



The Flaws in Project-based Carbon Credit Trading and the Need for Jurisdictional Alternatives

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BYRON SWIFT

Contributing Authors:

KEN BERLIN, GEORGE FRAMPTON, AND FRANK WILLEY

I. Introduction and Summary

It has long been recognized that the creation of funding programs to pay for the value of carbon sequestration in tropical forests could be a powerful tool to address climate change. Such programs, if implemented effectively, could unlock funding for forest and ecosystem conservation in developing countries while supporting local economies and reducing carbon emissions into the atmosphere.

This issue brief assesses the current widespread market-based methodology using voluntary carbon offsets to reduce deforestation based on individual projects in developing countries. This methodology generates credits that are then sold by traders to private businesses to offset their carbon emissions—and is under severe attack. This carbon credit market grew fourfold from \$500 million in 2020 to almost \$2 billion in 2022,¹ but has been thrown into serious and broad disrepute by a series of critical analyses and investigations that conclude, in the words of one extensive review of the largest certifier of forest carbon credits, 90 percent of the currently certified offsets were “likely to be worthless.”²

The **Atlantic Council Global Energy Center** develops and promotes pragmatic and nonpartisan policy solutions designed to advance global energy security, enhance economic opportunity, and accelerate pathways to net-zero emissions.

- 1 Approximately 40 percent of such credits are based on forest conservation projects. “New! State of the Voluntary Carbon Markets 2023 Finds VCM Demand Concentrating Around Pricier, High-Integrity Credits,” Ecosystem Marketplace, accessed April 10, 2024, <https://www.ecosystemmarketplace.com/articles/new-state-of-the-voluntary-carbon-markets-2023-finds-vc-demand-concentrating-around-pricier-high-integrity-credits/>.
- 2 Patrick Greenfield, “Revealed: More than 90% of Rainforest Carbon Offsets by Biggest Certifier Are Worthless, Analysis Shows,” *Guardian*, January 18, 2023, <https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe>; and Lisa Song and James Temple, “The Climate Solution Actually Adding Millions of Tons of CO2 into the Atmosphere,” *ProPublica* and *MIT Technology Review*, April 29, 2021, <https://www.propublica.org/article/the-climate-solution-actually-adding-millions-of-tons-of-co2-into-the-atmosphere>; and Romm, “Are Carbon Offsets Unscalable?” Ivy S. So, Barbara K. Haya, and Micah Elias, *Voluntary Registry Offsets Database*, Berkeley Carbon Trading Project, University of California, Berkeley, May 2023, <https://gspp.berkeley.edu/research-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/offsets-database>.

This issue brief examines several significant (and at times unresolvable) problems with the project-based approach to carbon credit trading to reduce deforestation. It identifies major flaws, both in its structure and in implementation, that severely limit the effectiveness of this methodology and its ability to achieve the intended purpose of reducing carbon emissions.

This brief first assesses the significant problems in implementation that arise when trading companies attempt to develop and commercialize carbon credit projects in the field, particularly in remote landscapes where the rule of law is weak.³ It then analyzes three critical structural problems with project-based credit trading that lead to a fundamental lack of integrity in such programs. These are:

- The intractable difficulties of basing a regulatory structure on issues as difficult to prove as the requirements of additionality⁴ and preventing leakage.
- The major transaction and intermediary costs that can absorb half the funding.
- The relatively short duration of project-based carbon crediting programs, which is far less than the life of the additional CO₂ emissions that are consequently emitted (and supposedly foregone).

The authors also explain how economic forces and incentives exacerbate these problems, particularly with programs carried out by commercial credit traders. This analysis also notes that although significant work is being done within the voluntary carbon market community to improve the quality of project-by-project certification, these efforts are unlikely to adequately address these inherent structural and implementation problems.⁵

Any one of these issues is enough to limit or even reject the use of project-based carbon credits as a methodology to reduce carbon emissions from deforestation. Taken to-

gether, they present an overwhelming case to do so and provide strong evidence of the need to develop a major new approach to using markets to combat deforestation.

Finally, this brief discusses better alternatives such as jurisdictional carbon programs administered by governments or Indigenous associations that are larger in scale and could perform much better in both reducing emissions and in strengthening the social fabric required to assure credit integrity, accurate measurement, and adequate co-benefits. This approach becomes particularly effective when extended to cover all forested lands in a given country.

II. Experiences

The issue brief begins with three experiences of the principal author, Byron Swift—who has been involved in forest conservation programs for decades in Latin America—which illustrate the problems encountered on the ground with project-based carbon credit programs.

The first experience occurred when the conservation organization for which the principal author worked introduced a reputable carbon trading company to an Indigenous nation in northern Peru, with whom the organization had worked for several years to establish a major regional conservation area that would safeguard their ancestral territory. The trading company was forward thinking and ecologically minded, but because of the profound operational and cultural differences between private carbon traders and Indigenous and rural communities, this effort created major problems.

The company acted in a normal businesslike way for a company in the Western market economy, talking glowingly to local stakeholders about the revenue that could be made from its product (carbon credit trading), and shopped for likely projects in tropical forests. Their representatives traveled to the Peruvian Amazon, talked to the national,

3 Joseph Romm, “Are Carbon Offsets Unscalable, Unjust, and Unfixable—and a Threat to the Paris Climate Agreement?,” White Paper, University of Pennsylvania Center for Science, Sustainability, and the Media, June 2023, <https://web.sas.upenn.edu/pcssm>. “The Biggest Obstacle to Saving Rainforests Is Lawlessness,” *Economist*, February 27, 2023, <https://www.economist.com/international/2023/02/27/the-biggest-obstacle-to-saving-rainforests-is-lawlessness>.

4 Additionality refers to emission reductions achieved through a project or action pursued as a result of an incentive and would not have otherwise occurred, i.e., additional reductions. See Climate Change Authority (CCA), *Coverage, Additionality and Baselines—Lessons from the Carbon Farming Initiative and Other Schemes*, CCA Study, Government of Australia, April 2014, 29, https://www.climatechangeauthority.gov.au/sites/default/files/CCA_CFIStudyPublicReport_v7.pdf.

5 Efforts include, for example, *Tropical Forest Credit Integrity Guide for Companies: Differentiating Tropical Forest Carbon Credit by Impact, Quality, and Scale*, Integrity Council for Voluntary Carbon Markets, and the Science Based Targets Initiative, among others. See Coordinator of the Indigenous Organizations of the Amazon Basin (COICA) et al., *Tropical Forest Credit Integrity Guide for Companies*, updated March 2023, [TFCIGuide.org](https://tfciguide.org); Science Based Targets Initiative (SBTi) et al., *SBTi Monitoring Report, 2022: Looking Back at 2022 and Moving Forward to 2023 and Beyond*, August 2023, <https://sciencebasedtargets.org/resources/files/SBTiMonitoringReport2022.pdf>; and the Integrity Council for the Voluntary Carbon Market, *Core Carbon Principles, Assessment Framework and Assessment Procedure*, July 2023, <https://icvcm.org/wp-content/uploads/2023/07/CCP-Book-R2-FINAL-26Jul23.pdf>.

regional, and local government authorities that might be involved, held brief meetings with the Indigenous community's leadership, and left. They concluded that the economics of this particular project were not optimal for them and decided not to pursue it.

While the company's approach was typical of Western business culture, the local Indigenous community perceived things very differently—that a group of unfamiliar people arrived, talked to the governments involved, told them their forests were worth millions of dollars in standing carbon, and left. The community never heard from the trading company again, and their natural assumption was that a deal had been made between the company and the government, and they had been excluded from all benefits and negotiations once again, just as they had been with the rubber tappers long ago and the timber industry more recently.⁶

This experience not only caused problems for the organization's conservation project, but also had major national repercussions when this and even more egregious behavior by private carbon traders with other local Indigenous communities led Peru's Indigenous association to prohibit its member communities from dealing with carbon traders at that time.

About six months after these events, the leadership of this trading company visited the board of directors of the same conservation organization, seeking potential investors in their carbon trading program. At the meeting, they promoted the profitability of these carbon credit projects, saying they were high risk but could potentially yield a ten-to-one return for investors if carbon prices were high. This result, however, is neither effective nor equitable, as the vast majority of the funding would not be used to implement the project or benefit the local community or the country that is being incentivized to protect the project area. If such large profit margins were viewed as exploitative, it could significantly reduce support for this and future projects by local communities and national governments.

The second example comes from the principal author's work with an organization that had launched an effort over many years to conserve the biodiverse Nangaritza Valley adjoining Podocarpus National Park in Ecuador. When the

valley was still pristine Amazon forest, the organization had an opportunity to buy out a forty-owner campesino (farming) community that had bought pristine forested land in the valley on speculation that it would someday be developed. The organization's purchase of the land would reduce the pressure to build a road through the valley and preserve the forest connection between the Andes and the lowland Amazon to the east.

Before the organization could accomplish this project, however, representatives from a northern conservation group visited the valley promoting the idea of ecosystem service payments and the opportunity to earn carbon payments for the standing forest on their land. They mentioned theoretical dollar values for the carbon value of the forest that were far in excess of prices in the local economy, and in the space of an afternoon eliminated any hopes the organization had of buying this land for conservation at any fair price. As is often the case, no private carbon project materialized, but the traditional clearing of land for low-grade cattle raising did and there is now a road being built through the valley, causing high deforestation.

The third experience the principal author and others have repeatedly observed when working in communities to conserve a piece of land in which carbon traders also are interested is that the traders often urge the landowners not to protect their land in any formal way until they are able to reap the benefits of a carbon trade. Since carbon trades are difficult and rarely occur, this kind of advocacy causes a chilling effect on any other direct land conservation efforts or programs for these lands.

The principal author found the latter problem to be widespread in 2023 in the Peruvian Amazon, where private traders are actively promoting the possibility of carbon funding. This has motivated communities to request additional lands to expand their territories, far more than official rules allow for the needs of the community, and if granted, the expansion would reduce the size of conservation areas planned for these same lands by several hundred thousand hectares. In other instances, communities are even bringing lawsuits to strip protection status from a protected area (i.e., degazetting) so that the communities might then make a claim for that land and apply for carbon funding.

6 "Logging in the Amazon," World Wide Fund for Nature, 2020, https://wwf.panda.org/discover/knowledge_hub/where_we_work/amazon/amazon_threats/other_threats/logging_amazon/; and Lise Fernanda Sedrez, "Rubber, Trees and Communities: Rubber Tappers in the Brazilian Amazon in the Twentieth Century," in *A History of Environmentalism: Local Struggles, Global Histories*, eds. Marco Armiero and Lise Fernanda Sedrez (London: Bloomsbury Publishing, 2014), 147–66, ISBN (ePub): 978-1-4411-7051-4.

The author noticed that the very process of private traders searching for projects in these areas and mentioning what locally are vast sums of money creates major expectations that are rarely fulfilled or fairly negotiated.⁷ The approach has instigated social conflict both between communities and between communities and other sectors as they vie for land titles in order to benefit from possible future carbon projects. He concluded that these projects rarely achieve positive environmental results, and can instead often lead to greed, corruption, and social conflict in these areas.

III. Implementation Problems with Project-based Carbon Credit Trading

Using a crediting system based on individual projects has several serious problems in their implementation, especially when carried out by for-profit entities, as illustrated above. Some of these problems are inherent in such crediting programs:

- **Arbitrariness:** Project-based carbon projects are only implemented where a carbon trader decides they will be. One community may get a project, whereas others are left out. There is seldom any rational prioritization to protect those areas that need it the most, or where it could be most effectively pursued.
- **Inequity:** In the case described in the preceding bullet point, one community would receive a substantial infusion of money, while adjacent communities in a similar position would receive no funding for conserving similar resources. This creates unfairness, greed, resentment, and social problems in the subject area.⁸
- **High transaction costs** and lengthy time frames: Especially with communities, one wants a simple pro-

cess that provides a fairly prompt award for a community's decision to protect their forests, and a process that is ideally under their control.

- **Increased social conflict over land and money:** These potential problems can lead to increased social conflicts, as the principal author described above; issues can involve land rights, revenue sharing, and the degree of transparency, consultation, and inclusion.

Other problems tend to arise especially when the crediting system is undertaken by private for-profit credit traders and/or occur in remote rural settings:

- **Lack of transparency:** There is little that is transparent about private carbon trades, which private traders reinforce by confidentiality clauses with landowners and communities.⁹ Price Information is typically opaque, and many verification systems do not require project developers to reveal how the money from credits will be used.¹⁰
- **One-sided contracts and overreaching:** Crediting contracts are complex, and there is a major difference in the legal knowledge and capacity of commercial traders and that of communities, which may not have the expertise needed to protect themselves from exploitative practices. This creates a knowledge gap, which trading companies can take advantage of.¹¹ Features and provisions that private traders often include in deal documents that communities and landowners must sign include:
 - A lack of information about the sale price and buyers of the carbon credits.
 - Confidentiality clauses that may have criminal penalties.

7 "A Fair Share of the Voluntary Carbon Market? How the Absence of Standard Rules on Benefit Sharing Arrangements Hurts Local Communities and Indigenous Peoples," Policy Briefing, Carbon Markets Watch, November 2023, <https://carbonmarketwatch.org/publications/a-fair-share-of-the-voluntary-carbon-market/>.

8 Valentina Guido, "From Paper to People: Bringing Equity to Carbon Markets," Rocky Mountain Institute, December 19, 2022, <https://rmi.org/from-paper-to-people-bringing-equity-to-carbon-markets/>.

9 Dan Collison, "Credit Where Credit's Due: Who's Benefiting from the Voluntary Carbon Market?," White & Case LLP, December 12, 2022, <https://www.whitecase.com/insight-our-thinking/africa-focus-winter-2022-credit-where-credits-due>.

10 "Transparency in Voluntary Carbon Market Registries," Carbon Market Watch, March, 2024, <https://carbonmarketwatch.org/wp-content/uploads/2024/04/CMW-Lost-in-Documentation-Transparency-in-voluntary-carbon-market-registries.pdf>; Dieter Holger, "Many Companies Are Shying Away From Carbon Credits," *Wall Street Journal*, Jan. 17, 2023, <https://www.wsj.com/articles/many-companies-are-shying-away-from-carbon-credits-11673900838>; Patrick Greenfield and Nyasha Chingono, "We Don't Know Where the Money is Going," *Guardian*, March 15, 2023, <https://www.theguardian.com/environment/2024/mar/15/money-carbon-credits-zimbabwe-conservation-aoe>. ("Under the rules of Verra—which approves three-quarters of all voluntary carbon offsets—project developers are not required to disclose or audit where the money from credits goes.")

11 Ryan Jacobs, "The Forest Mafia: How Scammers Steal Millions through Carbon Markets," *Atlantic*, October 11, 2013, <https://www.theatlantic.com/international/archive/2013/10/the-forest-mafia-how-scammers-steal-millions-through-carbon-markets/280419/>.

- Exclusivity requirements.
- Requirements that the community pay for the technical studies, with loans to the community at high interest rates.
- Requirements that all intellectual property of the project belongs to the company.
- Conflict resolution and choice of law clauses that favor the company.
- Requirements that the company own all the ecosystem services provided by an area.

■ **Cultural and capacity differences:** There is an enormous cultural and capacity gap between the commercial credit traders who must survive in a highly competitive global market economy, and the rural communities that own or inhabit most forest lands. On the one hand, the negotiating power and technical sophistication of the carbon traders can lead to heavily one-sided agreements; and on the other, these traders have little expertise in the enabling conditions of rural conservation and sustainable development projects. To be successful, a project requires not only financing, but also the capacity to address all political elements, an understanding of the communities' cultural values, and the time required to build trust. The time frames, capacities, and costs of private carbon credit trades do not allow them to do any of these.

■ **Weak rule of law in remote parts of tropical countries:** Carbon crediting transactions usually take place in remote parts of tropical countries where the rule of law is weak, land rights are poorly defined, institutions lack capacity, and corruption is commonplace.¹² These challenges should be addressed through long-term capacity building and institutional strengthening, investment in defining property rights, and development of a stronger rule of law and collaborative framework between all groups.¹³ The credit trading approach implemented at a project level provides few incentives for solving such problems.

The challenge surrounding private carbon traders undertaking carbon credit trading is not ill will, as many of the companies mentioned above had good intentions. The problem is much deeper: project-based carbon credit trading programs carried out by commercial carbon traders in remote rural areas of the world may be inevitably flawed, and in most cases cannot create the enabling conditions for effective carbon mitigation or ecosystem conservation. These problems are much more appropriate for jurisdictional programs implemented by government or social actors, as described below.

IV. Structural Problems with Commercial Forest Carbon Credit Trading Programs

There are three structural problems with all project-based carbon credit trading programs that are even more serious than the challenges in implementation described above. First, crediting programs lack integrity due to major innate problems such as the inherent difficulty of proving additionality and lack of leakage. Second, as much as half of the project revenues go toward transaction fees, intermediary costs, and traders' profits rather than to the local communities which manage the forests. And third, the longevity of most carbon projects is far shorter than the time carbon dioxide will persist in the atmosphere. Here's a closer look at the problems.

1. Lack of Integrity

Project-based emissions credit trading is a highly imperfect regulatory methodology that has rarely worked well anywhere.¹⁴ The problem is that key issues like additionality and leakage, described in greater detail below, are very difficult to prove, the system is easily gamed, accountability is lax, transparency is lacking, and it requires very high transaction costs to even begin to address these problems.

- **Additionality:** Credit trades require that project sponsors demonstrate that the emissions reduc-

12 "The Biggest Obstacle to Saving Rainforests Is Lawlessness," *Economist*, February 27, 2023, <https://www.economist.com/international/2023/02/27/the-biggest-obstacle-to-saving-rainforests-is-lawlessness>.

13 "The Biggest Obstacle," *Economist*.

14 EPA's experience with credit trading programs with criteria air pollutants and with wetland mitigation banking have both shown pervasive problems that are very difficult to solve. See Byron Swift, *Emission Reduction Credit Trading Systems: An Overview of Recent Results and an Assessment of Best Practices*, Research Report, Environmental Law Institute, September 2002, (evaluating Discrete Emission Reduction Credit Trading Programs); and Lisa Wainger and D. King, "Wetland Values Indicators for Scoring Mitigation Trades," *Environmental Law Journal* 20, no. 413 (2001). A principal successful model is nitrogen oxide (NOx) credit trading in NOx nonattainment areas in the United States, but in such areas virtually every source is known and accurately monitored with very strong regulatory enforcement. That makes these areas more of a cap-and-trade system, which has high integrity, than a crediting system, and so is an exception that proves the rule.

tions created by a project will be “additional” to what would have happened anyway without the carbon trade. Additionality is very difficult to prove because it requires identifying and quantifying a counterfactual, which is hard to do, plus a determination of what a proponent would have done had they not entered into a carbon offset agreement—which is impossible to do, as that intention is known only to them. Crediting systems can therefore be easily gamed, which happens when those already protecting forest or intending to take an emissions-reduction action assert that the forest is threatened, and then apply for and receive carbon credits for the protective action they had planned to take anyway. A further problem with additionality is that it also discourages landowners from protecting their land in the near term, since doing so would make additionality harder to demonstrate in any subsequent efforts to earn carbon credits. This creates a chilling effect on any current land conservation programs over that land.

- **Leakage:** Leakage occurs when protecting forest in one area through a credit trade simply displaces deforestation pressure to another area.¹⁵ This problem occurs “whenever the spatial scale of the intervention is inferior to the full scale of the targeted problem.”¹⁶ Demonstrating that leakage will *not* occur is very difficult to do with any accuracy.
- **Gaming or manipulation:** Credit programs are easily gamed or manipulated due to the difficulty of determining issues like additionality and leakage. A recent technical study shows that carbon traders would choose the most favorable quantification methods for their particular project for issues such as additionality, leakage, carbon content, and permanence, collectively leading to a widespread overestimate of

the carbon that would be sequestered, sometimes of an order of magnitude.¹⁷ The principal author’s own experience examining various problematic emissions credit trading programs¹⁸ found that they varied from being merely ineffective¹⁸ to being downright fraudulent,¹⁹ which occurred when traders received credits for projects they knew would produce no additional emissions reductions.

Most of the above problems are exacerbated when for-profit trading companies implement crediting systems. The market forces they face are to maximize profits, which create strong incentives to exaggerate benefits, present overly optimistic projections, and seek out projects with low additionality. Trading companies also face strong drivers to minimize costs, which means minimizing payments to communities for their carbon rights, or for on-the-ground investments in carbon conservation. This is a market failure, as the market incentives for commercial companies do not incentivize the conservation outcomes and emissions reductions that the crediting system is intended to support.

Results are potentially better when credit systems are operated by social actors such as governments, Indigenous federations, or nonprofit actors. Although such groups are not immune from problems or the market forces mentioned above, their incentive structure is markedly different: to accomplish their social mission versus maximizing profits. They also are also more likely to view the communities and landowners involved as constituents, rather than cost centers. This is further assessed in the section below describing jurisdictional programs.

2. Excessive Transaction and Intermediary Costs

Transaction and intermediary costs are a significant drain on potential impact of credit trading, eating up as much as

15 Note that while credit trading programs are weak, they are the polar opposite of emissions cap and allowance trading programs, which have helped to resolve important environmental pollution issues by implementing a strict standard (the cap) and have very high environmental integrity.

16 Sven Wunder, “How Do We Deal with Leakage?,” in *Moving Ahead with REDD Issues, Options and Implications*, ed. Arild Angelsen (Bogor Barat, Indonesia: Center for International Forestry Research, 2008), https://www.researchgate.net/publication/242555627_How_do_we_deal_with_leakage.

17 “We found evidence of widespread over-crediting across all four quantification factors covered in this report. Many REDD+ credits are created from unrealistically high baselines, unrealistically low estimates of leakage and durability risk, and high estimates of carbon stocks in forests.” B. K. Haya et al., *Quality Assessment of REDD+ Carbon Credit Projects*, Berkeley Carbon Trading Project, September 2023, <https://gspp.berkeley.edu/research-and-impact/centers/cepp/projects/berkeley-carbon-trading-project/REDD+>; and *Exposing the Methodological Failures of REDD+ Forestry Projects*, Carbon Market Watch, September 2023, <https://carbonmarketwatch.org/wp-content/uploads/2023/09/Error-log-Exposing-the-methodological-failures-of-REDD-forestry-projects.pdf>.

18 Byron Swift, *Emission Reduction Credit Trading Systems*, Environmental Law Institute, <https://www.eli.org/research-report/emission-reduction-credit-trading-systems-overview-recent-results-and-assessment>.

19 Several times, the principal author and his colleagues were contacted by private traders who, mistakenly thinking they were fellow traders, would offer deals assuring them that the offset generators would have to do nothing different from their current activities, but would receive credits for their supposed emissions reductions.

half of the project funds. These costs reduce the amount of funding reaching communities and on-the-ground carbon reduction. Crediting systems are inherently expensive to operate,²⁰ and require costly due diligence and verification programs to attempt to address the weaknesses described above.²¹ The transaction costs alone can easily constitute 25 percent of the total project budget and projects are even costlier when implemented by commercial carbon trading companies, which need to charge enough to cover their operational expenses and profit. In an exhaustive study of one of the largest private carbon projects, it was determined that only 14 percent of the funds went to the communities responsible for most mitigation actions, whereas 42 percent went to the carbon trader for its costs and profits.²² The result is that regularly as much as half of a project's budget is spent on transaction costs and intermediaries, rather than going toward the programs and communities that make the carbon reductions.²³

3. The Longevity Problem

Another major issue with current private-sector carbon offset programs is the longevity problem: carbon dioxide lasts many hundreds of years in the atmosphere (some estimates put this figure at more than 300 years),²⁴ but typical crediting projects for carbon sequestration from biological sources such as forests only guarantee about twenty years of sequestration.²⁵ Even if we accept the US Environmental Protection Agency's one hundred year approach to global warming potential (GWP),²⁶ if a crediting project lasts only twenty years, potentially five crediting projects could take place sequentially for the same tract of forest, resulting in 5 tons of CO₂ emitted for every ton of carbon actually se-

questered over that one hundred years.²⁷ Even more tons of additional emissions will result if leakage occurs, or if one assumes CO₂ will persist for more than one hundred years. This is why groups like the Sierra Club have traditionally been opposed to allowing carbon offsets from biological sequestration.²⁸

Although one cannot resolve the longevity problem for credit trading projects, one can ameliorate it while protecting forests through varied approaches. One would be allowing credits based only on an increasing forest stock in a jurisdiction, as described below, thus ensuring increasing sequestration of carbon dioxide even though some areas are being deforested. Another is to create permanence by funding projects such as the designation of protected areas, purchasing or titling land that will be permanently conserved, or creating long-term sustainable finance mechanisms.²⁹ A third would be to support projects with major additional benefits, known as climate co-benefits, in poverty alleviation, biodiversity conservation, provision of water and other ecosystems services, and mitigation, even if the credit program lasts for only twenty years. However, crediting programs that do not address carbon stocks cannot fully resolve the longevity problem.

Unfixable Flaws

Due to the fundamental nature of the flaws in the project-based credit transactions described above, it is not clear that any amount of improved verification protocols will help to solve them. However, work is underway to restore trust in the current accounting methodologies that govern private traders. The Integrity Council on Voluntary Carbon

20 T. R. H. Pearson et al., "Transaction Costs for Carbon Sequestration Projects in the Tropical Forest Sector," *Mitigation and Adaptation Strategies for Global Change* 19 (2014): 1209–1222, <https://doi.org/10.1007/s11027-013-9469-8>.

21 Standards like the Verified Carbon Standard program, developed by Verra, and the core carbon principles of the Integrity Council for the Voluntary Carbon Market (ICVCM) create expensive requirements in due diligence, verification, and recordkeeping that each project must meet.

22 Greenfield and Chingono, "We don't know where the money is going"

23 Bart Crezee and Ties Gijzel, "Showcase Project by the World's Biggest Carbon Trader Actually Resulted in More Carbon Emissions," Follow the Money (website), National Institute on Money in Politics, January 27, 2023, <https://www.ftm.eu/artikelen/south-pole-kariba-carbon-emission/kort>.

24 A NASA study estimates 300 to 1,000 years. See Alan Buis, "The Atmosphere: Getting a Handle on Carbon Dioxide," NASA News, NASA's Jet Propulsion Laboratory, October 9, 2019, <https://climate.nasa.gov/news/2915/the-atmosphere-getting-a-handle-on-carbon-dioxide>.

25 Note that the ICVCM core carbon principles recommend increasing the duration of crediting projects to forty years. See the Integrity Council for the Voluntary Carbon Market, *Core Carbon Principles, Assessment Framework and Assessment Procedure*, July 2023, <https://icvcm.org/wp-content/uploads/2023/07/CCP-Book-R2-FINAL-26Jul23.pdf>.

26 GWP is the unit of measure expressing how much a given gas might warm the Earth's atmosphere over a certain time span.

27 Potentially, five carbon credit programs lasting twenty years each could be implemented successively over one hundred years for the same area, with each repetitive counting of the same amount of carbon as conserved, while each also allows that additional amount of carbon to be newly emitted by each credit buyer. See generally, Romm, "Are Carbon Offsets Unscalable?," 41.

28 Sierra Club, "Policy on Carbon Markets," June 21, 2007, <https://www.sierraclub.org/sites/default/files/carbonmarkets.pdf>.

29 See, for example, projects listed at World Land Trust's Carbon Balanced program, which has operated since 2005, <https://www.worldlandtrust.org/what-we-do/carbon-balanced/offsetting-for-organisations/our-projects/>.

Markets, a broad-based new partnership with prominent and credible advisers, is proposing a new assessment framework to rank standards and guidelines governing not only forest credits but all different kinds of private market voluntary credit programs.³⁰ The new approach has already incentivized certifying agencies to try to overhaul and improve their processes. Verra, the largest certifier of voluntary offsets, is implementing plans to simplify their methodology from five accounting methods down to one to restore trust in the voluntary carbon market and reduce the possibility for gaming by the private traders that rely upon Verra standards.³¹ However, it is difficult to envision effective mechanisms that would enable these agencies to address the fundamental problems with project-based credit trading analyzed here.

V. Jurisdictional Carbon Alternatives

Jurisdictional carbon programs are a much more effective way to achieve carbon mitigation while avoiding most of the structural and implementation problems mentioned above. Jurisdictional programs can be defined as “low-cost, high-integrity emissions reduction credits [via] large-scale forest protection efforts at the level of entire countries, subnational jurisdictions, or Indigenous federations.”³² These crediting programs are negotiated between the investors and governments, subnational jurisdictions, or Indigenous federations. Emissions reductions are typically achieved through government policies and measures and evaluated by monitoring total carbon stocks and sequestration in the designated jurisdiction’s forests.

Thus, a country or other jurisdiction can develop programs that are straightforward to measure and designed

to be inclusive and transparent. The achievements of the entire program can then be supported independently through foreign aid or other grant-based programs, or they could be marketed as carbon credits. According to Forest Trends, a nonprofit focused on environmental finance, “Jurisdictional programs could help take the tropical forest agenda to scale, addressing systemic drivers of forest loss across large territories.”³³

Program Benefits

There are two major benefits to jurisdictional programs: larger areas mean less leakage, and the programs involve governmental or social-sector organizations.

First, the very large areas of jurisdictional programs, typically many millions of acres, is a major advantage. This greatly reduces the problems of leakage and low additionality, as the large coverage area prevents deforestation pressure from shifting within the region and can ensure net carbon reduction through its payment structure. As an example, the LEAF Coalition, a global partnership established by Norway, the United Kingdom, and the United States that has mobilized more than \$1.5 billion to fund jurisdictional programs, currently sets a minimum coverage size of 2.5 million hectares.³⁴

Second, and perhaps more importantly, jurisdictional programs are typically implemented by national or subnational governments or Indigenous federations. The LEAF Coalition, for example, requires its programs to be developed by government or Indigenous associations.³⁵ These social entities are legally organized to support the best interests of the communities or landowners involved, creating a dramatic shift in both how carbon credit programs are

30 The Integrity Council for the Voluntary Carbon Market, *Core Carbon Principles, Assessment Framework and Assessment Procedure*, Integrity Council for the Voluntary Carbon Market, July 2023, <https://icvcm.org/wp-content/uploads/2023/07/CCP-Book-R2-FINAL-26Jul23.pdf>.

31 Eklavya Gupte, “Verra Makes Major Changes to Methodology of Forest-Based Carbon Offsets,” ed. James Leech, S&P Global Commodity Insights, April 20, 2023, <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/agriculture/042023-verra-makes-major-changes-to-methodology-of-forest-based-carbon-offsets>.

32 *Why Large-Scale Forest Protection Must Urgently Be Part of Corporate Climate Mitigation Strategies: How The Jurisdictional Approach to Emission Reduction Crediting Unlocks Transformational and Systemic Change*, joint publication of Emergent, Forest Trends, UN Environment Programme, and Environmental Defense Fund [Leaf Coalition], 2021, <https://jaresourcehub.org/wp-content/uploads/2022/02/Emergent-Jurisdictional-White-Paper-1-July-2021.pdf>.

33 Stephen Donofrio et al., “Voluntary Carbon and the Post-Pandemic Recovery,” Ecosystem Marketplace Insights Brief, Forest Trends, September 21, 2020, <https://waconservationaction.org/wp-content/uploads/2020/11/EM-Voluntary-Carbon-and-Post-Pandemic-Recovery-2020.pdf>.

34 See <https://leafcoalition.org/>. The LEAF Coalition addresses problems that beset project credit programs by moving to the jurisdictional level and requiring: (a) each program be developed by a national government, subnational government, or local Indigenous communities; (b) that carbon credits be issued only if the entire jurisdiction reduces emissions (with no credits granted to individual projects); (c) that the jurisdiction reduce emissions by 500,000 tonnes of CO₂ equivalent over a five-year period; (d) the verification of reductions by the independent Architecture for REDD+ Transactions (ART) TREES Standard; (e) the program meets strict REDD+ standards; (f) the national jurisdiction set an overall NCD target under the Paris Agreement that includes forests; and (g) jurisdictions wishing to participate to submit a detailed proposal, subject to review by a committee established by LEAF.

35 “Press Release: LEAF Coalition Commitments Top \$1.5 Billion,” LEAF Coalition, <https://emergentclimate.com/wp-content/uploads/2022/11/press-release-leaf-coalition-commitments-top-1.5-billion.pdf>.

implemented and a sea change from the incentive structure that faces private companies. Incentives can become aligned with promoting community welfare and reducing emissions, which are much more appropriate outcomes for carbon offset programs than maximizing profit.

Another positive aspect of involving such social actors is that they have the capability and hopefully motivation to address many of the long-term challenges facing crediting programs. They can strengthen the governance structures of rural communities, improve communities' ability to handle and track financial flows, and strengthen the management of carbon mitigation programs. In contrast, market forces incentivize commercial carbon traders to simply close one deal and move on to the next, leaving long-term issues unresolved.

In addition, jurisdictional programs typically have better on-the-ground practices. If well designed, they are able to successfully address many of the implementation problems seen in commercial carbon projects. At the practical level, large-scale jurisdictional programs have the potential and should aim to achieve the following at the project (i.e., land-owner) level:

- Simple application process, with a prompt decision for a landowner's or community's decision to protect their forests.
- Universal structure, where all who qualify will receive a payment.
- Open and transparent, with all involved knowing the rules and how they are applied.
- Equitable, with widely shared benefits.
- Not subject to gaming.
- Genuine consultation processes, and do not lead to social conflicts.
- Reasonably priced payments to landowners and rural communities that are significant, but not enough to be exorbitant or set up unrealistic expectations.

- Objective and accurate measurement systems, e.g., measuring carbon stocks instead of flows.

- Low transaction costs.

Note also that existing projects that do protect forests and meet high quality and integrity standards under the current project-based approach could be nested within broader jurisdictional programs where such programs exist. This is in line with recommendations in the Tropical Forest Credit Integrity Guide, a resource created by a coalition of environmental groups for companies to consider when offsetting their emissions by purchasing forest carbon credits in the voluntary market.

Improved Carbon Impact

With jurisdictional programs, more funding is available for conserving forests compared with for-profit carbon credit trading. In the latter model, up to half of a project's funding often goes to pay the transaction costs, operating costs, and profits of the carbon traders—not for carbon sequestration. Jurisdictional programs can have much lower transaction costs and thus leave more funding available to reach the ground in-country, greatly improving their carbon impact.

One possible strategy to enhance these advantages is to adopt a “nested” approach that allows much simpler and transparent transactions between the program implementor and landowners that fulfill the criteria above and leaves the crediting transaction to be developed between the project leader and the carbon market. An example of such a program is the Socio Bosque program of Ecuador that provides ecosystem service payments of US\$5 to US\$30 per hectare annually to communities or individuals who agree to conserve the forests on their land for twenty years. The Ecuador program now covers several million acres, and while the amounts paid seem low by developed country standards, they have been significant and effective for the rural poor and communities with large land holdings.³⁶ Costa Rica has a similar program that provides up to US\$50 per hectare annually over a five-year time period.³⁷ A potential crediting transaction can then occur subsequently, when the program implementor can sell the credits gained over the entire program to buyers.

³⁶ See generally, “Ecuador’s Socio Bosque Program,” Initiative 20x20, <https://initiative20x20.org/restoration-projects/ecuadors-socio-bosque-program>.

³⁷ Note that in both of these programs, the cost is low and could be considered to be equivalent to the benefits of a twenty-year sequestration, more like a rental of the sequestration benefits; this is unlike crediting programs that receive payment for a permanent sequestration of carbon, while providing only a twenty-year benefit. Neither of these country programs solve the longevity problem, but they do provide a relatively rapid and fair way for landowners to receive direct payments for their conservation action at greatly reduced transaction costs.

Overall, jurisdictional programs have the potential to be a major advance over project-based credits because they are able to resolve most of the serious problems in implementation, and more effectively address the fundamental problems attributed to forest carbon credit projects. They also have significantly higher integrity, as they reduce the problems of additionality and leakage, and can allocate a far higher portion of the resources invested to the communities and countries involved.

Remaining Challenges for Jurisdictional Programs

There are still remaining issues with jurisdictional programs, as the subject jurisdiction must design a program that is fair, equitable, and efficient. Other potential issues include:

- **Longevity:** It is difficult for any crediting program for biological carbon sources such as deforestation to adequately address the longevity problem, given the length of time CO₂ lasts in the atmosphere. However, jurisdictional programs can offer a more cost-efficient way to sequester carbon tons (such as Socio Bosque), and an attempt can be made to support permanent projects, as described above.
- **Verification and transaction costs:** Jurisdictional programs can vary greatly depending on their design and execution, and so require verification at the program level. A number of standards have been formed that promote the values mentioned above. The LEAF program cited above uses the verification developed by Architecture for REDD+ Transactions (ART) as its required gold standard.³⁸ Other initiatives, such as the Mecanismo de Gobernanza Territorial (Territorial

Governance Facility)³⁹ and the Kawari Fund,⁴⁰ strive to strengthen the governance and support the interests of local Indigenous communities in the verification and other needs of jurisdictional carbon programs. Although the situation is much improved over project-based credits, the verification process still extends time frames and imposes significant costs for many kinds of jurisdictional programs.

- **Incomplete coverage of partial programs:** Another problem inherent to all partial programs is that even if the programs succeed, the country as a whole can still have major net deforestation, which would limit its compliance with national goals under the Climate Convention.⁴¹ LEAF programs, for example, can be regional or partial; and even though 2.5 million hectares is a large area, major deforestation can take place in other areas of the nation or jurisdiction.⁴² The history of the Clean Development Mechanism, intended to provide an additional avenue for emissions reduction after the Kyoto Protocol, also illustrates these risks.⁴³ This problem can be resolved by taking the jurisdictional program to the country level, discussed below.

VI. Comprehensive Jurisdictional Carbon Programs

The ultimate advance in jurisdictional carbon programs would be to create a program at the national level that covers all forests within that country. This would be a stock-based approach, which could be done by establishing as a baseline the entire carbon stock in the country's forests and adjusting that baseline every year according to a predeter-

38 "The LEAF Coalition is fully focused on integrity, only purchasing forest carbon credits that meet the stringent criteria of the robust and independent ART TREES Standard, which guarantees the highest levels of environmental integrity and social safeguards." See <https://www.leafcoalition.org/home>; and Architecture for REDD+ Transactions, *The REDD+ Environmental Excellence Standard (TREES), Version 2.0*, ART Secretariat and Winrock International, August 2021, <https://www.artredd.org/wp-content/uploads/2021/12/TREES-2.0-August-2021-Clean.pdf>.

39 This fund is a partnership between the Mesoamerican Alliance of Peoples and Forests (AMPB), the Interethnic Association for the Development of the Peruvian Rainforest (AIDSESP), the Confederation of Indigenous Nationalities of the Ecuadorian Amazon (CONFENIAE), the National Organization of the Indigenous Peoples of the Colombian Amazon (OPIAC), and Forest Trends. See <https://mecanismodegovernanzaterritorial.org/>.

40 See www.kawarifund.earth; note that the author works for Re:Wild, which is a principal organizer of the Kawari Fund.

41 Under Article 4 of the Paris Agreement to the Climate Convention, developing country parties commit to prepare and maintain their national determined contributions (NDCs) and to pursue domestic mitigation measures, with the aim of achieving their NDCs' objectives. See <https://unfccc.int>.

42 In Colombia, for example, only one of thirty-two departments has applied for a LEAF program, leaving open what happens in the rest. See "Bolivia and Colombian Department of Chocó Receive Green Light on LEAF Coalition Proposals as New Window for Submissions Opens," Emergent Climate, April 25, 2023, <https://emergentclimate.com/bolivia-and-colombian-department-of-choco-receive-green-light-on-leaf-coalition-proposals-as-new-window-for-submissions-opens/>.

43 "Nearly 70% of all CDM offsets went to China and India. Yet during the same time, China built so many coal plants that its CO₂ emissions increased by nearly as much as the U.S. emits today. India's emissions doubled." See Romm, "Are Carbon Offsets Unscalable?" p. 41.

mined schedule that would be differentiated for each developing forested country.⁴⁴ Reducing that rate of deforestation to achieve increases in carbon stocks above the baseline would generate credits that could be sold to buyers.

The ability to implement this system depends on high quality monitoring to determine with precision the amount of above-ground carbon stock in an entire country. Such methods have now been developed using advanced sensing techniques and remote satellite imagery and are becoming highly accurate at the country level.⁴⁵

An important aspect of the comprehensive jurisdictional approach is that it can better align the objectives of the jurisdictional program to reduce forest-related emissions with the objectives of the national carbon reduction obligation adopted as the country's National Determined Contributions (NDCs) under the United Nations Framework Convention on Climate Change. As such, the program could become more than simply a crediting system and be a core component of the country's compliance system.

This approach would be a significant advance beyond even partial jurisdictional programs, as it addresses each of the three fundamental problems of credit trading:

- **The credits generated would have high integrity:** The scale of the approach significantly diminishes or even eliminates the problems of additionality and leakage. Attempts to game the crediting system would no longer be an issue, as the measurement of carbon stock becomes a relatively simple objective measurement of carbon stock, and the satellite monitoring could be undertaken remotely by an international authority.
- **Transaction costs would be greatly reduced:** In a program's operational phase, these costs would be lower because there would be no or fewer complex measurements to make, and verification systems would only need to deal primarily with issues such as transparency and equity in terms of the money spent.

- **The longevity problem would be partially addressed:** The jurisdictional program would become more aligned with the country's national commitment under the climate convention, which in a practical sense is the major interim objective to obtain.

The broad adoption of such high-integrity systems has the potential to create a major impetus to lower the cost of compliance of carbon mitigation strategies worldwide, while providing developing countries and communities with needed capital and conserving more biodiverse tropical forests along with their provision of global and local ecosystem services.

VII. Conclusion

Project-based carbon credit programs have several fundamental flaws that are very hard to resolve. These include the difficulties of demonstrating additionality and avoiding leakage, which creates a fundamental lack of integrity; out-sized transaction costs that drastically reduce the funds that could otherwise go toward carbon sequestration; and the longevity problem that carbon emissions will last much longer in the atmosphere than the duration of the crediting projects intended to compensate for them.

There are also implementation problems that have exacerbated these failures, especially when implemented by private traders. These include issues of inequity in the application of private carbon projects, their lack of transparency, misplaced economic incentives that pressure private companies to reduce costs or investment in the country, and the cultural differences and imbalance in bargaining power between commercial trading firms and rural communities. These have led to social unrest and conflict when commercial credit traders work to create carbon deals in remote rural and forest areas.

Due to the fundamental weakness of project-based crediting programs, verification systems to date have failed to

44 For developing countries, this would likely mean a number of years of slightly increasing emissions that represent a gradual reduction in the rate of deforestation, before a net-zero baseline is achieved. We note that President Lula of Brazil recently urged Amazonian countries to reach a net-zero baseline by 2030, but that may be ambitious for many countries. See Carla Bridi and Fabiano Maisonnave, "Brazil's Lula Lays Out Plan to Halt Amazon Deforestation, Make Country 'Global Reference' on Climate," Associated Press, June 5, 2023, <https://apnews.com/article/brazil-climate-carbon-amazon-deforestation-marina-d24fdc687f8e1ef27da2265bf70aad2f>.

45 Ralph Dubayah et al. "GEDI launches a new era of biomass inference from space." *Environ. Res. Lett.* 17, (2022), 095001, DOI 10.1088/1748-9326/ac8694. O. Csillik et al., "Monitoring Tropical Forest Carbon Stocks and Emissions Using Planet Satellite Data," *Scientific Reports* 9 (2019): 17831, <https://doi.org/10.1038/s41598-019-54386-6> (measuring 6.928 billion metric tons); Carnegie Institution, "Peru's Carbon Quantified: Economic and Conservation Boon," *ScienceDaily*, July 30, 2014, www.sciencedaily.com/releases/2014/07/140730094037.htm. ("The new map reveals that the total aboveground carbon stock of the country is currently 6.9 billion metric tons.")

protect the integrity of most voluntary credit transactions; and we think it unlikely that any new more stringent verification protocols can solve these structural problems. Jurisdictional crediting programs, however, could help resolve most of these problems and should therefore be implemented. To the extent that project-based transactions continue, the vigorous work conducted by existing certifiers and monitors must continue to update standards for verification and nest or integrate projects within larger jurisdictional programs so as to maximize the accomplishments under project-based transactions.

Jurisdictional trading programs have the potential to be greatly superior to project-based programs due to their broader scope and implementation by governments or Indigenous associations, which have a greater commitment to solve social issues associated with successful carbon reduction, including transparency, equity, and capacity building. Therefore, jurisdictional programs have a much greater

chance of actually reducing emissions, benefiting local communities and the jurisdiction's government, and conserving tropical forest with their biodiversity and ecosystem values.

Ultimately, carbon mitigation programs need to shift to address and reward overall reductions in emissions from deforestation by focusing on changes in national stocks of carbon, which is a far more effective way of reducing the emissions of any pollutant. This will require comprehensive jurisdictional programs that are countrywide or regional,⁴⁶ coupled with monitoring methods that can accurately measure such stocks over these large areas and criteria for making sure technical assistance and funding flow back into local conservation programs and communities.⁴⁷ Doing so would materially help many countries simultaneously achieve multiple goals of supporting local communities, promoting sustainable development, conserving tropical forests, and meeting emission reduction targets under the Paris Agreement to the Climate Convention.

46 A related option would be a countrywide compliance program, i.e., an emissions cap and allowance trading program, that would have extremely high integrity, but would require an international agreement on emissions levels and monitoring and enforcement methods.

47 Karimon Nesha et al., "An Assessment of Data Sources, Data Quality and Changes in National Forest Monitoring Capacities in the Global Forest Resources Assessment 2005-2020," *Environmental Research Letters* 16, no. 5 (2021): 054029, <https://doi.org/10.1088/1748-9326/abd81b>.

About the Author

Byron Swift is an environmental lawyer and senior adviser for wildlands at Re:wild. He has devoted much of his career, over forty years, to conservation issues in Latin America, working in almost all countries with a focus on protected areas, natural resources management, and capacity building of local nongovernmental organizations and institutions. An environmental lawyer, he has served as president of Nature and Culture International, founder and president of Rainforest Trust, and head of the US office of the International Union for Conservation of Nature (IUCN). He has also spent a decade working with the Environmental Law Institute on pollution control and trading issues, and has worked on carbon issues since 1996.

Contributing Authors

Ken Berlin is a senior fellow and director of the Financing and Achieving Cost-Competitive Climate Solutions project at the Atlantic Council's Global Energy Center. For most of his career, he was an environmental and climate change lawyer and ended his legal career at Skadden, Arps, Slate,

Meagher & Flom. Berlin co-founded the Coalition for Green Capital in 2010 and from 2014 to 2022, he was president and CEO of The Climate Reality Project, which was founded by Al Gore.

George T. Frampton is a distinguished senior fellow and director of the Transatlantic Climate Policy Program at the Atlantic Council's Global Energy Center. He was co-founder and CEO of The Partnership for Responsible Growth and has served as chair of the White House Council on Environmental Quality, assistant secretary of the Department of the Interior, senior counsel in Coving & Burling's Clean Energy Group, and president of the Wilderness Society.

Frank Willey is a project assistant for the Financing and Achieving Cost-Competitive Solutions Project at the Atlantic Council's Global Energy Center.

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Atlantic Council

1030 15th Street, NW, 12th Floor,
Washington, DC 20005

(202) 463-7226, www.AtlanticCouncil.org