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Carbon tax as a tool for territorial development in the post- pandemic times in Colombia: Relationship state, vulnerable communities and formal and informal economies

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Abstract

One segment of the population is particularly vulnerable to the risks caused by an environmentally degraded world. Despite years of struggle for policy and regulatory reforms, pandemics show conditions of increased exposure to climate risk for populations in situations of inequality and vulnerability. Once this link is made explicit, climate change action mechanisms, such as carbon pricing, are potential tools for strengthening social justice. Through a systemic review of the structure of the Colombian carbon tax and its causality with territorial action, strengths and weaknesses were identified to make its impact-application effective for social justice in the Pandemic - Post-Pandemic era. It is recognized that the focal point in the usefulness of the carbon tax in the economic recovery process is the distribution of benefits from the sale of high-quality certified carbon to the communities that live with the forests, where territorial development is promoted, guaranteeing equity for the actors in the system.

Keywords: Taxation, Climate change, Carbon tax, Social justice, Pandemic.

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1. Introduction

The 21st century, marked by economic growth, relative political stability, and the visualization of social problems, has brought with it the need to rethink agendas, structure new models of financing, and redistribute wealth through mechanisms for the efficient and effective collection of what will constitute one of the main sources of state financing, with a determining impact on the processes of environmental degradation.

The period of *conventional fossil resource* exploitation is drawing to a close, but this does not mean a gradual elimination of its environmental impact. This is due to the efforts aimed at developing *non-conventional extractive activities*, characterized by the use of technologies that are capable of more severely damaging natural resources, marine biospheres, tar sands, and oil shale. These processes have been decisive in accelerating the current climate crisis, where greenhouse gas levels have led to a rethinking of the international agenda.

Thinking about the protection of the *Commons in an environment of social fragility* [1] implies the imperative of caring for them from a collective perspective, given that their neglect determines social mobilizations in order to guarantee territorial development [2]. This phenomenon is exacerbated by the fact that the geographic spaces most affected by this issue suffer from high levels of state neglect.

Therefore, nations such as Colombia have implemented centralized strategies with a territorial impact, such as the carbon tax; a tax that aims to meet greenhouse gas mitigation targets. This economic instrument and its respective application raise the question: is the carbon tax a tool for territorial development in Colombia in the post-pandemic era? The answer to this question is that this tax is a tool for territorial development, insofar as it is set for the purpose of mitigating the emission of greenhouse gases and its destination is aimed at redistributing conventional tax burdens on practices that deteriorate the environment, thereby promoting an incentive to the factors of labor and capital, with a focus on environmental/ecosystemic capital and, therefore, the enabling element of social justice. However, it faces differentiated operating conditions in a period of post-pandemic economic recovery.

In this sense, this article aims to determine the reasons why the carbon tax is a territorial development tool for Colombia in post-pandemic times, from the establishment of the causal relationship between pandemics, climate change, and social justice. It considers why forests represent an asset and social solution to inequality and analyzes the potential impact of the carbon tax on social justice. For this, a qualitative type of research was carried out, which included a documentary review of primary and secondary sources and had an exploratory scope following that established by Hernández et al. [3] given the thematic relevance at a time of reformulation of public policies in a framework of overcoming crises and a popular clamor explicit in mobilizations based on inequality. Based on this research, we conclude that there is a causal relationship between the carbon tax and social justice, which makes it a tool for territorial development in Colombia in the post-pandemic era, and we identify the structural aspects that need to be adjusted in order to enhance its effectiveness.

2. Pandemics, Climate Change and Social Justice: Causal Relationship

Pandemics share some causes and consequences with environmental degradation. Deforestation, for example, has facilitated access to viruses and zoonotic diseases through the capture of pangolins, which are linked to the transmission of SARS-CoV-2 to humans [4]. The same deforestation, which together with agricultural activities, causes 24% of global Greenhouse Gas emissions [5]. This relationship feeds back into the vulnerability of society and calls for the proposal of new models of action to deal with critical situations [6].

Climate change benefits the spread of diseases with an incidence in poor populations and without health infrastructure; such is the case of dengue fever, which could affect 4.1 billion people by 2055 and 5.2 billion people (52% of the world's population) by 2085, in scenarios of global temperature increase compared to 3.5 billion people (35%) for the same time frame, taking into account population growth only [7].

In turn, common consequences of climate change include: increased exposure to respiratory and mental illnesses; unemployment; damage to infrastructure and homes; and water and food shortages [8]. These consequences affect communities in situations of social exclusion and poverty in different ways; for example, in the Americas, specifically Afro- descendants and Latin Americans, both in their countries of origin and as migrants [9-11]. The bridge between "Afro" or "Latino" status and greater vulnerability to climate change and pandemics is the capacity for social change that is required in an environment of accelerated variability. This capacity is depleted by the inequity suffered by these social communities, represented in the ability to access resources that become scarce, both in pandemics and in scenarios affected by climate change [12].

Social injustices, such as racism and sexism, generate impacts on the very components degraded by pandemics and the results of climate change. Racism manifests itself in a set of personal beliefs and attitudes, segregation imposed by laws, and ultimately, a structural injustice [13]. Since the 19th century, people with white skin have dominated the political and economic spectrum in the United States and Latin America. Moving forward in time, as certain political schemes and institutions have fallen, we have continued to experience this pattern where racism is significant because it continues to present people of color with various disadvantages [14].

To identify the effect of COVID-19 on the population undergoing processes of inequity, the case of the United States has one of the best repositories of information. Lower-income and Afro-American communities in the United States are not only at higher risk of contracting chronic diseases but also at a higher risk of COVID-19 infection. Serrano [15] which increases the risk of COVID-19 infection; they also experience unequal access to health care, employment opportunities, incarceration, and a lack of health insurance.

These disparities contribute to higher mortality rates among non-Hispanic Afros relative to non-Hispanic Whites, which, even within the subject groups, are not always the case [16]. That even within groups subject to economic and social deprivation, are prone to higher risk of comorbidities and premature mortality compared to persons who are chronologically older, but more privileged [17]. This pattern is repeated in Latin America and is emphatic in conditions of poverty, associated with a lack of hospital infrastructure [18, 19]. To this must be added the impact of the virus on the deepening challenges to overcome social injustice, by virtue of the impacts on the economy of each state [20]. However, the United Nations Environment Programme (UNEP) finds that only 18% of recovery spending worldwide could be classified as "green" and that most of that spending was in high-income countries[1].

In Colombia, demographics, the presence of armed conflict, illegal activities, the performance of institutions, and inequity in land distribution (problems surrounding social justice and governance) have determined rates of deforestation, access to infrastructure, and changes in land use, among others, thus being the main source of greenhouse gas (GHG) emissions [21]. These variables, exacerbated by the global public health calamity, are common causes of the origin of deforestation and the effects of the pandemic, and they determine the need for optimal policy and fiscal instruments to address both risks.

However, not everything translates into negative effects. The pandemic period has contributed to the reduction of GHG emissions; however, it should be noted that this analysis is not included in the research, as it is the result of contingency and not of structural measures, so that the avoided emissions are ephemeral [22].

3. Forests: An Asset and Social Solution to Inequality

Forests and their link to climate change in a framework of environmental degradation present in international scientific judgements and civil society considerations establish a call togovernments. The Intergovernmental Panel on Climate Change (IPCC) has categorized the sourcesof emissions in order to protocolize the reports submitted by the member countries of the United Nations Framework Convention on Climate Change (UNFCCC); These note relationships between forests and agriculture (AFOLU categorized in the GHG inventories in sections 3A, 3B and 3C) with rural areas, where emissions occur, as well as with cities, by containing agricultural supply chain processes and affecting the socio-ecosystems that provide services to cities[2]. This relationship makes the management of forests and the establishment of agricultural production sites central toa social justice agenda [23].

The agriculture, forestry and other land use (AFOLU) sector contributes 24% of global GHG emissions from anthropogenic sources, dominated by deforestation of forests in the tropics [24]. Between the years 1750 and 2011, about 180 GtC were released into the atmosphere due to land use change, mainlydeforestation, and in terms of area, according to [25] 200 Mha or about 5% of the forest area will be lost between 2006 and 2025, resulting in an additional 17.5 GtC being released. Over the next 100 years, forest cover will be reduced by 500 million hectares (globally), which is 1/8 of the current forest cover, affecting, in turn, the ability to provide water regulation and timber provision, among other fundamental services.

The most promoted instrument, given its effectiveness for climate change mitigation, is carbon pricing, considering its potential to help countries steer their economies towards a carbon (emissions) neutral growth path through two possible forms: carbon taxes or tradable permit systems (cap-and-trade systems) [26].

The structure of carbon taxes and tradable permits (cap-and-trade systems) for emissions changes according to the country where they are designed and applied. There are at least 46 initiatives to determine carbon pricing in countries and 32 from subnational provisions, generating revenues of US$44 trillion in 2019 [27].

When analyzing the operational structures of carbon taxes and the cap-and-trade system, it is identified that their main objective is to send an economic signal to discourage carbon-intensive activities, especially the exploitation of fossil fuels. This economic signal is important to the extent that those who pay the tax are taxpayers with high purchasing power and can make the decision to reduce their emissions, subject to the price per ton that makes the change of model economically attractive. The estimated ideal price for achieving the Paris Agreement temperature target (1.5 °C) is at least US$40-80/tCO2 by 2020 and US$50-100/tCO2 by 2030, provided there is a supportive policy environment [28]. However, in Latin America, the carbon price rangesfrom US$ 3 (Mexico) to US$ 6 (Argentina)/tCO2e [29].The main differences between the structure of carbon pricing instruments, whether taxes or caps, are the emission sources they cover, hence the economic sectors they affect, depending on the costper ton of carbon, as well as the destination of the resources.

In the case of Colombia, compliance with the Paris Agreement (2015) and the goal of becoming carbon neutral by 2050 will only be achieved with the net-zero reduction of deforestation achieved with the help of cooperative or market mechanisms. The target in the Paris agreement is to reduceemissions by 51%. In this scenario, the estimated and described GHG emission trajectories correspond to 233.58 Mton CO2e in 2010, 291.30 Mton CO2e in 2020, 332.70 Mton CO2e in 2025 and 345.80 Mton CO2e in 2030. In this way, the state acquires a reduction target of 176.36 Mton CO2e in 2030 [30].

In this way, Colombia is making progress at the international level on forests and climate, especially in the negotiation of the details on which cooperative mechanisms (commonly known as markets) can be implemented, with potential financing for forest conservation. In parallel to these negotiations, the countries have been making progress in obtaining international support to strengthen their capacity to meet the technological, human and institutional requirements arising from the international negotiations, in the form of catalytic forest restoration projects. Colombia presented itself to the

[1] See https://www.unep.org/news-and-stories/press-release/are-we-track-green-recovery-not-yet.
[2] See https://www.unep.org/news-and-stories/press-release/are-we-track-green-recovery-not-yet.

international community as a country with high forest cover and low deforestation[2], which means, in terms of international cooperation, an attractive investment and development pillar from the regions [31]. Under this discourse, the country has accumulated the possibility of $550 million USD in payments for REDD+ results (bilateral programs with Norway, REM, and the Biocarbon Fund), to which it may have access if it demonstrates performance in reducing deforestation, while the investment of resources should leverage a better system of management and protection of forests with a community approach.

However, in order to access this USD 550 million in addition to resources from national mechanisms such as the carbon tax, under the scheme of recognition of mitigation results, deforestation rates must be reduced and this in turn is a forest governance action guaranteeing thegood living of communities in or adjacent to forests. This is even more complex in a pandemic scenario[3].

Among the possibilities for resource investment, we identify nature-based solutions as actions that address the common causes and consequences of pandemics and climate change, in pursuit of social change towards equity. Nature-based solutions are cost-effective for Latin America [33]. The results and effects of the application of eco-sustainable models are considered, both for the consolidation of the economy and emerging sectors, and for the contribution to the rational and reasonable use of non-renewable resources that stimulate new forms of production. At the same time, they organize the interaction with the wild environment, reducing the probability of new pandemics and establishing processes of territorial development.

During the years 2019 and 2021 in Colombia, protests took place that were partially supported by environmental problems, specifically: the absence of a policy and its implementation to reduce deforestation, the refusal and delay in ratifying the Escazú Agreement, and the reinforcement of actions to protect environmental leaders. In this environment of demands, but also of funding opportunities, civil society has not felt represented and continues to demand structural changes from government bodies; knowledge of how to access these resources from the climate change agenda is not widespread, and forests are not the mechanism for access. In this sense, this problem must take into account that its cause lies in the tax reforms that have taken place in recent presidential terms. These have failed to reconcile the social process with the exploitation of natural resources, as they would mean a reduction in the net and gross margins of industries, making investment in them unattractive, as a high tax burden would hinder the fundamental assumption of the ongoing business of industrial companies.

4. Carbon Tax: A Possible Link Between Forests, Climate and Social Justice

Currently, the application, allocation, and realization of resources from carbon price (market) mechanisms (other than carbon tax) do not provide sufficient cases for analysis. However, the Colombian case is appropriate, as the commitments made under the Paris Agreement will only be met if investments are made in forest areas, where there is a state commitment to establish a reduction in emissions from deforestation that is equivalent to a deforestation rate of between 0 net and 50,000 ha/year by 2030.

In this sense, the carbon tax has a legislative mandate that favors its implementation specifically for projects in rural areas, and under its non-taxation mechanism, it generates a territorial intervention model based on the interaction of voluntary carbon market rules with an official monitoring, reporting, and verification system [34].

The resources captured via carbon tax in Colombia amount to 370 million dollars in 2020. These resources have been accumulated to invest in the territory, strengthening the post-conflict agenda, managing coastal erosion, reducing deforestation, strengthening the system of protected areas, and conserving water sources and strategic ecosystems (i.e., paramos). At the same time, it includes a "no taxation" mechanism that allows taxpayers to avoid paying the tax if they report the acquisition of certified carbon in mitigation projects verified under International Organization for Standardization standards, leading to around 35% (+170 M US$ 2017 - 2020) to be directly invested in climate change mitigation actions. However, it should be considered that the monetization of the tax implies establishing a market through which a tool for economic compensation is created, derived from counterproductive effects on the environment, with which, through carbon certifications, the purpose of this financial instrument is guaranteed.

The operation of this system has identified the strength of not overburdening institutions with the task of institutional accreditation[3] and carbon verification, as well as the effectiveness of investment in territory[4]. However, there are also weaknesses centered on the quality of the results and the agreements that intermediaries make with communities.

In this sense, when studying the causation process and not the carbon tax, it should be clarified that the mitigation results of the forestry sector are not carbon, as a chemical element *per se;* the mitigation results are given by a "certificate" those accounts for a social and economic change, onetowards the perception and positive use of the forest. The measurement of these activities is in terms of tons of carbon, due to the feasibility of monitoring and development in the framework ofan agenda to reduce GHGs, however, this does not imply transactions of tangible goods but intangible ones, considering their transactional nature as *commodities*, under the typology of certified carbon, characterized by their realisation in voluntary markets, different carbon[4],[5] emission reduction credits (CERs), as they are not related to the mechanisms of the Kyoto Protocol [36]. In addition, according to article 420 of the Colombian Tax Statute (ET) and article 173 of Law 1819 of 2016, this activity is not subject to VAT, but it does generate income and withholdingtax in accordance with articles 9, 12, 24 and

[3] The Green Climate Fund approved US$28 million to combat deforestation in the Amazon biome and to reactivate an economic reactivation strategy in times of pandemic [32].
[4] The model does not assign conformity assessment responsibilities to public institutions, but instead assigns this task to accredited bodies recognised by the IAF.
[5] To date, the resources taxed via causation (approximately 1 trillion $COP) from the tax have not been invested, while a similar amount from non-causation has financed more than 100 projects [35].

26 of the ET. Considering, furthermore, that forest carbon management, within the framework of the non-taxation of carbon tax (Law 1819 of 2016 and Regulatory Decree 926 of 2017), requires an administrative scaffolding to the measure, on which there is no operational and administrative precedent, i.e., it is in the process of consolidation.

This new structure must be designed with the understanding that in rural areas, economic and social changes, certified in carbon units, are only possible to the extent that the forest represents a better quality of life or benefits and not a "blockage to land use" as was wrongly stated in some old regulations[5] or the negative vision of the forest originated by asymmetric pacts or scams. Therefore, it is strategic to understand in detail how carbon is created, which of these steps underlie the agreements between communities and intermediaries, and the steps that allow profitability to be generated through the development of projects.

In general terms, the creation of a verified mitigation result or ton of carbon has been documented in academic literature, UNFCCC decisions, methods of voluntary certification programs, methods that support agreements between countries, and rules at the country level. In Colombia, the quantification of GHG emissions and mitigation results requires the meshing of four elements from public, private, and international institutions: (I) the family of ISO 14064 and 14065 standards, (II) technical references in regulated and voluntary standards, (III) national standards with special attention to accounting standards formulated in Resolution 1447/2018, and (IV) the commercial viability of mitigation actions, always guaranteeing the principle of additionality and bringing direct benefits to mitigation implementers in the territory covered by symmetrical or "fair" covenants.

To describe, in detail, this system of verified carbon in Colombia, three subsystems are analyzed,which show the causality between the ethical referents of climate change, the norms that are created to achieve them and the institutions that implement them. Subsequently, the current state of the laws, decrees and resolutions that constitute the Colombian framework for climate[6] action is detailed [37]. In the international references, the main methods that have provided for reductions subject to transactions are analyzed, such as: the Clean Development Mechanism, other international voluntary standards, and national methodological references; to this is added the analysis of market behavior and the current and potential role of communities to achieve a comprehensive study and identify opportunities for innovation to be developed by actors interested in improving Colombian carbon transactions.

Carbon enabled for "non-revenue" arises in mitigation projects, mainly rural, seeking to be included in national accounting in order to comply with international agreements. For that purpose, it must comply with MRV rules, consolidated in Resolution 1447/2018, which requires verification by an accredited body to assess compliance according to IAF rules with the capacity to execute ISO 14064 standards. Once this chain is achieved, which assigns credibility to the actions on the ground, a verified and certified mitigation result is obtained, or not, constituted in a tradable intangible, which for the fiscal year 2019, the DIAN reported transactions for COP$ 220,000 billion pesos during 2019 in carbon transactions.

Given the social, political-normative and economic interplay of "non-causation" from the transactional use of carbon, different and harmonious rules are required. Such harmony implies analysing three subsystems of climate change mitigation (sources, rules and forms[6]) with regard to the creation of verified carbon, as they allow the totality of processes and actors to be encompassed, as well as a clear understanding of the relationships involved and the rules that influence carbon certification.

4.1. Origin of the Rules

The sources, i.e. the theoretical, ethical and practical referents [38] refer to the findingsof academic and policy think tanks. The main source that determines the urgency of mitigation actions is the IPCC's post-normal scientific information[7] IPCC [40]. Zalles [41] and IPCC [40] consisting of 4 working groups: I) Physical Basis, II) Impact, Adaptation and Vulnerability, III) Climate Change Mitigation and IV) National Greenhouse Gas Inventories. Ofthese groups, the Inventories group (III - IV) has generated (more detailed) procedures for the evaluation process of mitigation actions, emissions reports and mitigation results at country level,this evaluation process is consolidated in the good practice guidelines (Law 1844 of 2017; Law 1931 of 2018; Strategy 2050 and Decision 13/COP.20).

For their part, the States, in accordance with their own scientific processes, are a source of regulations that align with international ethical references, although there is a tendency towards modification insofar as the information has applicability at the local level, influenced by profound problems of territorial governance, with specificity in the Colombian case. This is why the generation of forestry information in Colombia, the rate of deforestation, and early warnings such as the statistics decentralized by the Regional Autonomous Corporations (e.g., volumes of wood harvested) do not manage to establish fluid communication in rural areas towards the strengthening of a forestry culture. The evidence of this approach is that the capacity to generate information on forests does not correspond with their sustainable use. However, the process of consolidation of the Colombian MRV system has demonstrated advantages in its operational capacity, especially through the generation of information from the Forest and Carbon Monitoring System incorporated as a tool for monitoring in the National Development Plans 2014 - 2018 and 2018 - 2022, as well as in the Climate Change Law (1931/2018), suggesting that the centralized production of information in Colombia plays a fundamental role for the

[6] See Article 29 of Law 135 of 1961.

[7] These three levels homologise Luhmann's functional systemic theory where the world society is composed of closed functional subsystems, each organised around a distinct social function with the capacity to generate its own rules (operational closure). Each system observes society on the basis of its own function and differentiates itself through specialised codes - binary distinctions, which do not allow external interference in the execution of its function. According to this theory, the main functional systems are: the political system, the economic system, the science system, the education system, the legal system, families, religion, the health system, the art system. In the case of the international climate change regime, the analysis of the scientific (sources), political-normative and economic-operational (forms) subsystems are the most relevant. See [39].

forestry sector and becomes the main reference for measuring the effectiveness of the sustainable use (or not) of the forest.

In the field of voluntary regulation of private organizations with respect to climate change, ISO is a benchmark for application and practical implementation, recognizing the need for an effective and progressive response based on knowledge, producing documents that support the transformation of scientific knowledge into tools for tackling climate change, creating rules on the operability of mitigation and adaptation actions at the organizational level through technical committees for the development of International Standards.

As a source *per se*, communities are ambivalent; on the one hand, the loss of their forest culture isevidenced by a deforestation rate of 200,000 hectares per year and 50% illegal logging [42] however, remnants of this forest culture, especially among indigenous and Afro peoples, are the answer to the positioning of an economy based on this culture. This approach structured the construction of the first two lines of the Integrated Strategy for the Control of Deforestation (Line 1: Socio-cultural management of forests and Line 2: Development of a forest economy) andpartially oriented the subsequent ones. On the other hand, Minambiente is currently in the transition from the strategy document to the construction of a policy, but it is expected that the roleof communities in climate change mitigation through sustainable forest management will be maintained.

In the subsystem of rules, i.e., regulations, the verification of mitigation results in the forestry sector has two expressions that are made harmonious in Resolution 1447/2018 and which in turnare consonant with their sources. Firstly, we have the rules that are generated by the negotiationof countries in the UNFCCC and result in decisions, technical guidelines to implement them, andnational regulations for their compliance (which include processes of participation of communities in their design). Secondly, we have the standards raised by private sector organizations through ISO documents.

Today, the set of rules obtained from the UNFCCC, which regulate the processes of generating verified results and the object of international transactions (payments for results), in the forestrycategory, is the Warsaw framework on REDD+[7] , which sets out the following activities: 1) reducing emissions from deforestation; 2) reducing emissions from degradation; 3) conservationof forest carbon stocks; 4) forest management; and 5) enhancement of forest carbon stocks, achieving emission reductions through sustainable forest management [43] in accordance with decisions: 4/CP.15, 1/CP.16, 2-12/CP.17, 29/CP.18, 9/CP.19, 13/CP.19 and 13-Annex/CP.19.

Taking into account the sources of norms, forestry projects have structured contracts between communities and intermediaries for the non-charging of carbon tax determined by[8] four levels of integration (Figure 1), including actors with greater relevance in each source and deriving technicalreferences that will be studied in detail below.

[8] Following the operation of the sources of international carbon demand, to date the only operational sources are those derived from the Varsivia Framework on REDD+, taking into account that the compliance period of the Clean Development Mechanism of the Kyoto Protocol, that to date the civil aviation programme (CORSIA) has not included forestry programmes that can be operated in Colombia and that the regulation of articles 5 and 6 of the Paris Agreement has not come into operation.

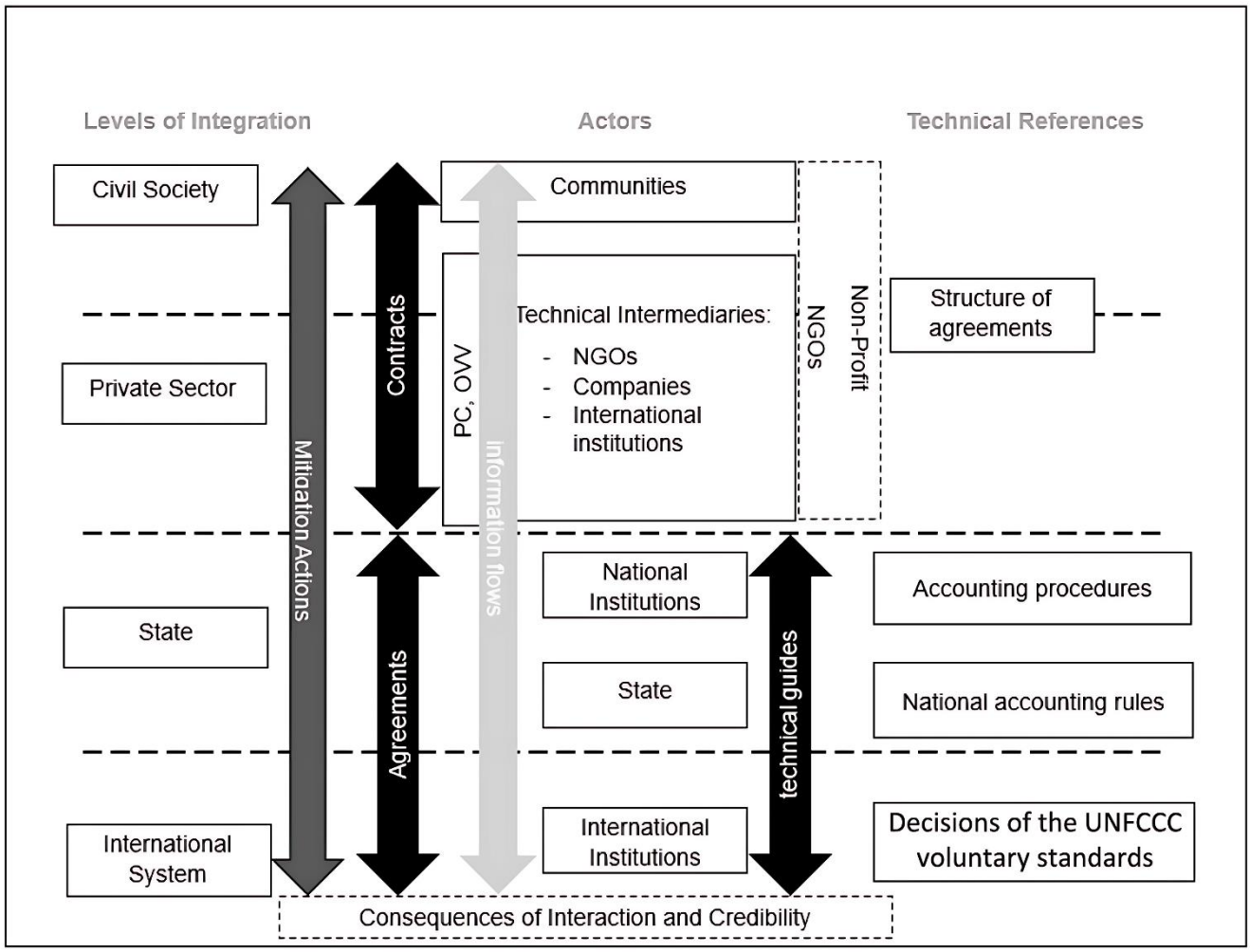

Figure 1.
Theoretical references necessary for the formulation of Technical Guidelines to supportcrediting processes of CO2 reductions/removals from mitigation actions.
Source: Pérez [44].

4.2. Technical References Involved in the Carbon Crediting Process

However, the only "functional" mechanism for international transactions in the forestry sector is the Warsaw Framework, at the project level for non-taxation. IPCC technical guidelines and CDM methods are considered as technical references to quantify the potential for avoided emissions or removals. These monitoring rules are executed by the technical intermediaries to consolidate a project document that, in turn, accounts for the activities developed by the communities, verifiable according to the requirements of ISO 14064 -2/3, 14065, and the specific methods of the certification programs. For their part, some NGOs, with technical capacity (given their volume of operations), have begun to develop a role of direct technical advice to the communities and without commercial aims in order to achieve symmetrical agreements with the intermediaries.

The Warsaw Framework on REDD+ has as an instrument the design and operation of the results-based payment scheme, which are agreements between states to transfer resources based on emission reductions from REDD+ activities, for which they establish requirements for countries that choose to implement this mechanism, with which to measure their results (mandate to establish a monitoring system and reference levels of forest emissions); a set of intervention actions (Action Plan) is established; and no exogenous damage is generated, both in social terms and in terms of other components of the environment (safeguards).

From these requirements, the safeguards, determined at COP 16 in Cancun, through their national interpretation and the requirement in Article 45 of Resolution 1447/2018, are expected to provide tools to achieve symmetrical contracts between communities and intermediaries. The seven safeguards are detailed in the Colombian context in 1, in order to reduce potential risks, promote benefits, and ensure respect for the rights of ethnic and local communities. In order to address and respect the safeguards, there are tools that seek to facilitate their applicability in the different phases of an initiative, i.e., feasibility, formulation, implementation [45]. Of these scales, it is the local one that can provide guidelines on contracts between communities and intermediaries; however, when reviewing its guidelines (national interpretation), they do not provide concrete tools to improve the structure of agreements between communities.

Table 1.
National interpretation of safeguards at REDD+ project level.

Safeguard summary	**Summary of National Interpretation**	**operation at the Community-intermediary agreement level**
In accordance with international agreements	Policies and measures must be aligned with the agreements.	It is not decisive, as international agreementsdo not detail the operation at the project level.
B Transparency and access to information	Open, complete, clear and appropriate data and information	Includes embeddable procedures: - Map of actors
		- Identification and monitoring of governance bodies - Monitoring of project documents - Capacity building processes.
C Respecting the knowledge and rights of local communities	Follow national provisions regarding prior consultation and other laws on the projectthat affect communities.	Includes embeddable procedures: - Follow-up to the dialogue instances. - Follow-up on project documents. - Monitoring of activities in the collective territories. - Follow-up to benefit sharing.
D Full and Effective Stakeholder Participation	Ensuring full and effective participation	Includes embeddable procedures: - Participation plan. - Follow-up to the dialogue instances.
E Compatibility of measures, with the conservation of biological diversity	REDD+ initiatives should support the processes of conservation and enhancement of ecosystem services.	Includes embeddable procedures: - Project monitoring (verification reports) - Follow-up to community monitoring. - Follow-up of agreements (projects).
F Taking measures to address the risks of reversion	REDD+ initiatives support the consolidation of territorial and environmental management instruments.	Includes embeddable procedures: - Strengthening the TO instruments from the initiatives. - Monitoring of sectoral activities to prevent environmental degradation.
G Adopting measures to reduce the displacement of emissions	REDD+ initiatives incorporate measures to reduce the displacement of emissions, are monitored and controlled	Useful as a principle to implement at the project level, with operational but partial detail to implement in agreements. Includes embeddable procedures:
		- Monitoring the implementation of the projects. - Follow-up to community monitoring.

Source: Pérez [44].

The main challenge of the safeguards is that their verification mechanisms are instrumentalized, given that they are documents without a normative anchor; i.e., although they are a source for structuring carbon transactions, they do not end up establishing concrete and binding rules in the framework of contracts between intermediaries and communities.

The second expression of standards comes from private organizations that have created voluntary regulatory frameworks to organize their climate change processes for both adaptation and mitigation. This standardization is governed under the ISO standard; this standardization is governed under the ISO standard, which has had an impact on the regulatory processes for climate change in Colombia, through the appropriation of its procedures via Decree 926 of 2017, i.e., it establishes a mechanism to make effective the non-causation of the national carbon tax, thus ensuring an interaction between the UNFCCC standards and the organizational standards of ISO, with the application of ISO 14064-1, which details the principles and requirements for the design, development, management, and reporting of GHG inventories at the organizational level, as well as the requirements for determining GHG emission and removal limits, quantifying the organization's GHG emissions and removals, and identifying specific company activities or actions to improve GHG management.

In turn, ISO 14064-2 indicates the principles and requirements for determining baselines, and tracking, quantifying and reporting emissions at the project level. It focuses on GHG projects orproject-based activities specifically designed to reduce GHG emissions and/or increase GHG removals and provides a basis for GHG projects to be verified and

validated. The most recent conceptual changes in ISO 14064 - 2/2018 include the update of the concept of additionality andthe baseline scenario, as well as the removal of text related to the Kyoto mechanism.

ISO 14064-3 expresses the requirements for the verification of GHG declarations related to GHG inventories, GHG projects, and product carbon footprints. It describes the process for verification or validation, including verification or validation planning, evaluation procedures, and assessment of GHG declarations of organizations, projects, and products. The organizational structures that develop the conformity assessment processes or institutions involved in carbon crediting range from local organizational systems to the UNFCCC. This quality management system is based on stakeholder independence, i.e., to the extent that the Validation and Verification Bodies for project compliance with ISO 14064 standards have no interest in the approval of project proposals.

For its part, the UNFCCC ensures that States implement its provisions through ratified international conventions, as in the Colombian case; a State that, through a moderate monist approach, establishes institutional responsibilities through the MinAmbiente and the DNP, institutions that lead the implementation of climate change mitigation at the central level, articulated with the territorial entities (mayors, governors, and Autonomous Corporations), although it is the MinAmbiente that formulates the MRV rules at the project level. In addition, the UNFCCC relies on international organizations for the implementation of cooperation, providing consultants to support the public function where the main ones in the Colombian agenda on forest carbon (with main implementation in the Amazon) are FAO - UNEP - UNDP (UN-REDD+ program), the Forest Carbon Partnership Facility, the German cooperation agency, and the World Institute for Green Growth. These national and international institutions have determined the rules of operation of carbon tax market transactions. The absence of the inclusion of communities in formulating technical aspects of MRV is noteworthy.

Associated with the way in which the UNFCCC operates, agreements are signed between states and/or multi-donor funds that assign roles to public institutions that propose actions with the private sector for the implementation of financing achieved by payments for results in the reduction of emissions from REDD+ activities. These avoided emissions, without prejudice to the fact that the negotiation takes place between governments and state institutions of the countries, also require verification by an independent third party, generally groups of experts who reconstruct the calculations in search of their relevance. In this sense, the credibility or accreditation of those who verify the results is given by the choice of experts and the guarantee of independence.

So, states can trade forest carbon under the Warsaw Framework, but at the same time, private parties trade forest carbon for non-taxation. To harmonize this potential double counting, Resolution 1447/2018 created a set of institutional rules and responsibilities, as follows:

- The project owner: the communities, but in some cases, it is the intermediary. It isresponsible for reporting the information.
- The Validation and Verification Body: must ensure that the information reportedis true and complies with the provisions of R 1447/2018, ISO 14064-2 and the specific methods of the certification program.
- The certification program has two functions: the first is to formulate detailed methods with respect to the general guidelines of 14064-2 and 3. In the second instance, it keeps the accounts between project operators and taxpayers by issuing emission cancellation statements, a task for which it includes or is associated with a registry.
- The taxpayer of the tax, according to Decree 926/2017, is the one who pays the tax to the extent that he or she buys or uses fossil fuels (natural and liquefied gas, gasoline, paraffin - Jet Fuel, ACPM, and Fuel Oil) from a producer or importer; therefore, he or she is the claimant of the verified carbon coming from the projects.
- DIAN is responsible for the collection and administration of the tax (25% for adaptation, 5% PNN, and 70% for post-conflict actions, including 15% for reducing deforestation in the Amazon).

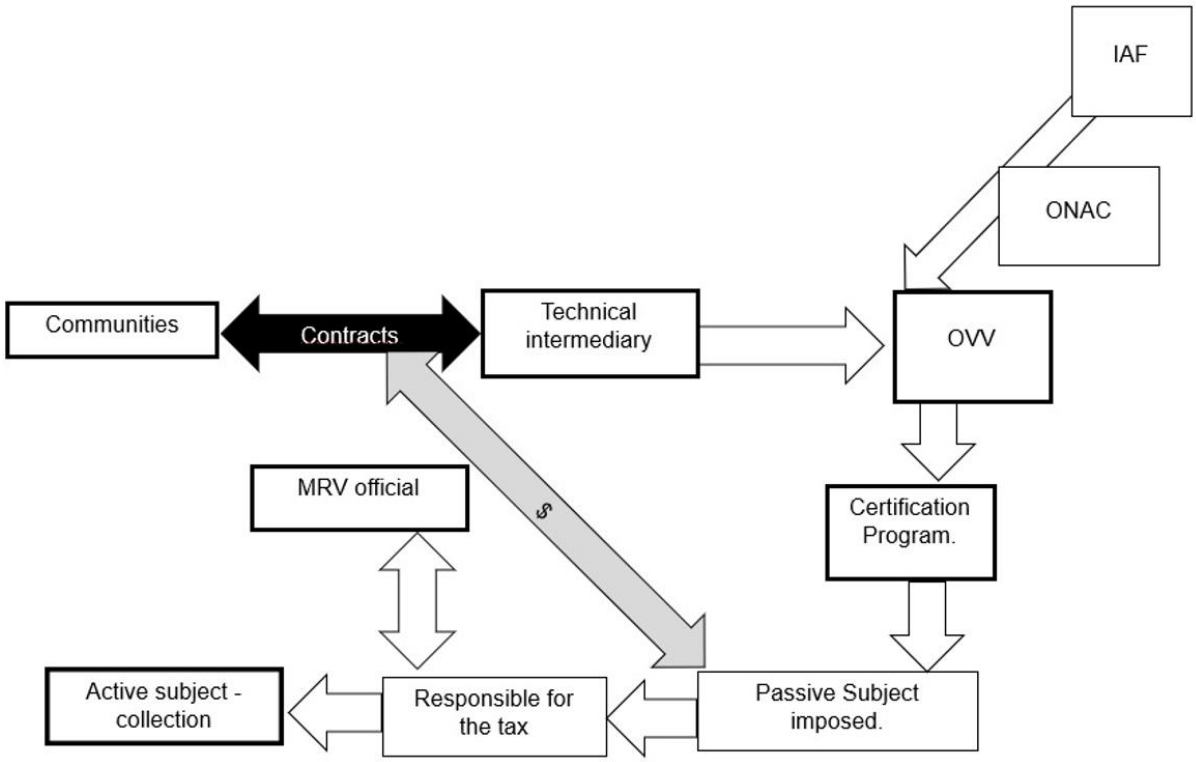

Figure 2.
Institutions involved in the generation of verified carbon.
Source: Pérez [44].

This system, its effectiveness, the improvement of forest management and its impact on social justice will only work if the theoretical behavior is implemented and the expected behavioral aspects are achieved, i.e. the principle of transparency, which allows easy access to information on the projects both in the repositories of the Conformity Validation Bodies and in the certification programs in such a way that any actor can reconstruct the validation and verification process and question it. The oversight of the Conformity Validation and Verification Bodies are independent bodies, with no interest in the approval of projects and with specific technical capacity for evaluation. Control, through auditing processes following ISO 14064 standards, characterized by being exhaustive and complete in the project formulation chain, as they include the evaluation of social safeguards, detailed documented field visits for the verification of project activities and an assessment of the quality of the units of results obtained; and certification programs that offer robust standards relevant to the Colombian context and aligned with the official accounting framework.

Compliance with these aspects is the responsibility of the VVOs, the DIAN, and the Ministry of Environment, by ensuring adherence to MRV regulations through monitoring the quality of the information entered into the National Registry.

Recently, forest carbon results have come under criticism. There have been reports of gaps in the monitoring of optimal compliance with agreed agreements, such as inflation of actual reduction figures or exaggerated increases in carbon credits. Carbon Market Watch has analyzed projects in the Colombian Amazon, and The Guardian newspaper, together with Unearthed, published an investigation in which they report that some REDD+ project proponents, in both cases, report that the real carbon reduction figures in forestry projects are inflated. Another case is reported in ProPublica by Lina Song and James Temple, who present the study conducted by CarbonPlan, which warns about California's forestry offset program. This program compares the carbon stored with the regional average; the difference is what awards carbon credits. The problem is that this comparison is made with considerably low regional averages, which increases the difference and, therefore, the credits awarded. A similar situation occurs when companies use tree species that absorb little carbon, but, because of their similarities, are passed off as the highest performing forests to credit carbon credits [46].

Considering the above, these situations greatly damage the credibility and viability of REDD+ projects, as they start as an alternative to reduce CO2 emissions and have the potential to become a highly profitable business based on phantom carbon credits. The need then arises to establish a neutral entity to oversee full compliance with the reduction agreements agreed upon; it is not enough to have a standard or technical guide drawn up. For example, Colombia established through Decree 926 of 2017 and Resolution 1447 of 2018 the guidelines that regulate the carbon tax and greenhouse gas mitigation actions through REDD+ projects. However, in this environment of lack of clarity and possible non-compliance by projects, in addition to establishing the ministry as a regulatory body, it is relevant to assign an area and procedure dedicated to ensuring compliance with the regulations regarding the establishment of baselines in projects.

4.3. The Colombian Carbon Market in Operation

Prior to the establishment of a permanent demand, carbon transactions in Colombia were marginal, due to

international dynamics [47]. Prior to 2017, transaction prices reachedpennies on the dollar and on the international voluntary market they were sold at an average of USD 3.4 per TCO2eq.[8] [47]. Meanwhile, a dynamic demand from the implementationof the Warsaw Framework on REDD+, to date accumulates transaction capacity of USD 4 billionunder mechanisms: Bilateral agreements with Norway, FCPF, GCF, BioCarbon Fund, VoluntaryStandards and REM[9].

It should be noted that access to international finance is mediated by national government accounting mechanisms; in the case of REDD+, through the formulation of Forest Reference Emission Levels. These levels, in their local reconstruction, tend to be more conservative than the baselines generated with voluntary market standards, which are generally based on modeling the threat of deforestation adjacent to the project. This creates a potential tension at the local level as intermediaries attempt to promote less conservative projection systems by including communities in this discussion.

In the national context, the formulation of projects has been boosted by the carbon tax of Law 1819/2016 and Decree 926/2017, which constitutes the "no causation" procedure, creating a carbon price benchmark with the value of the tax with an annual update of one point above the CPI until a Tax Value Unit (UVT) is achieved[10] (UVT), which, depending on the growth of the CPI can be achieved in approximately 30 years [47].

Transactions between intermediaries and taxpayers are at maximum values of 15,000 COP$ 15,000 (2020)[11], under these values the actors involved in non-basis transactions expect to reachthe ceiling of the tax (550 MMCOP$[12]).

It is expected that the behavior of the approach to communities for the formulation of mitigation projects will grow in line with the increase in demand for certified carbon, on which UPME statistics indicate a scenario of increased consumption of fossil fuels (between 2014 and 2017 it grew by 4% on average), which, added to the annual tax price adjustment rule (0.1 + CPI), will lead to an increasing demand for verified carbon as well as the possibility of access to international markets.

Non-causation created a stable demand that allows for the maintenance of the functioning of a transaction system while opening up new market opportunities, especially those structured by the UNFCCC, CORSIA, and IMO. Following the regulation derived from Resolution 1447/2018, strengthening its functionality creates a strategic path, as it is the only regulatory version worldwide that includes the interaction between the voluntary and the official. While the alignment with the official, required in chapter 2 of the resolution, tends to penalize the volumes of outcomes [30], this behavior leads to the need for more projectsthat in turn generate benefits more uniformly than the scenario of few projects with many reductions.

4.4. Communities in the Colombian Carbon Market

There is a problem of transparency as the information repositories do not allow the reconstruction of the results, as they are not available for all the projects. The project areas and the reference areas are not clearly differentiated, which is why the analysis was carried out on the structure of the non-causation system and the role of the communities in carbon certification. Following the information flows established by the systems of sources, rules, and forms, and analyzing the structure of the contracts between communities and intermediaries, as well as the knowledge of the experts consulted, the standard procedure for the implementation of a forestry project was established (Figure 3) and the functions that the community is carrying out in the current scenarioand in an ideal scenario resulting from a potential process of ownership of the projects (grey areas) were identified on this procedure.

[9] According to the State of the Voluntary Market Report 2019, available online at https://app.hubspot.com/documents/3298623/view/63001900?accessId=eb4b1a.

[10] A UVT established by the Development Plan 2018-2022 in order to standardise and homogenise the different tax values in Colombia creates a value that unifies the adjustment of taxation through the annual inflation data between the months of October to October issued by the DANE, to date is 35 thousand pesos. This means that, if the tax increases by the CPI plus one point and the tax ceiling is a UVT also based on the CPI, the time in which the tax will reach the ceiling can be summed up as the number of years in which growing by one point it reaches a growth of one UVT of today, i.e. approximately 30 years.

[11] Value estimated by interviewing market actors. It is unfeasible to report a benchmark because prices are established in the framework of contracts under private commercial law.

[12] Calculation based on the amount of fossil fuels per carbon price in the event of taxation.

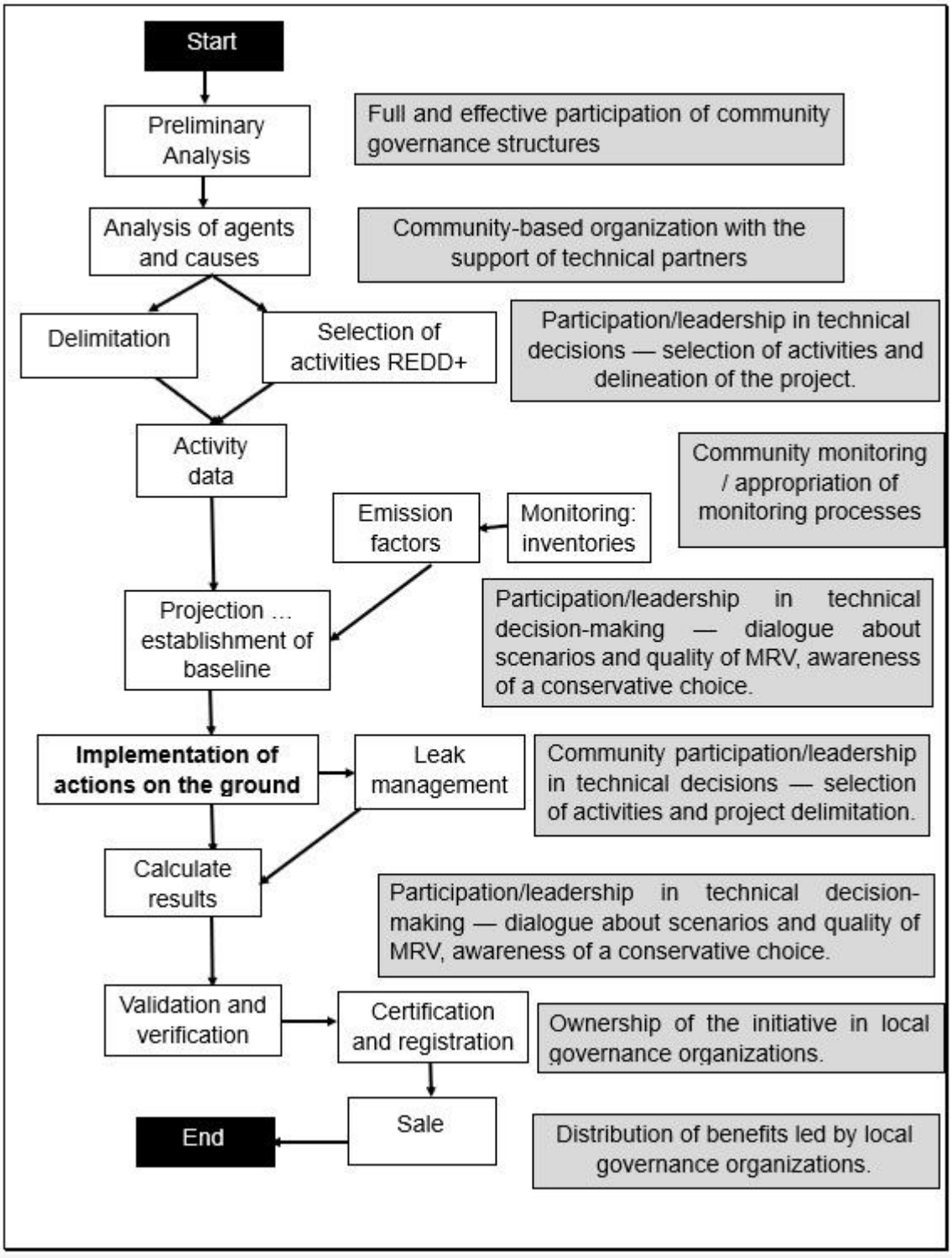

Figure 3.
Community roles in REDD+ project steps. In grey, improvements for communitymanagementof projects are specified.

The communities, being the executors of their cultural changes that result in the feasibility of certified carbon, are supplementary agents focused on certain project activities: participation, inventories, execution of territorial actions, and reparation of benefits. However, these are not all the tasks that can be fulfilled; indeed, communities should be the administrative support of the project with technical support elements. It is for this reason that in an ideal scenario, the communities would make all the decisions and implement all the steps except those of a more technical specificity.

5. Conclusions

This can be achieved by establishing a process of transparency in which everyone knows the profits that remain in each link and the responsibilities associated with profitability, as it has been possible to establish a disproportion in the

cost and tax burden of the projects financed, which does not provide development for the indigenous communities that operate the resources.

There is an urgent need to define financial models that allow projects to operate and establish fair contracts between intermediaries and communities. Forest carbon projects must ensure that their benefits are maximized in terms of social justice in the situations affected by the pandemic, through the appropriation of these benefits by community-based organizations. Guaranteeing the quality of the results through a robust interoperable MRV between private actors and government registries is an action that brings equity to populations with structural inequalities.

Given the situation of resource appropriation complexity, it is imperative to promote investments in the profitability of projects in the shared aspects of reducing climate vulnerability, GHG emission reductions, and pandemic risk. This implies the development of methodological guidelines for national implementation and interpretation of safeguards, ensuring positive impacts on contracts between communities and intermediaries. This would guarantee benefits in two ways: first, by updating detailed methodologies regarding certification programs that include rules and standards that account for equitable and asymmetric contracts between contractual actors; second, by strengthening the capacities of OVV to be able to effectively control and monitor quality verification processes.

In the same sense, the research process warns of the need to strengthen the capacities of the national environment and interior portfolios in order to guarantee adequate registration, reporting, and monitoring of safeguards, as well as the establishment of normative standards to regulate safeguards. This implies benefiting and strengthening communities in the management of capacities on carbon tax and non-taxation mechanisms. The strengthening of these capacities would require an adequate analysis of the costs of forest mitigation activities, tax costs, and tax planning, for an adequate application of the tax benefit, as there is legal uncertainty in the realization of resources and in the contractual links between actors in the system *per se*, for the active subject and a structural risk for the active subject, in terms of the effects on the short, medium, and long-term fiscal frameworks. Addressing these conditions implies developing dialogues with taxpayers and formulating agendas with certification programs to design robust and contextually relevant Colombian standards that develop social safeguards frameworks (including rules on fair deals) and also rules on alignment with the official accounting framework.

In summary, it is essential that the monitoring system, in compliance with the principle of transparency, operates and guarantees easy access to information on projects both in the repositories of the Conformity Validation Bodies and in the certification programs, so that any actor can reconstruct the validation and verification process and question it. Evidence on the quality of the Conformity Validation and Verification Bodies' processes includes evidence of audit processes, with special assessment of compliance with social safeguards.

References

[1] L. González, *Sustainability and common goods. Economists without Borders*. Madrid, Spain: Ecosfron, 2015.

[2] F. A. Llorens, "Climate crisis and territorial development: In search of alternatives to unregulated neoliberal capitalism," *TERRA: Revista de Desarrollo Local,* vol. 6, pp. 254-270, 2020.

[3] R. Hernández, C. Fernández, and P. Baptista, *Research methodology*, 5th ed. Mexico D.F: McGraw-Hill Interamericana, 2010.

[4] A. Hassanin, P. Grandcolas, and G. Veron, "Covid-19: natural or anthropic origin?," *Mammalia,* vol. 85, no. 1, pp. 1-7, 2021. https://doi.org/10.1515/mammalia-2020-0044

[5] IPCC, "Climate change 2014: Synthesis report," Contribution of Working Groups I, II and III to the Fifth Assessment Report of the. Geneva, Switzerland: [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.), 2014.

[6] D. Di Nella and V. Ibáñez, "Causes and consequences of pandemic COVID-19: From the immobility of humanity to the deconcentrated movement of people," *Revista Derechos en Acción,* pp. 415-485, 2021. https://doi.org/10.24215/25251678e407

[7] A. Y. Chang, D. O. Fuller, O. Carrasquillo, and J. C. Beier, "Social justice, climate change, and dengue," *Health and Human Rights,* vol. 16, no. 1, pp. 93-104, 2014.

[8] L. Mason and J. Rigg, *People and climate change: vulnerability, adaptation and social justice*. Oxford: Oxford University Press, 2019.

[9] J. Hardoy and P. R. Lankao, "Latin American cities and climate change: Challenges and options to mitigation and adaptation responses," *Current Opinion in Environmental Sustainability,* vol. 3, no. 3, pp. 158-163, 2011.

[10] W. E. Baethgen, "Vulnerability of the agricultural sector of Latin America to climate change," *Climate Research,* vol. 9, no. 1-2, pp. 1-7, 1997.

[11] G. J. Nagy *et al.*, "Climate vulnerability, impacts and adaptation in Central and South America coastal areas," *Regional Studies in Marine Science,* vol. 29, p. 100683, 2019. https://doi.org/10.1016/j.rsma.2019.100683

[12] M. Pinilla, A. Ramírez Varela, and C. González, *The poor, the most affected by the pandemic*. Bogotá: UNIANDES, 2020.

[13] S. Haslanger, "Racism, ideology, and social movements," *Res Philosophica,* pp. 1-22, 2017. https://doi.org/10.11612/resphil.1547

[14] C. Clayton, "The changing face of racism in America," Retrieved: https://digitalcommons.winthrop.edu/source/SOURCE_2020/allpresentationsandperformances/195, 2020.

[15] C. Serrano, *Coronavirus in the US: The devastating impact of covid-19 among African Americans*. USA: BBC News, 2020.

[16] US Department of Health and Human Services, *Data 2010: the healthy people 2010 database*. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics, 2010.

[17] T. Chin *et al.*, "US county-level characteristics to inform equitable COVID-19 response," *MedRxiv,* 2020. https://doi.org/10.1101/2020.04.08.20058248

[18] S. G. Litewka and E. Heitman, "Latin American healthcare systems in times of pandemic," *Developing world bioethics,* vol. 20, no. 2, pp. 69-73, 2020. https://doi.org/10.1111/dewb.12262

[19] D. Delgado *et al.*, "Personal safety during the COVID-19 pandemic: Realities and perspectives of healthcare workers in Latin America," *International Journal of Environmental Research and Public Health*, vol. 17, no. 8, p. 2798, 2020. https://doi.org/10.3390/f10030272
[20] A. Sumner, C. Hoy, and E. Ortiz-Juarez, "Estimates of the impact of COVID-19 on global poverty," WIDER Working Paper, No. 43, 2020.
[21] A. Castro-Nunez, O. Mertz, A. Buritica, C. C. Sosa, and S. T. Lee, "Land related grievances shape tropical forest-cover in areas affected by armed-conflict," *Applied Geography*, vol. 85, pp. 39-50, 2017. https://doi.org/10.1016/j.apgeog.2017.05.007
[22] C. Le Quéré *et al.*, "Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement," *Nature Climate Change*, vol. 10, no. 7, pp. 647-653, 2020. https://doi.org/10.1038/s41558-020-0797-x
[23] F. J. Murillo Torrecilla and R. Hernández Castilla, "Towards a concept of social justice," *Iberoamerican Journal on Quality, Effectiveness and Change in Education*, vol. 9, no. 4, pp. 7-23, 2011.
[24] V. Saynes Santillán, J. D. Etchevers Barra, F. Paz Pellat, and L. O. Alvarado Cárdenas, "Greenhouse gas emissions in agricultural systems in Mexico," *Terra Latinoamericana*, vol. 34, no. 1, pp. 83-96, 2016.
[25] G. Kindermann *et al.*, "Global cost estimates of reducing carbon emissions through avoided deforestation," *Proceedings of the National Academy of Sciences*, vol. 105, no. 30, pp. 10302-10307, 2008.
[26] F. Flues and K. Van Dender, *Carbon pricing design: Effectiveness, efficiency and feasibility: An investment perspective* (no. 48). OECD Publications. https://doi.org/10.1787/91ad6a1e, 2020.
[27] G. Romero, A. Álvarez-Espinosa, S. Calderón, and A. Ordóñez, "Impactos distributivos de un impuesto al carbono en Colombia: vínculo entre modelos de microsimulaciones y equilibrio general," *Lecturas de Economía*, no. 89, pp. 163-198, 2018.
[28] The World Bank, *Date overview of carbon pricing*. USA: The World Bank, 2020.
[29] J. E. Alatorre, K. Caballero, J. Ferrer, and L. M. Galindo, *The social cost of carbon: An aggregate view from Latin America*. New York: ECLAC, 2019.
[30] Ministry of the Environment (MinAmbiente), *Report on greenhouse gas emissions trajectories and reduction targets for 2030*. Brasília: Ministry of the Environment, 2017.
[31] F. López Loffsner, *Deforestation, environmental justice and post-agreement in Northwestern Guaviare*. Bogotá: Universidad Nacional de Colombi, 2018.
[32] Ministry of Foreign Affairs of Colombia, "Ministry of Foreign Affairs of Colombia," Retrieved: https://www.cancilleria.gov.co/newsroom/news/fondo-verde-clima-aprobo-28-millones-dolares-colombia-su-lucha-deforestacion-amazonia, 2021.
[33] B. W. Griscom *et al.*, "Natural climate solutions," *Proceedings of the National Academy of Sciences*, vol. 114, no. 44, pp. 11645-11650, 2017. https://doi.org/10.1073/pnas.1710465114
[34] Congress of the Republic of Colombia, *Debate of political control on the carbon tax*. Bogotá: Congress of the Republic of Colombia, 2021.
[35] C. E. Aristizábal Alzate and J. L. González Manosalva, "Carbon taxation in Colombia: A tax mechanism against climate Change," *Semestre Económico*, vol. 22, no. 52, pp. 179-202, 2019. https://doi.org/10.22395/seec.v22n52a8
[36] DIAN, *Concept 13505 of 31 May 2017*. Bogotá: National Tax and Customs Directorate, 2017.
[37] Ministry of Environment and Sustainable Development, *Documento nacional del sistema de monitoreo reporte y verificación MRV para Colombia*. Bogotá: Ministry of Environment and Sustainable Development, 2017.
[38] B. Feltz, *Philosophy and ethics of climate change. UNESCO Courier: One World, Multiple Voices*. Paris, France: UNESCO, 2019.
[39] N. Luhmann, *Theories of distinction: Redescribing the descriptive models of the social world*. Stanford, CA: Stanford University Press, 2013.
[40] IPCC, *Special report on the impacts of global warming of 1.5°C above pre-industrial levels and Related global greenhouse gas emission pathways, in the context of strengthening the global Response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. Geneva, Switzerland: Intergovernmental Panel on Climate Change (IPCC), 2020.
[41] J. I. Zalles, "Local ecological knowledge and biological conservation: Post-normal science as a field of interculturality," *Íconos. Revista de Ciencias Sociales*, no. 59, pp. 205-224, 2017. https://dx.doi.org/10.17141/iconos.59.2017.2587
[42] L. M. Silva, "Deforestation and illegal logging: A study of the amazonian forests and impacts on indigenous cultures," *Journal of Environmental Management*, vol. 23, no. 4, pp. 453–467, 2011. 453–467
[43] A. Angelsen and T. K. Rudel, "Designing for REDD+ success: A guide to the science of sustainable forest management and carbon offsetting," *Forests*, vol. 4, no. 4, pp. 533-556, 2013. https://doi.org/10.3390/f4040533
[44] M. C. Pérez, *Why AVERAGE? Credibility in the results-based payments of the Warsaw Framework on REDD*. Bogotá: Universidad Externado de Colombia, 2020.
[45] A. Camacho, I. Lara, and R. D. Guerrero, "Ensuring respect for the rights of ethnic and local communities in environmental and development projects: Tools and safeguards for their effective implementation," *Environmental Development and Sustainability*, vol. 19, no. 4, pp. 1225-1244, 2017. https://doi.org/10.1007/s10668-017-9924-1
[46] S. Song and A. Temple, "Carbon credits and the challenges of forest management: A critique of current methodologies and the risk of inflated credit values," *Journal of Environmental Economics and Policy*, vol. 13, no. 2, pp. 175-188 2021. https://doi.org/10.1080/21606544.2021.1880224
[47] ANDI, "Analysis of the proposal to modify the carbon tax," *Chamber of Large Energy and Gas Consumers*, vol. 1, pp. 1-10, 2019.

Acronyms

AFOLUAgriculture , Forestry and other Land UsesAR IPCC Assessment Report
ART REDD+ Transaction Architecture
BAU Trend Scenario
DNP National Planning Department
FAO Food and Agriculture Organisation of the UN
UNFCCCUnited Nations Framework Convention on Climate Change
CORSIAProgrammes of Mitigation for Civil Aviation
COPConference of the Parties to the United Nations Framework Convention on ClimateChange
GHG Greenhouse Gas
IAF International Accreditation Forum
ISO International Organisation for Standardisation
ICONTECColombian Institute of Technical Standards and Certification IPCC Intergovernmental Panel on Climate Change
CDM Clean Development Mechanism NDC Nationally Determined Contribution
IAS International Financial Reporting Standard NREF Forest Reference Emission Level
SDG Sustainable Development Goal
SAP Sectoral Action Plan on Climate Change TO Spatial Planning
REDD+ Reducing Emissions from Deforestation and Forest Degradation UPME Mining and Energy Planning Unit
VCS Verified Carbon Standard