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Symbols of Climate Action: Audit Labor and the Production of Carbon Credits

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ABSTRACT

Voluntary carbon markets (VCMs) are promoted as tools for financing climate mitigation, yet their effectiveness and credibility remain contested. This article examines how carbon credits are produced and destabilized as symbols of climate action, emphasizing the forms of ecological and audit labor that sustain their legitimacy. Based on 7 months of ethnographic fieldwork and 30 interviews in Colombia, I trace the trajectory of a carbon credit from its production through local farming and auditing practices to its circulation at a chocolate fair in Paris. Drawing on Kockelman's semiotic ontology of the commodity, I show that credits acquire value only by establishing a credible equivalence between ecological practices and their symbolic representation. However, the audit labor of measuring, verifying, and certifying often outweighs or appropriates ecological labor, producing credibility rather than mitigation. When this gap becomes visible, the market responds not by aligning more closely with ecological practices but by multiplying layers of verification—an "audit spiral" that sustains credibility while deepening opacity.

1 | Introduction

Voluntary carbon markets (VCMs) have emerged as a central mechanism for private actors seeking to offset greenhouse gas (GHG) emissions or enhance their environmental credentials. Yet their effectiveness and credibility remain intensely debated. This article explores the production and destabilization of carbon credits as symbols of climate action, focusing on the forms of labor that sustain—or undermine—their legitimacy.

A carbon credit is a certificate that represents GHG reductions or removals achieved through ecological labor. Some projects remove carbon directly from the atmosphere, such as by planting trees or using direct air-capture technologies. Others prevent emissions by protecting forests against deforestation or modifying livestock diets to reduce methane. The mitigation outcomes of this ecological labor are measured, validated, and certified through specific methodologies before being converted into tradable credits, each intended to represent 1 metric ton of verified emission reduction or removal.

A series of prior translations is, however, required before this process can be conceptually possible by defining climate, climate change, and carbon. Several of these translations have been extensively examined in the anthropological and sociological literature, including the social construction of the climate as an object that can be measured and modeled (Edwards 2010), the framing of climate change as a human-made problem grounded in the accumulation of GHGs in the atmosphere (Broecker 1975; Keeling 1970), and the standardization of these gases into a single commensurable unit known as carbon dioxide equivalent (CO_2e) (MacKenzie 2009; Whitington 2016).

These translations established the foundation for climate action by identifying a measurable target—CO_2e—against which interventions can be directed. Some of these interventions have been the establishment of a global carbon budget and the creation of carbon markets (Galvin and Silva Garzón 2023; Lahn 2021), where emission rights and offsets circulate as commodified units of "atmospheric space" (Machaqueiro 2017). Previously analyzed in *Economic*

Anthropology as a semiotic process (Machaqueiro 2017), these operations alone are insufficient to explain how carbon credits acquire symbolic authority as evidence of climate action. An additional translation is required, linking the outcomes of ecological labor carried out on the ground to the certificates produced through measurement, verification, certification, and ranking (i.e., audit labor).

Tracing the trajectory of a carbon credit from a chocolate fair in Paris to the rural areas of Colombia, this article shows that this final translation is carried out by a dense network of audit institutions. As a result, the carbon market is embedded in what Shore and Wright (2015) call "audit culture" (421), in which indicators, benchmarks, and procedures govern both internal practices and external legitimacy. When this audit network is successful in representing ecological labor taking place on the ground, carbon credits are able to circulate in the market as proof of climate action. However, when the audit network is questioned, the legitimacy and market value of carbon credits are destabilized.

This discussion is important because the carbon market has been the target of intense criticism in recent years. Investigative reports, amplified by articles in *The Guardian* (Dufrasne 2021; Haya et al. 2023), reveal that many offset projects exaggerate their effectiveness, fail to enforce standards, and lack long-term sustainability. Scholars further argue that some projects have displaced communities (Chomba et al. 2016), restricted access to resources (Asiyanbi 2016; McElwee et al. 2017), exacerbated land conflicts (Howson 2017), and even provoked legal disputes and violence (Andoke et al. 2023; Schmid 2023). As a result, the credibility of carbon credits as symbols of climate action has been significantly eroded, affecting both the volume and value of market transactions (Procton 2024).

I argue that the function of the carbon audit network is not to produce mitigation but to produce credibility and enable the extraction of economic value. Following Power's (1999) analysis of the audit society, the growing public scrutiny of the carbon market points to an audit network that is largely performative. The network succeeds when it generates credits that are credible enough to be purchased, even when not backed by real mitigation outcomes. In such cases, this analysis shows, the production of carbon credits is disproportionately defined by audit labor rather than by ecological labor. While planting or conservation work remains necessary in forest and agrarian mitigation projects, in some cases this labor is minimal or is appropriated from preexisting activities rather than initiated by carbon projects. Thus, what ultimately matters to the audit network of the carbon market is the production of a symbolic claim to climate action, not climate action itself.

This helps explain why recent responses to carbon controversies have focused on adding new layers of verification. As ecological labor is perceived to be lacking, the response has been to enlarge the audit network, multiplying efforts to make claims appear credible without necessarily expanding ecological labor on the ground. This not only renders the network more complex but also generates further demands for auditing the auditors. Strathern (2000) had already warned us that audit cultures produce paradoxical effects. The proliferation of documentation can obscure rather than clarify practices. Moreover, verification mechanisms generate recursive demands for further oversight with no ultimate ground of certainty.

This article is methodologically inspired by Kockelman's (2006) semiotic ontology of the commodity, which enables an ethnographic analysis of commodity networks while keeping labor central to value production. On one hand, this framework allows me to extend the semiotic analysis initiated by Machaqueiro (2017) by systematically examining the semiotic production of carbon credits. On the other hand, it turns attention back to labor. Although approaches such as Callon's (1998) "marketization" or Appadurai's (1986) "social life of things" emphasize the role of networks in the production of commodities, they do not consider labor to be central to the constitution of economic value. By contrast, Kockelman's anthropological approach combines the semiotics of Charles Sanders Peirce with Marx's labor theory of value, thereby offering a way to analyze commodities that foregrounds both meaning making and labor.

Emphasizing the role of labor in the production of economic value serves as a counterpoint to the fetishization of carbon credits as abstract financial assets detached from the social relations that produce them. Even when carbon credits circulate as commodities without producing any mitigation, they are sustained by a labor of calculation, persuasion, and appropriation. While other authors have challenged carbon market fetishism by exposing the abstractions of carbon accounting (Dalsgaard 2014; Machaqueiro 2017) or framing their economic value as the outcome of state rents (Felli 2014), I emphasize the role of labor—in particular, the disproportional gap between ecological and audit labor that seems to be affecting the carbon market.

This article is structured as follows. It begins with the analysis of a carbon credit that I purchased at a chocolate fair in Paris. This document is linked to specific actors, agricultural practices, and localities in Colombia, which are abstracted and codified as serial numbers. Through these codes, local socioenvironmental relations are transformed into mobile symbols of climate action capable of circulating in international markets. I then trace Colombia's carbon market audit network, composed of institutions and practices that generate and sustain the credibility of these symbols. The following section examines how these audit networks are enacted on the ground, comparing the relative centrality of audit and ecological labor in the production of carbon credits. After conceptualizing these observations semiotically, the article concludes by analyzing how the carbon market is seeking to reconstitute its audit network in response to mounting controversies, layering new forms of verification without questioning the underlying logic of audit culture. I use pseudonyms throughout the article to protect the identity of interlocutors and organizations.

This article is based on 7 months of ethnographic fieldwork in Colombia and approximately 30 interviews with actors across the Colombian VCM. It forms part of a larger four-year project that investigates the social dimensions of agricultural carbon accounting in Canada, India, and Colombia.

2 | Carbon Credits as Symbols of Climate Action

What is a carbon credit? At the 2023 Salon du Chocolat that took place in Paris, some of the world's top chocolatiers gathered to showcase their creations. Amid the abundance of chocolate, it took me some time to find the booth of a Colombian foundation, Carbon02, which produces carbon credits linked to agricultural crops. Carbon02 was presenting the outcomes of the mitigation project Agricultura Limpia that enables small and medium-sized Colombian farmers to generate carbon credits through their crops, a practice known as carbon farming.

Carbon farming refers to a set of land management practices designed to increase the amount of carbon stored in vegetation and soils, typically through activities such as planting trees, improving soil health via cover cropping or reduced tillage, restoring wetlands, or managing livestock to reduce methane emissions. The goal is to generate measurable, verifiable climate benefits that can be rewarded through carbon markets or incentive programs. Within the broader AFOLU (agriculture, forestry, and other land use) category, carbon farming generally applies to sequestration-oriented projects that establish or restore vegetation to create new carbon sinks. Other AFOLU strategies, such as REDD+, focus on avoiding emissions by protecting and managing existing forests that are threatened by deforestation.

The carbon credits that result from the ecological labor of carbon farming and REDD+ projects are usually sold through digital platforms where different types of customers buy credits to offset their emissions or improve their environmental profile. At the chocolate fair, however, Carbon02 introduced an innovative way to market these credits: Visitors received a chocolate bar, each accompanied by a QR code granting access to one carbon credit. Buying a bar meant simultaneously funding the promise of removal of 1 metric ton of carbon from the atmosphere.

During the 2 days of the chocolate fair, I saw the puzzled faces of visitors who approached the stand to taste or buy Colombian chocolate and were instead received with a marketing speech about carbon credits. Alvarado and Mejia, the two representatives of Carbon02, explained that their chocolate bars were producing verified carbon emission removals through the planting of cocoa crops in remote areas of Colombia and showed pictures of the farms and farmers involved in their cocoa initiatives. Like some of the visitors of the stand, I decided to buy a chocolate bar and download the accompanying carbon credit (see Figure 1).

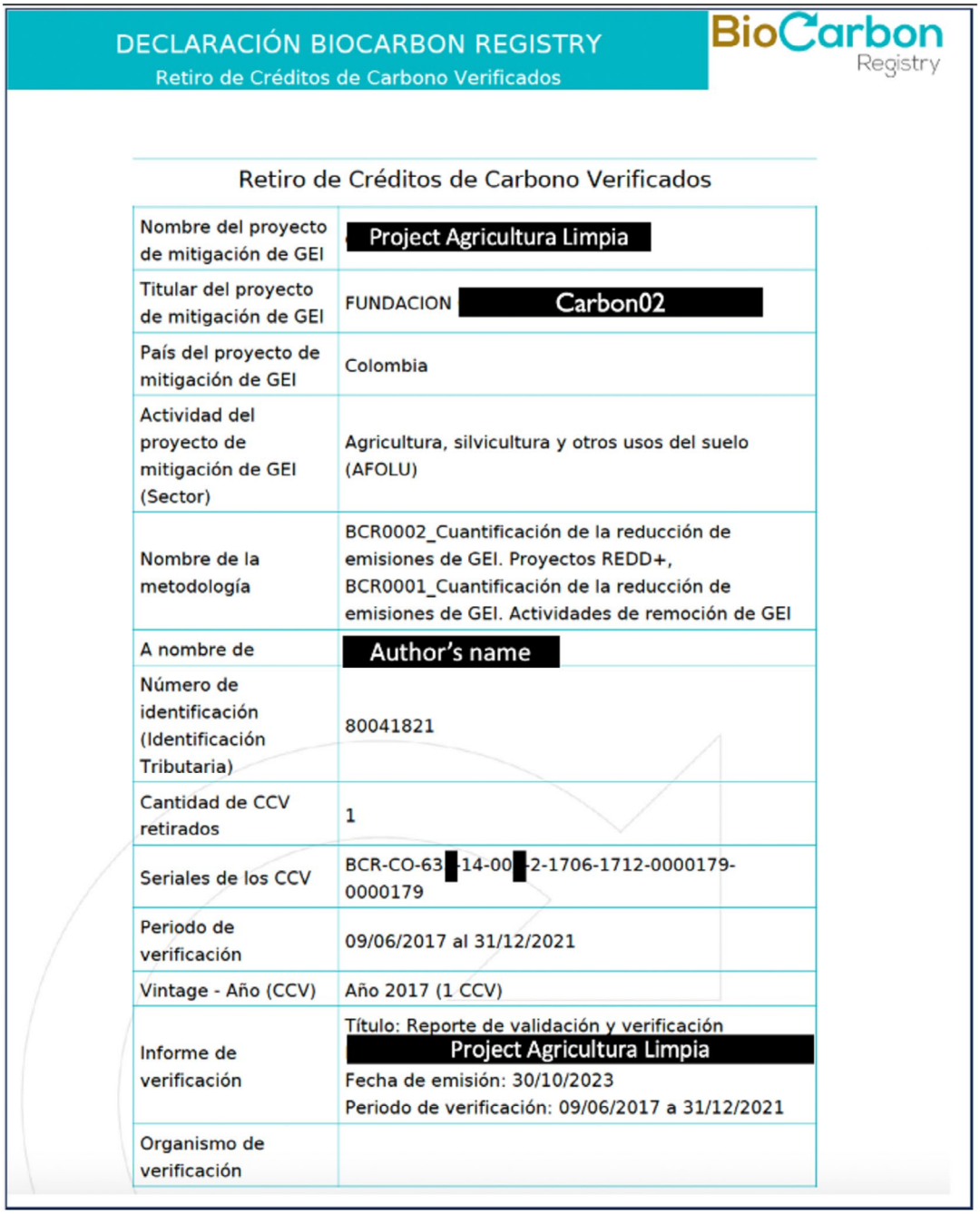
The carbon credit turned out to be a document, formally known as a certificate of carbon emission reductions or removals, that claims to represent 1 metric ton of CO_2e mitigated by the Agricultura Limpia project. The document includes key details about the project, such as its country of origin, the type of mitigation activity that it carried out, and the methodology that it used to measure its results, among other things. Each carbon credit is also codified with a unique identifying serial number designed to prevent double counting of results (see Figure 2). After a credit is bought and used (e.g., when a purchasing company discloses the purchase of carbon credits in its environmental reports), its serial number is permanently "retired" from the registry where it is stored and can no longer be traded.

This serial number is so central in transforming carbon credits into symbols of mitigation outcomes that some accounts equate carbon credits with their serial number. An article in *Foreign Policy* defines carbon credits as "tradable serial numbers that confer the right to pollute the Earth" (Funk 2015). The power of this number lies in its symbolic ability to condense different actors, practices, and locations into a single object that represents climate action, which resonates with Turner's (1970) understanding of symbols as units of meaning that condense, unify, and polarize different ideas, values, and emotions. Figure 2 breaks down the content of the serial number of the carbon credit I bought in Paris. It indicates that the credit was issued by the Biocarbon Standard (BCR) in Colombia (CO) and represents the mitigation results of a project managed by the developer "Carbon02" (code 63X). The project carried out AFOLU activities (code 14) under the name "Agricultura Limpia" (code 00X). The serial number also reveals that the project's results were verified between June and December 2017 (codes 1706 and 1712) and that these credits were designated for commercialization (code 2).

Treated as symbols of climate action, serialized carbon credits become an "immutable mobile" (Latour and Woolgar 1986) that can traverse spatial boundaries without their meaning and structure changing along the way—traveling from remote areas where mitigation projects are implemented, such as Vichada, Colombia, to international markets where carbon credits are traded, including venues like the Salon du Chocolat in Paris. However, the materiality and sensorial realities of the ecological labor that underlies the production of carbon credits are difficult to codify and integrate into the carbon credits—something that Alvarado and Mejia tried to compensate for in Paris by showing visitors of the stand pictures of the local crops and farmers that were linked to the mitigation results represented by the credits.

The production of carbon credits as mobile and tradable symbols of climate action has sometimes led to their fetishization as objects that are valuable in themselves. While some companies buy carbon credits to use them as offsets, some financial actors buy carbon credits to speculate on price fluctuations, waiting for the right moment to sell them at a higher price (Barratt and Sandler Clarke 2022). Carbon credits have also been used as the foundation of financial securities that aggregate credits from various project types and deliver carbon allowances in annual tranches to meet compliance obligations (Bryant 2018, 610). They have also served as collateral by leveraging "expected income streams from purchase agreements for offset credits" (Bryant 2018, 613). Sometimes they are even tokenized via a "bridging" process, where carbon credits are canceled or retired in a crediting registry and reissued as blockchain-based crypto assets (World Bank 2023, 45).

Despite the enthusiasm with which some actors buy, sell, and speculate on carbon credits, their value depends on their capacity to act as symbols of climate action, which is not universally



DECLARACIÓN BIOCARBON REGISTRY
Retiro de Créditos de Carbono Verificados

BioCarbon Registry

Retiro de Créditos de Carbono Verificados

Nombre del proyecto de mitigación de GEI	[redacted] Project Agricultura Limpia
Titular del proyecto de mitigación de GEI	FUNDACION [redacted] Carbon02
País del proyecto de mitigación de GEI	Colombia
Actividad del proyecto de mitigación de GEI (Sector)	Agricultura, silvicultura y otros usos del suelo (AFOLU)
Nombre de la metodología	BCR0002_Cuantificación de la reducción de emisiones de GEI. Proyectos REDD+, BCR0001_Cuantificación de la reducción de emisiones de GEI. Actividades de remoción de GEI
A nombre de	[redacted] Author's name
Número de identificación (Identificación Tributaria)	80041821
Cantidad de CCV retirados	1
Seriales de los CCV	BCR-CO-63[redacted]-14-00[redacted]-2-1706-1712-0000179-0000179
Periodo de verificación	09/06/2017 al 31/12/2021
Vintage - Año (CCV)	Año 2017 (1 CCV)
Informe de verificación	Título: Reporte de validación y verificación [redacted] Project Agricultura Limpia Fecha de emisión: 30/10/2023 Periodo de verificación: 09/06/2017 a 31/12/2021
Organismo de verificación	

FIGURE 1 | A carbon credit. Purchased by the author. Identifying information of the project developer and mitigation project are redacted, and pseudonyms are used instead.

accepted. Critics argue that some carbon credits amount to little more than "hot air," failing to represent genuine emissions reductions or removals (Dufrasne 2021). Others argue that financial speculators hold them to profit from price variations, not to contribute to climate action (Dufrasne 2023; Suppan 2009). Additionally, some project developers have been accused of exploiting local communities, raising concerns about the ethical and environmental integrity of mitigation projects linked to carbon markets (Aguilar-Støen 2017; Alusiola et al. 2021; Bermúdez Liévano 2023; GAIA 2023). In short, the creation of carbon credits as symbols of climate action is constantly challenged and needs to be continually produced and reproduced.

3 | Audit Networks: The Actors and Practices Behind the Production of Carbon Credits

How are carbon credits produced as symbols of mitigation results? A month after the Salon du Chocolat, I did something most carbon credit buyers rarely do: visit the projects behind the credits. In November 2023, I flew from Bogotá to Puerto Carreño, the capital of Vichada—one of Colombia's most remote and sparsely populated regions, located near the Venezuelan border. The area is so isolated that only one daily flight, operated by the Colombian Air Force's airline (Satena), connects it to Bogotá.

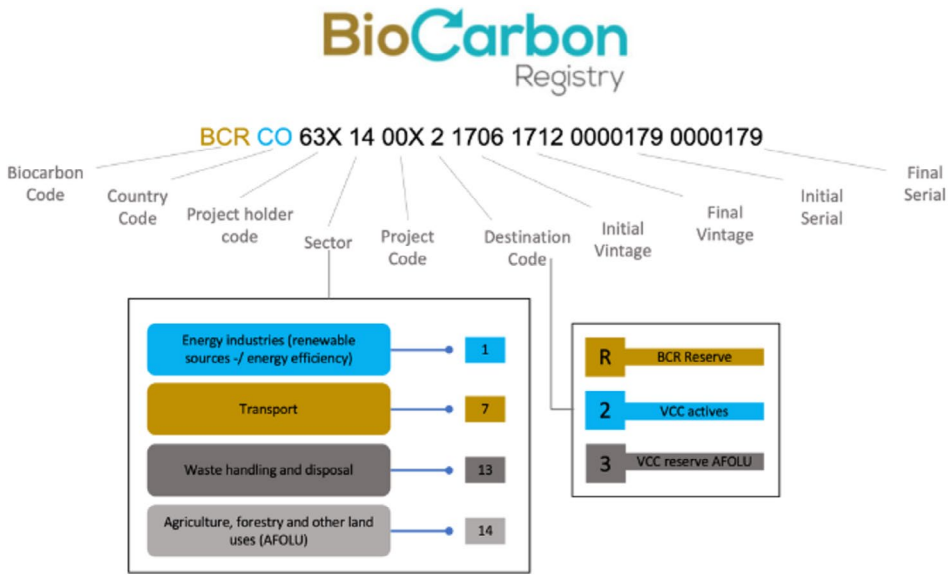


FIGURE 2 | The serial number. Elaborated by the author based on the handbook of good practices (Biocarbon Registry 2023, 35). Identifying information of the project developer and mitigation project is redacted.

Upon arrival, I hired a local driver to visit cashew farms participating in Carbon02's Agricultura Limpia project. After 4 h on dirt roads, we reached the Arroyo farm, managed by Ojeda, an advocate of regenerative agriculture. Ojeda showed me his organic fertilizer system, made from animal manure, milk, and molasses, and introduced me to his buffaloes, which help distribute fertilizer and will later be used for high-density rotational grazing. He also kept beehives for pollinating his cashew crops and producing honey (Silva Garzón 2024).

Ojeda's farm left a strong impression. Through sustainable fertilization, livestock management, and pollination, Ojeda and his team of workers aim to produce organic cashews that enhance biodiversity and contribute to climate change mitigation. It seemed the carbon credit I had bought in Paris was, at least partly, backed by genuine environmentally friendly practices. Still, I had no way of measuring his actual contribution to carbon removal, nor did I meet the other 69 farmers or see the 3416 ha that make up the full project. Yet, I had a rare privilege: visiting the landscapes and people whose work is converted into carbon credits.

How, then, can the vast majority of consumers—who lack this opportunity—believe in carbon credits as symbols of climate action? They rely on a network of audit institutions that monitor mitigation activities, measure and verify results, and confer legitimacy. The production of a carbon credit is thus embedded in what Shore and Wright (2015) call "audit culture" (421): a mode of governance defined by the growing dominance of indicators, measurements, and rankings, used to manage organizations internally and to display quality, efficiency, and accountability to external audiences. In carbon markets, the collective work that underpins the production of carbon credits can be described as audit labor.

How does the audit network work? Project developers like Carbon02 adhere to the methodologies and guidelines of a carbon standard of their choice (also referred to as programs or certification companies). These private entities establish the rules and procedures for measuring, verifying, and certifying carbon credits. They aim to ensure that mitigation projects genuinely reduce or remove carbon emissions while respecting landholders' rights. Two central quality criteria are additionality, which requires that the project's carbon benefits go beyond what would have occurred without it, and permanence, which concerns the durability of those benefits over time and the risk of reversal due to events like land-use change, fire, or degradation.

Carbon standards certify projects that meet these and other requirements. However, because project developers pay standards for certification services, conflicts of interest may arise, potentially encouraging the approval of low-quality projects to maintain business relationships. To mitigate this, independent validation and verification bodies (VVBs) assess compliance with the chosen standard's guidelines at different stages of the project cycle. Initially, they validate the project design before it is registered in the carbon standard. Later, once results are generated, they visit projects to verify that these results are real and align with the approved methodology. After a VVB confirms the results, the carbon standard issues one carbon credit for each metric ton of CO_2e mitigated. These credits are then stored in a registry—managed either by the standard itself or by an independent entity—until they are sold on the market.

Although both certification companies (carbon standards) and VVBs contribute to the credibility of carbon credits, they do so through distinct modalities of audit labor. Certification companies, such as Verra or the Biocarbon Registry, exercise a discursive form of authority by defining what counts as legitimate mitigation. Their work consists in the production of categories, taxonomies, and procedures that transform ecological processes into codified, measurable, and ultimately tradable outcomes. VVBs, by contrast, perform a more situated and performative form of audit labor: They materialize credibility through visits, measurements, and reports that attest to the correspondence

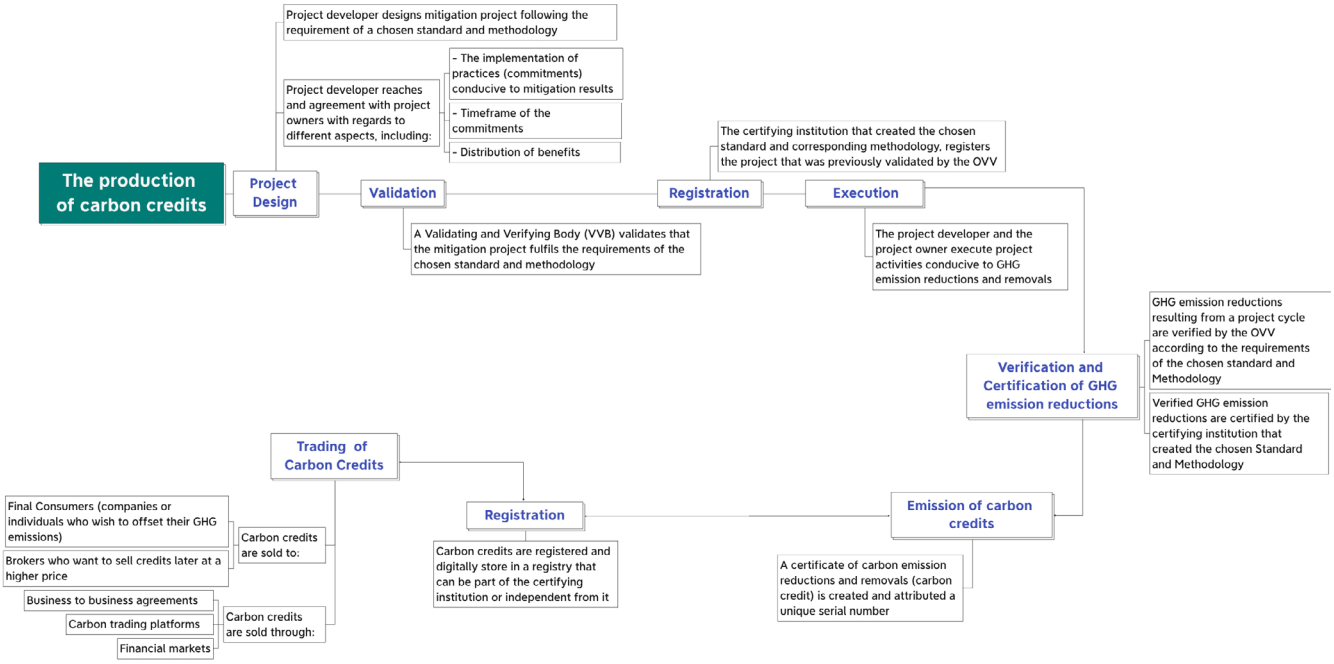


FIGURE 3 | The audit network of a carbon credit. Elaborated by the author.

between what happens on the ground and what is inscribed in the standard.

In short, the production of a carbon credit is a process in which audit actors work to transform mitigation activities into a credible symbol of climate action. Project developers implement methodologies set by carbon standards, while independent third parties validate and verify results before credits—mobile, unique, and tradable—are issued. Figure 3 summarizes this network, highlighting the various practices involved in producing a carbon credit.

Recent carbon controversies have cast doubt on the effectiveness of the carbon audit network, redirecting attention back to the ecological relations of production behind their existence. VVBs have been accused of failing to enforce compliance with social safeguards, resulting in poor implementation and climate injustice (Haya et al. 2024, 5). Cases have emerged in which the same mitigation results are counted more than once (A&O Shearman 2025) or in which credits are stolen from registries (Frunza 2013) and resold across multiple markets (Funk 2015). Thus, although the carbon audit network is designed to produce carbon credits as symbols of climate action, a competing interpretation portrays them as instruments of speculative capitalism—detached from meaningful climate action and implicated in unjust socioenvironmental relations.

By far the most significant challenge faced by carbon audit networks concerns what is known as "additionality," or the ability to prove that mitigation results are in fact additional to those that would have occurred in the absence of a carbon project. This issue is particularly acute in REDD+ projects, which aim to protect forests from imminent deforestation. Such threats are typically determined through estimates of expected forest loss, with project success assessed against this baseline. The higher the baseline is, the greater the apparent mitigation results if existing forest is conserved. This creates an incentive for project developers to target forests where the risk of deforestation is minimal and little active conservation is required and to pair such forests with artificially elevated baselines of deforestation. In this way, developers can inflate mitigation results while doing minimal conservation work.

In cases with severe additionality issues, the mitigation results legitimized by the audit network are not proportionally backed by ecological labor on the ground. In such instances, auditing becomes largely performative (Power 1999)—a ritual of verification that legitimizes the symbolic power of carbon credits, even when the audit itself is superficial or ineffective. Returning to the ethnographic case from Vichada, the next section shows that additionality concerns are central not only to REDD+ but also to audit practices in agricultural carbon farming. Exploring additionality in this context allows us to see how the carbon audit network is enacted and to analyze its ability to represent ecological labor taking place in local settings.

4 | Audit Versus Ecological Labor

In climate action circles, it is often claimed that additionality concerns are less pressing in reforestation and agricultural projects than in REDD+. As opposed to REDD+, where mitigation results depend on estimates of expected deforestation—a figure open to manipulation—in reforestation and agriculture, they are said to rest largely on direct biomass measurements of crops or trees planted to sequester carbon. Such measurements indicate how much carbon has been captured and stored as plant material (wood, leaves, roots, etc.).

My ethnographic observations suggest that this confidence in agricultural carbon farming can be misleading, particularly regarding how results are measured and how projects qualify.

Though I did not observe any wrongdoing among the actors behind the production of the carbon credit I bought in Paris, following this credit from market to field shed light on certain mechanisms of the audit network that give room to opportunism.

Ojeda, the cashew farmer, first told me how he entered carbon credit production over coffee in a Bogotá café. An upper-middle-class economist based in the city, Ojeda co-owns an agribusiness consultancy serving farmers across Colombia. Years earlier, a client tipped him off to an investment opportunity: Indupalma, the now-defunct Colombian Association of Oil Palm Growers, was seeking investors to plant rubber in eastern Vichada. After carefully analyzing the project, Ojeda and his partners bought around 800 ha of land for the venture, only for it to collapse amid a national corruption scandal affecting Indupalma, leaving them with idle land. Following the lead of neighboring growers, they switched to planting cashew.

A few years later, Ojeda was contacted by Alvarado, the carbon project developer from Carbon02 whom I had met in Paris. Alvarado had heard about the new cashew producers who, like Ojeda, had been part of Indupalma's failed rubber initiative. Early in their conversations, Alvarado asked about the age of Ojeda's cashew trees, the property's tenure history, prior land uses, and its total size—information needed to determine whether the plantation could qualify for carbon credit production.

Under most carbon standards, Ojeda would have had to prove that his cashew trees were planted for mitigation purposes or that they were young plantations that had sequestered more carbon than they'd emitted over their lifetime. While Ojeda had planted cashews for economic rather than environmental reasons, he had followed environmentally friendly practices likely associated with low carbon emissions. Alvarado therefore proposed a plan of action: They could document that the plantation was young (most carbon standards in Colombia allow a 5-year window from planting in which a crop can be registered as a mitigation project) and construct a land-use history that met eligibility rules. This would allow them to register the plantation and retroactively claim credits for the carbon removed during that time.

To build this narrative, they could compile old photographs, WhatsApp messages, notes, receipts, and similar records to present to auditors (the validating and verifying bodies) as evidence that the planting aligned with mitigation goals. Paola, an auditor I met at the Latin American Climate Summit in Cartagena, confirmed this. As we danced salsa after a day of sessions, she explained that almost anything could serve as evidence in a mitigation story, though "soft data" such as notes and photos are usually complemented by "hard data" such as satellite imagery confirming crop age. Crucially, the case must be made within the early years of the crop's life—the time window allowed by carbon standards.

What struck me was that rather than seeking new land for fresh mitigation, project developers often looked for existing crops that could be enrolled in mitigation narratives. From my perspective at the moment, this practice raised additionality concerns: If the crops predate the mitigation project, their carbon sequestration would have occurred regardless, and it would therefore not be the result of new ecological labor. Why, then, do carbon standards allow registration windows that open the door to this practice instead of requiring that only newly planted crops be eligible?

The answer lies partly in agricultural risk. Farmers are unlikely to commit to a new crop and a mitigation project simultaneously without knowing the crop will survive its first years. Thus carbon standards grant a time window so that farmers can establish viable crops before registration. Furthermore, the mere existence of a crop does not guarantee positive carbon outcomes; a project must demonstrate a net carbon gain in crops over time. However, this same window also creates opportunities to register existing plantations that may not have a positive carbon balance, provided they can be narratively framed as recent and aligned with mitigation goals.

To limit abuses, some carbon standards in Colombia have shortened the planting-to-registration window, making it harder to fabricate false agricultural histories. Others, however, keep windows as long as 10 years, enabling them to recycle projects rejected by stricter standards. Many actors in the carbon market view such practices as unethical and the resulting credits as low quality—as "hot air." Thus the narrative production of mitigation stories is not only central in REDD+ projects through the fabrication of baselines (Greenleaf 2024) but also present in agricultural carbon farming.

Perhaps recognizing these risks, Ojeda remained skeptical of Alvarado's proposal at first. To him, developers seemed to be scouting for "places where the work had already been done" and could simply be converted into credits. Alvarado, however, saw it differently: he believed he was rewarding environmentally friendly farmers by "enrolling" them in carbon projects through which they could be compensated for their ecological efforts. Either way, both Alvarado and Ojeda described a process in which developers target recently established agricultural areas still eligible under a chosen standard's time window.

Ojeda's remark about "work already done" and Alvarado's remark about "enrolling" farmers into carbon markets are revealing. These encounters highlight the existence of at least two types of labor behind the production of carbon credits: ecological labor—the agricultural labor of farmers and rural workers—and audit labor, the translation of these practices into certified carbon credits. When Alvarado contacted Ojeda, the cashew crop was already in place; what remained was to translate this agricultural labor into mitigation outcomes—a process initiated by the developer and continued through validation and verification visits. Without these audit practices, Ojeda's crop might still have sequestered carbon, but it would not have been transformed into credits.

The production of agricultural carbon credits is therefore characterized by varying proportions of ecological and audit labor. In some cases, audit labor predominates: when agricultural work predates the mitigation project or when additionality is weak. In these cases, the carbon audit network appears capable of producing tradable commodities independently of any ecological work. But this is, of course, not the case: Agricultural

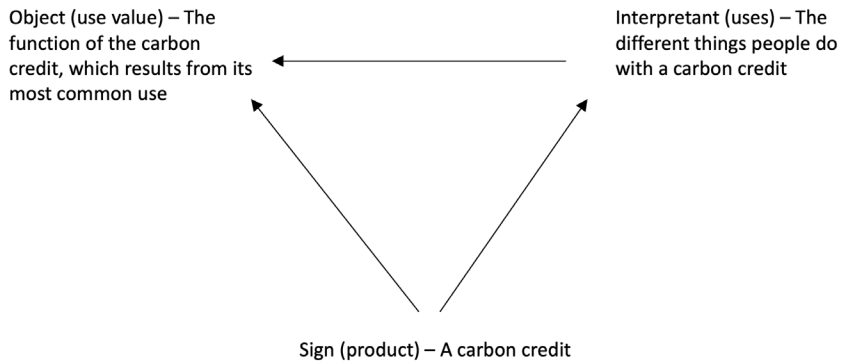


FIGURE 4 | The use-value of a carbon credit. Elaborated by the author using Kockelman's (2006, 88) general scheme.

and conservation labor remain indispensable. Yet, rather than undertaking all of this labor themselves, the actors of the carbon market claim or appropriate the labor that is crystallized in existing crops for their own mitigation purposes.

To be clear, this is not necessarily the case for the agricultural labor carried out after the establishment of the mitigation project. Carbon standards require project developers and farmers to commit to long-term monitoring and maintenance obligations that guarantee the durability of the carbon stored in vegetation or soils. These permanence conditions extend the reach of audit labor into the future, structuring the rhythms and priorities of ecological work. Thus, after the establishment of the mitigation project, there is a higher chance that the ecological labor of the project will be guided by the expectations of the audit system, nuancing the distinction between ecological and audit labor made in this article.

However, the ethnographic case presented in this section shows that the ecological labor that leads to the production of a carbon credit is not always additional. It can result from the appropriation of past labor. To be clear, this argument differs from Marxist scholarship on economic value in carbon markets. In particular, Felli (2014) argues that carbon markets do not create new economic value but instead appropriate part of the surplus value generated by high-emitting industries through administrative mechanisms. The state extracts rents from these industries by obliging them to purchase emissions rights, pay carbon taxes, or offset their emissions and redistributes these rents to actors implementing mitigation activities via the carbon market. From this perspective, the audit network and the ecological practices involved in the production of carbon credits do not create new economic value; they perform only appropriative labor that enables carbon market actors to access these state rents.

This argument holds conceptually as long as carbon markets rely primarily on state rents. It becomes less convincing, however, for the voluntary portions of the carbon market that create their own demand. If these segments of the market mature, carbon mitigation has the potential to become a socially recognized need addressed by the market independently of regulatory requirements. In such a scenario, the ecological and audit labor involved in producing carbon credits could also be understood as productive labor that generates new economic value. I am therefore not arguing, as Felli (2014) does, that carbon markets lack the potential to generate economic value. Instead, I am calling for greater attention to the interplay between ecological and audit labor in the making of carbon credits as symbols of climate action. If the gaps that exist between the two are not examined, the performative segments of the carbon market will continue to monetize "hot air" or to appropriate the real value created by past labor.

5 | The Semiotic Production of Carbon Credits

In the previous sections, we explored the audit labor behind the production of a carbon credit. Even when carbon credits circulate as commodities without producing any significant mitigation, they are sustained by a labor of legitimization: the rituals of verification that justify the sale of carbon credits as symbols of climate action. Going a step further, the semiotic perspective of Kockelman (2006) allows us to see that consumers also play a role in deciding whether to accept the symbolism proposed by carbon credits. When buyers purchase and retire carbon credits, they perform a gesture of climate action—an act through which environmental responsibility is both materially and symbolically claimed. This performative act validates the symbolic power of carbon credits, even when devoid of significant ecological labor. This helps explain how, despite carbon controversies, carbon markets continue to grow.

However, Kockelman's approach allows us to see that the performative act of the buyer depends on different types of labor, such as the generation of mitigation results on the ground and the production of legitimacy and persuasion by audit networks. Other approaches, such as Callon's (1998) *marketization* or Appadurai's (1986) *social life of things*, share methodological affinities with Kockelman's work from an ethnographic perspective. Yet they locate the defining moment of commodification in the sphere of exchange rather than production (labor), treating exchange as the point at which an object acquires economic value. Following Simmel's (2004) theory of value, Callon (1998) and Appadurai (1986) argue that it is in exchange where value is revealed, as market actors decide how much they are willing to sacrifice to obtain a product. By reducing the commodity's defining moment to exchange—a seemingly neutral space where goods of equivalent

value are traded—these approaches obscure the political dynamics embedded in commodity production. In contrast, Kockelman (2006) proposes a semiotic analysis of value that foregrounds labor, combining Peircean semiotics with Marx's labor theory of value.

From his perspective, the use-value of a carbon credit emerges through a semiotic relationship: A carbon credit is an *instrument* that functions as a sign of its potential uses or *interpretants* (e.g., a symbol of mitigation results, a mere document representing "hot air," an object of financial speculation, or the protagonist of an anthropological study). Through repeated collective use in a specific way, a dominant interpretant becomes *objectified*, or stabilized as the defining use-value of that instrument. Use-value is therefore not an inherent property of an object but a *semiotic relationship* that becomes collectively stabilized when a significant portion of people reach a consensus about an instrument's primary function and act accordingly. See Figure 4 for a visual description of this process.

The use-value of carbon credits is therefore not static but contingent on the stability of the semiotic relationship that underpins their legitimacy. Once a carbon credit is issued and placed on the market, buyers decide whether to acquire it. This moment embodies what Marx called the *salto mortale* of the commodity—the crucial transition from subjective use-value to collective exchange-value. When buyers purchase and retire credits, they indirectly validate the audit network, strengthening carbon credits' interpretation as symbols of mitigation.

Conversely, when this use-value is questioned, carbon credits may fail to complete their market transition, and their ontology as commodities is destabilized. Consider a *Guardian* article from May 30, 2024, titled "Corporations Invested in Carbon Offsets That Were 'Likely Junk'" (Lakhani 2024). When this type of narrative proliferates, the purchase of carbon credits becomes a costly risk for buyers, and their incentives to avoid the carbon market increase. By threatening to unravel the semiotic relationship that links carbon credits to climate mitigation, these counternarratives affect the perceived use-value of carbon credits and hinder their commercialization.

More broadly, the economic value of carbon credits depends on the semiotic equivalence produced between the credit and the mitigation results it claims to represent. This equivalence underpins the use-value of carbon credits and serves as a prerequisite for their exchange-value. Without the production of this equivalence, carbon credits cannot exist as symbols or as commodities. To be persuasive, this equivalence demands considerable audit labor. The use-value of carbon credits is established by a network of actors who claim to observe, verify, and certify that a document truly represents the outcomes of ecological labor.

While this audit network is not always effective from an ecological perspective, what ultimately matters is the legitimacy that these institutions are able to signal to the public. When successful, audit labor is capable of mediating between two kinds of symbolic power: that of developers who claim to have generated mitigation and that of buyers who claim to have offset their emissions. The extent to which such signaling must be backed by real action on the ground depends on public interest and pressure, which cannot be taken for granted. Some actors have a genuine interest in climate change mitigation but may lack the knowledge to navigate the carbon market, whose intricate audit networks render it opaque. Others willingly turn a blind eye, purchasing cheap credits to comply with regulations. However, when a visible gap opens between the symbol and what it represents, controversies emerge: consumers cease to view carbon credits as credible symbols of climate action. When this occurs, the audit network must be recalibrated to prevent carbon credits from losing both their symbolic legitimacy and their economic value.

6 | Closing the Gap? Strategies to Reestablish the Carbon Market's Credibility

In September 2023, I attended the Colombian Climate Summit in Cali, organized by the Colombian Association of Carbon Market Actors (Asocarbono). The event brought together project developers, carbon standards, VVBs, policy makers, international organizations, and a small number of Indigenous and Afro-descendant leaders. The summit's theme, "The Voice of Communities," was intended to signal the association's willingness to engage with community representatives in the wake of recent controversies in carbon markets.

Despite these gestures, the atmosphere was dominated by unease and by competing narratives about the causes of the controversies and who should ultimately be held accountable (Silva Garzón et al. 2026). Journalistic investigations critical of the sector were a constant point of discussion, especially in informal exchanges, with rumors circulating that a reporter from *The Guardian* was present. Many participants feared that sustained public scrutiny could draw the attention of regulators, prompting policy changes unfavorable to the market. Confidence had already been shaken: a sustainability consultant from Accenture explained to me that multinational corporations were becoming hesitant to purchase offsets, largely because it was increasingly difficult to distinguish between high- and low-quality credits. In financial markets, where credits are resold multiple times and bundled into complex products, tracing their origins was even harder.

By the time of the International Emissions Trading Association's Latin American Climate Summit in Cartagena a year later, these concerns had been reframed as a credibility crisis. Market actors responded through different and sometimes competing strategies.

The first strategy has been to reinforce the existing audit network by addressing governance weaknesses that had enabled poor oversight or inflated crediting. For example, Verra, a leading international carbon standard, launched its VM0048 methodology following sustained criticism from researchers at the University of California, Berkeley (Haya et al. 2023). This new methodology shifted baseline calculations from project-specific data to jurisdictional deforestation data, with the aim of reducing opportunities for inflated credit issuance (MSCI 2023). All registered REDD+ projects were required to transition to the new methodology within a set grace period, in an attempt to standardize practices and enhance transparency (Twidale 2024).

Although VM0048 represents an important step toward revising and reinforcing the audit network, it does not fully close the gap between what is certified and what happens on the ground. Haya et al. (2024) argue that the methodology still diverges from established scientific literature on carbon accounting, climate risks to permanence, and the effectiveness of safeguards. Moreover, they point out that some of the worst cases of overcrediting and weak safeguards stem not only from methodological design but also from poor implementation by project developers and ineffective oversight by third-party verifiers.

Thus, while revising methodologies narrows the room for opportunism, it does not resolve deeper problems of enforcement and implementation. Revisions also create a paradoxical effect that Strathern (2000) identified in audit cultures: Efforts to restore accountability through stricter procedures simultaneously signal that previous systems were inadequate, undermining the very credibility they seek to rebuild.

A second strategy seeks to address this by bringing in new actors to conduct additional audit labor. These organizations independently evaluate carbon projects to help buyers differentiate between good- and poor-quality credits, providing indirect oversight of the implementation of standards. For example, the Integrity Council for the Voluntary Carbon Market (2024) introduced its "Core Carbon Principles" (CCPs), awarding a CCP label to projects that meet its guidelines. Meanwhile, private agencies, such as Sylvera, Calyx Global, and BeZero Carbon, have begun ranking projects using satellite imagery, machine learning, and complex scoring systems (World Bank 2023).

Yet expanding the audit network without challenging its underlying epistemology of procedural compliance only reinforces uncertainty. A report by Carbon Markets Watch (Dufrasne 2023) criticizes the transparency of rating agencies as "uneven and lacking," highlighting that their methodologies are inconsistent and frequently produce divergent recommendations for investors. The report also shows that rating agencies rarely integrate the enforcement of social safeguards, which are supposed to protect local communities from harm. The report thus calls for stronger oversight. These developments exemplify what Strathern (2000) and Power (1999) describe as a recursive dynamic in audit cultures: For rating agencies to gain credibility, they themselves would require oversight—yet who audits the auditors? Verification mechanisms generate demands for meta-verification, producing an audit spiral with no ultimate ground of certainty.

A third strategy attempts to escape this regress by shortening the chain between project implementation, certification, and credit retirement. Some corporations are now developing their own mitigation initiatives, internalizing audit labor to align projects with their environmental and social standards and to reduce the risk of greenwashing. Rabobank's ACORN program exemplifies this approach: It aims to generate additional income for small-scale farmers by promoting agroforestry and facilitating participation in international carbon markets (ACORN 2024). In Colombia, ACORN has partnered with the nongovernmental organization (NGO) Solidaridad to implement Asómbrate, a project involving small-scale coffee and cocoa producers across 50,000 ha of land (Asómbrate 2024).

Although such arrangements improve traceability and can align projects with corporate environmental, social, and governance (ESG) commitments, they also attract criticism for potential risks to peasant autonomy, opaque data practices, and environmental trade-offs (Gómez Gil and Seufert 2024). By sponsoring and internalizing carbon projects, corporations expose themselves more directly to these critiques. Their ESG teams must therefore develop expertise in carbon markets and closely monitor sponsored projects, effectively shifting audit labor away from standards and VVBs and onto the corporations themselves. Therefore, these arrangements do not escape the audit spiral but rather relocate it: Corporate ESG departments must now develop their own monitoring systems and verify their own claims—processes that themselves become objects requiring external validation by investors, NGOs, and sustainability consultants.

Taken together, these strategies reveal a market struggling to reassert the symbolic value of carbon credits through new layers of audit labor. Whether by revising methodologies, multiplying oversight actors, or internalizing verification, each approach seeks to restore credibility but simultaneously undermines it through paradoxical effects and recursive dynamics consistent with Strathern's (2000) and Power's (1999) analyses of audit cultures.

However, while these efforts might be ineffective in terms of auditing, they have concrete political economic effects. As layers of verification accumulate, an increasing share of the carbon market's benefits risks being absorbed by certifiers, verifiers, rating agencies, and ESG departments rather than by farmers and forest communities whose labor underpins mitigation projects. The paradox is clear: Attempts to "close the gap" may stabilize the market's symbols of climate action, but they also deepen the structural tendency for value to flow toward those who translate farming and conservation into credits rather than those who perform the ecological work itself.

7 | Conclusion

This article has examined carbon credits as unstable symbols of climate action, produced through networks of auditing practices that translate diverse ecological and social processes into tradable financial instruments. By following the trajectory of a single carbon credit from a chocolate fair in Paris to farms in Vichada, Colombia, I have shown that carbon credits do not exist simply as technical units of greenhouse gas reduction but are the result of a semiotic process that combines ecological and audit labor.

This analysis demonstrates that the labor of producing carbon credits is not reducible to agricultural or conservation work alone. Equally central are the practices of measurement, verification, certification, and ranking that rearticulate local socio-environmental relations as carbon commodities. In some cases, audit labor even predominates, producing a gap between what happens on the ground and what is represented in the market. This occurs, for example, when baselines of deforestation are inflated in REDD+ projects to exaggerate mitigation results or when preexisting crops are retroactively enrolled into carbon farming schemes.

To describe carbon credits as symbols of climate action is to highlight that they function only insofar as they establish a credible equivalence between ecological practices and symbolic representations. When the ecological labor underpinning a carbon credit is not proportional to its representation, the audit network is accused of being merely performative, and the credibility of the credit falters. In other words, when the gap between symbol and referent becomes too visible—as in cases of inflated baselines or retroactive crediting—the value of carbon credits is destabilized.

Recent controversies illustrate this fragility and explain the institutional responses aimed at increasing oversight. These reforms are presented as mechanisms to guarantee that ecological labor is truly being carried out on the ground. Yet they frequently achieve this by expanding audit labor—some of which appropriates, rather than produces, ecological labor. Instead of clarifying the underlying practices of conservation or farming, these reforms enlarge and complicate the audit network, rendering it more opaque. The result is an audit spiral: Credibility is pursued not through closer alignment with ecological practices but through the multiplication of auditing mechanisms.

In practice, this means that prospective buyers of carbon credits are now expected to navigate an increasingly complex field of oversight institutions. They must consider labels issued by governance bodies that evaluate projects against broad principles; private rating platforms that rely on satellite imagery, artificial intelligence, and other technologies; carbon standards that produce methodologies and certify credits; and VVBs that independently assess projects on the ground. Each of these actors claims authority to determine whether a carbon credit represents genuine mitigation, but together they constitute a layered chain of evaluation rather than a direct assurance of ecological labor.

Whether future reforms will succeed in narrowing the gap between ecological and audit labor—or merely multiply layers of performative verification—remains an open question. However, as oversight intensifies, a growing share of carbon revenues risks flowing to auditors, certifiers, and rating agencies, rather than to the farmers and forest communities whose ecological work underpins mitigation projects. The production of carbon credits as symbols of climate action will therefore remain a political arena where different forms of labor and value are contested, appropriated, and destabilized.

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