved, REDD+ programs verified with the TFS would be eligible to transfer credits into linked emissions trading systems.

Offsets in the California cap-and-trade system typically transact for 5-20% less than emissions allowances sold at auction. Allowance prices reached $18 per ton in 2019,[44] typically ranging from $14-$17 per ton, depending on vintage year and invalidation designation. The length of the invalidation period (the number of years after offset issuance in which an offset can be invalidated by the CARB if found to be insufficient) has a significant impact of offset prices and buyer behavior. Offsets are typically issued with an eight-year invalidation period, meaning that the CARB may invalidate the offset at any point within eight years of issuance. This can be reduced to three years by meeting project reverification criteria. Although offset invalidation is exceedingly rare in the California offset market,[45] concerns about invalidation risk have a major effect on buyer behavior. This is because the financial and compliance risk of offset invalidation falls on the buyer. If the invalidated offset has already been retired for compliance use, the regulated company must replace the invalidated offset with an appropriate allowance, a new offset, or pay a significant fine for non-compliance.

[40] H. Harvey et al., "California Climate Policy," Energy Innovation LLC, accessed May 25, 2021, https://energyinnovation.org/policy-programs/california-climate-policy/

[41] Estimated based on forest carbon registry records

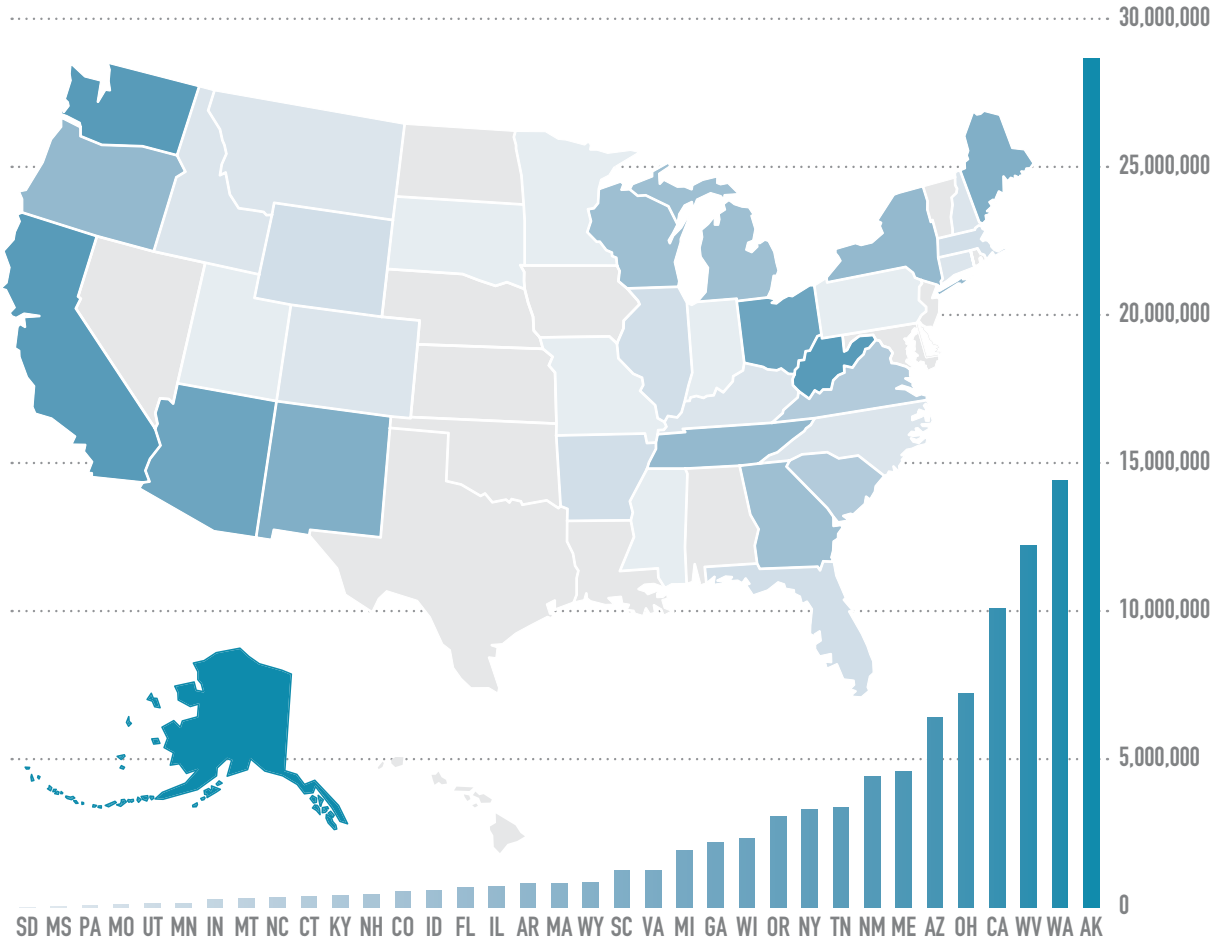
[42] The California Compliance Offset Protocol Task Force made recommendations, including a subgroup on forestry, in March 2021.

[43] California Compliance Offset Protocol Taskforce, "Chapter Four," Final Recommendations, March 2, 2021, https://ww2.arb.ca.gov/sites/default/files/2021-03/offsets_task_force_final_report_030221.pdf

[44] "Summary of California-Quebec Joint Auction Settlement Prices and Results," California Air Resources Board, 2020, https://ww2.arb.ca.gov/sites/default/files/2020-08/results_summary.pdf

[45] "Offset Credit Invalidation," California Air Resources Board, accessed May 25, 2021, https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-credit-invalidation

Figure 6. California Forest Carbon Issuances by Project Location



Source: Ecosystem Marketplace

Regional Greenhouse Gas Initiative (RGGI) COMPLIANCE

The Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade policy covering power sector emissions in eleven states in the northeastern U.S. (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia) allows a portion (3.3%) of the compliance obligation to be fulfilled through carbon offsets.[46] The RGGI program has established offset protocols for landfill methane capture, forestry and afforestation, destruction of ozone-depleting substances, and energy efficiency. Except for a 2017 landfill gas capture offset project issuance, the RGGI offset market has been largely inactive, and no forest carbon offsets have been issued as of March 2021.[47] One reason is because the auction price for allowances in the RGGI cap-and-trade market is substantially lower than other comparable market systems. The lower value of allowances in the RGGI system makes it difficult to develop cost effective offset projects for the RGGI market. Within RGGI, allowances trade for $4-8 per ton in quarterly auctions, compared to $15-18 per ton in the California cap-and-trade system and as much as $30 per ton in the Alberta cap-and-trade system.

[46] Pennsylvania is developing a proposal for a power sector ETS covering CO2 emissions largely consistent with RGGI. A final proposal is expected in 2021, with 2022 as the earliest start date for Pennsylvania's ETS to join RGGI. Pennsylvania's power sector is the size of 40% of RGGI, so its inclusion would significantly increase the size of the RGGI carbon market.

[47] "Regional Greenhouse Gas Initiative Allowance Tracking: Offsets," The Regional Greenhouse Gas Initiative, accessed May 25, 2021, https://www.rggi.org/allowance-tracking/offsets

Colombia Carbon Tax — COMPLIANCE

Beginning in 2017, Colombia implemented a national carbon tax on distributors of some fossil fuels, which covers about 27% of Colombia's emissions from all sectors. The tax was set at (and has remained close to) about $5 per ton CO2e.[48] Carbon neutral businesses are exempt from the tax, and businesses can qualify as carbon neutral if they purchase offsets produced within Colombia from an approved third-party standard accredited by the National Accreditation Body of Colombia.[49]

More than half (56%) of the Verified Carbon Standard (VCS) offset projects in Colombia were from Agriculture, Forestry, and Land Use (AFOLU) projects. Of those, 70% were REDD+ projects and 24% were Afforestation, Restoration, and Reforestation projects. Despite making up just more than half of VCS projects, AFOLU projects generated almost all (98%) of the VCU issuances in Colombia by the end of 2020. This amounted to 21.8 MtCO2e, of which 21 MtCO2e were REDD+. The vast majority of these issuances occurred since the Colombian carbon tax was passed at the end of 2016, with over 90% of retirements for the compliance market.

Colombia was the first compliance market to allow the use of project-based REDD+ credits. As of January 2021, REDD+ credits made up over 97% of Verified Carbon Unit Issuances from AFOLU projects in Colombia.[50]

Demand for credits exceeds supply. In 2020, about 12.5M credits applied toward compliance with the carbon tax; annual demand is almost four times greater, at 40M credits annually. Due to low supply, market price for credits has been 80%-95% of the carbon tax price, or at least $4 per ton.[51] Travel restrictions and other logistical difficulties from the COVID-19 pandemic have further limited the supply of credits by delaying validation and verification processes in 2020, shrinking the number of issuances to close to 2017 levels, when the Carbon Tax was first introduced. However, the number of issuances began to rebound in the fourth quarter of 2020, particularly from AFOLU projects.[52]

Australia's Emissions Reduction Fund — COMPLIANCE

Following the repeal of Australia's emissions trading system in 2014, the Emissions Reduction Fund was developed to provide payments to landowners and businesses to voluntarily reduce emissions and increase carbon removals. These voluntary emission reductions are purchased by the government as a central component of its climate action commitments. Australia's Clean Energy Regulator has committed to purchasing 192M tons of Australian Carbon Credit Units (ACCUs) by 2030, of which 47.3M have already been delivered. Prices increased year-over-year from 2017 to 2019 but remained below $10 (USD) per ton. ACCUs are sold through a reverse auction mechanism: project developers report the lowest price required to undertake an emissions reduction project in accordance with ACCU methodologies, and the government purchases the lowest-cost option to fulfill their auction quota. The ACCUs sold at auction are largely for future removals (e.g., the government agrees to purchase offsets from projects which have yet to be developed). Contracts are only paid after the emissions reductions occur, which are set to occur within 10 years.

Both agriculture and forestry-based offset projects are eligible for this program. The majority of ACCUs sold at auction (36.92M) have been forestry offsets. There are 11 approved vegetation management methodologies, including tree planting and improved forest management, as well as a methodology for savanna fire management, whereby credits can be earned through prescribed burning of savanna landscapes to reduce the risk of high-intensity wildfires during the dry season. There are also seven accepted methodologies for development of ACCUs through agriculture, including cattle herd management and soil carbon sequestration.

[48] World Bank, "Carbon Pricing Dashboard," accessed November 20, 2020, https://carbonpricingdashboard.worldbank.org/map_data

[49] Ministerio de Ambiente y Desarrollo Sostenible, Principales Preguntas Frente Al Impuesto Nacional Al Carbono Y La Solicitud De No Causación Por Carbono Neutralidad, 2017, https://www.minambiente.gov.co/images/abc_carbono_final29ago.pdf

[50] Verra, Data And Insights: Colombia, Issue #3 – Q4/2020, Verra, 2021, https://verra.org/data-insights/colombia/january-2021/

[51] IETA, Carbon Market Business Brief: Colombia, IETA, 2020, https://www.ieta.org/resources/Resources/CarbonMarketBusinessBrief/CarbonMarketBusinessBriefColombia2020.pdf

[52] Verra, Data And Insights: Colombia, Issue #3 – Q4/2020, Verra, 2021, https://verra.org/data-insights/colombia/january-2021/

New Zealand's Emissions Trading System COMPLIANCE

New Zealand's emissions trading system (ETS) was launched in 2008, with the goal of reducing country emissions to 30% below 2005 levels by 2030. The New Zealand policy is unique in the depth of industries covered under the policy. Agriculture and forestry emissions are covered in New Zealand's emissions trading system, in addition to transit, building, industry, and power sector emissions. The New Zealand system accepted Clean Development Mechanism (CDM) offset credits for emission trading compliance through 2015.

The New Zealand policy requires that any forest established before 1990 be enrolled in the emissions reduction program. Any conversion of those forests must be compensated with emissions trading allowances. This policy both creates an incentive to reduce deforestation and an incentive to invest in reforestation and forest restoration. Carbon credits are based on an increase in carbon stocks. Forest owners enrolled in the compliance market must pay for loss of carbon stocks (due to deforestation or fire) and can receive payment for increases in carbon stocks. The Permanent Forest Sink Initiative (PFSI), a separate government sustainable forestry program for privately owned forests, will end following reforms in 2020. A new, permanent post-1989 forest activity program within the New Zealand ETS will replace it.

The New Zealand system was amended in 2020 to introduce auctions for emissions units (beginning in March 2021), and to replace a price cap on emissions units with a cost containment reserve which is triggered when the emissions unit price reaches NZD $50 per unit.[53] The reforms also introduced a price floor, set at NZD $20 per unit increasing 2% annually, and a fixed price purchase option, set at NZD $35 (~USD $24.10).[54] These reforms have significantly increased the price of emissions units, from less than NZD $20 (~USD $13.80) in 2016 to NZD $35.30 (~USD $24.30) in 2020.[55,56] The inclusion of international offsets is under consideration, but not before 2026.

Japan – Saitama ETS & Tokyo Cap and Trade COMPLIANCE

The Tokyo metropolitan area introduced an emissions trading scheme in 2010, covering emitters in the transportation and manufacturing industries, as well as commercial and residential buildings. The emissions trading policy has established the target of reducing emission by 30% below 2000 levels by 2030. The Tokyo cap-and-trade system has been linked with the Saitama emissions trading scheme since the introduction of the Saitama ETS in April 2011, and credits can be traded between the systems. Saitama's ETS has an established target to reduce emissions by 21% from 2013 levels by 2020.[57]

Offsets are eligible for use in both the Tokyo and Saitama systems. Saitama allows covered entities to use "Forest Absorption Credits," generated from forests in Saitama prefecture.[58,59] Credits from forests inside Saitama Prefecture are counted at 1.5 times the value of regular credits.

Republic of Korea ETS COMPLIANCE

The South Korean ETS, launched in 2015, covers 73.5% of the country's GHG emissions. In the first phase of the policy (2015-2017) regulated entities were allowed to use offsets to fulfill up to 10% of their compliance obligations. In this first phase, only domestic offsets were eligible for compliance

[53] Reforms for the forestry sector that will come into effect in 2023 include simplified accounting measures for new entrants (ICAP 2021).
[54] "Reforming the NZ ETS," Ministry for the Environment, accessed May 25, 2021, https://www.mfe.govt.nz/overview-reforming-new-zealand-emissions-trading-scheme
[55] Theecanmole. "New Zealand emission unit (NZU) monthly prices 2010 to 2016: V1.0.01" [Data set], Zenodo, 2016, http://doi.org/10.5281/zenodo.221328
[56] "NZ Carbon Prices", Carbon Forest Services LTD, 2020, https://www.carbonforestservices.co.nz/
[57] ICAP, Japan - Saitama Target Setting Emissions Trading System, (Berlin: International Carbon Action Partnership, 2020), https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=84
[58] ICAP, Japan - Tokyo Cap-and-Trade Program, (Berlin: International Carbon Action Partnership, 2020), https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=51
[59] ICAP, ICAP Status Report 2021, (Berlin: International Carbon Action Partnership, 2021), https://icapcarbonaction.com/en/?option=com_attach&task=download&id=723

use. Companies could use either Clean Development Mechanism projects developed domestically, or offsets certified in the separate Korean Offset Credit (KOC) system. The South Korean system has been gradually transitioning to allow more international credits. In Phase 2 of the program (2018-2020) regulated entities were again allowed to use offsets to fulfill up to 10% of their compliance obligations, of which up to 5% could be international credits.[60,61] Phase 3 of the program, which began in 2021, the share of offsets allowed to fulfill compliance obligations decreased to 5%, but no separate limit for international credits applies. The South Korean offset program has established methodologies for afforestation, reforestation, forest restoration, as well as agricultural offset methodologies related to reducing methane emissions from rice cultivation.[62] To date, more than 10 million offset credits have been registered in South Korea's Forest Carbon Registry.[63] These offsets are eligible for use in the Korean emissions trading systems, as well as for voluntary compliance.

China National ETS — COMPLIANCE

China began development of a national ETS in 2017, which came into effect on 1 February 2021, with compliance obligations for entities in the power sector emitting over 26,000 tCO2 annually from the 2013-2019 period. The compliance cycle started on 1 January 2021 and covers an estimated 2,225 entities, covering roughly 40% of the country's annual carbon emissions (equating to 4,000 MtCO2e per year),[64] making it the world's largest ETS. The National ETS allows for the use of China Certified Emissions Reduction (CCER) from 2021 onwards. Covered entities can use offsets for up to 5% of their verified emissions from CCER projects in renewable energy, carbon sinks, methane utilization, and others. While forestry offsets are eligible for compliance use, the level of forestry offset use in practice will depend in large part on allowance trading prices and the supply of renewable energy offsets for compliance use. If the allowance price is low and a large supply of low-cost renewable energy offsets exists, as was the case in the China's subnational programs, then forestry offsets will likely not play a large role in China's cap-and-trade system.

China (Subnational Programs) — COMPLIANCE

There are eight subnational ETSs in China. Each accepts carbon offsets for compliance use. Some programs have established additional requirements for the types of CCER offsets that may be used for compliance, such as restrictions on accepted vintage years and project types. CCER protocols are largely aligned with CDM protocols, and forestry projects are accepted within the CCER program. The vast majority of CCER offsets have been issued to wind, solar, and hydropower projects, although an estimated 2.54 MtCO2e of forestry offsets are anticipated to be generated annually (of 139.57 MtCO2e annual total).[65] Fujian province's subnational program specifically promotes forestry projects by allowing companies to meet a greater percentage of their compliance obligations through offsets if forestry offsets are part of the strategy.[66] In the Fujian ETS,

[60] To qualify a South Korean company had to hold at least 20% of the ownership rights, operating rights, or the voting stocks of the company generating the offset; a Korean company supplies the low-carbon technology worth at least 20% of the total project cost; or the projects are funded by a Korean company with a national or regional government operating in a UN-designated Least Developed Country or a low-income economy (as classified by the World Bank).

[61] ICAP, Korean Emissions Trading Scheme, (Berlin: International Carbon Action Partnership, 2021), https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems%5B%5D=47

[62] Asian Development Bank, The Korean Emissions Trading Scheme, (Manila: Asian Development Bank, November 2018), https://www.adb.org/sites/default/files/publication/469821/korea-emissions-trading-scheme.pdf

[63] "Forest Carbon Registry," Carbon Registry, accessed May 25, 2021, https://carbonregistry.forest.go.kr/fcr_web/fco/main/intro/index.do

[64] ICAP, ICAP Status Report 2021, (Berlin: International Carbon Action Partnership, 2021), https://icapcarbonaction.com/en/?option=com_attach&task=download&id=723

[65] X. Zhao et al., "The Status of China's Voluntary Carbon Offset Market," Environmental Defense Fund, July 24, 2021, https://www.edf.org/climate/status-chinas-voluntary-carbon-market

[66] ICAP, China – Fujian Pilot ETS, (Berlin: International Carbon Action Partnership, 2021), https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems%5B%5D=87#:~:text=The%20province%20of%20Fujian%20launched,except%20in%20the%20first%20year.

2.6 MtCO2e of forestry offset credits were transacted by October 2020, with an estimated value of $5.5M.[67] The subnational programs have to avoid overlapping coverage of the power sector with the newly launched national ETS. Those pilots that established allocation plans before the national ETS launched (Beijing, Fujian, Guangdong, and Tianjin) will have power sector entities covered by the pilots for 2020 emissions; the others will be covered under the national system, no longer under the pilots. For 2021, China's power sector will be regulated by the national ETS.[68]

Table 3. Subnational Compliance Programs in China: Annual Emissions Caps, Average Allowance Price per Ton, and Offset Provision by Program

Regional Program	Annual Program Emissions Cap in 2020[69]	Allowance Average Price per tCO2e in 2020 (USD)[70]	Offset Provisions[71]
Beijing	50 MtCO2e	$12.93	CCERs accepted for up to 5% of emissions. 50% of CCERs must come from projects in Beijing municipality. Forest carbon projects receive up to 60% of certified emission reductions.
Chongqing	100 MtCO2e	$2.83	CCERs accepted for up to 8% of emissions. All CCERs must come from projects in Chongqing municipality.
Fujian	200 MtCO2e	$2.79	CCERs accepted for up to 5% of emissions or up to 10% of emissions if CCERs and FFCERs (Fujian Forestry Credits) are allowed.
Guangdong	465 MtCO2e	$4.03	CCERs accepted for up to 10% of emissions. Seventy percent of CCERs must come from projects in Guangdong province.[72,73]
Hubei	256 MtCO2e	$4.64	CCERs accepted for up to 10% of emissions. All CCERs must come from projects in Hubei province. Since 2016 only forestry and household biogas allowed to fulfill compliance obligations.[74]
Shanghai	158 MtCO2e	$6.01	CCERs accepted percentage varies.[75]
Shenzhen	31 MtCO2e	$2.34	CCERs accepted for up to 10% of emissions.
Tianjin	170 MtCO2e	$3.66	CCERs accepted for up to 10% of emissions.[76]

[67] ICAP, ICAP Status Report 2021, (Berlin: International Carbon Action Partnership, 2021), https://icapcarbonaction.com/en/?option=com_attach&task=download&id=723

[68] The World Bank. 2021. State and Trends of Carbon Pricing 2021(May), World Bank, Washington, DC. Doi: 10.1596/978-1-4648-1728-1. License: Creative Commons Attribution CC BY 3.0 IGO

[69] ICAP, ICAP Status Report 2020, (Berlin: International Carbon Action Partnership, 2020), https://icapcarbonaction.com/en/icap-status-report-2020

[70] "Allowance Price Explorer," International Carbon Action Partnership, 2020, https://icapcarbonaction.com/en/ets-prices

[71] IETA, Use of Offset Credits Across Emission Trading Systems and Carbon Pricing Mechanisms, (Washington, DC: International Emissions Trading Association, 2014), https://ieta.org/resources/Resources/3_Minute_Briefings/use%20of%20credit%20offset%20across%20etss_%20briefing_final%20version.pdf

[72] Guandong's Provincial Puhui Certified Emission Reductions Program (PHCER) approved methodologies include amongst others forest protection and forest management.

[73] In addition to the quantitative limit applied to individual entities, Guangdong sets an upper limit to the total volume of offsets allowed. In 2019, entities were allowed to use up to 1.5 million offsets (CCER and PHCER) towards compliance obligations, with the priority given to the province's CCERs and PHCERs first. Other offsets will then be allowed in accordance with the order of enterprises' written applications until this limit is reached. The number for 2020 has not yet been announced.

[74] X. Zhao et al., "The Status of China's Voluntary Carbon Offset Market," Environmental Defense Fund, July 24, 2021, https://www.edf.org/climate/status-chinas-voluntary-carbon-market

[75] For compliance year 2019, the use of CCER credits was limited to 3% of the verified emissions, of which up to 2% was for credits generated outside the Yangtze River Delta region. Between 2016 and 2018, the use of CCER credits was limited to 1% of the annual allocation. Between 2013 and 2015, the limit was 5%.

[76] For the 2019 compliance year, at least 50% of the credits must originate from Beijing, Tianjin, or Hubei.

Emerging Compliance Offset Markets

CORSIA — IN DEVELOPMENT

In 2016, 192 countries signed on to the United Nation's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) program, pledging that any increase in international aviation emissions above an agreed baseline level will be offset. Aviation has accounted for nearly one gigaton (1000 MtCO2e) per year[77] (nearly 2% of annual global emissions) and emissions are projected to grow further under a "business as usual" scenario. The International Civil Aviation Organization (ICAO), which administers CORSIA, has projected that 333 MtCO2e of offsets will be required to achieve compliance per year by 2035.[78]

CORSIA began operation on January 1, 2021.[79] Initially, the emissions baseline (from which net-zero growth offset requirements are determined) was to be calculated as an average of 2019 and 2020 emissions levels. However, the COVID-19 pandemic and wide cessation of airline travel means CORSIA driven-demand has been far lower than originally projected. In recognition of this, ICAO revised its baseline policy to reflect only 2019 emissions.[80] In the near term, CORSIA demand will likely remain suppressed throughout its planned pilot phase of 2021-2023.[81]

In November 2020, ICAO announced that several additional forestry and land-use offset standards would be accepted within the program. The Architecture for REDD+ Transactions' "The REDD+ Environmental Excellence Standard" (ART-TREES) and the Verified Carbon Standard's (VCS) Jurisdictional and Nested REDD+ methodologies were accepted within CORSIA, paving the way for Jurisdictional REDD+ credits to be used for CORSIA compliance. In tandem with these approvals, the ICAO issued guidance that forestry projects registered with the Climate Action Reserve, the American Carbon Registry, and Gold Standard and Verra's VCS could also be compliant except for projects located in countries with REDD+ commitments that generate more than 7,000 credits per year.[82] In March 2021, ICAO approved Global Carbon Council credits for use in CORSIA, but excluded forestry credits.[83] These policy decisions present a clear opportunity for growth in market-based REDD+ payments, particularly at the national and subnational jurisdictional scale and for forestry and land-use projects in developed countries.

Canadian Federal Offset System — IN DEVELOPMENT

The Canadian Federal government is in the process of developing a country-wide carbon offset program, which is intended to advance emissions reductions on a national scale. Although program scope, timeline, and specifics are still under development as of March 2021, the Government of Canada has proposed that eight offset project types be accepted into the program, including Afforestation/Reforestation, Improved Forest Management, and Soil Organic Carbon project types.[84] The Canadian Federal Government recognized the Alberta and British Columbia offset programs as source of credits for the federal Output-Based Pricing System in August 2020.

[77] "Facts & Figures," Air Transport Action Group, accessed May 25, 2021
[78] ICAO, "Committee on Aviation Environmental Protection (CAEP), (Montreal: International Civil Aviation Organization (ICAO), Feb 2019),
[79] Jocelyn Timperley, "Corsia: The UN's plan to 'offset' growth in aviation emissions," Carbon Brief, February 4, 2019, https://www.carbonbrief.org/corsia-un-plan-to-offset-growth-in-aviation-emissions-after-2020
[80] G. Waldron, "ICAO decisions set stage for 2021 Corsia Pilot," Flight Global, 2020, https://www.flightglobal.com/airlines/icao-decisions-set-stage-for-2021-corsia-pilot/141332.article
[81] Uncertain, but highly likely suppressed demand in the near term due to the pandemic is why we have placed CORSIA in the "Emerging" section.
[82] ICAO, CORSIA Eligible Emissions Units, (Montreal: International Civil Aviation Organization (ICAO), November 2020), https://www.icao.int/environmental-protection/CORSIA/Documents/TAB/TAB%202020/ICAO_Doc_CORSIA_Eligible_Emissions_Units_November_2020.pdf
[83] In March 2021 ACR's eligibility, which includes US forest carbon credits, was extended for units vintage 2021-2023. These are the first post-2020 units approved by ICAO; ICAO, CORSIA Eligible Emissions Units, (Montreal: International Civil Aviation Organization (ICAO), March 2021), https://www.icao.int/environmental-protection/CORSIA/Documents/ICAO%20Document%2008%20_%20CORSIA%20Eligible%20Emissions%20Units_March%202021.pdf
[84] J. Cocker, "Canada: Federal Government shortlists eight types of projects for the development of carbon offset protocols," Baker McKenzie, August 14, 2020, https://www.lexology.com/library/detail.aspx?g=9f1c8171-1864-4fef-9659-59a25e9dd6a3

Mexico Emissions Trading System Pilot Program — IN DEVELOPMENT

Mexico's new emissions trading scheme (ETS) began its pilot phase on January 1, 2020 and is expected to reach a transition phase by 2022 and a final operational stage by 2023. The scheme governs CO2 emissions from the energy and industry sectors, representing around 37% of Mexico's total emissions.

In the pilot phase, participants can meet up to 10% of their compliance obligations through offsets (including through forestry) or early action credits that were verified and validated under domestically or internationally recognized protocols.[85] The Mexican Ministry of Environment and Natural Resources (SEMARNAT) has signaled it will establish a program to supply offset credits from domestic projects.[86]

Since 2014, Mexico's Stock Exchange, with support from SEMARNAT, the Environmental Defense Fund, and others, has also operated a voluntary domestic carbon market called MÉXICO2. MÉXICO2 credits correspond to projects aimed at reducing or sequestering GHG emissions, including reforestation, renewable energy, and methane capture projects.[87] Currently, the credits purchased through MÉXICO2 can only be used for voluntary offsets. Though the intention was that credits purchased through MÉXICO2 could be used in lieu of paying Mexico's carbon tax, the necessary framework has not been established to facilitate this. Currently only credits from CDM projects in Mexico and EU ETS-compliant credits can be used in this way.[88]

Colombia's National Program of Tradeable GHG Emission Quotas — IN DEVELOPMENT

Colombia is developing an ETS, called the National Program of Tradable Greenhouse Gas Emission Quotas (abbreviated PNCTE in Spanish), which will complement the Carbon Tax and existing offsetting measures, which include forestry offsets (see Colombia Carbon Tax). As outlined in Colombia's Law 1931 of 2018, emitters may use carbon tax and offset credit payments to comply with the PNCTE. The infrastructure for the PNCTE registry is scheduled to be in place by July 2021 and fully operational by 2024.[89,90,91]

South Africa Carbon Tax — IN DEVELOPMENT

South Africa implemented a carbon tax on high-emitting businesses and companies in 2019. The carbon tax, set at ZAR 134 / metric ton (~$7.70/metric ton), increases annually and contains an allowance for offset use to count towards carbon tax liability. Maximum offset use varies by sector (e.g., companies in the electricity sector may use offsets to fulfill up to 10% of their tax obligation, while cement companies may only fulfill up to 5% of their tax obligation with offsets).

The South Africa offset system accepts offsets that are registered with CDM, VCS, and Gold Standard, which includes several forestry protocols. The Carbon Offset Administration System is a registry launched in 2020 to enable regulated entities to surrender credits against their tax liability. The first offset surrender period (the deadline for

[85] World Bank, "Mexico Pilot ETS", Carbon Pricing Dashboard, World Bank, 2020, https://carbonpricingdashboard.worldbank.org/map_data

[86] IETA, Carbon Market Business Brief: Mexico, IETA, 2020, https://www.ieta.org/resources/Resources/CarbonMarketBusinessBrief/CarbonMarketBusinessBriefsMexico2020.pdf

[87] "Proyectos de carbono," MÉXICO2, accessed November 20, 2020, http://www.mexico2.com.mx/proyectos-de-carbono.php

[88] Environmental Defense Fund, Mexico: A Market-Based Climate Policy Case Study, (Washington, DC: Environmental Defense Fund, 2016), https://www.edf.org/sites/default/files/mexico_case_study.pdf

[89] IETA, Carbon Market Business Brief: Colombia, (Washington, DC: International Emissions Trading Association (IETA), 2020, https://www.ieta.org/resources/Resources/CarbonMarketBusinessBrief/CarbonMarketBusinessBriefColombia2020.pdf

[90] World Bank, 2020, "Expanding Carbon Pricing in Colombia: Final report for the Partnership for Market Readiness Project," November 2020, http://documents1.worldbank.org/curated/en/559731608060479169/pdf/Expanding-Carbon-Pricing-in-Colombia-Final-Report-for-the-Partnership-for-Market-Readiness-Project.pdf

[91] ICAP, ICAP Status Report 2021, (Berlin: International Carbon Action Partnership, 2021), https://icapcarbonaction.com/en/?option=com_attach&task=download&id=723

companies to submit offsets to fulfill a portion of their carbon tax obligation for that period) closed in October 2020. Verra estimates that the South African offset market will grow to 10M tons per year, of which a significant portion may be forestry projects.[92]

National Voluntary Offset Markets

United Kingdom Woodland Carbon Code — VOLUNTARY

Companies operating within the United Kingdom (UK) have the option of offsetting their UK-based emissions by purchasing Woodland Carbon Units through the Woodland Carbon Code.[93] Woodland Carbon Units correspond to carbon sequestration achieved through reforestation and forest management projects within the UK; a unit is equivalent to one metric ton of CO2 removed from the atmosphere. Each unit costs between £7 and £22 (~US$ 9.30-29.20). The purchase of credits is voluntary and geared towards companies that are interested in offsetting their emissions for non-compliance reasons (i.e., net zero or carbon neutral commitments). All large companies are required to report GHG emissions under UK law. As of March 2021, the most recent date for which data was available, the Woodland Carbon Code had 708 carbon projects registered, representing over 31,000 hectares (ha) of woodland, and were projected to sequester 11.1 MtCO2e over the projects' lifetimes. In March 2021, the Woodland Carbon Code had issued about 3.5M Pending Issuance Units and just over 7,000 Woodland Carbon Units. Of the units issued, around 1M Pending Issuance Units and 800 Woodland Carbon Units are currently available for sale; 1,811 Woodland Carbon Units have been retired.[94]

The Woodland Carbon Code is a voluntary mechanism but may have a role in compliance markets in the future. The UK developed its own emissions trading scheme (launched on January 1, 2021) after leaving the EU, with which high-emitting businesses are required to comply. The scheme is modeled after the EU's Emissions Trading Scheme and uses the EU's methodology for calculating emissions, which does not allow for the use of forestry or any other type of offset purchases.[95] However, the option to use offset credits generated from international or domestic forestry projects (such as those registered in the Woodland Carbon Code) may be available in future years, pending development of operational frameworks to integrate these offsets.[96,97]

Netherlands Green Deal — VOLUNTARY

In 2017, the Netherlands unveiled its Green Deal Pilot National Carbon Market, a voluntary carbon market designed to enable sectors not covered by the EU ETS system (e.g., built environment, agriculture, forestry, transport) to buy and sell credits generated from projects that sequester carbon within the Netherlands. Each credit represents one metric ton of CO2e.

These projects are evaluated and verified by the National Carbon Market Foundation (Stichting Nationale Koolstofmarkt, SNK in Dutch) to verify the amount of emissions reduction and carbon sequestration the projects are achieving. Projects include those that restore, rehabilitate, or protect natural areas that sequester carbon, such

[92] Verra Set to Support South Africa's Carbon Tax," Verra, August 18, 2020, https://verra.org/vcs-in-south-africa/#:~:text=Stationary%20and%20some%20non%2Dstationary,2%25%20annually%2C%20plus%20inflation.
[93] UK Woodland Carbon Code, accessed 18 Nov 2020, https://www.woodlandcarboncode.org.uk/uk-land-carbon-registry
[94] "Retired Credits," UK Woodland Carbon Registry, accessed 23 April 2021, https://mer.markit.com/br-reg/public/index.jsp?entity=retirement&name=&standardId=100000000000042&acronym=WCC&additionalCertificationId=&unitClass=&sort=account_name&dir=ASC&start=15&categoryId=100000000000001
[95] UK Government, The Greenhouse Gas Emissions Trading Scheme Order 2020, UK Statutory Instruments, 2020 No, 1265, 2020, www.legislation.gov.uk/uksi/2020/1265/contents/made
[96] UK Government, Commission Implementing Regulation (EU) 2018/2066, 2018, www.legislation.gov.uk/eur/2018/2066/contents
[97] ICAP, ICAP Status Report 2021, (Berlin: International Carbon Action Partnership, 2021), https://icapcarbonaction.com/en/?option=com_attach&task=download&id=723

as peat meadows, salt marshes, and forests. Projects can also focus on recycling, energy efficiency, and reducing methane from cattle ranching.[98]

The Dutch government revealed its Climate Agreement in June 2019, which established a series of targets and implementation strategies for various industries. Though the agreement included a new carbon tax, integrated into the EU ETS system, no options for offsetting tax compliance requirements with emissions reduction or carbon sequestration projects, such as those in the voluntary National Carbon Market, were mentioned.[99]

Japan VOLUNTARY

Japan has implemented two programs to work toward their target of net-zero emission by 2050. The "J-Credit" system is a voluntary offset registry aimed to allow Japanese businesses to fund domestic emissions avoidance and removal projects. The J-Credit registry includes two methodologies for forestry: afforestation and improved forest management.

Japan has also developed the "Joint Crediting Mechanism" which facilitate partnerships between Japan and other partner countries[100] to incentivize low-carbon technologies and develop and implement mitigation actions. The Joint Crediting Mechanism (JCM) provides a framework through which Japan's contributions to these international projects can be evaluated and credited towards Japan's emissions target. To date, 172 projects have been developed through the JCM program. The majority relate to renewable energy and energy efficiency; however three REDD+ projects have been developed through the program. In Cambodia, a REDD+ project began with a 120,000 ha portion of the Prey Lang Wildlife Sanctuary, the largest tropical lowland evergreen forest in Indochina. The project's aims are to generate verified carbon credits for purchase by Mitsui & Co., while improving on the ground environmental enforcement and community livelihoods. The second phase of the project, 2021-2031, will expand to 431,683 ha of PLWS. In Indonesia's Boalemo District, a REDD+ JCM project seeks to reduce deforestation associated with agriculture (avoiding an estimated 86,000 tCO2e each year). In Laos, a JCM project developed to reduce deforestation and forest degradation in the Luang Prabang province is estimated to avoid 140,000 tCO2e each year by providing alternative livelihoods for villagers in the province.[101] Neither project has been issued JCM credits as of March 2021 but issuances are anticipated in the coming years.

[98] Over de Green Deal," Stichting Nationale Koolstofmarkt, accessed 23 November 2020, https://nationaleco2markt.nl/over-de-green-deal/ (Dutch only)

[99] Netherlands Government, National Climate Agreement, June 2019, https://www.klimaatakkoord.nl/klimaatakkoord/documenten/publicaties/2019/06/28/national-climate-agreement-the-netherlands

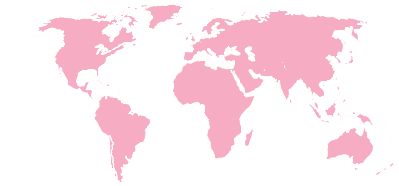
[100] The 17 JCM partner countries are Bangladesh, Cambodia, Chile, Costa Rica, Ethiopia, Indonesia, Kenya, Lao PDR, Maldives, Mexico, Mongolia, Myanmar, Palau, Saudi Arabia, Thailand, the Philippines, and Vietnam,

[101] "The Joint Crediting Mechanism" Global Environment Centre Foundation. n.d., http://gec.jp/jcm/

FOREST CARBON IN GLOBAL VOLUNTARY OFFSET MARKETS

Overview of Voluntary Markets

Global Voluntary Market



Carbon credits increasingly have options to be sold in either voluntary or compliance markets as regulated markets such as Colombia now accept offsets verified by the independent standards VCS and Gold Standard, whose methodologies were originally developed for the voluntary markets. Likewise, ICAO has approved the use of multiple independent standards under the regulated CORSIA regime. However, there remains a vibrant (and growing) purely voluntary market, driven by new corporate demand.[102] In the voluntary markets, this means few restrictions are found in terms of project type, where offsets originate, or other credit attributes. The only major limitation is which methodologies independent standards have opted to approve. As a result, credits transacted exhibit a wide range of characteristics and prices. The focus of this section is this global voluntary market, specifically the forestry and land-use credits segment.

Other features differentiating voluntary versus compliance markets include size, flexibility, and market infrastructure. Although the compliance markets now cover 21.7% of GHG emissions each year,[103] more than 10 B tons, almost all compliance credits are allowances issued by governments rather than offsets. Voluntary markets are much smaller than compliance markets but are comprised solely of offsets that drive reductions and removals elsewhere.

The voluntary markets continue to serve as a lab in which new methodologies and protocols are developed, tested, and improved. For example, the VCS approved a standalone blue carbon methodology for restoration activities (VM0033) in 2015. More recently, the REDD+ Methodology Framework (VM0007) was updated to expand its applicability to tidal wetland conservation and restoration activities, including activities on mangroves, seagrasses, and salt marshes, and to incorporate improvements on the earlier methodology. This makes VM0007 the first blue carbon conservation methodology approved under any major GHG program. Another key difference between voluntary and compliance markets is that unlike compliance credits, most voluntary offsets are transacted bilaterally, over the counter (OTC), with no centralized repository for price and volume data. Ecosystem Marketplace aims to address that gap by tracking global transactions in voluntary markets by going beyond publicly available data (e.g., offsets issued by standard-setting bodies) to gather data directly from market actors. This data is then complemented with insights from bilateral interviews with market experts to develop insights and identify trends in the voluntary markets.

This section of the report provides details on the forestry and land-use credits transacted in 2019 that EM tracked in its 2020 Carbon Survey, including the metrics of price, volume, standards, location, and buyers. For context, in some cases we've also provided data on credits transacted in 2017 and 2018, as this information was collected after the release of the previous State of Forest Carbon Finance report in 2017. The 2020 EM Carbon Survey gathered confidential carbon market transaction data and sentiments from 152 respondents, a 24% increase in respondents from the 2019 EM Carbon Survey. Information was collected between April and August 2020. Because some respondents do not answer all survey questions, the data below notes the subset of transactions on which summary figures are based.

If you are actively transacting carbon offsets, or plan to, and are not a recipient of our survey, please contact EM at info@ecosystemmarketplace.com
Detailed transactional data is kept confidential. Aggregated anonymized results are only shared when there are at least three respondents to a particular question or set of offset attributes.

[102] For more detail on the evolution of the voluntary carbon market see: https://voluntarycarbonmarket.org
[103] The World Bank. 2021. "State and Trends of Carbon Pricing 2021" (May), World Bank, Washington, DC. Doi: 10.1596/978-1-4648-1728-1. License: Creative Commons Attribution CC BY 3.0 IGO.

Volumes and Prices by Project Category

Ecosystem Marketplace categorizes offset transactions according to seven broad project categories, one of which is forestry and land use.[104] For 2019 EM found that corporate net-zero pledges fueled a record transaction volume (across all project categories) of at least 104 MtCO2e, which was an increase of 6% over 2018. Thirty-five percent of this total was forestry and land-use credits, although this represented a 28% decrease in forestry and land-use volume since 2018.

Forestry and land-use offsets lead voluntary markets by value and compete with renewable energy on volume

Over the past several years, the larger share of credits transacted by volume in the voluntary markets has toggled between renewable energy and forestry and land use. Renewable energy credits were the most transacted project category in voluntary markets during 2015-2017. Although renewable energy volumes continued to grow in 2018, forestry and land-use volume surged by an incredible 264% that year. This made forestry the most-traded project category by volume at 51.1 MtCO2e, representing over half of total market volume in 2018. Forestry and land use's place as the top-traded category was short-lived, however. Its volume dropped in 2019 to 36.7 MtCO2e (Table 4), while renewable energy volume rose 78%.

Despite lower volumes in 2019 relative to renewable energy, forestry and land-use credits remained by far the market leader in terms of value, with $159.1M transacted that year. The average global price for forestry and land-use offsets tracked by EM in 2019 was $4.33 per ton, an increase of 28% from 2018. The median price of forestry credits transacted was significantly higher than the average price (Table 4). This reflects the fact that typically a relatively small number of large-volume transactions occur at lower prices, driving the average price well below the median.

Table 4. Voluntary Markets Forestry and Land-use Credits by Volume, Price, and Value, 2017-2019

Transaction Year	Volume (MtCO2e)	Average Price ($/tCO2e)	Median Price ($/tCO2e)	Value ($M)
2017	16.9	$3.85	$9.75	$65.1
2018	51.1	$3.39	$9.33	$173.0
2019	36.7	$4.33	$9.00	$159.1

Certainly, part of the explanation for why renewables replaced forestry and land use as the most heavily traded project category in 2019 was their much lower price, averaging only $1.42 in 2019. Forestry and land-use offsets often deliver co-benefits such as support for indigenous people, the provision of jobs, and other activities advocated in the Sustainable Development Goals (SDGs). For this reason, prices for offsets generated from forestry and land-use projects are often higher than those generated through renewable energy.

However, as renewable energy development has become cheaper than traditional energy sources, the financial additionality argument for renewables is becoming more difficult to make. As a result, carbon standards such as VCS and Gold Standard are phasing out their recognition of offsets generated through the provision of renewable energy.[105] This could bode well for demand for forestry credits.

[104] Agriculture credits are counted as part of this category as well. Other categories include Renewable Energy, Waste Disposal, Household Devices, Chemical Processes/Industrial Manufacturing, Energy Efficiency/Fuel Switching and Transportation. For a full list of project categories and project types they comprise, see: https://www.forest-trends.org/wp-content/uploads/2018/09/Factsheet_Carbon-Offset-Project-Types-and-Categories.pdf

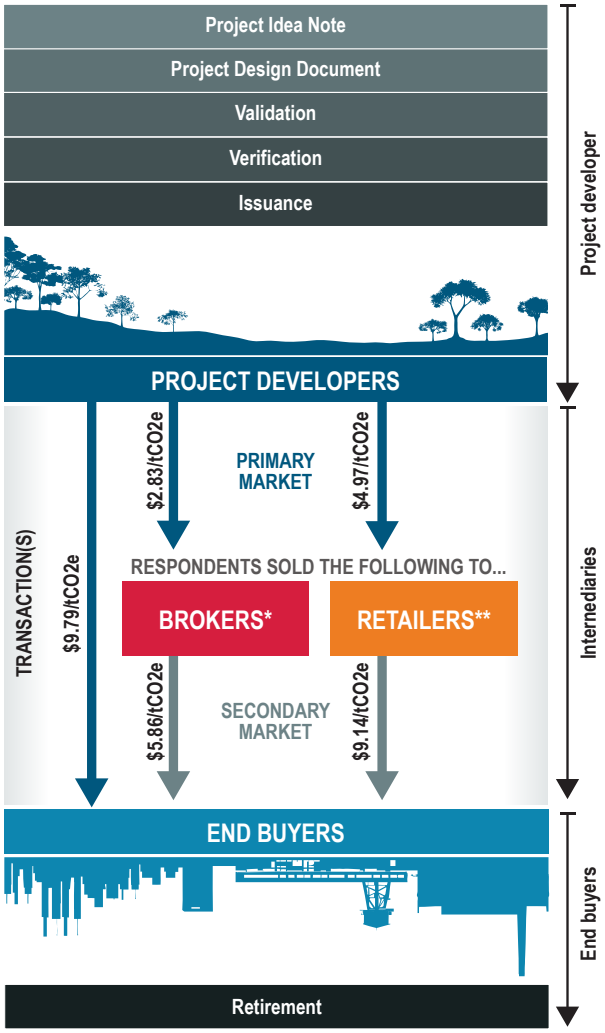
[105] These standards will continue to recognize offsets generated through the development of renewable energy projects that clearly need carbon finance to exist, such as off-grid projects in middle-income countries and large-scale projects in least-developed nations or conflict zones within medium-income countries. Additionally, standards such as VCS and Gold Standard still allow all renewable energy projects registered prior to the beginning of 2020 to develop and verify credits through their initial crediting period.

The variance in forestry volumes and prices year-to-year also partly reflects the large-scale scope of some REDD+ projects that may bring several million tons to market in any given year. Higher volume transactions tend to sell at lower prices, which appears to be what happened in 2018, when a relatively small number of high-volume/low-price REDD+ transactions from Latin America drove volumes up and prices down.

Wide variation in forestry and land-use offset prices between primary and secondary markets

EM Carbon Survey participants are requested to denote whether a transaction occurred in the primary market (the initial transaction of offsets from a project developer to the first buyer — either market intermediaries or end buyers) or the secondary market (subsequent sales of offsets by market intermediaries). For a subset of transactions, EM was able to further breakdown average weighted prices in the primary and secondary market according to project developers, intermediaries (brokers and retailers), and end buyers, as depicted in Figure 7. The highest average price observed ($9.79 per ton) was for a relatively small number of transactions in which the project developer sold directly to an end-buyer.

Figure 7. The Offset Cycle and Associated Average Voluntary Market Prices from Project Development to Retirement, 2019



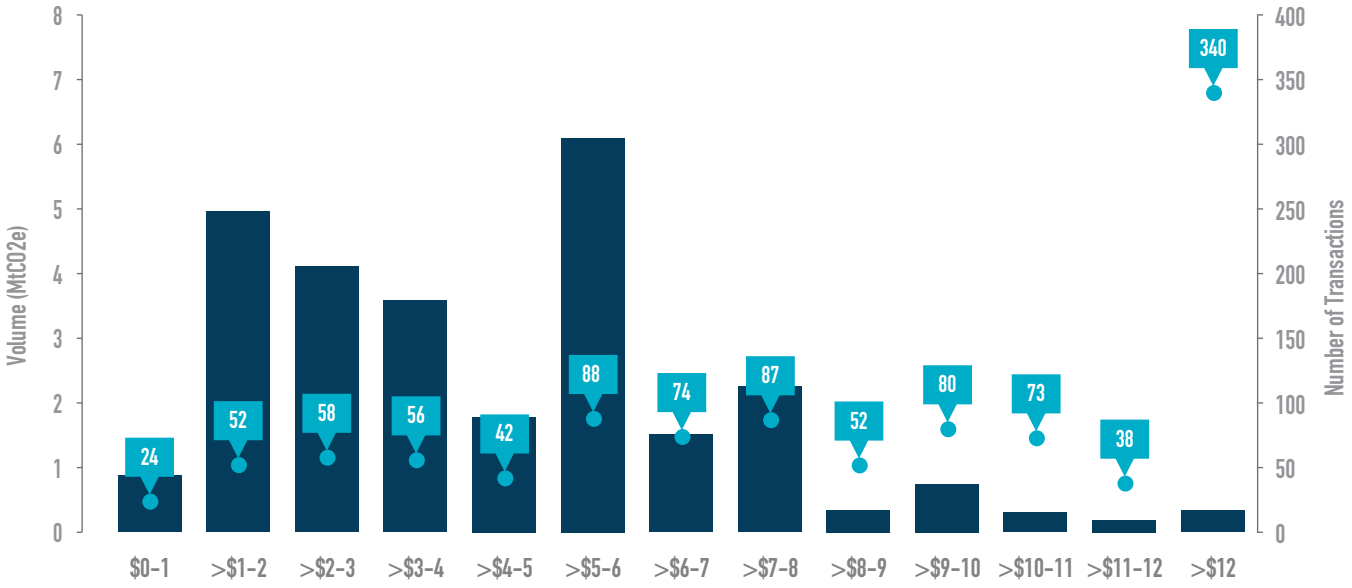
*Brokers do not take ownership of offsets. EM removes double counting in instances where project developers and brokers respond on behalf of the same offset transaction.

**Retailers do take ownership of offsets.

Note: Figure based on 261 transactions in 2019, in which respondents identified themselves solely as project developers, brokers or retailers. Figure includes voluntary market data only.

Prices for forestry credits in 2019 continued to exhibit a wide range, from a low of $0.50/tCO2e to more than $200/tCO2e (the latter being for a handful of very small transactions of less than 10 tons). This is due to the wide array of attributes (location, type, etc.) that influence price, and the fact that many voluntary market transactions are bilateral OTC trades rather than traded as a standardized commodity in a central marketplace. Most of the volume traded fell between $1 to $8 per ton (Figure 8). However, a significant number of smaller transactions (340 in 2019) occurred at $12 per ton or more.

Figure 8. Voluntary Forest Carbon Offsets: Volume Transacted and Number of Transactions by Price, 2019



Note: Based on 1,064 transactions representing 27.1 MtCO2e in 2019. Voluntary markets data only.

Standards

VCS expands market share accounting for almost 90% of volume

Although the use of third-party, verified standards is not strictly required in the voluntary markets, the use of independent standards has long been the norm. In 2019 more than 99% of forestry and land-use credits transacted used an independent standard, which provide methodologies that ensure emission reductions took place. Along with registries, (in many cases managed by the standard organization) standards ensure that credits can be tracked and claimed by their rightful owners. The Verified Carbon Standard (VCS) continued to dominate this space in 2019 with 89% of the market share of the forestry and land-use credits tracked by EM. This reflects a further consolidation around VCS as the most-used standard for forestry and land-use credits from three years ago when VCS accounted for about 82% of the market.

Additionally, more than 80% of the VCS credits added the Climate, Community and Biodiversity (CCB) Standard to verify co-benefits “beyond carbon.” This share was up from 74% of VCS credits transacted in 2016.

The next most popular standards used on the voluntary forest carbon market by market share were American Carbon Registry (ACR) with 4.8%, Plan Vivo (which focuses on community and small-holder activities in developing countries) with 2.5%, and Climate Action Reserve (CAR) with less than 1% market share. CAR and ACR both focus on projects in North America.

Although the Gold Standard has a particular focus on co-benefits and aligning crediting activities with the SDGs, only ~3.5% of the credits it issued through 2020 were forestry-related, and in 2019, less than 1% of forestry and land-use credits tracked by EM were Gold Standard-verified. This was a significant decrease in market share for Gold Standard, which represented 4% of the market share in EM’s 2017 report. Historically strong in renewable energy

projects, Gold Standard issuances may begin to shift more to other project types, including afforestation, since, as of early 2020, it is no longer verifying new grid-connected renewable energy projects in the developed world.

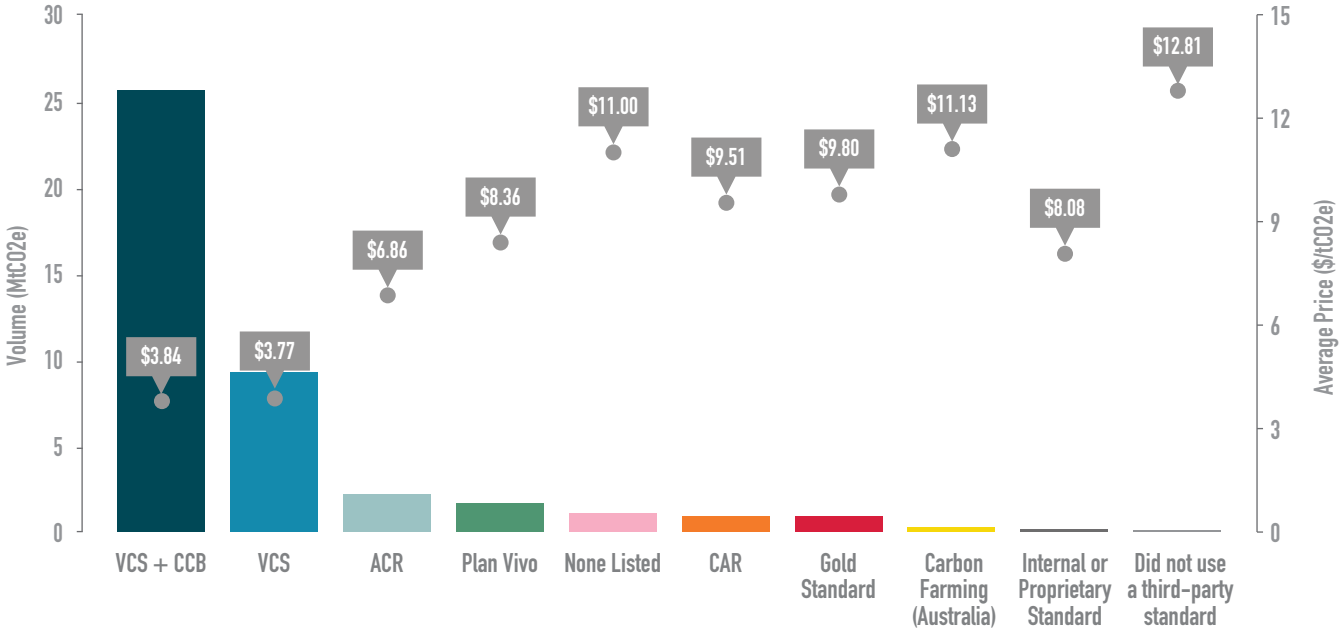
Prices vary widely by standard, but are driven by underlying project attributes and co-benefits

As seen in Figure 9, the average price of credits varied significantly across the standards. However this price differential is more likely driven by credit attributes such as project type, transaction size, and location, which are themselves associated with certain standards. For example, in 2019, 42% of VCS credits contracted were REDD+. Those VCS credits' average price of $3.83 per ton was close to the global average price for REDD+ credits. Gold Standard forestry credits are primarily afforestation/reforestation, which have a higher average price than REDD+, resulting in a higher average forestry credit price of $9.80 per ton. Plan Vivo's average forestry credit price in 2019 was $8.36 per ton. Both Plan Vivo and Gold Standard are also likely earning a higher price per ton due in part to their focus on smaller volume transactions and co-benefits.

In the case of VCS credits sold with additional CCB verification, at first glance the CCB add-on seemed to offer a minimal price premium in 2019 ($3.84 for VCS+CCB vs. $3.77 per ton without CCB), which is not inconsistent with past EM findings. But this may be misleading and could reflect the location of the VCS+CCB projects, which tend to be in low-income countries. Indeed, statistical analysis of all 2019 transactions data shows that additional co-benefits certification was a significant driver of price. This finding is also consistent with previous surveys by EM[106] which showed that co-benefits were buyers' most important consideration when choosing which offsets to purchase.

The North American-focused ACR and CAR standards saw average prices of $6.86 and $9.51 per ton, respectively. This partly reflects the higher cost of labor, land, and other inputs in high income countries, as well as North American buyers' willingness to pay higher prices for offsets from their continent. Transactions from projects that did not use a third-party standard sold at a price of $12.81 per ton but accounted for only 0.3% of the market. Here, price was influenced strongly by a small number of high-priced European projects.

Figure 9. Voluntary Forest Carbon Offsets: Market Volume and Value by Standards, 2019



Note: Figure includes voluntary market data only. The small amount of transacted offsets issued by Australia's Carbon Farming Initiative were not those purchased by the government's Emissions Reduction Fund.

[106] Kelley Hamrick and Melissa Gallant, Fertile Ground: State of Forest Carbon Finance 2017, (Washington, DC: Forest Trends, 2017), https://www.forest-trends.org/publications/fertile-ground/

Location

Demand concentrated on countries at high risk of deforestation, with Latin America leading the way

In 2019, EM tracked forest carbon offsets produced in 28 countries; however more than 86% of these offsets came from only eight countries: Indonesia, Peru, Kenya, Brazil, the US, Guatemala, Zimbabwe, and Ethiopia (Figure 10). All of these countries are home to tropical forests at risk of deforestation, except the US, which has a growing base of corporate buyers aiming to address net-zero commitments through the voluntary markets in the absence of national targets.

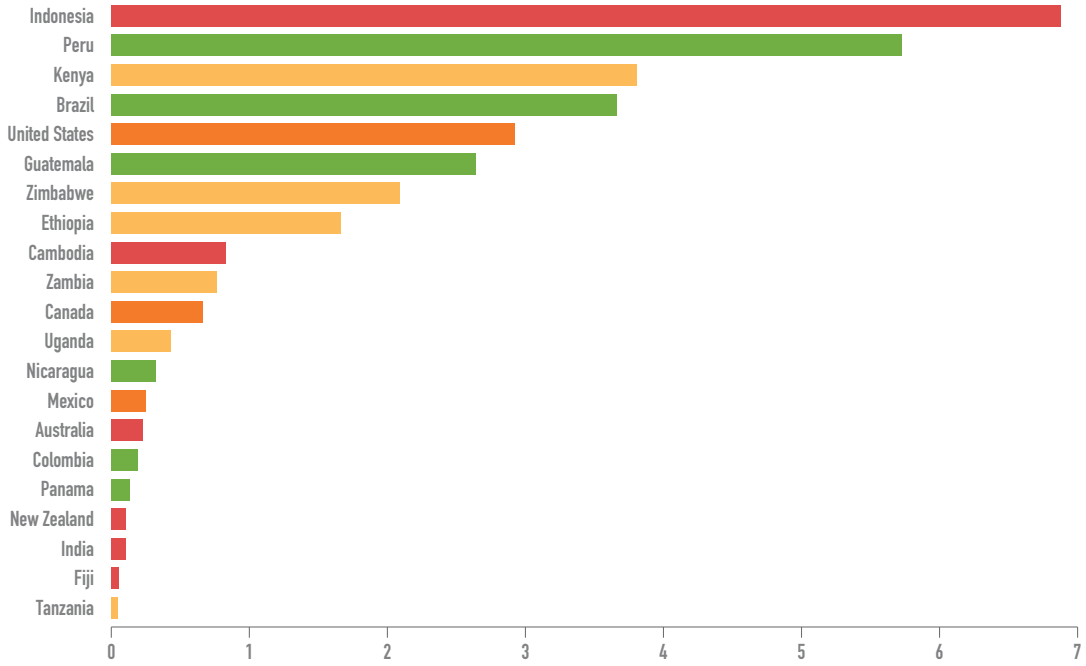
Latin America maintained its place as the region from which the most forestry and land-use credits transacted originated in 2019, accounting for 38% of market share. Peru (5.7 MtCO2e), Brazil (3.7 MtCO2e), and Guatemala (2.6 MtCO2e) accounted for most of these credits. Not coincidentally, the credits from these high-volume countries, primarily producing REDD+, had a combined average price of $3.05 per ton, pulling down the Latin America average to $3.36 per ton, significantly below the global average of $4.33 per ton, and the lowest average price of any region. Other Latin American countries producing offsets included Nicaragua, Mexico, Colombia, and Panama. Together, these four countries accounted for 891 KtCO2e, primarily afforestation/reforestation (67% combined), at an average price of $6.69 per ton.

Africa accounted for 27.1% of forest carbon offsets transacted in 2019, with the most significant volumes coming from East Africa, including Kenya, Zimbabwe, Ethiopia, Zambia, Uganda, and Tanzania. Significant price differentials were seen across these countries but the regional average of $4.13 approached the global forestry and land-use average.

Asia was the source of 23.1% of forestry credits transacted in 2019, with Indonesia alone accounting for 86% of that volume. At 6.9 MtCO2e, Indonesia was the highest volume source country EM tracked in 2019. Cambodia and India maintained their spots as the 2nd and 3rd highest volume countries in Asia.

Projects in North America, Europe, and Oceania continue to sell at lower volumes than Latin America, with the exception of the US, which was the source of 2.9 MtCO2e credits in 2019, at an average price of $7.47 per ton. Oceania traded less than 400 KtCO2e, but at a significantly higher average price of $12.67 per ton, tracking just below the prices of the region's compliance market prices.

Figure 10. Voluntary Carbon Offsets: Market Size by Project Location, 2019



Note: Based on 1,116 transactions representing 36.7 MtCO2e in 2019. Figure includes voluntary market data only.

Only a handful of organizations with credits originating in Europe responded to the EM survey, amounting to 128,000 tons at an average price of $27.23 per ton. This price should be viewed with caution as it is based on relatively few data points.

Project Type

REDD projects lead volume, while tree-planting consistently commands higher prices

In 2019, REDD+ was by far the largest forestry and land-use project type by volume, at a combined 23.3 MtCO2e (subtypes of REDD+ in Table 4). This is a significant increase over the 10.6 MtCO2e tracked in the *2017 State of Forest Carbon Finance* report, although a pullback from the peak of 30.8 MtCO2e tracked by EM in 2018, when particularly large volumes came out of Peru. The average global price of REDD+ credits in 2019 was $3.80 per ton.

Tree-planting projects, or afforestation/reforestation, grew significantly from 2 MtCO2e in 2016 to 8.4 MtCO2e in 2018, then fell back to 3 MtCO2e traded in 2019, at an average price of $7.69 per ton that year.

Tree-planting projects, which remove carbon from the atmosphere, as opposed to REDD+ projects that focus primarily on avoided emissions, frequently command higher prices, in part due to the cost of inputs required. Afforestation/Reforestation (A/R) credits exhibited an incredibly wide price differential in 2019, with a minimum price reported of $2 per ton and maximum of over $200 per ton. The price premium for A/R may continue to increase with a constrained supply, and some large corporate buyers such as Microsoft perceiving carbon removals as a preferred offset type. Many companies appear to have inferred such a preference from net-zero guidance from the Science-Based Targets initiative, which does not allow offsets to substitute for emissions abatement but does allow for removals to neutralize residual emissions toward the end of net-zero strategies.

Table 5. Voluntary Market Forestry and Land-use Project Types by Volume, Price, and Value, 2019

Project Type	Volume	Average Price ($/tCO2e)	Minimum Price ($/tCO2e)	Maximum Price ($/tCO2e)	Median Price ($/tCO2e)	Value
REDD+, Avoided Unplanned Deforestation	13,386,771	$3.65	$0.56	$93.84	$6.00	$48,853,880
REDD+, Avoided Planned Deforestation	8,934,187	$4.21	$0.86	$19.50	$6.00	$37,612,958
Non-specified Forestry and Land-use	6,089,321	$2.49	$0.50	$50.00	$20.16	$15,171,298
Afforestation/ Reforestation	2,978,265	$7.69	$2.00	$212.77	$13.20	$22,910,350
Improved Forest Management	2,101,119	$8.03	$6.54	$18.84	$9.84	$16,862,762
REDD+, Non-specified	947,911	$2.07	$0.85	$22.00	$5.90	$1,965,234
Sustainable Agriculture/ Agroforestry	441,298	$8.74	$2.00	$21.54	$11.75	$3,856,502

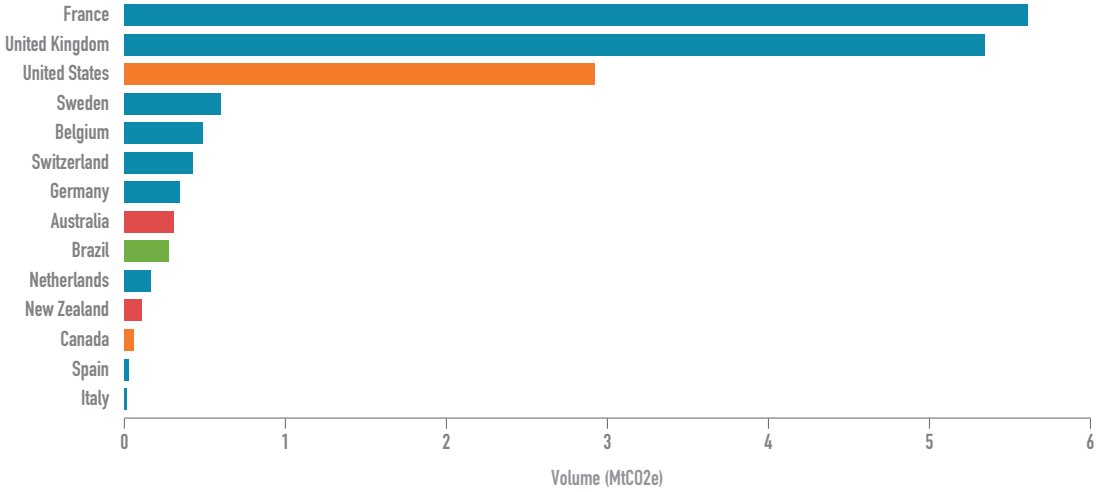
Note: Based on 1,116 transactions representing 36.7 MtCO2e in 2019. Voluntary market data only.

Buyers

Forest Carbon Buyers Concentrated in Europe and US

From the subset of data reported to EM that provided information on general buyer characteristics in 2019, EM found most forest offset buyers in voluntary markets were concentrated in a handful of countries (consistent with previous years' reporting). As seen in Figure 11, the top three buyer countries by volume were France (33.0 %), the UK (31.4%) and the US (17.2%). These three buyer countries accounted for about 75% of the value of the market for which buyer countries were reported.

Figure 11. Voluntary Market, Forestry and Land-use Offset Purchases by Top Buyer Countries by Volume, 2019



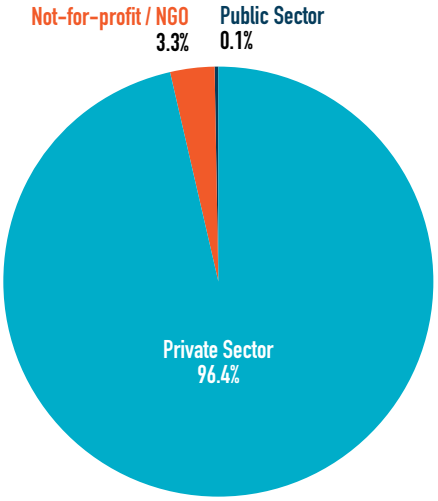
Note: Based on 882 transactions representing 17 MtCO2e in 2019. Figure includes voluntary market data only.

As previously noted in Figure 7, buyers can be subdivided into end buyers (organizations that ultimately intend to retire offsets they purchase) and intermediary market actors (retailers and brokers). Almost 60% of the forest carbon offsets transacted in 2019 were purchased by end buyers. This is a drop off from 70% of the market three years prior, and likely points to an increase in the role of market intermediaries for forestry offsets.

Private-sector companies continue to comprise most buyers of forestry and land-use offsets, with 96.4% of credits by volume purchased in 2019 (Figure 12). In many cases, private sector buyers are purchasing credits as end-users, intending to retire them as part of their corporate strategy to address their GHG emissions. In some cases, companies may be speculating in forestry credits, whose long-term prices many consider low and therefore are perceived as a good investment.[107] Ecosystem Marketplace data shows that 24.3% of the volume purchased by private-sector buyers were purchased as an "intermediary," meaning they intended to sell these credits onwards to other buyers. Non-profit buyers represented only 3.3% of the volume purchased in 2019. Of that volume, 7.3% was purchased as end-buyers to address climate goals, and 92.7% as market intermediaries. Overall, of the volume transacted in 2019 that listed buyer types 73.6% were end users and 26.4% were market intermediaries.

[107] "Carbon trading: the 'one-way' bet for hedge funds," Financial Times, August 23, 2020 https://www.ft.com/content/a5ff89ec-323c-4fb8-85a1-9d0225ae3cdb

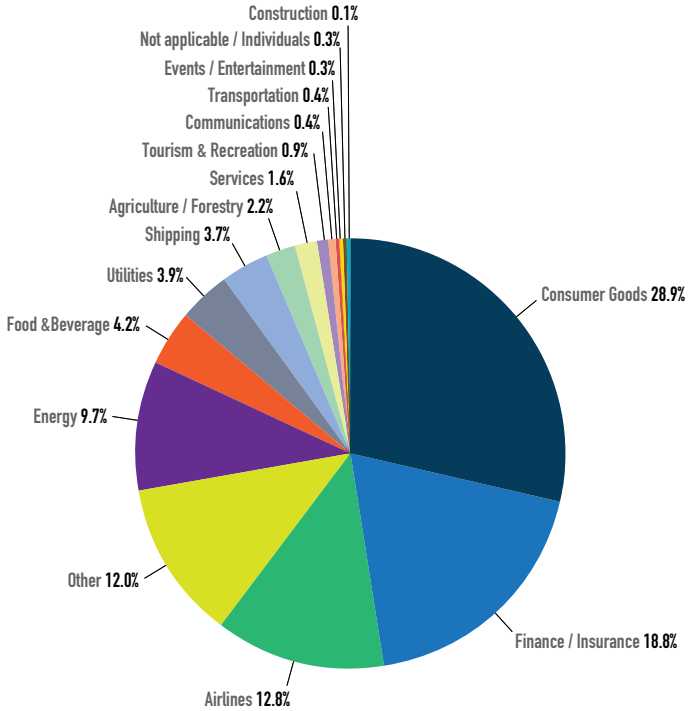
Figure 12. Voluntary Market Forestry and Land-use Offset Buyers by Profit Status, 2019



Note: Based on 618 transactions representing 17.8 MtCO2e in 2019. Figure includes voluntary market data only.

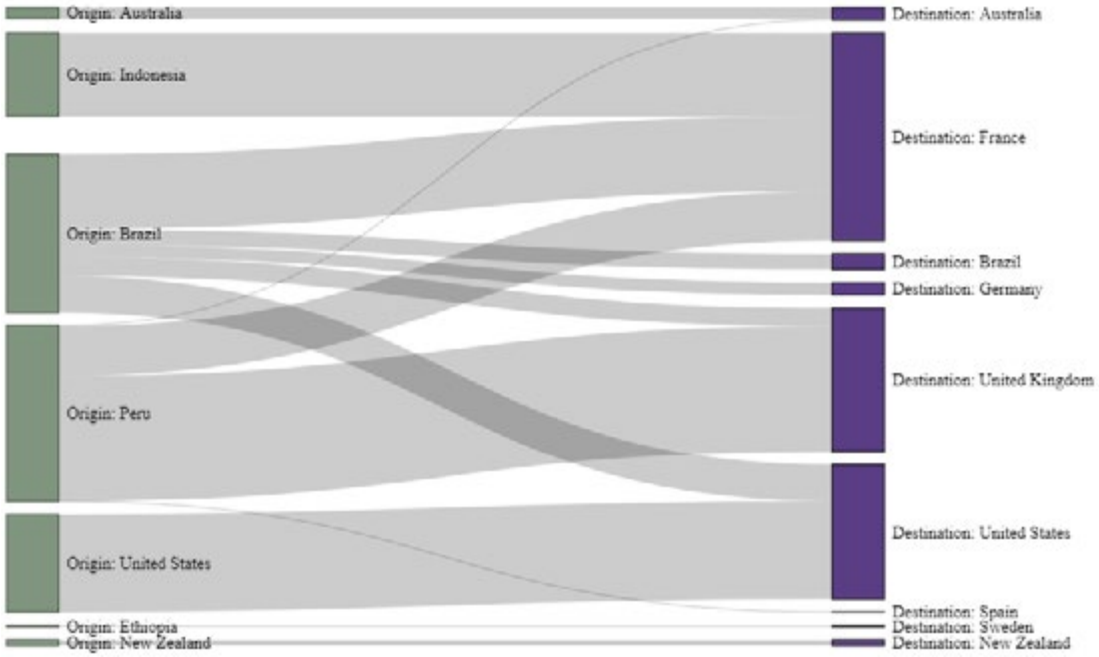
Forest Carbon buyers are further broken down by sector in Figure 13 with Consumer Goods, Finance/Insurance, and Airlines sectors accounting for 60% of market volume.

Figure 13. Forestry and Land-use Offset Buyers by Sector, 2019



Note: Based on 575 transactions representing 13.4 MtCO2e in 2019. Figure includes voluntary market data only.

Figure 14. Top Country of Origin and Buyer Locations of Forestry and Land-use Credits in the Voluntary Market.



Note: Based on 553 transactions representing 9.5 MtCO2e in 2019. Figure includes voluntary market data only.

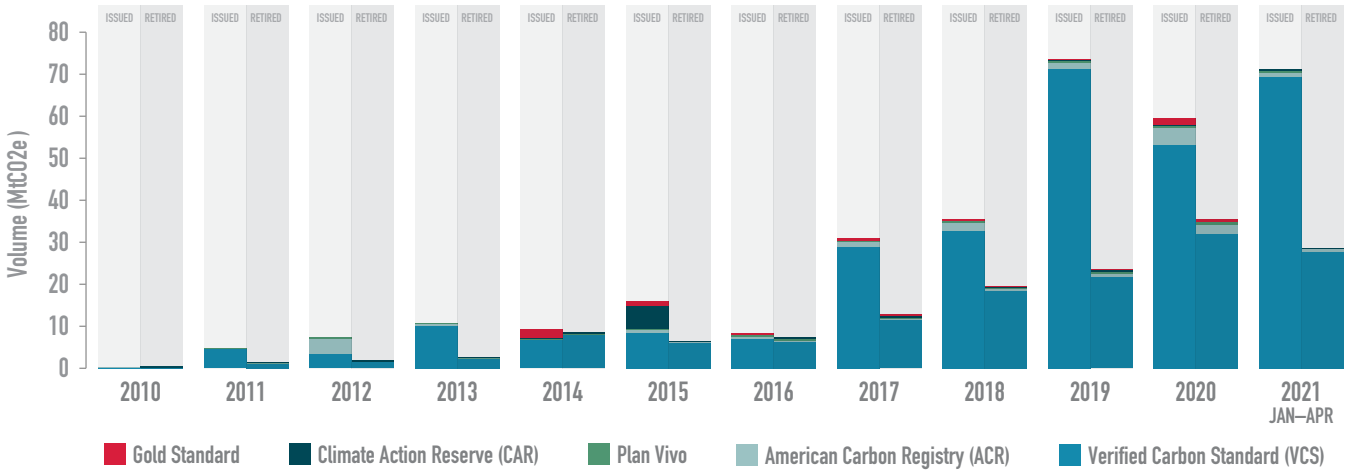
Figure 14 depicts the relative volume of transactions reported to EM from the leading countries of origin of forestry and land-use credits and the corresponding location of buyers (for the subset of transactions where both data points were obtained).

Voluntary Issuances and Retirements in 2019

After developing a forest carbon project, either a voluntary or compliance standard will issue offsets to a project developer that is equivalent to the project's avoided or sequestered emissions. Each issued offset has a unique serial number, which appears on a registry. Registries track the buying and selling of carbon offsets (which are referred to as "transactions") noting when an offset is retired, or permanently removed from trading.

Here, we summarize data obtained from the five largest independent, third-party (previously referred to as "voluntary") standards today: the Verified Carbon Standard (VCS); American Carbon Registry (ACR); Climate Action Reserve (CAR); Gold Standard; and Plan Vivo (PV).

Figure 15. Historical Issued and Retired Forestry and Land-use Offset Volumes by the Five Largest Independent Standards, 2010-2020, (and 2021 through April)



Note: This figure tracks forestry and land-use project registry data reported from ACR, CAR, Gold Standard, Plan Vivo and VCS from 2010 to 2020. Figure includes voluntary market data only.

Demand for forest carbon is rising steadily, still outpaced by supply, but closing the gap

As seen in Figure 15, there has been a rapid rise in forestry and land-use credit issuances and retirements over the past four years (2017-2020), amounting to 199.4 MtCO2e of issuances and 91.3 MtCO2e of retirements. This represents approximately 78% of total forestry and land-use credit issuances from 2010-2020 (256.2 MtCO2e) and 76% of retirements (120.2 MtCO2e) in just those four years. A little more than half (53%) of the total forestry and land-use credits issued from 2010-2020 were not retired by the end of 2020 and remained available for sale. The issuances to retirements gap increased between 2017-2019, but that gap began to close in 2020. Demand for voluntary forestry and land-use offsets rose steadily during the last four years, with each year marking a new high in retirement volumes. More recent analysis by EM showed that forestry offsets led both issuances and retirements in Quarter 1(Q1) 2021 with 20M offsets retired and 24.9M issued, approximately half the total of all issuances and retirements during that period. Forestry offset retirements more than doubled in Q1 2021 compared to Q1 2020 and more than quadrupled compared to Q1 2019.

The data also indicates a continuing consolidation around VCS as the most traded forestry and land-use credit by standard, with VCS-verified issued credits accounting for 90% of the market from 2010 to Q1 2021 and 91% of retirements during that period.

Outlook: Demand for "Natural Climate Solutions" expected to grow on the back of jurisdictional REDD+ buyer interest

Most, if not all, market participants interviewed by EM saw a continuing trend in favor of NCS, with new sources of forestry and land-use credits in development, such as Jurisdictional REDD+ (see the following section), and new initiatives promoting NCS, such as IETA's Markets for Natural Climate Solutions. Anecdotal evidence also suggests that demand for offsets associated with forestry appeared strong in 2020. Later sections will explore differences between projects versus jurisdictional credits and removals versus reductions.

JURISDICTIONAL REDD+ FUNDING MECHANISMS

Public Funding for REDD+

In addition to the sale of REDD+ project carbon credits in voluntary and some compliance markets, a number of REDD+ funding mechanisms exist that promote a phased approach to developing national and subnational REDD+ programs via readiness, implementation, and results-based finance. The purpose of this readiness funding is to build capacity and enabling policies to prepare developing tropical forest nations to effectively measure, monitor, report, and verify emissions reductions from REDD+ activities, rather than paying for REDD+ results. In other words, readiness funding is not dependent upon achieving deforestation or carbon emission milestones. Next, funding for implementation addresses drivers and proximate causes of deforestation and forest degradation. Results-based payments for emission reductions incentivizes mitigation actions and builds the market for REDD+ emission reductions. Results-based payments are performance-conditional, meaning that they will only be disbursed when REDD+ initiatives can demonstrate they have reduced deforestation and forest degradation using prescribed metrics. Most international climate finance for REDD+ activities to date have come from bilateral and multilateral public sources and flowed to "readiness" programs.

Results-based payments are beginning to flow

Although REDD+ results-based payments have experienced delays as groundwork was developed to establish robust REDD+ programs at scale, funding is beginning to flow. For example, as of November 2020, the Green Climate Fund (GCF) approved $496.75M in REDD+ results-based payments to Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Indonesia, and Paraguay. The Forest Carbon Partnership Fund (FCPF) Carbon Fund (which provides results-based finance) had $870M in committed funding through June 2020, and although no payments for emissions reductions have been made as of April 2021, $181M in Emission Reduction Payment Agreements (ERPAs) had been approved as of June of 2020.[108] This figure had increased to almost $670M in signed ERPAs as of May 2021. Governments such as Norway, Germany, Switzerland, the UK, and the US (via FCPF, GCF, and LEAF) have made large commitments and disbursements to REDD+ results-based finance. For example, Germany has pioneered subnational results-based agreements through its "REDD Early Movers" (REM) program and Norway has paid more than $1B to the Brazilian Amazon Fund (although payments from Norway and Germany to the Amazon Fund are currently suspended due to rising deforestation). This approach is being adopted by multilateral funds, including the FCPF and the Green Climate Fund (GCF). In May 2020, the Norwegian government approved a payment of $56M to Indonesia for emissions reductions of 17 MtCO2e for REDD+ in 2016-2017 (compared to the preceding decade). Most of these programs (Table 6) have made payment commitments of $5 per tCO2e. More recently, although no payments have been made yet, Norway has commitments of floor prices to Gabon and Colombia of $10t/CO2e certified by ART-TREES (Table 7).

The only subnational jurisdictions to receive multi-year results-based payments so far are Acre ($28.75 M) and Mato Grosso ($37.34M) in Brazil through the REDD+ Early Movers program and funding from the UK.[109] Some subnational jurisdictions are also developing jurisdictional REDD+ programs with the aim of developing carbon credits to be certified under standards such as ART-TREES (e.g., Amapá, Maranhão, and Tocantins in Brazil) and VCS-JNR.

Public results-based payments are increasingly blending with private market-based approaches

Results-based payments for REDD+ from bilateral and multilateral funding sources have traditionally been non-market payments that do not entail the transfer of a tradable credit in a market between a "buyer" and "seller." However market and non-market mechanisms are increasingly intertwined — REDD+ initiatives may receive funding from both

[108] Forest Carbon Partnership Facility, Forest Carbon Partnership Facility 2020 Annual Report, (Forest Carbon Partnership Facility, 2020), https://www.forestcarbonpartnership.org/document/fcpf-2020-annual-report

[109] Earth Innovation Institute and Forest Trends, The Forest Carbon Market and Jurisdictional REDD+, (Earth Innovation Institute and Forest Trends, forthcoming)

non-market sources and market-based payments for the sale of carbon credits once the reductions are achieved. The public-private partnership LEAF is an example, in which public funded results-based payments are expected, at least in part, to support floor prices for REDD+ programs in the event that private demand is insufficient. In another example, the Forest Carbon Partnership Facility (FCPF) is pursuing acceptance of its REDD+ credits within the CORSIA market, further blending the market and non-market REDD+ funding models.

Additionally, the FCPF Carbon Fund is separated into two parts or "tranches." Tranche B is closer to a results-based payment mechanism, in which emission reductions achieved remain with the country that produced the REDD+ results and can be used against their NDC (not to be sold on to other third-party buyers). However, under Tranche A ERPAs, which represent approximately 5% of the Carbon Fund, the emission reductions can transfer to the buyers to use for any other purpose, which may include for their compliance or resale, and are therefore considered market-based transactions.

Pre-verification finance

A challenge for jurisdictional REDD+ is that payments occur after results, leaving a potential upfront financing gap (as with many major national infrastructure programs). Donor grants and loans from development finance institutions can play a role in filling this gap. However, given the major investment costs (in many cases), for forest country governments of ending deforestation, the bottleneck of due diligence requirements accompanying traditional "input-based" aid has translated into limited resources for forest countries to meet ambitious targets. Private sector investment and innovation, as well as efforts by agribusiness companies and consumer countries to take deforestation out of commodity supply chains, will also be important in delivering the full mitigation potential of forests. However, these actions can only go so far in the absence of ambitious policies and incentives on the ground in forest countries.

Different financial mechanisms to provide pre-verification finance have been proposed, including upfront payments from private buyers in exchange for a reduction in price paid on delivery; payments for call options on REDD+ credits; payments for jurisdictional REDD+ credits in relation to historical emissions reductions; enhanced bond structures explicitly linked to REDD+ revenues; and trade finance linked to demand for REDD+ credits/carbon neutral commodities. Ultimately it is about scale. With a sufficiently high and predictable carbon revenue stream, forest countries could expand national budget allocations knowing that the investment needed to achieve REDD+ outcomes would not lead to a long-term increase in the national debt. Credit rating agencies and development finance institutions could treat efforts to achieve and go beyond NDC goals as investments delivering positive financial returns. And donor governments could more confidently provide additional grant funding for capacity building.

The major public funding mechanisms for REDD+ active during the past decade are summarized in Table 6. Brief descriptions of each mechanism follow.

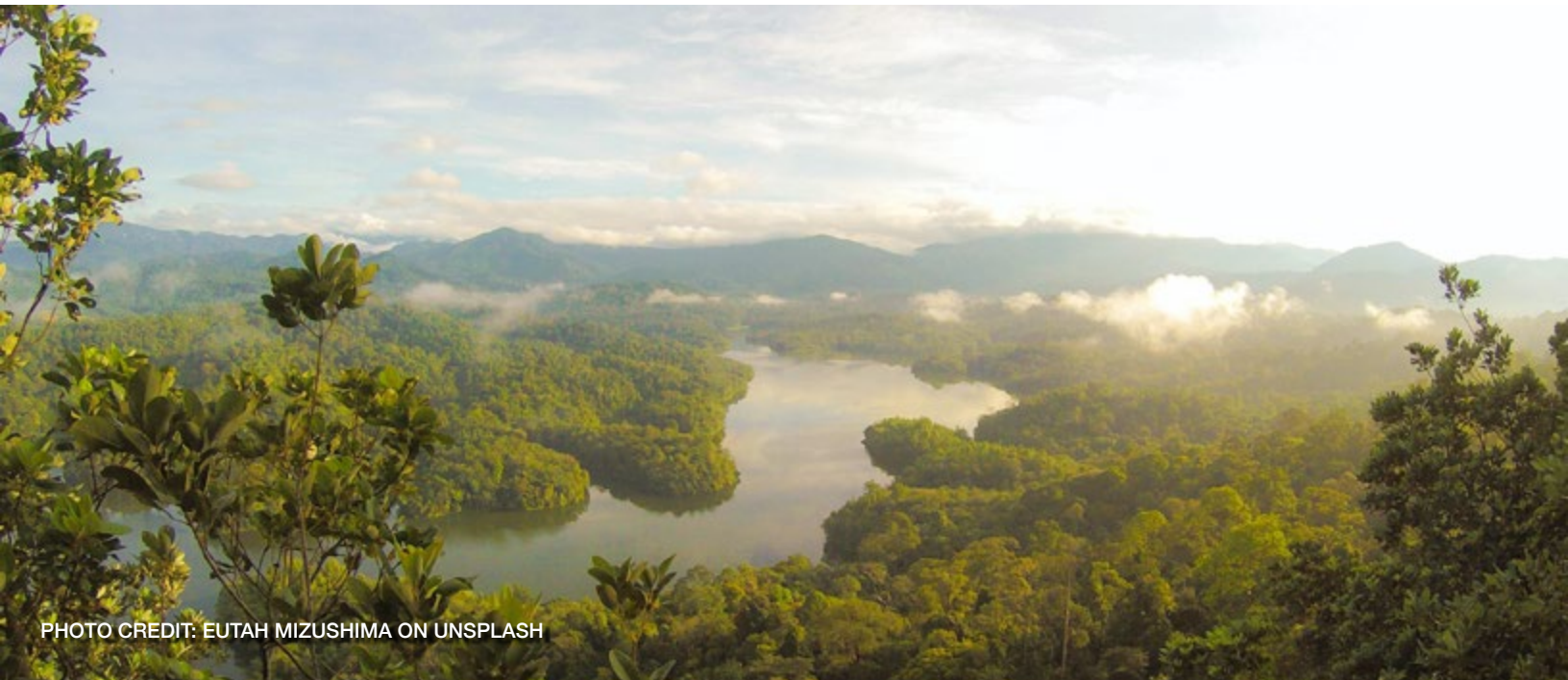


PHOTO CREDIT: EUTAH MIZUSHIMA ON UNSPLASH

Table 6. Summary of REDD+ Funding Mechanisms

Fund	Exclusive to Forest Carbon	Fund Recipients	Amount Committed to the Mechanism (USD)	Signed Agreements/ Amount Disbursed by the Mechanism (USD)
UN REDD Programme	Yes	65 Developing Nations	$337M	$336M (readiness funding)
FCPF Readiness Fund	Yes	47 Developing Nations	$465M (in the Readiness Fund as of December 2020. $399M pledged and $66M in investment income)	$369M (disbursed, as of December 2020. All readiness funding.)
FCPF Carbon Fund	Yes	18 Developing Nations (ERPAs signed with 14 countries by May 2021 – Table 7)	$875M (as of December 2020)	$45M disbursed as of December 2020 ($669M in signed ERPAs as of May 2021).
World Bank BioCarbon Fund ISFL	No	Country Programs in Colombia, Ethiopia, Indonesia, Mexico and Zambia	$364M (as of December 31, 2020)	$41M disbursed (as of December 2020) Ethiopia is expected to sign an ERPA in 2021. Other ISFL countries expected to sign ERPAs in 2022.
The Amazon Fund	Yes	Amazonian Nations, Sub-national jurisdictions, independent projects	$1.288B received to date from Norway (94% of total) Germany and Petrobras	$533M in results-based payments[110]
Forest Investment Program	Yes	23 developing countries	$751M (through December 2020)	$270M (readiness and implementation, through June 2020)
Congo Basin Forest Fund	Yes	Countries in the Congo Basin	$186M	$58.9M (readiness funding)
Norway's International Climate and Forest Initiative	Yes	Brazil, Colombia, The Congo Basin, Ecuador, Ethiopia, Guyana, Indonesia, Liberia, Peru	$1.6B*	unknown
Green Climate Fund	No	Developing Nations	$500M allocated for a pilot program for REDD+ results-based payments. (Total GCF committed funding across all activities is $17.8B, $8.3B under Initial Resource mobilization and $9.5B under First replenishment)	Four projects (FP100, FP110, FP120 and FP121) have disbursed a total of $228.6M by February 2021 out of $496.75M approved in REDD+ results-based payments.

[110] The Amazon Fund is a results-based-payment arrangement between investors and Brazil. However disbursement from the Amazon Fund to projects in Brazil are grants, not results-based. For the purposes of this report, EM is counting this RBP.

Fund	Exclusive to Forest Carbon	Fund Recipients	Amount Committed to the Mechanism (USD)	Signed Agreements/ Amount Disbursed by the Mechanism (USD)
Central African Forest Initiative (CAFI)	Yes	Cameroon, Central African Republic, Republic of Congo, the Democratic Republic of the Congo, Equatorial Guinea and Gabon	$479M	$182M (implementation and results-based payments)
REDD+ Early Movers (REM)	Yes	Colombia, Ecuador and the Brazilian states of Acre and Mato Grosso	Acre: 25M Euros in phase 1, 2012- 2016; and approximately 31M Euros for phase 2, 2017-2022. Colombia $100M Ecuador: approx. $50M	Approximately $100.7M in results-based payments.
LEAF Coalition	Yes	To be determined. Open to all tropical and subtropical countries	Initial goal to mobilize $1B in finance by COP26, November 2021. Note that this is a pledge, not commitment.	None yet. Mechanism announced and requests for proposals were initiated on April 22, 2021.

*Disbursed through REDD+ programs and may overlap with other pledged amounts.

Public REDD+ Funding Programs: An Overview

The UN-REDD Programme is a flagship UN partnership between FAO, UNDP, and UNEP for the protection of forests and the Sustainable Development Agenda. It helps its 65 partner countries advance the implementation of the Paris Agreement, particularly Articles 5 and 6, to reduce deforestation, promote sustainable land use, advance international cooperative approaches to climate mitigation, and mobilize climate finance. To date, $337M has been pledged to the fund and $336M in readiness funding has been disbursed.[111]

The World Bank Forest Carbon Partnership Facility (FCPF) is a global partnership of governments and businesses focused on REDD+. The FCPF works with 47 developing countries across Africa, Asia, and Latin America and the Caribbean, along with donor governments that have made contributions and pledges totaling $1.274B.[112] The FCPF supports REDD+ efforts through its Readiness and Carbon Funds. The Readiness Fund supports nations in adopting national REDD+ strategies, developing reference emission levels, and designing measurement systems. The Carbon Fund, discussed in more detail in the REDD+ Carbon Credit Funding section, provides results-based payments to nations that have implemented their REDD+ strategies and achieved verifiable emissions reductions through jurisdictional programs. As of May 2021, the FCPF Carbon Fund has signed 14 Emission Reduction Payment Agreements totaling about $670M with countries that will begin generating emission reductions and receiving payments in 2021 (Table 7).

[111] "Trust Fund Factsheet – UN REDD Programme Fund," United Nations Development Programme Multi-Partner Trust Fund Office Gateway, http://mptf.undp.org/factsheet/fund/CCF00

[112] Forest Carbon Partnership Facility, Forest Carbon Partnership Facility 2020 Annual Report, (Forest Carbon Partnership Facility, 2020), https://www.forestcarbonpartnership.org/document/fcpf-2020-annual-report

Table 7. FCPF Carbon Fund Emission Reduction Payment Agreements, as of April 2021

Country	FCPF ERPA Contract (tCO2e)	Total Value (USD)
Vietnam	10,300,000	$51,500,000
Lao PDR	8,400,000	$42,000,000
Nepal	9,000,000	$45,000,000
Indonesia	22,000,000	$110,000,000
Madagascar	10,000,000	$50,000,000
Mozambique	10,000,000	$50,000,000
Ghana	10,000,000	$50,000,000
DRC	11,000,000	$55,000,000
Chile	5,200,000	$26,000,000
Costa Rica	12,000,000	$60,000,000
Cote d'Ivoire	10,000,000	$50,000,000
Fiji	2,500,000	$12,500,000
Republic of Congo	8,400,000	41,800,000
Dominican Republic	5,000,000	25,000,000
Total	**133,800,000**	**$668,800,000**

The World Bank BioCarbon Fund (BioCF) Initiative for Sustainable Forest Landscapes (ISFL), established in 2013, is a multilateral fund supported by donor governments and managed by the World Bank. The ISFL collaborates with forest countries around the world to promote REDD+ and sustainable agriculture, as well as climate smart land-use planning, policies, and practices. It is supported by Germany, Norway, Switzerland, the UK, and the US. As of December 31, 2020, $364M in funding has been pledged to the ISFL.[113,114]

The Amazon Fund is a REDD+ mechanism created to raise donations for efforts to prevent, monitor and combat deforestation, as well as to promote the preservation and sustainable use in the Brazilian Amazon. It has supported 103 projects through $1.288B[115] in pledged funding, of which $533M has been disbursed. Contributors are Norway, Germany, Petrobras, and the Fund is managed by Brazilian Development Bank BNDES. However, Norway and Germany suspended payments in 2019 due to rising deforestation.

The Forest Investment Program is part of the $8B Climate Investment Funds, which supports REDD+ commitments in developing countries. Funds are disbursed to support institutional capacity for forest governance, invest in deforestation mitigation efforts, and provide alternative livelihoods and poverty reduction programs. Through December 31, 2020, $751M has been pledged to 23 countries, with $270M disbursed through June 30, 2020.[116]

[113] Biocarbon Fund Initiative for Sustainable Forest Landscapes, 2020 Annual Report, (Washington, DC: World Bank, 2020), https://www.biocarbonfund-isfl.org/sites/isfl/files/2020-10/ISFL%202020%20Annual%20Report_Web_Final.pdf
[114] Personal communications with The World Bank
[115] "Donations," Amazon Fund, accessed May 25, 2021, http://www.amazonfund.gov.br/en/donations/
[116] Personal communications with The World Bank

The Congo Basin Forest Fund was established in 2008 with the African Development Bank and the Central African Forests Commission to promote conservation and forest management in the Congo Basin. To date, $186M has been pledged, and $58.9 million has been disbursed.[117]

Norway's International Climate and Forest Initiative (NICFI) supports global efforts to reduce destruction of tropical forests. It aims to halt GHG emissions from deforestation and forest degradation in developing countries. NICFI leads these efforts from the Norwegian Ministry of Climate and Environment. Norad manages significant parts of the funds under the climate and forest initiative on behalf of the ministry. NICFI funds are disbursed through the multilateral REDD+ funds, including the Amazon Fund, as well as independent grant-making. The NICFI has pledged to invest approximately $300M per year in forestry initiatives.

The Green Climate Fund (GCF) is an operating entity of the financial mechanism of the UNFCCC established to support developing countries to limit or reduce their greenhouse gas emissions and to adapt to the impacts of climate change. $17.8B in funding has been committed to the fund to date. Including co-financing, the GCF portfolio has grown to $30.3B from which $8.3B are from GCF resources, with $5B for implementation and $1.7B disbursed.[118] The GCF has eight priority areas, including a dedicated agriculture, forestry, and other land use focus area. The GCF supports sustainable land use and forest management projects as well as provides REDD+ results-based payments. In total, the GCF has approved $496.75M in REDD+ results-based payments through its pilot program which operated from 2017 to 2020 when it exhausted its funding. Eight projects have been approved from the following countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Indonesia, and Paraguay. All approved projects under the RBP pilot program are expected to be under implementation by the third quarter of 2021.[119]

The Central African Forest Initiative (CAFI) is a partnership between the UNDP, FAO, the World Bank, the Central African countries of Cameroon, Central African Republic, Republic of Congo, the Democratic Republic of Congo, Equatorial Guinea, and Gabon, and donors, including the EU, France, Germany, the Netherlands, Norway, South Korea, and the UK. CAFI supports Central African partner countries' policy reforms and on the ground activities on REDD+ to mitigate climate change and reduce poverty. Gabon will become the first African nation to receive REDD+ results-based payments through an agreement with Norway via CAFI announced in September 2020. The ten-year arrangement sets a minimum price of $10 per ton.[120]

The REDD+ Early Movers (REM) program was established in 2011 by the German Federal Ministry for Economic Cooperation and Development (BMZ). REM targets countries or jurisdictions that are actively protecting forests by providing performance-based payments for REDD+ verified emission reductions. To date, REM has been implemented in the Brazilian states of Acre and Mato Grosso, Colombia, and Ecuador.

The Lowering Emissions by Accelerating Forest finance (LEAF) Coalition, launched on Earth Day, April 22, 2021, the LEAF Coalition is a public-private initiative that will finance jurisdictional REDD+ from tropical and subtropical forest countries. Initial donor participation includes the governments of Norway, the UK, and the US, as well as nine initial companies. Emission Reductions will be verified and issued by Architecture for REDD+ Transactions. Transactions will be facilitated by Emergent at a minimum price of $10 per ton. The LEAF Coalition aims to mobilize at least $1B in financing by COP26 in November 2021. Proposals from tropical and subtropical jurisdictions for emission reductions during the 2022-2026 period are now being sought.

[117] "The Funds," Climate Funds Update, accessed May 25, 2021, https://climatefundsupdate.org/the-funds/

[118] Green Climate Fund, Status of Pledges and Contributions (Initial Resource Mobilization), (Incheon, Green Climate Fund, February 28, 2021). https://www.greenclimate.fund/sites/default/files/document/status-pledges-irm-gcf1_2.pdf.

[119] Status of the GCF pipeline – Addendum IV; Update on the REDD-plus Results-Based Payments GCF/B.28/Inf.08/Add.04, 22 February 2021

[120] UNDP Climate and Forests, "Gabon: First in Africa to receive payments for preserved rainforests," United Nations Development Programme (UNDP), September 22, 2020, https://www.climateandforests-undp.org/gabon-first-africa-receive-payments-preserved-rainforests

Scaling Up REDD+: Jurisdictional Approaches & Nesting

Tropical deforestation alone drives an estimated 7% of global GHG emissions.[121] One clear implication is that REDD+ is an essential part of the strategy to achieve Paris Agreement goals. Some forest carbon experts believe that jurisdictional approaches to crediting are best positioned to facilitate scaling up, despite their complexity and the need for greater capacity building. The jurisdictional approach provides incentives for governments to do what only they can, such as addressing land tenure issues, illegal deforestation, and licensing of concessions.[122]

A jurisdictional REDD+ program is a government-led program to address the drivers of deforestation and forest degradation and to enhance forest carbon stocks over a large jurisdiction of forest cover across subnational and national scales. Jurisdictional programs are different from REDD+ projects, which cover a relatively small area, carry out activities (as opposed to policies and regulations) to address local drivers of deforestation or degradation, and are often implemented by civil society organizations or private companies.

Some stand-alone REDD+ projects have existed for decades, selling credits into the voluntary markets, and more recently, compliance markets such as Colombia. These projects enable innovation at the site level and can help drive private finance to areas where deforestation threats are highest. Ecosystem Marketplace has identified more than 60M REDD+ project credits transacted between 2017–2019, generating more than $350M in revenue. Although certainly not an insignificant amount, REDD+ will have to scale up significantly to achieve the Paris Agreement goal of cutting global GHG emissions in half by 2030 and achieving net-zero emissions by 2050.

The middle ground between REDD+ stand-alone projects and REDD+ jurisdictional approaches is a system that can support both projects and jurisdictional programs. Such an approach, known as “nesting,” is a framework designed to embed smaller projects into larger jurisdictional programs, as well as subnational programs into national programs. Nesting aims to align accounting and reporting of emissions and removals at the jurisdictional and project levels and clarify the roles of public and private-sector engagement that best suit national circumstances. A key challenge in nesting is reconciling project-level baselines with jurisdictional-scale baselines, as there are some concerns that many projects use inflated baselines. However nesting raises other new technical challenges, particularly as there are many ways to develop a nesting program.

Climate Focus has proposed four simplified models to illustrate the array possible of approaches, while recognizing that in reality, actual nested systems do not strictly adhere to any one model but are often hybrids.[123] At the two poles of this spectrum lie a jurisdictional-only emission reduction (ER) program and a project-only crediting program. Under the jurisdictional-only model, ERs are accounted for and monetized at the national scale, and the government determines how to share benefits with local actors and projects. Under the project-only crediting model, crediting occurs at the project level, with the government implementing REDD+ and regulating projects, but not monetizing ERs at the national level. In fact, neither of these two extremes are truly nested programs, but define the boundaries, as described by Climate Focus. The nested models lie in a middle ground, referred to as centralized-nested and decentralized-nested, in which crediting occurs at multiple scales. In this framework, the main difference between the two nested models rests on whether a national government aims to define a system that limits and allocates ERs based on national performance (the centralized-nested model), or a system that allows projects the autonomy to generate and monetize ERs directly. VCS-JNR is currently the only operational REDD system that supports these options with concrete guidance and tools. At the time of publication of this report, Climate Focus is developing this framework into a manual for the World Bank that is intended to provide governments with practical advice and guidance on designing and implementing nested REDD+ systems.

[121] The Investor Guide to Deforestation and Climate Change, June 2020. Ceres.

[122] Seymour, F. 2020. “INSIDER: 4 Reasons Why a Jurisdictional Approach for REDD+ Crediting Is Superior to a Project-Based Approach.” World Resources Institute. Accessed March 1 2021. https://www.wri.org/blog/2020/05/insider-4-reasons-whyjurisdictional-approach-redd-crediting-superior-project-based.

[123] As presented at IETA Live: Carbon Market Virtual Series - The Future of Nested REDD+: The State of Play. 17 November 2020, https://www.ieta.org/resources/Conferences_Events/2020/Carbon%20Market%20Virtual%20Series/RVS_FINAL_IETA%20LIVE%2014%20FULL.pdf

Today, countries including Peru, Colombia, Guatemala, and Cambodia (see Box 2) are developing a variety of approaches to nesting, simultaneously strengthening national policies to address deforestation and working to integrate projects into national schemes.

As noted in the Jurisdictional REDD+ Funding Mechanisms section, much of the REDD+ program financing to date has focused on readiness funding, which lays the necessary groundwork for jurisdictions to transition to implementation, monitoring, reporting/verification, and results-based payments. Although jurisdictional REDD+ credits are not yet available in the marketplace, that could change soon given advances in jurisdictional standards (see next section). According to a recent study by Vivid Economics, avoided deforestation could generate up to $610B annually by 2050.[124]

Jurisdictional Standards

Greenhouse gas standards programs are developing and refining approaches through which jurisdictional and nested REDD+ programs can be awarded carbon offsets.[125] Historically, REDD+ initiatives have largely relied on funding pledged from bilateral and multilateral ODA sources. Today, jurisdictional and nested REDD+ standards organizations are creating and updating the necessary protocols for credit verification and validation, as well as architecture for governance, decision-making, credit registration, and issuance, in order to provide new pathways for public and private-sector funding for REDD+ initiatives.

This section outlines four standards (Table 8) that support the development of jurisdictional REDD+ programs. Some of these standards have been established for many years and are undergoing revisions, while others are new to the market or still in development. These standards vary by which REDD+ activities are eligible for crediting, but all set out rules and requirements for developing a REDD+ program, setting reference level emissions, measuring the program's GHG results, and ensuring strong social and environmental safeguards. Three of the four standards allow nesting of projects within jurisdictional programs, providing flexibility for countries to nest according to their preferred standard. VCS-JNR is unique in that it provides specific rules, tools, and guidance on how to implement a nested approach. While some jurisdictional REDD+ standards have been available for almost a decade, none of these standards has registered a program or issued credits yet, largely due to the capacities and up-front level of effort required. Countries must establish a national REDD+ strategy, set reference levels, design and implement measurement, reporting, and verification systems, and set up national REDD+ management arrangements. The process must also inform, engage, and include indigenous peoples, local communities, and other stakeholders and ensure the Cancun Safeguards (UNFCCC decision on safeguards for REDD+) are met.[126] By way of example: in 2008, FCPF launched a funded program to help countries prepare and develop jurisdictional REDD+ programs. Since then, 14 countries have advanced their programs far enough to sign an agreement with the FCPF within the last year and start the process of monitoring and measuring GHG benefits.

[124] Vivid Economics, An Investor Guide to Negative Emission Technologies and the Importance of Land Use, (London: Vivid Economics, 2020), https://www.vivideconomics.com/wp-content/uploads/2020/10/Investor-guide-to-NETs-and-land-use.pdf
[125] Currently VCS JNR is the only standard that contains requirements for nesting.
[126] "Safeguards," REDD+ Web Platform, accessed May 25, 2021, https://redd.unfccc.int/fact-sheets/safeguards.html

Table 8. Summary of Jurisdictional REDD+ Standards as of April 2021

	Verified Carbon Standard — Jurisdictional and Nested REDD Program	Forest Carbon Partnership Facility Methodological Framework	California Air Resources Board Tropical Forest Standard	Architecture for REDD+ Transactions, The REDD+ Environmental Excellence Standard
Year made public	2012	2013	2019	2020
Total number of programs using the standard	Costa Rica and Paraguay have started the validation of a jurisdictional program. Peru is pilot testing a new nesting tool and Verra is in discussions with several other jurisdictions to do the same.	15	Unknown, however CARB intends to monitor jurisdictions who use the Standard and report annually on progress being made	Five jurisdictions have submitted TREES Concepts Costa Rica, Guyana, Amapá, Maranhão and Tocantins, Brazil. ART is also included in bilateral / multilateral agreements with Gabón and Colombia.
Total number of credits issued	None	None	None	None
Credit price	To be determined by buyer and seller	$5 per ton[127]	To be determined by buyer and seller	$10 per ton floor price guarantee by Emergent
Crediting period	10 year minimum with option to renew up to 30 years	Dec 31, 2025, when the FCPF Carbon Fund expires	Begins once the sector plan is complete and continues until 2050	Five-year minimum; may be renewed. No maximum number of crediting periods
Emission estimates / Accounting	Revision: activity-based accounting	Apply the latest IPCC guidelines	No specific requirements but must be consistent with IPCC Tier 3 methodologies and ISO 14064-1:2006	Activity-based accounting and land-based accounting
Can HFLDs use historical trend-based FRELs?	Updates pending	Yes. HFLD countries can adjust historic emissions upwards	Unknown	The HFLD approach is pending approval under TREES 2.0
Monitoring frequency	At least once every 4-6 years	At least twice during the term of the ERPA	Every calendar year	Verification following calendar years 1, 3 and 5. Years 2 and 4 optional.
Allows nesting?	Yes, detailed tools and rules to carry out nesting. Only JNR Requirements include such rules.	Yes. At least five programs with nested projects under implementation in the FCPF program jurisdictions.	Yes, but no established rules or guidance	Yes, but no established rules or guidance

[127] "Standards and Management," Forest Carbon Partnership Facility, accessed May 25, 2021, https://www.forestcarbonpartnership.org/standards-and-management

	Verified Carbon Standard — Jurisdictional and Nested REDD Program	Forest Carbon Partnership Facility Methodological Framework	California Air Resources Board Tropical Forest Standard	Architecture for REDD+ Transactions, The REDD+ Environmental Excellence Standard
Setting reference levels	Under JNR Version 4, reference level calculated as the historical annual average over a period of 4 to 6 years, with reassessments every 4-6 years. Verra is exploring options to establish jurisdictional FRELs that include increasing GHG emission trends where they can be justified by national circumstances. Removals are currently not included in JNR version 4. Requirements for carbon stock enhancements will be included in a future update to the JNR Requirements. Nested project baselines and lower-level jurisdictional FRELs are estimated by applying the JNR Allocation Tool, which uses the jurisdictional FREL and considers the risk of deforestation and forest degradation.	Reference level determined using a 10-year historical average but also allows flexibility for timeframe used and national circumstances, allowing projected and modeled baselines in some cases. Adjustments do have a cap on changes from the historical average. Removals are included in the baseline.	Ten-year historic reference period (crediting baseline at least 10% below the reference level and declining).	Five-year historic reference period for the five years immediately preceding the crediting period start. Valid for five years. Cannot increase. Separate baseline for removals and for crediting HFLD proposed under TREES 2.0.

This report does not evaluate the quality of the standards nor the resulting credits. An assessment of the main factors that influence credit integrity (additionality, baseline setting, quantification of emission reductions and removals, permanence, and leakage) can be found in A close look at the quality of REDD+ carbon credits.[128] A more recent assessment of the differences between ART, JNR v4.0, and GCF (non-market payments) and how countries can assess the best fit for them can be found on Ecosystem Marketplace.[129]

VCS Jurisdictional and Nested REDD Program

Established in 2012, the Verified Carbon Standard (VCS) Jurisdictional and Nested REDD+ (JNR) program[130] is one of the oldest programs for crediting emission reductions and removals from jurisdictional REDD+ programs and the only one offering specific rules and a registry to accommodate for nesting. Initially released in 2012, updated program requirements, JNR v4.0, were released on April 15, 2021 by Verra, which manages the VCS Program. VCS JNR includes rules and requirements for developing jurisdictional REDD+ programs. To issue credits, avoided emissions/emission reductions must be transparently reported and independently audited. Credits are issued in a registry to prevent double counting.

[128] T. Chagas et al., A close look at the quality of REDD+ carbon credits, (Amsterdam: Climate Focus, March 2020), https://www.climatefocus.com/sites/default/files/A%20close%20look%20at%20the%20quality%20of%20REDD%2B%20carbon%20credits%20%282020%29%20V2.0.pdf [Note that this publication does not reflect the changes in JNR Requirements v4.0]

[129] Donna Lee and Till Neef, "ART, JNR or GCF… Which is Best for Countries?," Ecosystem Marketplace, May 2021, https://www.ecosystemmarketplace.com/articles/shades-of-redd-art-jnr-or-gcf-which-is-best-for-countries/

[130] Details: https://verra.org/project/jurisdictional-and-nested-redd-framework/

The VCS JNR program is widely applicable. Participants have the option to develop national or subnational jurisdictional programs or national reference levels, with subnational program and project nesting options. National and subnational governments are eligible to use the VCS JNR Requirements. Eligible subnational governments can be one or two administrative levels below the national government (e.g., state/provincial or municipal/city, respectively). A national-level jurisdiction can establish a REDD+ program that accounts for emissions from deforestation and degradation, or it can simply establish a national (or subnational) reference level to be used for nesting. The reference level would not be part of a program. Instead, civil society organizations, the private sector, and even national and subnational governments would develop projects using the reference level to estimate their baseline. This option is intended for countries that are still working to establish a full REDD+ program and helps ensure that existing and new project level activities are aligned with national accounting while the program continues to develop.

VCS JNR credits include avoided emissions and emission reductions from REDD+ activities. emovals from forest carbon enhancements (e.g., afforestation/reforestation, assisted natural regeneration, and improving low-productive forests to high-productive forest) will be included in a subsequent update later in 2021. REDD+ programs can reduce emissions by addressing deforestation and forest degradation. Degradation includes activities that reduce degradation on managed timberlands (e.g., improved forest management practices). Verra is presently exploring options for allowing the use of historical deforestation trends in countries where jurisdictional circumstances justify their application, though they are not currently allowed under the standard.

The VCS JNR program is applicable at the national or subnational scale and allows for a few different nesting scenarios. National governments must have an implementation plan that outlines the policies, activities, and locations to reduce emissions. The implementation plan should be the National REDD+ Strategies/Action Plan, following the UNFCCC decisions. A lower-level program can nest into a higher-level program or higher-level reference level. A project can nest into a jurisdictional program (national or subnational). There can also be a scenario where a project nests into a subnational program that nests into a national program. The project baseline and the subnational program reference level would be allocated from the higher-level jurisdictional reference level according to the deforestation and/or degradation risk identified in the project area. For example, a project would develop a baseline based on a national reference level.

JNR v4.0 changes include a new guidance on addressing uncertainty and a new risk mapping tool and FREL allocation tool to help programs with nesting. The allocation is based on the deforestation/degradation risk spatially assessed through the new JNR Risk Mapping Tool (or other approved methods) and the JNR Allocation Tool which distributes portions of a jurisdictional FREL to set nested project baselines and nested program FRELs. As such, JNR follows the de-centralized-nested model as described above. These concrete tools are designed to facilitate high-quality, credible nested accounting.

In November 2020, the ICAO Secretariat announced that VCS JNR credits issued to governments (with some exceptions for small projects) are eligible for use in the CORSIA compliance market (see CORSIA, pg. 22).

Verra recently released VCS v4.1 under which Verified Carbon Units (VCUs) used in the context of Paris Agreement Article 6 mechanisms and international Paris-related programs (such as CORSIA) must be labeled to demonstrate that they adhere to the requirements of these mechanisms or programs. These credits will require a corresponding adjustment (CA) to ensure that the same mitigation outcome, or unit, is not used for more than one international purpose under the Paris Agreement or CORSIA

Architecture for REDD+ Transactions, The REDD+ Environmental Excellence Standard (ART-TREES)

The Architecture for REDD+ Transactions (ART), one of the newest jurisdictional programs, was established in 2018 with Winrock International as the Secretariat. ART is a crediting program with independent governance that establishes and implements the rules and requirements for developing a jurisdictional REDD+ program under “The REDD+ Environmental Excellence Standard” (TREES).

In February 2020, ART released a first version of TREES and launched its registry. A public consultation period for TREES version 2.0 (that includes updates for elements that were not addressed in TREES 1.0 – removals, HFLD, ICAO, and double-counting) ran from February 1 to April 2, 2021, with results to be announced in the third quarter of 2021.

ART requires that emission reductions be transparently reported and independently verified by an accredited validation and verification body. ART-TREES credits can be bought or sold directly between participating jurisdictions and buyers or via the Emergent Forest Finance Accelerator, which assists in brokering transactions between private sector buyers and government suppliers.

National governments are eligible for crediting under TREES. Subnational governments that meet TREES requirements are also eligible to use the standard, but only as part of a transition toward a national-level REDD+ program by December 31, 2030. Subnational governments can only be one level down from the national (e.g., state or province) and must have authorization from the national government to participate. Projects can nest within the national or subnational program or other non-accounting arrangements can be made. TREES does not specify the way in which nesting must be conducted. As such, ART/TREES follows the centralized-nested model as described above. Governments must demonstrate the right to the emission reductions.

A national-scale Participant must include at least 90% of all forest area in its monitoring and reporting with exclusions only allowed in limited circumstances. National-scale Participants should make an effort to include 100% of forest areas in accounting. National governments can submit subnational accounting areas totaling at least 2.5M ha of forest. Subnational accounting areas may aggregate several administrative jurisdictions. This requirement is aligned with ART's principle of encouraging large-scale emission reductions. There is no minimum size for national-level programs.

TREES Participants must include forests in their NDCs (TREES is the only standard with this requirement), and accounting and reporting should align with requirements under the Paris Agreement and towards their NDCs. Jurisdictional programs cannot claim credits under ART TREES and another GHG standard. When credits are sold and transferred outside of the country for use by another country towards its NDC achievement or for use by an airline for CORSIA, the host country must issue a letter of authorization and agree to make a corresponding adjustment. Such rules are in place to prevent double claiming with NDCs under the Paris Agreement and with CORSIA. TREES provides concrete requirements for demonstrating that the program has addressed all of the Cancun Safeguards.

ART credits emission reductions from activities that reduce deforestation and forest degradation. TREES version 2.0 is being expanded to credit for jurisdictional removals (e.g., reforestation, afforestation, forest carbon stock enhancement from non-forest to forests). ART will allow countries to earn credits for removals when deforestation and degradation are demonstrably below the crediting level. Other changes being considered for TREES 2.0 include: a new crediting approach for high-forest low-deforestation (HFLD) countries; enabling indigenous territories to be eligible as a distinct subnational accounting area; revised approaches to addressing uncertainty; and guidance on avoiding double claiming, including rules to avoid double counting with CORSIA.

National governments must have an implementation plan that outlines the activities and locations to reduce emissions. The implementation plan should be the National REDD+ Strategies/Action Plan, following the Warsaw Framework. Subnational Participants must specify which interventions in the National REDD+ Strategies/Action Plan are relevant to the subnational accounting areas.

In November 2020, the ICAO Secretariat announced that ART TREES credits are eligible for use in the CORSIA compliance market.

Forest Carbon Partnership Facility (FCPF), Methodological Framework

The World Bank is the secretariat of the Forest Carbon Partnership Facility (FCPF). The FCPF is a partnership between REDD+ countries and climate finance donors to reduce deforestation and forest degradation, conserve and sustainably manage forests, and enhance forest carbon stocks. FCPF has two funds, the Readiness Fund and the Carbon Fund. The Readiness Fund supports countries in developing capacity needed to support REDD+. The Carbon Fund provides payments for verified emission reductions from REDD+ programs that have transitioned from readiness

to implementation. REDD+ programs in the Carbon Fund must follow the FCPF Methodological Framework to be eligible for crediting.

The 47 countries with subtropical and tropical forests, including those with high-forest, low-deforestation (HFLD) are participants of FCPF.[131] The REDD+ activities of countries eligible for crediting must reduce emissions from deforestation, forest degradation, conserve carbon stocks, and sustainably manage forests and enhance forest carbon stocks. After successful completion of readiness activities, countries can design and implement subnational or national jurisdictional REDD+ programs with results-based financing from the Carbon Fund. The area of programs must align with national jurisdiction or with subnational jurisdiction one-level below the national level. The programs supported through the Carbon Fund cover 10% to 100% of the forest area of countries, highlighting large ambition of countries in promoting REDD+.

The national government must endorse the REDD+ programs for their consistency with national strategies to address GHG emissions and have plans to align with national reference levels and monitoring systems. The REDD+ program must be implemented by an entity that is authorized to implement and enforce the proposed REDD+ interventions. The program must demonstrate that it has the rights to the credits and to be able to transfer the credits to the Carbon Fund.

After the FCPF Carbon Fund approves a REDD+ program, the country with approved program can sign an Emission Reduction Payment Agreement (ERPA) with the Carbon Fund. Recently signed ERPAs are summarized in Table 7. The term of the ERPA determines the length of the crediting period.

The ICAO has conditionally approved FCPF as an eligible emissions unit program within CORSIA. FCPF is not approved until the long-term obligations after the fund's sunset are addressed.

California Air Resources Board (CARB), Tropical Forest Standard (TFS)

The Tropical Forest Standard (TFS) was endorsed in September 2019 by the California Air Resources Board (CARB). TFS is a standard, but at this point not a crediting program with governance, verification oversight or a registry. TFS was developed by CARB staff and endorsed by the CARB Board after a decade of collaboration within the Governors' Climate and Forest (GCF) Task Force. GCF includes membership from 38 states and provinces from ten countries.[132]

The purpose of TFS is to establish robust criteria for jurisdictional REDD+ programs to demonstrate performance in reducing emissions from tropical deforestation (and degradation, if applicable) in order to enable jurisdictions to access financing through linkage with an emissions trading system or with financing tools, such as voluntary carbon offset programs, sustainable sourcing commitments, payments for ecosystem services, and others. If the TFS has been formally adopted by the CARB and implementing regulation approved, REDD+ programs verified to the TFS would be eligible to transfer credits into linked emissions trading systems, wherein entities regulated under such a system could purchase credits to meet a portion of their compliance obligations.[133]

TFS is unique from the other REDD+ standards in that it targets subnational jurisdictions, though it can also be applied to national jurisdictions. A focus on subnational jurisdictions is useful for states and provinces that are taking more aggressive climate action than at the national level.

The additionality and crediting benchmark for TFS is a crediting baseline that is at least 10% below the historic reference level and linearly declines to a jurisdiction-specific 2050 emissions target for the sector. Only emission reductions that go beyond the crediting baseline are considered additional and eligible for crediting.

[131] "Countries," Forest Carbon Partnership Facility, accessed May 25, 2021, https://www.forestcarbonpartnership.org/countries

[132] Colombia, Ecuador, Peru, Brazil, Cote d'Ivoire, Nigeria, Indonesia, US, Mexico, and Spain

[133] Notably, CARB's endorsement of the TFS did not include linkage with any jurisdiction or direct incorporation of the TFS into California's Cap-and-Trade Program. Incorporation of the TFS and any linkage to California's program would require a separate regulatory action.

Programs must conform to the GCF Task Force Guiding Principles for Collaboration and Partnership Between Subnational Governments, Indigenous Peoples and Local Communities,[134] the Cancun Safeguards, and the REDD+ Social and Environmental Safeguards standard.

TFS is applicable to jurisdictional-scale programs that address deforestation and degradation of native tropical forests. Non-native forests, monoculture, and industrial plantations are not eligible for crediting because TFS aims to reward actions that protect and expand forests that maintain a diversity of native species and multiple growth stages. The activities that are eligible for crediting under TFS are reducing emissions from deforestation and degradation. The subnational jurisdiction must demonstrate how the program fits within a national program to address tropical deforestation and degradation. The TFS allows crediting to nested projects.

Jurisdictional programs are required to develop a sector plan to address deforestation in the tropical forest sector. The sector plan must describe the jurisdiction's approach for reducing emissions and minimizing leakage, the system for monitoring, reporting, and verifying emission reductions, and its methods to enforce the activities that reduce deforestation to meet the technical specifications of the TFS.

[134] Governor's Climate & Forests Task Force, Guiding Principles for Collaboration and Partnership Between Subnational Governments, Indigenous Peoples, and Local Communities, (Boulder: Governor's Climate & Forests Task Force, December 2020), https://www.gcftf.org/resource/guiding-principles/

FOREST CARBON & CORPORATE ENGAGEMENT: FROM CREDITS TO SUSTAINABLE SOURCING

Introduction: Commodity Production, Deforestation, & Climate Change

The conservation of forests (and other natural landscapes) and climate change are closely connected, and they influence and are influenced by the activities of the private-sector. Around a quarter of global GHG emissions are from agriculture, forestry, and other land uses (AFOLU).[135] Forest and other natural ecosystem conversion and degradation, soil carbon loss, and emissions from livestock and soil and nutrient management all contribute to AFOLU GHG emissions.[136] Conversion of forests to cropland and pastureland to produce commodities, such as beef, soy, and palm oil, is responsible for the majority of permanent tree cover loss globally.[137] Agriculture is an important industry for many countries' economies, and therefore, many governments subsidize agricultural production at the level of almost $600B from the world's 54 largest economies.[138] This figure dwarfs forest carbon finance mechanisms, such as initiatives that help farmers increase productivity on existing land as opposed to expanding into forests. Forest carbon finance mechanisms, such as REDD+, cannot be deployed successfully at scale in the absence of reforms to the subsidies that drive the destruction of forests. Around half of CO2 emissions from tropical agriculture and forestry expansion are from the production of beef cattle and oil crops (e.g., palm oil, soy).[139]

Supply Chain Emissions

Though the companies involved in the production of commodities are directly responsible for deforestation and forest degradation, ongoing demand for commodities by companies in "downstream" supply chains (i.e., those that process, trade, manufacture, and retail commodities and their derivatives) is a proximate force driving the destruction in addition to subsidies. Particularly for companies in "downstream" supply chains that manufacture or retail consumer goods products, the vast majority of the GHG emissions associated with their business is not from their direct operations but embedded in their supply chain. In fact, around 90% of carbon emissions from fast-moving consumer goods companies (companies that sell relatively cheap products, like packaged food, beverages, toiletries, etc.) are from their supply chains.[140]

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[135] IPCC found that roughly 13% of carbon dioxide (CO2), 44% of methane (CH4), and 81% of nitrous oxide (N2O) emissions from human activities globally during 2007–2016 were associated with Agriculture, Forestry and Other Land Use (AFOLU); V. Masson-Delmotte et al., Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, (Geneva: Intergovernmental Panel on Climate Change (IPCC), 2019), https://www.ipcc.ch/srccl/.

[136] Pete Smith et al., "Agriculture, Forestry and Other Land Use (AFOLU)," Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Edenhofer, O. et al, (eds.), (Cambridge, UK: Cambridge University Press, 2014), https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf

[137] V. Masson-Delmotte et al., Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, (Geneva: Intergovernmental Panel on Climate Change (IPCC), 2019), https://www.ipcc.ch/srccl/

[138] "Government policies providing more than USD 500 billion to farmers every year distort markets, stifle innovation and harm the environment," Organization for Economic Cooperation and Development (OECD), June 30, 2020, https://www.oecd.org/agriculture/news/government-policies-providing-more-than-usd-500-billion-to-farmers-every-year-distort-markets-stifle-innovation-and-harm-the-environment.htm

[139] Florence Pendrill et al., "Agricultural and forestry trade drives large share of tropical deforestation emissions," Global Environmental Change, 56 (2019), www.sciencedirect.com/science/article/pii/S0959378018314365

[140] CDP, Fast Moving Consumers, (London: CDP, 2019), http://6fefcbb86e61af1b2fc4-c70d8ead6ced550b4d987d7c03fcdd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/004/150/original/CDP_Consumer_Goods_2019_Exec_summary.pdf?1551891654

Historically, many companies have been unaware of the GHG emissions lurking in their commodity supply chains and neither measured nor made targets to reduce these emissions. However a growing number of companies are accounting for their supply chains emissions in their emissions reduction strategies. Initiatives like the Science-Based Targets Initiative and Greenhouse Gas Protocol have provided key support for companies to measure and set targets to reduce emissions from their direct operations ("Scope 1" and "Scope 2" emissions) and from their supply chains ("Scope 3" emissions). The Science-Based Targets Initiative supports companies to make sound emissions reductions and net-zero emissions targets, while the Greenhouse Gas Protocol provides public and private-sector entities with guidance on measuring and managing GHG emissions, including estimating Scope 3 emissions when the exact location from which the commodities originated and the associated land-use change is unknown.[141]

Corporate Commitments Integrating Deforestation Elimination & GHG Goals

Companies are motivated to take action to reduce deforestation and emissions associated with their activities because climate change and deforestation are serious financial risks. For example, climate change and ecosystem service loss jeopardize the production of agricultural commodities, which many companies' businesses depend on. Risks from negative publicity, increased government regulations, and volatility in the prices of commodities and other materials are also associated with climate change and deforestation. Additionally, multi-stakeholder initiatives like the Consumer Goods Forum and the New York Declaration on Forests have increased awareness of deforestation-related issues in commodity supply chains and have set collective targets for their corporate members and/or signatories to address commodity-driven deforestation in their supply chains. As of March 2021, over 400 companies had made pledges to achieve zero net deforestation in their commodity supply chains through the Consumer Goods Forum.[142]

Commodity-specific initiatives have also driven awareness and action from commodity users. For example, in 2017, 35 cocoa companies that source from Ghana and Côte d'Ivoire signed onto the Cocoa and Forests Initiative (CFI), which pledges to eliminate deforestation from cocoa production. As part of the CFI, these companies work directly with governments,[143] and the CFI is now a key component of Ghana's REDD+ strategy.[144] The Soy Moratorium in Brazil, which enables traders and slaughterhouses to avoid purchases of soy and beef from newly deforested parts of the Amazon, contributed to a plunge in deforestation between 2007 and 2013,[145,146] but several other programs designed to incentivize sustainable land management have struggled to find policy, finance, and market support.[147,148]

Forest carbon finance can play a catalytic role in supporting the expansion and improvement of certification and auditing programs. For example, the Roundtable for Sustainable Palm Oil certification body has benefited from forest carbon finance in Central Kalimantan, Indonesia and Sabah, Malaysia, where two high-profile efforts in support of province-wide sustainable palm oil certification have garnered popular support but are struggling to finance the costs of certification. Carbon finance strategies may help address some of these financial challenges.[149]

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[141] "Greenhouse Gas Protocol," Greenhouse Gas Protocol, accessed May 20, 2021, https://ghgprotocol.org/

[142] "Our Members," Consumer Goods Forum, accessed 31 Mar 2021, https://www.theconsumergoodsforum.com/who-we-are/our-members/

[143] "Mondelēz International advances forest-protection efforts in West Africa," Mondelēz International, 2017, https://bit.ly/2l3tDeJ.

[144] Allie Goldstein, "Subsidies for Deforestation-Driving Commodities Dwarf Conservation Finance," Ecosystem Marketplace, 2015, https://www.ecosystemmarketplace.com/articles/subsidies-for-deforestation-driving-commodities-dwarf-conservation-finance-new-report/

[145] H.K. Gibbs et al. "Brazil's Soy Moratorium: Supply-chain governance is needed to avoid Deforestation," Science, 347(2015), 377–378, https://science.sciencemag.org/content/347/6220/377

[146] H. Gibbs et al., "Did ranchers and slaughterhouses respond to zero-deforestation agreements in the Brazilian Amazon?" Conservation Letters, 9(2016), 32–42, https://conbio.onlinelibrary.wiley.com/doi/pdf/10.1111/conl.12175

[147] T. Carroll et al., Catalyzing smallholder agricultural finance, (Washington, DC: Dalberg Global Development Advisors, 2012), https://oneacrefund.org/documents/101/Dalberg_Skoll_Citi_Catalyzing_Smallholder_Agricultural_Finance_Farm_Finance.pdf

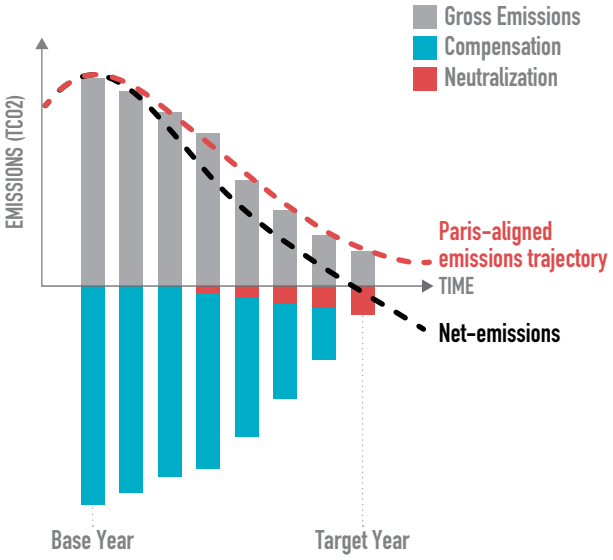
[148] J. Levin, Profitability and sustainability in palm oil production, (Gland, Switzerland: World Wildlife Fund, 2012), https://wwf.panda.org/?204548/Profitability-and-Sustainability-in-Palm-Oil-Production; Laven, A.,& Boomsma, M. 2012. Incentives for sustainable cocoa production in Ghana. Amsterdam: Royal Tropical Institute

[149] Dana Miller, Breanna Lujan, and Brian Schaap, Collaboration toward zero deforestation: Aligning corporate and national commitments in Brazil and Indonesia, (Washington, DC: Environmental Defense Fund and Forest Trends, 2017), https://www.forest-trends.org/publications/collaboration-toward-zero-deforestation/

The number of companies making commitments to address deforestation in their operations and supply chains continues to grow. According to data collected by Forest Trends' *Supply Change* initiative, out of nearly 900 companies that produce or source commodities associated with deforestation (palm oil, soy, timber and pulp, cattle, and cocoa), 514 of them – 57% have made commitments to produce or source sustainably-produced commodities, which is 67 more companies (a 15% increase) than in 2017.[150] Almost half (44%) of the companies with commitments identified by *Supply Change* had at least one commitment with an objective to reducing or eliminating commodity-driven deforestation from their direct operations or in their supply chain (see Appendix 4 for the full list of companies). Addressing commodity-driven deforestation can be complicated and resource-intensive for companies, especially for downstream companies separated from the commodity production process by many suppliers and may use multiple commodities that drive deforestation. For that reason, many companies that make deforestation-related commitments choose to achieve their commitments by sourcing commodities that are certified by an independent organization, as more than three-quarters (83%) had set commitments to source or produce certified commodities.

As part of the Science-Based Targets Initiative (SBTi), 744 companies have set emission reduction targets at the time of this report publication. Under the SBTi's "climate positive" approach, companies must reduce emissions within the operations of the company and its supply chains, consistent with a "Paris-aligned" abatement path. To date, 661 of these companies have set targets to reduce Scope 3 emissions (i.e., supply chain emissions).[151] Companies that are reducing their emissions as much as possible are expected to balance residual emissions by mid-century with carbon removals (termed "neutralization" by SBTi, Figure 16), to achieve net zero. Although offsets cannot substitute for the abatement required under SBTi while companies are on the path to net zero, this framework recognizes the value of financing emission reductions outside the company direct footprint and supply chain (referred to as "compensation"). Such compensation measures could take the form of removals, such as afforestation/reforestation, or avoidance/reductions measures, such as REDD+.

Figure 16. SBTi Climate Positive Approach[152]



[150] Stephen Donofrio, Philip Rothrock, and Jonathan Leonard, Supply Change: Tracking Corporate Commitments to Deforestation-Free Supply Chains, 2017, (Washington, DC: Forest Trends, 2017), https://www.forest-trends.org/publications/supply-change-tracking-corporate-commitments-to-deforestation-free-supply-chains-2017/

[151] "Companies taking action," Science-Based Targets Initiative, accessed March 30, 2021, http://sciencebasedtargets.org/companies-taking-action/#table

[152] Alberto Carrillo Pineda et. al. Foundations for Science-Based Net-Zero Target Setting in the Corporate Sector. SBTi, September 2020. https://sciencebasedtargets.org/resources/legacy/2020/09/foundations-for-net-zero-full-paper.pdf.

For the agribusiness sector, jurisdictional REDD+ can help companies with zero-deforestation supply chain commitments and Scope 3 targets, by reducing monitoring costs, lowering long-term risks, and promoting social and economic inclusion. In addition to their own efforts to decarbonize their supply chains, some companies could purchase REDD+ credits from the same jurisdictions that they source from as a supplementary way to accelerate forest protection. However, questions remain regarding how Scope 3 deforestation emissions align with jurisdictional REDD+ accounting.

Challenges and Opportunities in Corporate Engagement in Forest Carbon Finance

Despite the growing number of companies committing to eliminate deforestation, their actions have not had the intended impacts of eliminating, or even reducing, deforestation rates globally. In fact, the rate of primary forest loss has increased over the last ten years, especially in South America where forests continue to be converted to pastureland and cropland to produce commodities like beef and soy. However, corporate commitments in conjunction with national and subnational forest protection policies may be making an impact in Indonesia and Malaysia, where the primary forest loss rate has been declining since 2016.[153] Corporate commitments and policies more often target deforestation from palm oil or timber and pulp compared to beef or soy, as consumer activism for deforestation-free timber and palm oil has a longer history, therefore generating greater awareness and producing more tools (e.g., certification standards) for companies to use to ensure the commodity production did not contribute to deforestation.[154, 155]

While many companies have committed to address deforestation and climate change, there is still a considerable gap between companies making commitments and companies implementing actions to achieve deforestation-free supply chains and/or carbon neutrality, including actions that provide finance for forest carbon-related activities. Despite the clear link between deforestation and climate change and the financial risks (negative publicity, operational costs, etc.) posed by these issues, just 12 companies out of the 194 researched by *Supply Change* since it began collecting this data in April 2019, had integrated their emissions reduction strategies with their avoided deforestation commitments. A study by CDP found similarly low levels of engagement from companies in implementing NCS to address deforestation and climate issues in their supply chains. Out of 543 companies disclosing to the CDP Forests platform, only 84 (15%) had implemented nature-based solutions to mitigate climate change and/or biodiversity loss.[156]

Nonetheless, companies have been increasingly demonstrating an interest in investing in forestry and other land-use projects to offset their direct and supply chain emissions. More than 1,000 companies joined the UNFCCC's Race to Zero campaign, which launched in June 2020, thereby committing to achieve net-zero carbon emissions by 2050 at the latest.[157] In order to achieve this, these companies will need to eliminate emissions from their activities to the greatest extent possible and then offset remaining emissions that they cannot eliminate themselves through investments in projects that reduce or remove carbon elsewhere. Evidence shows that NCS can be a cost-effective way to achieve this. The challenge now for many of these companies is to shift 2050 targets to more near-term milestones and actions.

However, simply offsetting the volume of carbon emitted with carbon credits may not be sufficient to mitigate the emissions' impacts on nature and climate. To ensure that corporate offsetting approaches maximize the benefits to

[153] Mikaela Weisse and Liz Goldman, "Primary Rainforest Destruction Increased 12% from 2019 to 2020," Global Forest Watch (blog), March 31, 2021, https://www.globalforestwatch.org/blog/data-and-research/global-tree-cover-loss-data-2020/

[154] According to Supply Change data, of the companies that produce or source the respective commodities, 53% had made palm oil commitments and 47% had made timber and pulp commitments, while just 18% had made soy commitments and 11% had made cattle commitments.

[155] Peter Jopke and George C. Schoneveld, Corporate commitments to zero deforestation: An evaluation of externality problems and implementation gaps, Occasional Paper 181, (Bogor, Indonesia: Center for International Forestry Research (CIFOR), 2018). http://www.cifor.org/publications/pdf_files/OccPapers/OP-181.pdf.

[156] CDP, Unlocking Nature's Potential: Forests related Nature-based Solutions to address climate change and promote sustainable development, (London, CDP: 2020)

[157] "Race to Zero," UNFCCC, accessed 25 Nov 2020, http://unfccc.int/climate-action/race-to-zero-campaign#eq-1

both climate, nature, and society, the World Wildlife Fund released its Beyond Science-Based Targets: A Blueprint for Corporate Action on Climate and Nature in December 2020. This document aims to guide companies towards an approach that accounts not only for the carbon storage generated by offsets, but also the impacts of the offset projects on biodiversity, resiliency, and local communities.[158] In addition to or instead of offsets generated by reforestation or afforestation projects, some companies, such as Walmart (see below), will purchase credits from or invest directly in projects aimed at increasing soil carbon in agricultural systems, including croplands and pasturelands, in order to meet their net-zero emissions goals. Soils store large amounts of carbon – around four times currently stored in all vegetation and animal life – and this capacity has been reduced by human activities. Improved soil management can help restore its storage potential and has potentially enormous value as a natural climate solution.[159] For companies that rely on commodity production for their business, investment in agricultural systems that sequester carbon is an important integration of sourcing and climate change mitigation policies that could be extended to restoration and reforestation of forest ecosystems.

Emerging Examples of Corporate Investment in Forest Carbon Finance

Many corporations have unveiled specific commitments regarding NCS. For example:

- **Walmart:** In September 2020, Walmart pledged to achieve net-zero emissions by 2040. To achieve this, in addition to improving energy efficiency and renewable energy use in its direct operations, Walmart announced it plans to protect, manage, or restore at least 50M acres of land and 1M square miles of ocean by 2030.[160]
- **Microsoft:** In January 2020, Microsoft announced that it will be "carbon negative" by 2030, offsetting all the company's GHG emissions since the company's founding in 1975. It aims to do this in part through forest offset projects in the Brazilian Amazon and the US.[161]
- **Amazon:** Amazon committed $100M to fund worldwide reforestation and peatland protection efforts in 2019 as part of its strategy to achieve carbon neutrality by 2040.[162] Amazon's founder, Jeff Bezos, also pledged grant funding totaling $10B through his Bezos Earth Fund in 2020 – much of the money will go towards NCS.[163]
- **JetBlue:** Airline company JetBlue announced that from July 2020 onward, it will be offsetting all CO2 emissions from jet fuel for all its flights within the US. JetBlue purchases carbon credits from projects that sequester carbon and avoid GHG, such as forestry, landfill gas capture, and renewable energy.[164]
- **Shell:** Shell has pledged to reduce emissions by 60% by 2050, half of which will be through carbon removal and reforestation projects. It is currently developing $300M in carbon projects to enable customers to offset fuel through purchases at the pump.

[158] Brad Schallert et al., Beyond Science-Based Targets: A Blueprint for Corporate Action on Climate and Nature, (Gland, Switzerland: World Wildlife Fund and Boston: Boston Consulting Group, 2020), https://wwfint.awsassets.panda.org/downloads/beyond_science_based_targets___a_blueprint_for_corporate_action_on_climate_and_nature.pdf

[159] Robert J. Zomer et al., "Global Sequestration Potential of Increased Organic Carbon in Cropland Soils," Nature Scientific Reports, 7 (2017), https://www.nature.com/articles/s41598-017-15794-8

[160] "Walmart Sets Goal to Become a Regenerative Company," Walmart, September 21, 2020, https://corporate.walmart.com/newsroom/2020/09/21/walmart-sets-goal-to-become-a-regenerative-company

[161] Justin Catanoso, "Success of Microsoft's 'moonshot' climate pledge hinges on forest conservation," Mongabay, February 3, 2020, https://news.mongabay.com/2020/02/success-of-microsofts-moonshot-climate-pledge-hinges-on-forest-conservation/

[162] "Amazon Co-founds The Climate Pledge, Setting Goal to Meet the Paris Agreement 10 Years Early," Amazon, September 19, 2020, https://press.aboutamazon.com/news-releases/news-release-details/amazon-co-founds-climate-pledge-setting-goal-meet-paris

[163] Steve Zwick, "Natural Climate Solutions Win Big in First Bezos Grants," Ecosystem Marketplace, November 16, 2020, https://www.ecosystemmarketplace.com/articles/natural-climate-solutions-win-big-in-bezos-grants/

[164] "JetBlue is Going Carbon Neutral on All Domestic Flights," JetBlue, January 2020, http://blog.jetblue.com/offset-jan-2020/

LOOKING AHEAD

Global CO2 emissions dropped approximately 7% in 2020,[165] which is the annual pace required to achieve the Paris Agreement target of cutting emissions in half by 2030. However, this drop was largely due to economic contraction caused by the COVID-19 pandemic. Despite the economic contraction, tree cover loss and associated emissions from primary tropical forests increased by 12% in 2020.[166] To achieve Paris Agreement goals, new scalable, sustainable solutions must be implemented that do not involve global economic shut down. It's clear that the world is not going to offset its way out of the climate challenge. First and foremost, companies and nations need to make real emission reductions across all sectors. But if the interim 2030 goal is to be met, all viable solutions will need to be on the table. The ability of forest carbon to deliver cost-effective climate results at significant scale cannot be overlooked, particularly the potential of REDD+ to deliver near term climate results through avoided emissions. At a time when carbon markets are heating up and REDD+ funding mechanisms are pivoting from readiness to results-based finance, there are many promising signs for forest carbon finance, as well as barriers still to overcome.

The Promise of Jurisdictional REDD+

According to the IPCC, the Paris Agreement goals are not achievable without addressing tropical forest loss in the next decade. Jurisdictional REDD+ offers the promise of dramatically scaling the protection of these forests. Jurisdictional REDD+ is at an inflection point – readiness investments made over the past decade by various funding mechanisms have set the stage for results-based payments arrangements and new public-private coalitions. Jurisdictional REDD+ is also the preferred approach under UNFCCC (Paris Agreement Article 5) and CORSIA (under which ICAO has approved VCS-JNR and TREES). ICAO's inclusion of jurisdictional REDD+ sends a strong signal to the market. Moreover, it is possible that Article 6 negotiations at COP26 later this year may allow for international trading of credits from national REDD+ programs.

New pathways are also emerging for the private-sector to become a significant driver of jurisdictional REDD+ demand. To date, jurisdictional REDD+ credits have not been available in the market, and if they were, many companies may not be prepared to negotiate purchases from governments. However, both situations are changing, as TREES, VCS-JNR, and FCPF Tranche A are preparing to make credits available and new purchasing modalities come online. The Emergent Forest Finance Accelerator will facilitate large-scale private-sector purchases of TREES REDD+ credits, based on a private-public finance model in which public donors provide a $10 per ton floor price for credits. As of April 2021, over 50 companies are participating in the Emergent Private Sector Leaders Roundtable. An associated initiative, the Green Gigaton Challenge, aims to build a visible demand signal for jurisdictional REDD+ to unlock the supply pipeline of high-integrity credits and to promote the transaction of one gigaton of jurisdictional REDD+ annually by 2025.[167] New coalitions, such as LEAF, are positive signs of uptake of this approach. Moving forward, more needs to be done to ensure that funding provided to governments through jurisdictional mechanisms reach intended targets and provide real, accessibly benefits for forests and indigenous and local communities.

The Role of Nesting

Nesting provides a bridge between the innovation and targeted finance that projects have delivered in voluntary carbon market transactions and the scale needed from jurisdictional REDD+. Multiple countries are now developing their own bespoke approaches to nesting, tailoring policy to best fit their circumstances and goals.[168] In parallel, the jurisdictional REDD+ standards are also being updated (as in the case of TREES) or recently revised (VCS-JNR), while

[165] United Nations Environment Programme, Emissions Gap Report 2020 - Executive summary, (Nairobi: United Nations Environment Programme, 2020), https://www.unep.org/emissions-gap-report-2020

[166] "Primary Rainforest Destruction Increased 12% from 2019 to 2020," Global Forest Watch, March 31, 2021, https://www.globalforestwatch.org/blog/data-and-research/global-tree-cover-loss-data-2020/

[167] "About," Green Gigaton Challenge, accessed May 25, 2021, https://www.greengigaton.com/

[168] Kelley Hamrick et al., "Nesting REDD+: Pathways to Bridge Project and Jurisdictional Programs," The Nature Conservancy, March 2021, https://www.nature.org/content/dam/tnc/nature/en/documents/REDDPlus_PathwaystoBridgeProjectandJurisdictionalPrograms.pdf

FCPF is developing further guidance on the process and elements of nesting for policymakers. In many ways, the evolving jurisdictional standards and variety of financing mechanisms facilitate the diverse approaches being taken at the national level because countries can collaborate with the standard bodies and donors that align best with their goals. At the same time, this flexibility may have its limits, as achieving optimum long-term REDD+ results at scale will likely require national-level planning, particularly around accounting to address double-counting concerns. In addition to the double-counting challenge, a corporate preference for project-scale credits (which are easier to depict in an annual sustainability report) may also inhibit private investment in jurisdictional programs. Another ongoing challenge will be ensuring flexibility for creative country-defined approaches to nesting and jurisdictional REDD+, while minimizing inconsistencies between the supporting standards and financing institutions.[169]

Increasing Market Scale Will Require Higher Offset Prices

Expectations for carbon markets are soaring. The Taskforce on Scaling Voluntary Carbon Markets has estimated voluntary carbon markets could grow 15-fold by 2030 and 100-fold by 2050. German bank Berenberg estimates the overall global market for carbon offsets could increase to $200B by 2050.[170] If supply sufficient to satisfy that level of demand is going to materialize, a strong price signal is required to drive new development. Current prices, as discussed in this report will need to increase materially to drive the supply needed (e.g., $3-$4 per ton for REDD+ credits in voluntary markets, $5 per ton via some compliance or REDD+ mechanisms, or even the $10 floor price of Emergent).

The High-Level Commission on Carbon Prices estimated a global carbon price of $50-$100 per ton is needed by 2030 to achieve Paris Agreement targets.[171] Higher forest carbon prices will enable more forest carbon reduction credits in the near term and more removal credits from reforestation/afforestation in the medium to long term. A recent study showed that forest-based NCS offer annual mitigation potential of 5.5B tons (GtCO2e) at prices up to $100 per tCO2e, which is well above prices seen in today's markets.[172] Perhaps more importantly, higher priced forest carbon incentivizes companies with climate commitments to abate their direct emissions first. Sensing a bargain, large financial institutions, hedge funds, and multi-national corporations have begun to invest and speculate in forest carbon, with some analysts projecting global voluntary offset prices positioned to increase 10 to 20-fold in the coming years.[173]

The Influence of Investors

Given the need for up-front financing for most forest carbon projects, investors already play a critical role in taking forest carbon to scale by providing financing to offset developers and jurisdictions. Increasingly however, the finance sector is playing an even more influential role by driving the transition to a net-zero economy. The Glasgow Financial Alliance for Net Zero (GFANZ), announced on April 21, 2021, brings together existing and new net-zero finance initiatives (with assets more than $70 trillion) into one sector-wide strategic forum. Alliance members must use science-based guidelines to reach net-zero emissions, cover all emission scopes, include 2030 interim target setting, and commit to transparent reporting and accounting in line with the UN Race to Zero criteria. GFANZ combines the newly announced Net-Zero Banking Alliance (NZBA), with existing initiatives: the Net Zero Asset Managers Initiative and the UN-convened Net-Zero Asset Owner Alliance. Together these initiatives will seek to coordinate on how companies can align with a net-zero future.

[169] Kelley Hamrick et al., "Nesting REDD+: Pathways to Bridge Project and Jurisdictional Programs," The Nature Conservancy, March 2021, https://www.nature.org/content/dam/tnc/nature/en/documents/REDDPlus_PathwaystoBridgeProjectandJurisdictionalPrograms.pdf

[170] Frank Watson, "Global carbon offsets market could be worth $200 billion by 2050: Berenberg," SP Global, May 13, 2020, https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/051320-global-carbon-offsets-market-could-be-worth-200-bil-by-2050-berenberg

[171] Carbon Pricing Leadership Coalition, Report of the High-Level Commission on Carbon Prices, (Washington, DC: World Bank, May 29, 2017), https://www.carbonpricingleadership.org/report-of-the-highlevel-commission-on-carbon-prices

[172] B.W. Griscom et al., "National mitigation potential from natural climate solutions in the tropics," Philosophical Transactions of the Royal Society B: Biological Sciences, 375(1794)(2020), https://doi.org/10.1098/rstb.2019.0126.

[173] David Sheppard, "Carbon trading: the 'one-way' bet for hedge funds," Financial Times, August 23. 2020, https://www.ft.com/content/a5ff89ec-323c-4fb8-85a1-9d0225ae3cdb

Individual financial institutions are rapidly creating global investment funds and platforms to scale investments in this space. For example, HSBC has entered into a joint venture with the climate change advisory and investment firm Pollination to create HSBC Pollination Climate Asset Management which aims to launch NBCF, a carbon vehicle in 2021. The vehicle's goal is to raise approximately $600M at full size, with returns in the form of high impact carbon credits to help investors fulfil net-zero commitments. NBCF aims to only invest in nature-based solutions projects, including agriculture, forestry, land-use, blue carbon, wetlands, peatlands, and savanna fire management, focussing predominantly on developing country markets.

Other major financial institutions are making massive financial commitments to address climate change, environmental impacts, and sustainable development more broadly, including:

- **JPMorgan Chase** aims to finance $2.5 trillion in projects that address climate change and sustainable development by 2030.
- **Citigroup Inc.** has pledged $1 trillion by 2030 to fund climate change and sustainable development projects.
- **Bank of America** recently increased its ambition for an existing $300B sustainable business fund and will now aim to mobilize $1 trillion by 2030 for initiatives that support the net-zero transition.
- **Apple's $200M Restore Fund** partners with Conservation International and Goldman Sachs and will focus on forest carbon removal projects that generate a financial return. The Fund aims to remove at least 1 MtCO2e annually and address the remaining 25% of Apple's emissions by 2030.

The Taskforce on Scaling Voluntary Carbon Markets has called on investor groups to provide clear and consistent guidance to buyers on the appropriate use of offsets. Groups such as Ceres are already working with investors to address climate impacts within their portfolios and providing regular guidance to investors on the importance of addressing portfolio-wide deforestation risks.[174]

Removals vs. Reductions

Despite the need to dramatically reduce emissions in the next ten years, groups such as the Oxford Principles for Net Zero Aligned Carbon Offsetting and the Institutional Investors Group on Climate Change (IIGCC) have expressed a preference over the long term for offsets that focus on removing carbon from the atmosphere (e.g., afforestation, reforestation, and soil enhancement) over reduction-based offsets that prevent more carbon going into the atmosphere (such as REDD+ or renewable energy).[175] This also reflects the latest guidance by the Science-Based Targets Initiative (SBTi), which emphasizes internal decarbonization to get companies as close to zero absolute emissions as they can get, with offsets from removals (referred to as "neutralizations" by SBTi) used to counteract only those emissions that cannot be eliminated. Reduction-based offsets (or "compensation") are only encouraged by SBTi to achieve climate outcomes beyond a company's direct and value chain emissions.

Some in the environmental community[176] and private sector[177] are concerned that the emphasis on removals over reductions could discourage a focus on tropical deforestation, which still generates five gigatons of GHG emissions every year – more than all the industries of either France or the UK. The concern is that a corporate preference for removals will result in starving urgently needed finance for avoidance/reduction projects that derive from protecting existing forests. Both emission reductions and removals projects are needed, but it is important to keep in mind that forest protection offers the immediate benefit of keeping carbon out of the atmosphere now, versus the decades-long timeframes required to re-grow forests. This has reignited a debate over the role of reductions versus removals that has been burning within the environmental community since the advent of offsetting. The environmental community

[174] Ceres, The Investor Guide to Deforestation and Climate Change, (Boston: Ceres, June 2020), https://www.ceres.org/resources/reports/investor-guide-deforestation-and-climate-change

[175] Reduction-based offsets are still recommended in the near-term according to the Oxford Principles

[176] Frances Seymour, "Seeing the Forests as well as the (Trillion) Trees in Corporate Climate Strategies." One Earth. May 22, 2020.

[177] IETA, Investing in Natural Climate Solutions: the importance of reducing deforestation, December 2020

needs to do more to address conflicting advice regarding the legitimacy of reduction-based credits to increase confidence and reduce uncertainty that could inhibit private sector investment in REDD+.

Tree Planting & Restoration Initiatives

A number of major forest conservation and restoration initiatives at the global and regional scales are ramping up. Although these do not rely on forest carbon finance in the form of issuing and trading carbon credits, they are adjacent to forest carbon activities in terms of building political momentum for forest conservation and restoration, driving finance to forests and potentially impacting the additionality of forest carbon projects. It is to be determined whether these initiatives overlap in potentially conflicting ways with forest carbon projects and programs. Existing initiatives include:

- **The UN Decade on Ecosystem Restoration:** Led by the United Nations Environment Programme and the Food and Agriculture Organization of the United Nations, The UN Decade on Ecosystem Restoration runs from 2021 through 2030 and is building a global movement to ramp up restoration.
- **The Bonn Challenge:** Launched by the government of Germany and IUCN, the Bonn Challenge was established as a global goal to bring 150M ha of degraded and deforested landscapes into restoration by 2020 (210M ha pledged to date) and 350M haby 2030.
- **Initiative 20x20:** A country-led initiative in Latin America and the Caribbean in support of the Bonn Challenge to protect and restore 50M ha of forests, farms, pasture, and other landscapes by 2030. To date, 18 countries in the region and three regional programs have committed protecting and restoring more than 52M ha of degraded land by 2030.
- **The African Forest Landscape Restoration Initiative (AFR100):** A country-led effort to bring 100M ha of deforested and degraded landscapes across Africa into restoration by 2030. It aims to accelerate restoration to enhance food security, increase climate change resilience and mitigation, and combat rural poverty.
- **1t.org:** A global effort led by the World Economic Forum in support of the UN Decade on Ecosystem Restoration aiming to accelerate nature-based solutions by growing, restoring, and conserving one trillion trees by 2030.
- **The New York Declaration on Forests:** A voluntary and international declaration to take action to halt global deforestation by 2030. Its goals include, restoring 350M ha of degraded landscapes and forestlands and reducing emissions from deforestation and forest degradation as part of a post-2020 global climate agreement.
- **PROGREEN:** The Global Partnership for Sustainable and Resilient Landscapes is a World Bank fund that supports national efforts to reduce deforestation through improving livelihoods in developing nations. The PROGREEN fund has received a pledge of 200M Euros from Germany and is seeking to raise a total of $1B.
- **The Land Degradation Neutrality Fund:** An investment fund aimed at identifying and investing in land restoration projects that are financially profitable. The fund is managed by Mirova, and is supported by the governments of France, Luxembourg, Norway, and the Rockefeller Foundation. The fund has raised approximately $100M, largely from public investors, with the target of raising $300M to invest in restoration projects.

There is also increasing momentum to link finance for biodiversity and climate through forestry and land-use activities. For example, in January 2021 at the One Planet Summit for Biodiversity, co-hosted by the UN, France. and the World Bank, countries such as the UK and France made commitments to direct more climate finance to protect and restore forests, and encouraged other countries to do the same.[178] France committed to target 30% of its climate funds by 2030 for "nature-based solutions," such as the effort to develop a 5,000 mile strip of vegetation across the Sahel known as the Great Green Wall. The UK pledged to spend 25% of its £11.6B (US $16B) in international climate finance through 2025 on nature and biodiversity. The High Ambition Coalition (HAC) for Nature and People, an alliance

[178] A host of announcements regarding partnerships and funding for nature-based solutions to the climate challenge were announced at the 2019 UN Climate Action Summit. See https://nature4climate.org/nature-based-solutions-a-summary-of-announcements-and-developments-during-the-un-climate-action-summit-and-climate-week/

of more than 50 countries, was formally launched at the summit. The HAC is part of the Campaign for Nature 30x30 plan which calls for protecting at least 30 percent of the planet's lands and oceans by 2030.

National Level Commitments: Net Zero Commitments & NDCs

It is encouraging to see the rapid uptake of national net-zero commitments. The UK passed the world's first net-zero legislation and the EU, Germany, France, Spain, Sweden, the Republic of Korea, and New Zealand are developing net-zero legislation as well. More than 100 other countries have made carbon neutrality pledges, including some of the largest global emitters, albeit not yet backed by legislation: The US (cutting 2005 emissions in half by 2030 and net zero by 2050); China (peak emissions before 2030 and carbon neutrality by 2060); and Japan (net zero by 2050). Many of these countries have also signed on to the NBS Coalition, co-led by China and New Zealand, which launched a Climate Manifesto in 2019,[179] encouraging the recognition of the power of nature to address climate action.

However, these are long-range commitments. Much more important to address the immediacy of the climate crisis would be increasing the ambition of NDCs now. As noted, by the end of April 2021, only 81 out of the 130 countries that were slated to update their NDCs in 2020 had done so, and the potential of forests within those NDCs to address climate change remains largely untapped. Moreover, studies have shown that integrating climate cooperation through carbon markets into the Paris Agreement (the subject of Article 6), including REDD+, could, for the same total cost, result in almost doubling emissions reductions compared to a non-cooperative scenario for NDCs.[180] The latest versions of the draft Article 6 text do not exclude REDD+ or other forestry and land-use approaches; if this does not change at COP26, then REDD+ will likely be allowed.

A number of projects have moved ahead to pilot Paris Agreement Article 6.2, including the implementation of corresponding adjustments.[181] Switzerland and Peru finalized a deal in January 2021. Under this arrangement, Switzerland will claim the emission reductions against its national targets, and Peru will forfeit these reductions under its national accounting, a so-called Corresponding Adjustment under Article 6.2. The agreement does not mandate which types of projects can supply offsets. Although the initial projects have focused on cookstoves and waste management, around half Peru's emissions come from forestry and land use. Since the deal with Peru in October 2020, Switzerland has signed similar deal with Ghana and is in negotiations with Ethiopia, Nepal, and Cambodia. Given the difficulty in finalizing Article 6 under previous UNFCCC COPs, this deal could serve as a precedent and influence the COP26 negotiations.[182]

It also remains unclear if and how voluntary private sector investments in offsets will interact with Paris Agreement accounting. In many cases, seller countries may be unwilling to sell relatively low-priced credits on the voluntary market if they can't be counted towards their own NDCs. Corresponding Adjustments will be debated again at COP26, but perhaps a consensus on the accounting of voluntary offsets in relation to the Paris Agreement is beginning to emerge amongst two major factions in this ongoing debate.[183] In any case, voluntary action offers the potential to enhance ambition outside of NDCs or help meet NDCs.

[179] United Nations Environment Programme, The Nature-Based Solutions for Climate Manifesto, (Nairobi: United Nations Environment Programme (UNEP), August 14, 2019), https://wedocs.unep.org/bitstream/handle/20.500.11822/29705/190825NBSManifesto.pdf?sequence=1&isAllowed=y

[180] Pedro Piris-Cabezas, Ruben Lubowski, and Gabriela Leslie, Estimating the Power of International Carbon Markets to Increase Global Climate Ambition, (Washington, DC: Environmental Defense Fund, 2019), https://ceep.columbia.edu/sites/default/files/content/events/Lubowski%20et%20al.%20on%20Carbon%20Markets.pdf

[181] Nicole Krämer et al., "Article 6 Piloting: State of Play and Stakeholder Experiences," Climate Focus, December 2020, https://www.climatefocus.com/publications/article-6-piloting-state-play-and-stakeholder-experiences

[182] Other Article 6 pilots are also in development and detailed in Nicole Krämer et al. 2020.

[183] Hugh Salway and Charlotte Streck, "Claims + Credibility: Embracing Diversification to Scale Carbon Markets," Ecosystem Marketplace, April 26, 2021, https://www.ecosystemmarketplace.com/articles/claims-credibility-embracing-diversification-to-scale-carbon-markets/

Private-Sector Commitments: Moving from Net-Zero 2050 to Near-Term Actions

More than 1,500 companies have made climate change commitments in recent years, but those commitments are hard to compare across different approaches, GHGs covered, timelines to achieve net zero, scope of emissions addressed, and particular use of offsets.[184] Perhaps more important is the need to translate existing commitments into immediate actions to achieve the 2030 and 2050 goals. Unfortunately, a recent study found that 70% of companies that intend to transition to net zero by 2050 have yet to take action and 78% of investors believe most business leaders are failing to take sufficient action to achieve net zero by 2050.[185] If the current momentum seen in forest carbon markets is to be maintained and built upon, companies will need to be held accountable and deliver on their commitments, particularly over the next decade, or else risk repeating the history of missed targets of the New York Declaration on Forests, among other agreements.

Post-Pandemic Climate Commitments & the Green Growth Agenda

The global pandemic has created new challenges and opportunities for climate action. Eighty-five percent of senior executives surveyed by EM said that COVID-19 has delayed their transition to net-zero.[186] Yet, in compliance carbon markets, for the most, part prices fell for a short period around March-April 2020, then rapidly recovered. Anecdotal evidence from the voluntary markets in 2020 shows a similar pattern.[187] Demand for NCS-based credits has grown significantly in recent years, as reflected in this report, and is projected to accelerate.

Post-pandemic economic recovery packages also offer significant new opportunities for forest carbon finance. In the US, the Biden administration has promoted a “whole of government” approach to climate change and embedded it within its funding priorities, as reflected in its recently proposed infrastructure spending bill. An immediate outcome of this overall approach is the significant new investment in forest carbon in the LEAF Coalition, in collaboration other bilateral donors, for tropical forest protection. The UK, the Republic of Korea, and the European Green Deal have also linked recovery to NCS.

[184] Joeri Rogelj et al., “Net-zero emissions targets are vague: three ways to fix,” Nature, March 16, 2021, https://www.nature.com/articles/d41586-021-00662-3

[185] Standard Chartered, Zeronomics, a study into financing a net-zero world, (London: Standard Chartered, March 30, 2021), https://av.sc.com/corp-en/nr/ph/content/docs/SCB-PR-Zeronomics-a-study-into-the-financing-of-a-net-zero-world.pdf

[186] ibid

[187] As of the publication of this report, EM has begun collecting 2020 data under a new more flexible, online platform: https://www.ecosystemmarketplace.com/carbon-markets/

APPENDICES

Appendix 1: Glossary

Additionality: The requirement that emissions reductions claimed as offsets must go above and beyond emissions reductions that could have been achieved under a "business as usual" scenario.

Afforestation/Reforestation: Afforestation/reforestation is a project type involving establishment of forests on areas without forest cover to capture additional carbon in new tree biomass and other carbon pools. Emissions reductions occur primarily through additional carbon sequestration.

Agro-forestry: In this project type, land is managed using intermingled agricultural and forestry strategies, sequestering additional carbon in trees and/or soil and reducing carbon emissions compared to "business as usual" agricultural practices. Emissions reductions may occur through additional sequestration and/or avoided emissions.

Brokers: Brokers are intermediaries who do not take ownership of offsets but facilitate transactions for a fee between project developers and end buyers, between project developers and retailers, and/or between retailers. When given the opportunity, some retailers will also perform this role, but generally not at significant volumes.

Buyers: Buyers purchase offsets either for their own internal use (called "end buyers") or for re-sale to another buyer (called "intermediaries"). Intermediaries, such as retailers, purchase offsets with the intention to resell. In contrast, end buyers purchase offsets to count against their emissions and typically retire any purchased offsets to signal that those offsets are no longer available for sale.

Carbon Neutral: Carbon neutrality refers to offsetting an equivalent amount of carbon for an overall amount produced. This can be achieved by purchasing carbon credits and supporting GHG reduction initiatives, such as renewable-energy projects.

Co-benefits: Co-benefits are additional environmental, social, or other benefits arising from a carbon project that are quantified based on metrics or indicators defined by the project developer, a co-benefits certification program, or third-party carbon project standard that accounts for both climate and co-benefits. Some registries and standards enable co-benefits certification to be "tagged" onto issued carbon offsets, if quantification and verification of co-benefits are not already embedded in a carbon project standard.

Compliance markets: Compliance markets are the result of government regulation to reduce GHG emissions and allow regulated entities to obtain and surrender emissions permits (allowances) or offsets in order to meet predetermined regulatory targets.

Corresponding Adjustment: A carbon accounting approach proposed under the Paris Agreement that would address double counting of credits for Internationally Transferred Mitigation Outcomes (ITMOs) by enabling the purchasing entity to claim credits, such as a country under its NDC or an international system like CORSIA, while the selling entity forgoes claims on the credits sold.

Credit: See "Offset."

Emissions Trading System (ETS): A market-based regulatory approach to limiting greenhouse gas emissions, whereby overall emissions are limited, and individual polluters are allowed to trade pollution permits, and in some cases carbon offsets, to meet their individual emissions reductions. The most common form of an ETS is known as cap-and-trade.

End buyers: End buyers are buyers who purchase offsets with the intention to retire them. This is in contrast to retailers, who purchase offsets with the intention to resell them.

Forestry and land-use carbon: Carbon emissions that are either avoided or stored (or "sequestered") through forestry and land-use activities.

Improved Forest Management: Existing forest areas are managed to increase carbon storage and/or to reduce carbon losses from harvesting or other silvicultural treatments. Emissions reductions may occur through additional sequestration and/or avoided emissions.

Issuance: Issuance is the final carbon offset project stage, which occurs after third-party auditors have guaranteed a project has avoided or sequestered CO2 or an equivalent. Once a project has met all requirements by its voluntary standard, the developer can apply to a standards body to issue eligible offsets. Any offsets issued to the project owner come with a unique serial number and are listed in a registry that monitors any ownership transfers or offset retirement.

Jurisdictional REDD+: A multi-stakeholder, government-led program in developing countries to address the drivers of deforestation and forest degradation, plus the enhancement of forest carbon stocks across an administrative area at national, subnational, or regional scales.

Leakage: In order to become validated, forest carbon projects must prove that their activities are reducing deforestation in the project area while also ensuring that the deforestation drivers do not simply move outside the project boundaries and lead to deforestation elsewhere.

Methodology: A methodology lays out requirements for carbon offset projects for calculating emissions reductions. Project developers can either use pre-existing methodologies or develop new ones. Voluntary offset standards each have a list of approved methodologies that they accept.

National Determined Contribution (NDC): A pledge by a Party to the Paris Agreement to take climate action communicated to the UNFCCC Secretariat.

Nature-based Solutions (NBS): Nature-based Solutions protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. Nature Climate Solutions are a subset of Nature-based Solutions.

Natural Climate Solutions (NCS): Natural climate solutions support increased carbon storage and avoid GHG emissions through projects which promote conservation, restoration, and improved land management. The ecosystem services often focus on the protection of existing forests, biodiversity, and livelihoods of indigenous communities.

Nesting: The process of combining project-based REDD+ projects into jurisdictional programs to avoid double counting of emission reductions at different scales and to ensure private-sector emission reduction efforts maintain value.

Net-Zero: Net-zero carbon refers to reducing GHG emissions with the long-term goal of balancing the emissions produced and removed from the earth's atmosphere.

Offset: This term refers to a quantified environmental benefit that is designed to compensate for impacts to habitat, environmental functions, or ecosystem services. Offsets may be regulatory or voluntary. Within carbon and GHG markets, offsets specifically refer to one metric ton of CO2 or equivalent reduced, avoided, or sequestered by an entity to compensate for emitting that ton elsewhere.

Permanence: Permanence is the principle that carbon offsets must permanently remove the CO2 or equivalent emissions from the atmosphere or oceans. For forest carbon, a reversal of carbon storage can happen from human activity (e.g., logging) or unforeseen natural events (e.g., forest fires, pest outbreaks).

Primary market: The primary market for carbon offsets is defined as the initial transaction of offsets from the project developer to the first buyer in line—this can be an offset retailer or broker (i.e., the "secondary market") or a buyer of offsets for "end use" (i.e., end buyer) in the voluntary or compliance carbon offset markets.

Project: A project is a site, or suite of sites, where restoration, sequestration, or other activities are implemented for the purposes of marketing the resulting ecosystem service assets or outcomes to buyers. Carbon offset projects quantify their avoided or reduced emissions to produce tradable emissions reduction certificates, called offsets.

Project developer: A project developer is a catch-all phrase to describe organizations that create carbon offset projects, beginning with the initial Project Design Document all the way to offset issuance. Project developers include organizations that are the project owner, partner organizations involved in project implementation, project financiers/ investors, or others.

Reduced Emissions from Deforestation and Forest Degradation (REDD+): REDD+ refers to reducing emissions from deforestation and forest degradation in developing countries, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries. REDD+ activities take place in areas where existing forests are at risk of land-use change or reduced carbon storage. Activities focus on conserving these forests before they are degraded or deforested, resulting in the avoidance of a "business as usual" scenario that would have produced higher emissions. Emissions reductions occur primarily through avoided emissions.

REDD+ Readiness: Activities focused on building the capacity and technical capabilities that are required for national and subnational government to be eligible to receive public REDD+ funding.

Avoided Planned REDD+: Avoided planned REDD+ projects protect forests that have been legally authorized to convert to non-forest land.

Avoided Unplanned REDD+: Avoided unplanned REDD+ projects protect forests from unclear or multiple threats, such as subsistence agriculture, livestock grazing, collection of fuelwood charcoal, illegal logging, and small-scale extractive activities.

Registry: A registry issues, holds, and transfers carbon offsets, which are given unique serial numbers to track them throughout their lifetime. Registries can also retire offsets. In compliance markets, each market has its own designated registry. In the voluntary market, independent registries exist.

Results-based Payments: For the purposes of this report, results-based payments are payments that are tied to achieved emissions reductions.

Retailers: Retailers do not traditionally manage project development and documentation. Instead, they contract with project developers to take ownership of a portfolio of offsets that they then offer to end buyers. Retailers typically offer other corporate carbon management services to end buyers, such as advising on internal emissions reductions strategies.

Retirement: The final project development stage, retirement is the point at which an organization permanently sets aside a carbon offset in a designated registry, effectively taking the carbon offset's unique serial number out of circulation. Retiring offsets through a registry ensures that they cannot be resold. This is of particular importance if the buyer's intent is to claim the offset's emissions reductions against a carbon reduction or neutrality target.

Secondary market: The secondary market for offsets is comprised of sales among market intermediaries or between market intermediaries and end buyers.

Sequestration: The long-term storage of carbon in the biosphere or subsurface terrestrial features in order to reduce its concentration in the atmosphere.

Standard: A standard is 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. In the voluntary markets, a number of competing standard organizations have emerged with the intent to increase credibility in the marketplace. More recently, national and subnational regulated markets have also designed standards specific to regional needs for voluntary use.

Supplier: A supplier is any organization that sells carbon offsets, such as a project developer, retailer, or broker.

Transaction: A transaction occurs at the point that offsets are contracted by a buyer, regardless of whether suppliers agree to deliver offsets immediately or in the future.

Validation: The project development stage that follows the Project Design Document. Validation is the approval of carbon offset projects during planning stages. To achieve validation, projects must submit information on project design for third-party approval. Project design information generally includes baseline scenarios, monitoring plans, and methodologies for calculating emissions reductions.

Verification: The project development stage that follows validation. Verification may take place up to several years after validation. It refers to the process of verifying emissions reductions generated by an offset project to a particular standard, which quantifies actual emissions reductions to ensure that the appropriate number of offsets are issued to the project.

Voluntary carbon markets: Voluntary carbon markets refer to the collective voluntary transactions tracked worldwide. There is no centralized single marketplace for voluntary transactions but rather many discrete transactions and, in some cases, country or program-related markets (such as the UK's Woodland Carbon Code).

Appendix 2: Methodologies

This report was designed to track global finance committed each year to sequester carbon or avoid emissions through forestry and land-use activities. The main emissions-reducing forestry and land-use activities EM tracks are: tree-planting, forest management, Reducing Emissions from Deforestation and Forest Degradation, and agroforestry. The report scope also includes activities such as grasslands management, low-carbon farming, and wetlands restoration. Overall numbers include results-based payments for emissions reductions both through carbon offset transactions on carbon markets (both voluntary and compliance) and through bilateral or multilateral agreements to pay for REDD+ programs. EM acknowledges a "commitment" at the point that a contract is signed, committing the counterparties to both payments and results. The relevant unit of exchange is one tonne of carbon dioxide equivalent (tCO2e).

EM carbon markets data is collected through an annual survey of offset project developers, retailers, and brokers, as well as carbon offset standard bodies and accounting registries that track and facilitate offset ownership. Because this report has not been produced for 3+ years, it incorporates voluntary market transactions in calendar years 2017, 2018, and 2019. Over this period, the survey was distributed to approximately 418 organizations identified as potentially active in voluntary or compliance carbon markets. Of these, 172 organizations responded with data regarding forest carbon offsets. All told, EM tracked 6290 unique transactions of forest carbon offsets. A breakdown of EM's 2020 response rate by organization headquarters, project region, market type, and market role appears below.

Headquarters Location & Number of Organizations

Africa	9
Asia	11
Europe	50
Latin American and the Caribbean	23
North America	44
Oceania	15
Total	152

Number of Organizations Responding by Market Type

Voluntary	129
Compliance	24
Active in both markets	13

Number of Organizations Responding by Supplier Type

Project Developer or Investor	118
Retailer, Broker, or Other	80
Act in Multiple Roles	79

Notes regarding EM survey data:

- EM attempts to contact (sometimes through multiple emails and phone calls) all organizations that are active in forest carbon markets, but survey-based research is inherently based on response rate.
- To avoid any double-counting of transaction volumes, EM asked respondents to specify the volume of offsets transacted through a broker (who facilitates deals but does not take ownership of the tonnes). When an overlap was identified, the transaction was counted only once.
- EM does not track the individual "lives" of offsets as they pass through the value chain. For example, if a project developer sold an offset to a retailer and then the retailer sold the same offset to a final buyer, EM counts each transaction separately to derive the volume and value of transactions in the overall market. This methodology is consistent with most other marketplace analyses.
- Prices and values are collected in all currencies and converted to US dollars using the average exchange rate during the relevant calendar year.
- All price data presented in this report is volume-weighted for significance.
- This report presents only aggregated data. All supplier-specific information is treated as confidential. EM takes this very seriously and reveals more detailed information (such as transaction volume by country or standard) only when there is data from at least three different organizations.
- Because the aim of this report is to account for all payments for emissions reductions, EM does not apply any quality criteria screens for offsets included in calculations. However, it does follow up with some respondents to confirm or clarify survey responses that were incomplete or raised a red flag.

Beyond the survey, EM collected additional information on compliance markets through public data sources and interviews.

Information on payments for REDD+ programs was collected through public documents and interviews. These payments usually come about in a few phases:

- First, an announcement may be made by a bilateral or multilateral donor that they will fund up to a certain amount in REDD+ emissions reductions. Announcements represent potential money on the table, but they may not yet designate a recipient.
- Next, the parties to the agreement may sign a Letter of Intent, Memorandum of Understanding, or similar document that turns the announcement into a pledge. For the most part, this report considers results-based finance to be payments for verified emissions reductions. However, some results-based pledges also include money for activities other than emissions reductions (such as specific capacity-building outcomes)—and in some cases it is not possible to parse the two.
- A pledge becomes a commitment when a contract to pay for results is signed. Actual delivery of those results may occur immediately or in the future.
- The final stage of results-based payment is disbursement—when the money actually flows to the recipient party.

Appendix 3: Directory of Forest Carbon Offset Suppliers

An updated list of the EM Global Carbon Survey respondents can be found at: https://www.ecosystemmarketplace.com/carbon-markets/em-carbon-survey-respondents/

Appendix 4: Directory of Companies with Commitments to Address Commodity-driven Deforestation

3M
Aak Ab
Aeon
Agropalma
Ahold Delhaize
Ajinomoto
Alfred Ritter Gmbh & Co. Kg
Allied Bakeries
Apical Group
Archer Daniels Midland
Arcos Dorados Holdings
Arla Foods
Arnott's Biscuits
Asda
Asia Pacific Resources International Limited (April)
Asia Pulp And Paper
Asian Agri
Astra Agro Lestari
Avon
Avril Group
Bahlsen
Barilla
Barry Callebaut Group
Bayer
Beiersdorf Ag
Bel Group
Biomar Group
Blommer Chocolate
Brambles
British Airways
Bunge
Bunge Loders Croklaan
California Oils Corporation
Campbell's
Carbonex
Cargill
Carrefour
Casa Luker
Casino
Cémoi
Cermaq
Chocolats Halba
Clariant
Clarks International
Clorox
Colgate-Palmolive Company
Colruyt Group
Companhia Brasileira De Distribuicao Gpa
Compass Group
Conagra Foods
Coop Norway
Coop Switzerland
Costco
Croda International
Cvs Health
Daiwa House Industry Co.
Danish Crown
Danone
Danzer
Denofa
Dharma Satya Nusantara
Diageo
Doctor's Associates
Domino's
Drax Group
Dsm Nutritional Products Ag
Dunkin' Brands
E. Leclerc
Eagle High Plantations
Earth Balance
Edeka Zentrale
Eileen Fisher
Equatorial Palm Oil
Essity
Estee Lauder Companies
Fazer Group
Felda Global Ventures
Felleskjopet
Feronia
Ferrero Trading
Findus Nordic
Florin
Fonterra
Fuji Oil
Gebr. Van Beek Group
General Mills
Givaudan
Godrej Industries
Golden Agri-Resources
Golden Veroleum (Liberia)
Goodhope Asia Holdings
Goodman Fielder
Grupo André Maggi
Grupo Bimbo
Grupo Jd
Gsk (Glaxosmithkline)
Guan Chong Berhad (Gcb)
Guittard Chocolate Company
H&M Hennes & Mauritz Ab
Harpercollins
Henkel
Hershey Company
Hewlett-Packard (Hp Inc.)
Holmen
Home Retail Group
Iberdrola
Ica Gruppen
Inditex
Indofood Agri Resources
Inter Ikea Group
Interholco
International Flavors & Fragrances
International Paper Appm
Ioi Group
Jbs
Jeronimo Martins
Johnson & Johnson
Kao Corporation
Kellogg Company
Kering
Kimberly-Clark
Kingfisher
Kirin Holdings
Klabin
Kraft Heinz
Krispy Kreme
Kroger
Kuala Lumpur Kepong Berhad (Klk)
L'oréal
Landcorp
Lidl Stiftung & Co.
Lindt & Sprüngli
Lotus Bakeries
Marfrig
Marks & Spencer
Mars
McDonald's
Meiji Holdings
Metro Ag
Metro Cash & Carry
Minerva
Mondelez
Mondi
Monoprix
Mousquetaires
Musim Mas
Natures Organics
Neste Oil
Nestlé
New Britain Palm Oil
News Corp
Nippon Paper Group
Noble Group
Norges Gruppen
Nutreco International
Oji Holdings Corporation
Olam Food Ingredients
Olam International
Oriflame Cosmetics
Origin Energy
Orkla
Orsted
Pepsico
Post Holdings
Pro Fair Trade Ag
Procter & Gamble
Puratos Nv
Pz Cussons
Reckitt Benckiser
Remia C.v.
Restaurant Brands International
Royal Golden Eagle
Royale Lacroix
Safeway
Sainsbury's
Salim Ivomas Pratama
Sappi Group
Sc Johnson And Son
Sca
Scandi Standard
Sekisui House
Sime Darby Plantation
Sinar Mas Agro Resources And Technology (Smart)
Sipef
Socfin Group
Sodexo
Spar Österreich
St Hubert Group
Staples
Starbucks Coffee Company
Stella Mccartney
Stora Enso
Subway
Sucden
Sumitomo Forestry Co.
Superunie
Sveaskog
Systeme U
Tesco
Tetra Pak International
The Body Shop
Tiffany & Co.
Timberland
Toms Group
Tony's Chocolonely
Touton Group
Toyo Suisan Kaisha
Travis Perkins Group
Tree Zero
Unicharm Corporation
Unilever Plc
Upm-Kymmene Corporation
Us Foods Holding
Valio Oy
Valrhona
Vandemoortele
Vf Corporation
Walmart
Weyerhaeuser
Whitewave Foods
Wilmar International
Woolworths Group
Woolworths Holdings
Yum! Brands
Yves Rocher

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

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