SUPPLY AND DEMAND EVOLUTION IN THE VOLUNTARY CARBON CREDIT MARKET

October 2020

Giridhar Sankar

Kleinman Center
for Energy Policy

CONTENTS

EXECUTIVE SUMMARY

Carbon offsets are increasingly becoming a strategy to reduce environmental impacts, with the market for new offsets being the largest it has ever been in 2019. The original credits were traded on the Clean Development Mechanism established via the Kyoto Protocol in 1997, but after a few years the carbon markets experienced a crash in carbon prices due to the unreliability of certain carbon credit projects.

Today, recent gains have been driven by an increase in voluntary demand for these credits, as many private companies wish to participate in the offset market. Shareholder and public pressure have pushed these companies in recent years to drive this, and projects with societal benefits along with emissions reductions are seen as more attractive to voluntary buyers. Forestry carbon is the largest category of these credits, representing the most issuances of new credits per year over the past decade.

Within the forestry subcategory, Latin America and Southeast Asia have been the biggest recipients of carbon emissions reduction projects.

In Latin America, many of these projects are related to Amazon conservation, and the rate of deforestation of the Amazon has been slowed by more than half from its peak in the early 2000s due to REDD+ conservation projects as well as other carbon credit contributions. However, many forestry credit projects in Brazil and other bordering nations have not delivered the amount of credits promised at project outset. The reasons for this include insufficient funding, lack of cooperation of local authorities, and disruption of conservation by local communities. Future issuers of forestry credits will need to price their credits appropriately, and work in jurisdictions where they feel that forests can be protected to the extent promised in the credit sold. Otherwise, these credits will not fill their purpose, and the agreed emissions reduction won't materialize.

CORSIA, or the UN's effort to mandate carbon offsetting by airlines for their emissions growth, makes it even more important to get carbon offset projects correct. CORSIA requires airlines to offset gains in their emissions after 2020, and when using the pre-COVID airline traffic increase predictions, this could result in ~4–20x multiples of demand for credits from the carbon market size today. Once implemented, CORSIA has the potential to be the biggest non-voluntary driver of carbon credit growth.

Thus, providers of credits will need to ensure quality, appropriate funding, and cooperation with local institutions to meet the growing demand for these key instruments in the fight against climate change and focus on corporate social responsibility.

INTRODUCTION

Companies and individuals that care about climate change and want to curb their own emissions are increasingly considering carbon offsets as one strategy for reducing environmental impacts. The recent high profile decisions by Google, Microsoft, Unilever, and Amazon to go carbon neutral or negative over the next several decades have set an example for other businesses to make climate change a defining factor of their environmental, social and governance (ESG) strategies.

Large companies like Google have the ability to make their own capital outlays (for example by self-financing renewable energy projects for its data centers). Other companies who wish to follow suit, however, may lack the same procurement power. These enterprises can turn to carbon offsets in addition to other measures in order to balance their emissions.

Carbon offsets are tools that enable investment in projects that pass a set of screening criteria. Various providers (such as VCS and Gold Standard) make it their business to certify projects taking place around the world. The projects must demonstrate that they 1) reduce one or more greenhouse gases, and 2) would not have been undertaken without the offset money, proving their additionality.

Moreover, unlike a typical nonprofit donation, the proprietors of the carbon-reducing assets can make a financial return from them. For example, funding a renewable energy project ensures that the cash flows of the project go to the ultimate owner of the invested asset; not necessarily the holders of the carbon credit. As compensation for the capital, the carbon credit owner earns a profit based on the reduced emissions.

Typical project classifications include forestry (preserving or planting new trees and forests), energy efficiency, and renewable energy. Despite some high profile successes, many projects have suffered from the inability of the certification agencies to protect them from changes in government regulations and incentives. For example, some forest credits in the past have been abandoned by state governments in favor of expanding agriculture.

This digest focuses on the increased demand for carbon credits, due to improved participation from private companies as well as regulatory requirements placed on international airlines. Demand from these actors has increased meaningfully since the UN's Paris agreement, straining the supply of carbon credits.

The supply side of credits has suffered challenges of accountability and competing government incentives and there are examples of both successes and failures. The supplier of these credits will need to price them appropriately—striking the right balance between providing adequate funding to projects without demotivating interested parties—so that carbon credit systems are can become resilient enough to support a surge in growth.

KYOTO PROTOCOL AND THE ESTABLISHMENT OF THE CDM

The first widely used emissions trading program began with the amended Clean Air Act in 1990, which was put into place in the United States to reduce sulfur dioxide emissions, a compound that can cause acid rain when emitted into the environment. The system achieved a 40 percent reduction in SO_2 emissions, largely because it employed a simple cap-and-trade model between American states.

This model allowed polluters to trade permits, with caps based on historical emissions reductions (Rico 1995). This system afforded efficient pollution reduction, which the Kyoto protocol sought to achieve through a similar program for countries through its Clean Development Mechanism (CDM). However, this rollout was more complicated due to the divergent interests of the participants.

An interview with Professor Arthur van Benthem of the Wharton School at the University of Pennsylvania revealed some unfortunate economic consequences that went along with the original establishment of the CDM (Van Benthem 2020). Carbon reductions need to be "additional" in order to qualify as credits, and it was challenging to prove whether the credits established by the CDM were additional.

The concept of additionality refers to actions or projects that are above and beyond the scope of what the government was planning to fund in a given year, and the Kyoto protocol's purpose was to mandate reductions on top of what the countries were already doing. Given that these decisions are fungible based on what the lawmakers decided to include in the country's annual budget, it became hard to prove whether a conservation project or a renewable energy project was truly additional.

Moreover, there is a perverse incentive for countries to claim offsets in certain industries, such as energy, and then let other industries produce more. This can lead to negative outcomes, where emissions are falsely saved in one sector and then created in another. Lastly, many energy projects in state payer systems (where the government pays private companies for producing electricity) can be net present value (NPV) positive if the state offers a high enough electricity price. The state could claim that such a project is unfeasible if it has artificially lowered the power price in that region, which results in the same project being NPV negative.

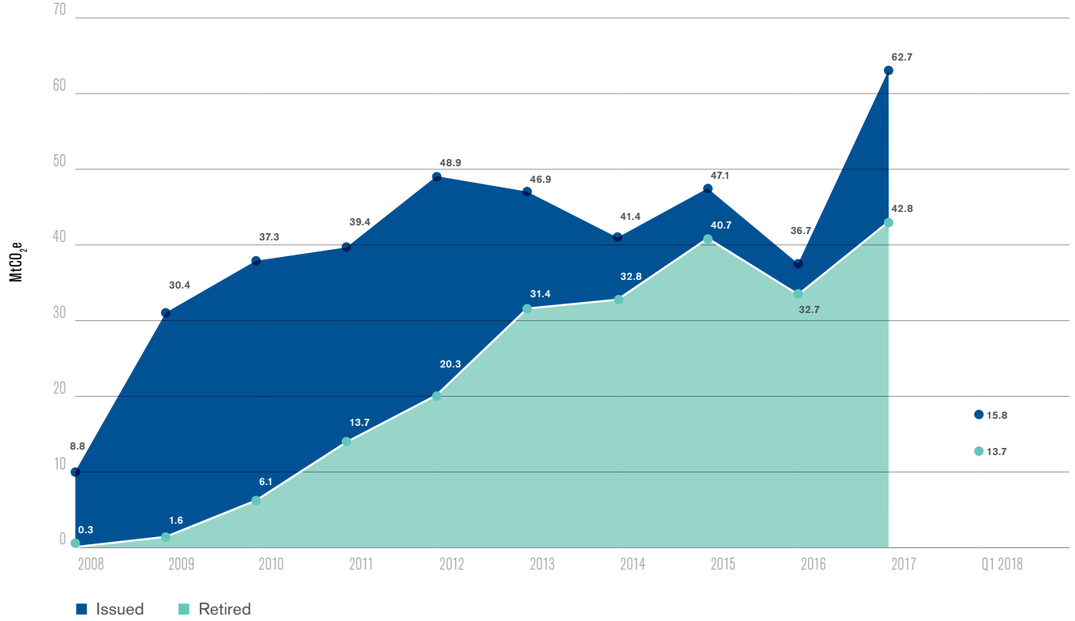
If the state does this, and then builds the energy installation anyway, it could claim the project to be "additional," as the project could not have been built without generating a positive NPV return. Therefore, economists have worried that the use of carbon credits in energy trading systems (ETS) could cause overall emissions from a country to increase if incentives were misaligned with emission reduction.

These factors contributed to the CDM's collapse in 2012, as there was insufficient political will to mandate tight controls on the credits, resulting in the decreased use of carbon credits as a currency in ETS projects around the world. This is not to say that cap and trade programs are ineffective, or not growing. On the contrary, cap and trade is now in wide use around the world, with the EU being the biggest market to use this system of carbon accounting. However, these largely national programs don't necessarily accept all carbon credits from third parties as tradeable goods, and can pick and choose between programs and regions that they are willing to qualify.

CARBON OFFSET MARKET SIZE, AND RECENT GAINS IN ISSUANCES

Carbon markets only truly picked up in the late 2000s, and growth overall can be traced to large international accords or industry decisions to participate in carbon markets. As one can see in the following chart describing total voluntary carbon credits issued and retired by year, the market was very nascent in 2008 (the start of the Kyoto Protocol's first commitment period). Over time, it has grown with a slight downtrend in 2012 when the CDM collapsed. There was a huge increase in the use of credits in 2017 with the Paris agreement, and the latest industry reports show total credit volume increased from 46.2 $MtCO_2e$ in December 31, 2017 to 98.4 $MtCO_2e$ (Donofrio 2019) in December 31, 2018, post-agreement.

FIGURE 1: HISTORICAL VOLUNTARY CARBON OFFSET ISSUANCES AND RETIREMENTS



Source: Hamrick and Gallant, Figure 1.

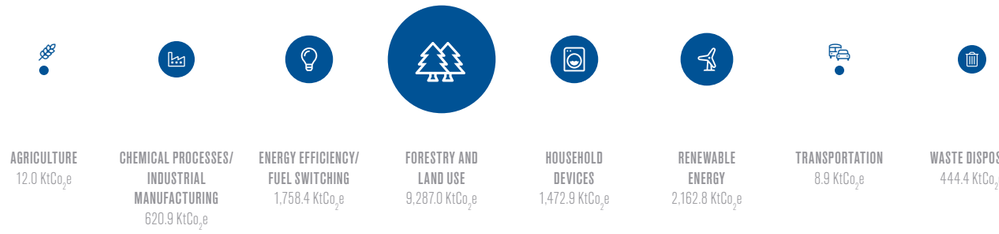
Notes: Data is based on project registries from the following carbon standards: American Carbon Registry (ACR), Climate Action Reserve (CAR), Gold Standard, Plan Vivo, and Verra's Verified Carbon Standard (VCS) as of April 2018. Based on 401.5 $MtCO_2e$ offsets issued and 212.4 $MtCO_2e$ offsets retired between 2008 and 2017. Although there was some pre-2008 market activity, it is not included in this figure due to a lack of consistent, publicly-available information.

FIGURE 2: Q1 ISSUANCES BY PROJECT CATEGORY, STANDARD AND COUNTRY

160 projects issued 15.8 $MtCO_2e$ offsets January–March 2018.

7.0 $MtCO_2e$ in January | **5.2 $MtCO_2e$** in February | **3.5 $MtCO_2e$** in March.

By Project Category



Source: Hamrick and Gallant, Figure 2.

This increase is likely to be linked to the Paris agreement's Article 6. This article replaces Kyoto's guidelines for the CDM and continues to push for a cap and trade system that spans across international markets. Unfortunately, the implementation of Article 6 still hasn't been agreed upon despite lengthy negotiations at the COP 25 summit held in Madrid last December, likely because of the issues that existed with the original market (Farand 2019).

Indeed, disagreements over this article intensified after COP 25. A post-mortem analysis of COP 25 indicates the main issues with Article 6 are 1) some countries wanting to transfer their surplus of old credits from the CDM into the new system, 2) the stringency of rules designed to prevent double counting, and 3) the overall mitigation goals of the system (as it is important to make sure the overall numbers of emissions decrease).

Especially challenging is the issue of the old CDM credits, which are today viewed as having little to no value. These credits could be included in any refresh of the CDM, and would dilute the value of any new carbon credits sold within the same system. This is because not every reduction per metric ton of carbon would be viewed as equal, as some of the old credits are viewed as not actually reducing the amount of emissions promised.

FORESTRY CARBON CREDITS

The most common type of carbon credit has traditionally been forestry, with this trend continuing in the most recent available data (Q1 2018).

Forestry credits can occupy two main categories: afforestation / reforestation (creating new forest or restoring existing), and improved forest management (preventing the destruction of certain forests for commercial uses like logging or agriculture). The most common certification designation for these projects, especially when conserving important swathes of forest around the world, is REDD+.

REDD+ includes these two main types of forestry credits, and these types of credits are popular because they are easy to understand, often meet criteria for "additionality," since forests naturally sequester carbon and have the co-benefit of protecting endangered species. Not all REDD+ projects produce carbon credits, as funding also comes from other sources. These projects can often be focused on conservation (38 percent) rather than carbon sequestration (20 percent), but each is generally able to achieve both goals if successful (Simonet 2014).

For example, the Rimba Raya project in Indonesia is one of the country's most important sites for protecting the Bornean Orangutan (Rimba Raya 2018). These conservation efforts are very popular among individual consumers and companies. However, forests are naturally a risky investment since they can be affected by natural disasters like fires, and are vulnerable to illegal human interventions if not properly protected. Various forestry projects have failed in past years, contributing to some mistrust in carbon credits in the wider international market.

CHALLENGES OF FORESTRY CREDITS: A BRAZILIAN EXAMPLE

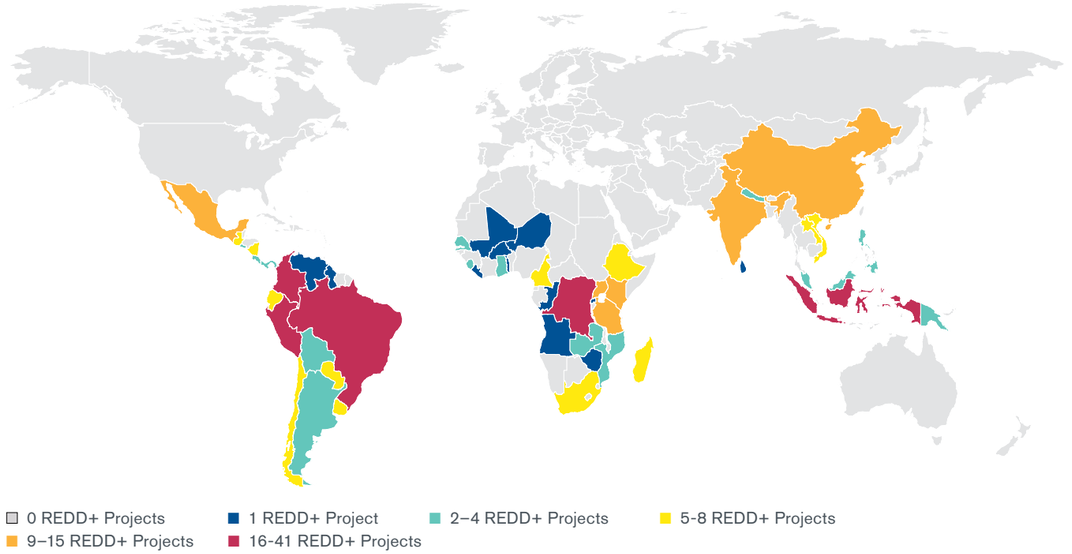
The most popular sources for forestry credits are Latin America (Amazon region), Southeast Asia, and the Democratic Republic of the Congo.

Forestry credits are often sourced from regions where there was natural forest cover that has been reduced due to human activity. Many important REDD+ projects have been located in Brazil, due to it having the majority of the Amazon within its borders and being one of the main sources of global tree loss.

Deforestation was slowed after the 2000s, but has continued at a rate of >5,000 km^2 per year. A study by Simonet et al. shows that local rainforest communities stopped their deforestation by 50% when presented with a REDD+ alternative, but only when the participants in the program cannot make a significantly larger sum of money if using the land for agriculture versus conservation (Simonet 2018).

Despite the REDD+ designation of the forest, however, tree degradation still continues and the ability of local authorities to enforce policies is in question. The main

FIGURE 3: LOCATION OF REDD+ PROJECTS IN 2014



Source: Simonet, et al. Figure 3.

conclusion of the researchers is that REDD+ has been successful in the area of the Amazon, but only to reduce the rate of deforestation rather than to stop it as the local authorities and landowners have in some cases deforested land that was earmarked for protection.

The funding of carbon credits and donations to the Amazon has therefore typically yielded fewer benefits than were "paid" for. An important caveat, however, is that without this support deforestation would have been much worse. There are some important high-profile cases in Brazil outside of the Trans-Amazonian highway that have skewed purchaser opinions with respect to these carbon credits.

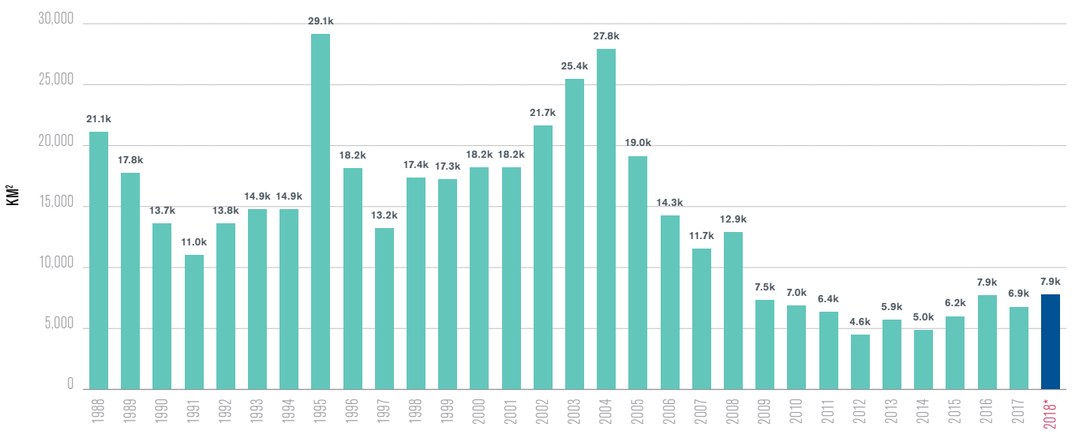
The Brazilian state of Acre is one popular destination for forest conservation projects, having ironed-out agreements with entities in both the UK and Germany to produce them (*ScienceDaily* 2019). Various projects carry social benefits because they fund poorer communities that traditionally have not held land rights to live nearby and maintain the project infrastructure. For this reason, California's ETS decided to accept projects from Acre in September 2019, while the EU ETS declined.

Unfortunately, some of the projects in Acre have been unsuccessful from a carbon credit perspective, for a variety of reasons. First, there is the potential for leakage, or logging simply being relocated to other areas. The Norwegian government notes in its analysis of contributions to REDD+ forestry that despite representing 51% of total contributions to the Amazon Fund (along with the United Kingdom and Germany), they still don't have the appropriate follow-up mechanisms to make sure that leakage doesn't happen. There is a lack of reporting of rainforest land coverage and degradation by the local government (NICFI 2020). This is especially concerning, as trees release some of the carbon they sequester during their lifetime back into the atmosphere when they are cut down, hampering the effectiveness of the carbon credit if leakage occurs.

The second key issue is the lack of sufficient funding raised for REDD+ projects. In Acre the government has adopted a policy favoring soy and cattle production over tracking environmental goals (Song 2019). Forest credit programs decided to compensate farmers for rubber from protected trees, to convince them not to raze land for agriculture. *ProPublica* noted that a kilogram of rubber from these reserves sells for about BRL 2, while a cow is worth BRL 800, which means that not enough financial incentives were provided.

The particular program in Acre that was analyzed seems unlikely to produce the amount of carbon offsets that were sold, because more capital was needed. Despite all these issues, these financial contributions to Brazil's anti-deforestation programs have helped the overall deforestation amount per year in km² to decline from a peak in 2004.

FIGURE 4: ANNUAL ESTIMATED DEFORESTING OF THE AMAZON, 1988–2018



Source: *Tropical Conservation Science Journal* on Amazon Deforestation in Brazil (Boucher and Chi 2018)

A counter-article to the *ProPublica* report written by the Environmental Defense Fund (EDF) discusses this in length, showing that financial contributions were key to slowing the destruction of one of the world's most precious resources (Schwartzman 2019). Unfortunately, the future in Brazil remains unclear, as Norway has paused donations into the Amazon Fund, and the government of Bolsonaro is opening up more areas of the protected forest to deforestation (Boffey 2019).

Figure 4 estimates how many km² of land was deforested per year in the Amazon, with the highest periods coming in the early 2000s before significant forestry conservation funding began.

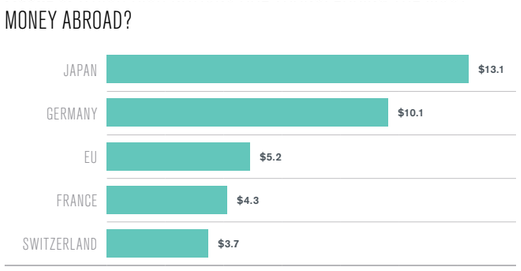
It's clear that forest conservation in order to attract capital investments from wealthy countries has run into roadblocks in Brazil, despite the positive effects that REDD+ programs have had on slowing the spread of deforestation. More needs to be done to account for, protect, and quantify these conservation efforts. Although today most REDD+ programs are not credit related and rather utilize the funding of international aid arms of governments, the need for certification will increase as the market for carbon credits grows via private actors who value and demand transparency.

It's clear that forest conservation in order to attract capital investments from wealthy countries has run into roadblocks in Brazil...

WEALTH TRANSFERS

When looking outside the lens of just forestry credit contributions, there is a clear trend of wealthy OECD countries investing in projects located in less wealthy countries (Yeo 2019). These wealthy countries consume more carbon than other nations and then often shift their carbon offsetting projects to regions where natural resources may be less expensive. If taking overall climate finance transfers either expressed as credits or public and private projects, the following nations are the highest participants:

FIGURE 5: WHICH RICH NATIONS ARE TRANSFERRING THE MOST MONEY ABROAD?



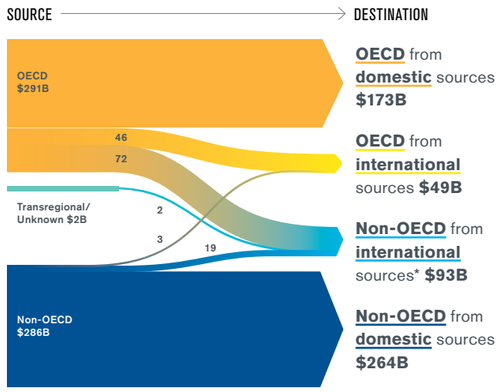
According to data that countries report to the UNFCC, Japan transferred the most—$13.1 billion—to developing countries in 2016. Japan has a history of reporting coal-related projects as climate finance, however. Switzerland transferred the most per capita, and per tonne of its own carbon emissions.

Source: *Nature*, Figure 3.

Another version of this analysis is to look at all financial flows, facilitated by additional data on all funding sources (public and private) from the Climate Policy Initiative (CPI). This is different from the analysis done by *Nature* because it includes money not purely focused on climate initiatives and encompasses both equity and debt financing. The capital in this chart would include investments in energy projects and electric car production, for example. The results show that most of this capital is invested domestically rather than in other countries, but the capital that moves internationally is primarily moving from OECD to non-OECD markets.

The CPI data introduces the hypothesis that high-emissions per capita countries (generally developed markets) are using these carbon negative projects in developing markets as an excuse to continue their behavior of consuming too much carbon. Although it is a positive thing that $93Bn of capital was transferred to development projects in non-OECD markets, regulators need to be aware that reducing carbon emissions is a better option until additionality, leakage, and other problems of credits can be solved.

FIGURE 6: CLIMATE FINANCE FLOWS BY OECD STATUS OF SOURCE AND DESTINATION ($USD BILLION, 2017–2018 ANNUAL AVERAGE)



*Flows with transregional destination are assumed to be directed to non-OECD countries.

Source: *Climate Policy Initiative 2019 Global Landscape of Climate Finance Report* (Buchner 2019).

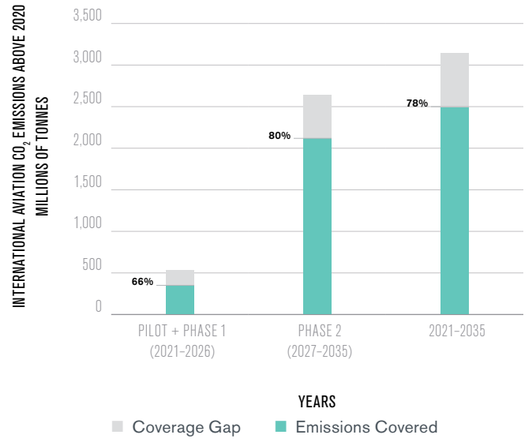
PRIVATE ACTORS

For industries that currently have carbon emissions as a necessary feature of their operations, carbon credits may be the only solution. These companies will be the next main driver for carbon market growth. Examples include businesses like Unilever that is offsetting all Scope 1 and Scope 2 emissions via credit purchases. However, the next demand shock to the system will come from airlines.

The ICAO has decided to establish the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as a methodology to offset any increase in airline carbon emissions after 2020. CORSIA has two key provisions that make it more effective than the original offsets proposed in the Kyoto Protocol, which are banning the double-counting of credits (counting by the country originating the credit, and by the country purchasing the credit), and requiring host country approval for the establishment of credits. Prior to these changes, credits could be provided by private actors within countries without host approval, which at times resulted in projects being tampered with (such as the situation in Acre) in the absence of government protection.

CORSIA will have voluntary test participation in two phases from 2021–26, and then mandatory UN state participation from 2027–35, according to the EDF. Since this will be compulsory, the majority of developed countries' airlines are expected to participate in the primary phases.

FIGURE 7: CUMULATIVE EMISSION REDUCTIONS TO BE ACHIEVED DEPENDING ON PARTICIPATION IN ICAO MBM



Source: *Environmental Defense Fund* Aviation Report, Figure 1.

This report shows the anticipated reduction in emissions per year (estimates were created prior to the COVID-19 pandemic); due to industry growth, in the Phase 2 and Phase 3 periods up to 80 percent of new emissions will be offset. In phase 2, that would be ~2,000 $MtCO_2e$ saved.

CONCLUSION

Carbon credits were originally established by international agreements, showing the cooperation of countries who wanted to make a dent in climate change. Since then, forestry credits have proven effective at slowing deforestation in the Amazon, but have not yielded their full promised results. It's unclear whether the increased government cooperation outlined by Article 6 of the Paris agreement will increase the verifiability of these credits. For example, the current presidential administration in Brazil has feuded with European countries looking to create forestry credits and it's not obvious that international requirements will change the administration's stance.

Given only 98.2 $MtCO_2e$ worth of carbon credits were purchased in 2019, and by 2026 CORSIA expects to be solely responsible for ~400 $MtCO_2e$ worth of annual offsets, there will be a significant increase in credit demand in coming years if airline travel resumes to pre-pandemic levels.

Providers of credits will need to find projects to invest the credit capital quickly, while still ensuring quality. To ensure supply side improvements, organizations will have to sharpen their carbon credit certification process in order to avoid the mistakes of the past, requiring government cooperation and increased capital provided per ton of carbon. Other industry agreements may emerge, inspired by the airline industry, and will require even more new credit solutions.

Some solutions (like that of the EU ETS) have focused on sponsoring projects within the nation or alliance where the capital originated, or reducing emissions via efficiency gains rather than projects. Other solutions could include increasing the price per $MtCO_2e$ offset to ensure that there is enough capital to support and ensure the operations of different types of credits. This would avoid the underfunding of projects that lose out to competing economic interests. No matter what, public cooperation is critical for these projects, as that protection will be needed to ensure the value of emissions meets the level promised.

On the demand side, as a method of mitigating climate change, these credits will probably remain the domain of the private market, which will need to find the best way to cooperate with these public institutions to achieve the carbon emissions reduction they hope for. This cooperation will be the only way to ensure that the future growth of carbon credits is maintained as a key solution to the world's greenhouse gas emissions crisis.

BIBLIOGRAPHY

Aggarwal, A. 2012. "How Sustainable Are Forestry Clean Development Mechanism Projects?—A Review of the Selected Projects from India." *Mitigation and Adaptation Strategies for Global Change*, vol. 19, no. 1, 2012, pp. 73–91.

World Bank. 2010. "World Development Report 2010." *World Bank, Washington, D.C.*

Boffey, D. 2019. "Norway Halts Amazon Fund Donation in Dispute with Brazil." *The Guardian*, Guardian News and Media.

Boucher, D, and Chi, D. 2018. "Amazon Deforestation in Brazil: What Has Not Happened and How the Global Media Covered It." *Tropical Conservation Science*, vol. 11.

Buchner, B. et al. 2019. "Global Landscape of Climate Finance 2019." CPI, *Climate Policy Initiative.*

2019. "Corsia: The UN's Plan to 'Offset' Growth in Aviation Emissions after 2020." *Carbon Brief.*

CORSIA Factsheet, *Environmental Defense Fund, www.edf.org/sites/default/files/documents/clean_development_mechanism_corsia_factsheet.pdf.*

"Unilever Boss Calls for Business Push on Net-Zero Emissions." *Edie.net, www.edie.net/news/9/Unilever-boss-calls-for-business-push-on-net-zero-emissions/.*

Donofrio, S., et al. 2019. "Financing Emissions Reductions for the Future." *Ecosystem Marketplace, Forest Trends, www.ecosystemmarketplace.com/carbon-markets/.*

Fagan, M. and Huang, C. 2019. "A Look at How People around the World View Climate Change." *Pew Research Center, www.pewresearch.org/fact-tank/2019/04/18/a-look-at-how-people-around-the-world-view-climate-change/.*

Farand, C. 2019. "What Is Article 6? The Issue Climate Negotiators Cannot Agree." *Climate Home News, Climate Home, www.climatechangenews.com/2019/12/02/article-6-issue-climate-negotiators-cannot-agree/.*

Hamrick, K and Gallant, M. 2019. "Carbon Markets." *Ecosystem Marketplace, www.ecosystemmarketplace.com/carbon-markets/.*

Hepburn, Cameron. 2007. "Carbon Trading: A Review of the Kyoto Mechanisms." *Annual Review of Environment and Resources*, vol. 32, no. 1, 2007, pp. 375–393.

ICAO's Market Based Measure. *Environmental Defense Fund, www.edf.org/climate/icaos-market-based-measure.*

2020. "In-Depth Q&A: How 'Article 6' Carbon Markets Could 'Make or Break' the Paris Agreement." *Carbon Brief, www.carbonbrief.org/in-depth-q-and-a-how-article-6-carbon-markets-could-make-or-break-the-paris-agreement.*

Lee, D. et al. 2017. "Characteristics of Forest Carbon Credit Transactions in the Voluntary Carbon Market." *Climate Policy*, vol. 18, no. 2, pp. 235–245.

Michał. "European Union Emissions Trading System (EU ETS)." *Emissions, www.emissions-euets.com/carbon-market-glossary/872-european-union-emissions-trading-system-eu-ets.*

"Norway's International Climate and Forest Initiative (NICFI)." *NoradDev, norad.no/en/front/thematic-areas/climate-change-and-environment/norways-international-climate-and-forest-initiative-nicfi/.*

Reed, P. 2011. "REDD and the Indigenous Question: A Case Study from Ecuador." *Forests*, vol. 2, no. 2, pp. 525–549.

Rico, R. 1995. "The U.S. Allowance Trading System for Sulfur Dioxide: An Update on Market Experience." *Environmental & Resource Economics*, Springer.

Schwartzman, S. 2019. "What *ProPublica's* Forest Carbon Credits Story Still Gets Wrong—and Right (with Update)." *Climate 411, Environmental Defense Fund, blogs.edf.org/climate411/2019/05/23/what-propublicas-forest-carbon-credits-story-gets-wrong-and-right/.*

Simonet, G, et al. 2016. "I&D #32 REDD Projects in 2014: an Overview Based on a New Database and Typology." *Chaire Economie Du Climat*, 19 Apr. 2016

Simonet, G. et al. 2018. "Effectiveness of a REDD Project in Reducing Deforestation in the Brazilian Amazon." *American Journal of Agricultural Economics*, vol. 101, no. 1, pp. 211–229.

2019. "The Carbon Offset Market: Leveraging Forest Carbon's Value in the Brazilian Amazon." *ScienceDaily, www.sciencedaily.com/releases/2019/04/190405170454.htm.*

Tuerk, A., & Zelljadt, E. (n.d.). *Climate Policy Info Hub. https://climatepolicyinfohub.eu/global-rise-emissions-trading.*

"What Is REDD?" What Is REDD? | *Forest Carbon Partnership Facility, www.forestcarbonpartnership.org/what-redd.*

Van Benthem, A. Personal interview. 19 Feb 2020.

Yeo, S. 2019. "Where Climate Cash Is Flowing and Why Its Not Enough." *Nature*, Nature Publishing Group, *www.nature.com/articles/d41586-019-02712-3.*

Zwick, S. 2019. "The Surui Forest Carbon Project." *Forest Trends Research*, USAID.

ABOUT THE AUTHOR

Giridhar Sankar is a MBA/MA candidate at The Wharton School. He received Kleinman Center funding to participate in the University of Michigan Renewable Energy Case Competition.

Cover Photo: istock.com/luoman

STAY UP TO DATE WITH ALL OF OUR RESEARCH:

kleinmanenergy.upenn.edu

Kleinman Center for Energy Policy

University of Pennsylvania
Stuart Weitzman School of Design
Fisher Fine Arts Building, Suite 401
220 S. 34th St.
Philadelphia, PA 19104

P 215.898.8502
F 215.573.1650

kleinmanenergy@upenn.edu