

Article

Partnering on Forests and Climate with Indigenous Peoples and Local Communities: Improving Success Indicators with Insights from a Conservation Incentive Program in Perú

Lauren T. Cooper ^{1,*} , Rowenn B. Kalman ², Cristina Miranda-Beas ³ , Deborah Delgado Pugley ⁴ ,
Ciro Alexander Castro Pacheco ⁴ , Patricio Zanabria Vizcarra ⁵, Anne M. Larson ⁶ and David W. MacFarlane ¹ 

¹ Department of Forestry, Michigan State University, East Lansing, MI 48824, USA; macfar24@msu.edu

² Department of Anthropology, Michigan State University, East Lansing, MI 48824, USA; kalmannr1@msu.edu

³ School of Government and Public Policy, Pontifical Catholic University of Peru, San Miguel 15088, Peru; c.mirandab@pucp.pe

⁴ Department of Social Sciences, Pontifical Catholic University of Peru, San Miguel 15088, Peru; deborah.delgado@pucp.pe (D.D.P.)

⁵ Asociación Servicios Ecosistémicos Perú, Cusco 08002, Peru

⁶ Center for International Forestry Research-World Agroforestry (CIFOR-ICRAF), Bogor 16115, Indonesia; a.larson@cifor-icraf.org

* Correspondence: ltcooper@msu.edu

Abstract

Despite substantial investments to curb tropical deforestation, effective conservation incentives for Indigenous peoples and local communities is not well-defined and generally under-researched. This study assessed an incentive mechanism in Peru for Indigenous communities that protect enrolled forests to explore whether the stated program goals are actualized in programmatic elements like the requirements, monitoring, and assessment of prioritized outcomes. The research team worked with Indigenous partners to develop key questions regarding how the mechanism could better support their values of conservation and development. Data were sourced from interviews with implementation experts and participants in eight Indigenous communities, a review of programmatic documents, and an assessment of nationally aggregated community data. The results revealed challenges in program capacity, a lack of cultural awareness, and a reliance on capitalistic economic indicators that exclude other aspects of well-being important for Indigenous peoples. We find that the program's success indicators do not adequately align with conservation or social realities on the ground and that enhanced indicators are needed to ensure success and avoid negative unintended consequences. We demonstrate that enhancing the assessment of governance, economics, engagement, and social inclusion can improve the design, implementation, and monitoring in this and similar programming. We conclude with generalizable recommendations for establishing requirements and monitoring in existing and future conservation incentive programs that target Indigenous communities.

Keywords: climate change; forests; livelihoods; conservation incentives; indicators; indigenous



Academic Editor: Jim Lynch

Received: 28 February 2025

Revised: 3 June 2025

Accepted: 9 June 2025

Published: 8 August 2025

Citation: Cooper, L.T.; Kalman, R.B.; Miranda-Beas, C.; Delgado Pugley, D.; Castro Pacheco, C.A.; Zanabria Vizcarra, P.; Larson, A.M.; MacFarlane, D.W. Partnering on Forests and Climate with Indigenous Peoples and Local Communities: Improving Success Indicators with Insights from a Conservation Incentive Program in Perú. *Sustainability* **2025**, *17*, 7176. <https://doi.org/10.3390/su17167176>

Copyright: © 2025 by the authors.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Forests cover approximately 31% of global land area and are vital for maintaining ecological balance, playing a critical role in climate and water regulation as well habitat provisioning for most global terrestrial biodiversity [1,2]. However, deforestation—driven by agriculture, logging, and infrastructure expansion—poses a significant threat, with an

estimated 10 million hectares of forest lost each year [1]. The current state of knowledge of forest conservation points to a growing understanding of the deep interconnections among forest ecosystems, livelihoods, and climate regulation, resulting in a need to address deforestation trends through a combination of forest management, sustainable development, and anti-poverty strategies. This is especially true when engaging those that live near, in, or are otherwise dependent on forests.

The Amazon rainforest spans over 5.5 million square kilometers across nine South American countries and is the largest tropical forest in the world. It harbors unparalleled biodiversity and provides critical ecosystem services like carbon storage, climate regulation, and freshwater cycling, supporting both regional and global environmental stability [3]. Despite its importance, the Amazon is under severe pressure from deforestation, primarily driven by agricultural expansion, illegal logging, and mining activities which threaten the forest's ecological integrity and risks pushing the ecosystem toward a tipping point, beyond which it may shift to a degraded savanna-like state [4–6].

The recent International Panel on Climate Change (IPCC) Special Report on Land highlights the need to halt forest conversion to protect our climate and biodiversity [7]. In turn, global climate negotiations prominently feature addressing deforestation and forest degradation as one of the most important nature-based solutions to reduce greenhouse gases [8]. Importantly, forest-dwelling Indigenous peoples and local communities (IPs and LCs) make decisions for over 36% of forests globally [9–11]. However, despite an estimated USD 12 billion pledged by governments to address tropical deforestation in the last major UNFCCC agreement on forests, only a fraction of those investments is reaching these rural decision-makers [12–14]. As such, improving the engagement of Indigenous communities is a central strategy to pursue both conservation and human development outcomes [14]. What is unclear is how this engagement, which can result in self-identified benefits for IPs and LCs, can be assessed and if existing indicators are capturing successes and challenges [15]. This paper identifies paths to improve such climate mitigation partnerships with IPs and LCs through a study of forest conservation incentive programming implementation, participation, and monitoring.

Governments are increasingly turning to incentive programs to encourage forest conservation behaviors among IPs and LCs [16–18]. Such “conservation incentives” refer to benefits provided to actors for their role supporting a range of activities that advance ecological goals. The nature of those benefits can take multiple forms, including payments for ecosystem services (PES) [19,20], results-based payments [21], and other agreements to conserve (e.g., easements) [22]. Many of these programs use conditional direct transfers (CDTs) or conditional cash transfers, meaning that the incentive is contingent on an activity or an outcome [23,24]. Such programs tend to be measurement-oriented, often for water or carbon, although other ecosystem services are possible. However, measurement-intensive approaches have been critiqued as a type of colonialism which reduces complex ecosystems to data points, requiring high levels of scientific expertise [25,26]. Other scholars critique PES on the basis that the incalculable value of nature cannot be wedged into commodities and Western economic structures [27–29]. Scholarly dialogue has explored how neoliberal PES policies attempt to present “capitalism as both the problem and the solution to the ecological crisis” [30] (p. 244) and that the continued advancement of capitalistic neoliberalism via PES can only be slowed by valuing people and ecological knowledges in the places they are situated [31].

Results-based payments are distinctive because they do not typically calculate ecosystem services but instead pay for specific outcomes (e.g., hectares of forest protected) [32,33]. How payments translate into benefits for agents of conservation is highly variable, poorly understood, and difficult to assess [34]. “Benefit sharing” refers to the intentional distribu-

tion of such benefits to stakeholders in response to their active participation or contribution to predetermined objectives of a program or project [35]. Benefit type and distribution affect outcomes in terms of behavior and buy-in [36,37], and the appropriateness of incentives by type and level have been assessed in terms of motivation [38], planning [39], activities [40,41], monitoring [42], and distribution [43]. Programs can directly or indirectly contribute benefits such as financial, biophysical and ecological, cultural, social capital, governance and rights (including land rights), intellectual property, transparency and security, and livelihoods [44–46]. Best practices for incentive distribution are generally under-researched, particularly in relation to social factors, in communal contexts [47,48] and variations in the benefit types provided to rural decision-makers [49,50].

We studied a conditional direct transfer mechanism targeting Indigenous communities in Peru, exploring the challenges and benefits of such programs in terms of Indigenous perspectives on conservation and well-being. In doing so, we tested a framework for systematically assessing and identifying needed improvements to conservation incentive programs with Indigenous peoples as partners.

The case of Peru reflects the global forest trends mentioned above and thus provides a relevant case study for our inquiry. With the second largest share of the Amazon, immense cultural diversity, and one of the largest national incentive programs in Latin America, Peru is an ideal context for investigating incentive impacts on IPs and LCs. Efforts to protect the Peruvian Amazon provide both local and global environmental services, protect biodiversity, and are globally valuable as climate mitigation strategies [51]. The country is striving to tackle the source of the problem by using incentives to shape behavior and decision-making to stop deforestation now and into the future. In short, by addressing both rural poverty and high rates of forest loss, Peru is leading experimental efforts to deploy incentives to slow deforestation and directly distribute benefits to rural decision-makers. Further, Peru has nearly two decades of intensive forest monitoring technical capacity building [52]. Basing our inquiry in Peru enabled us to study well-established incentive dynamics across a wide range of cultural and institutional actors to ensure a broad applicability of our findings.

Forests are central to Peru's public policies such as its Nationally Determined Contribution to the Paris Agreement [53] and National Climate Change Strategy [54]. As part of their target to conserve 54 million of the 68 million hectares of tropical forest, the Peruvian Ministry of the Environment (MINAM) National Program for the Conservation of Forests for Climate Change Mitigation (PNCB, in Spanish) uses a conditional direct transfer mechanism (TDC, in Spanish) to promote conservation in forest communities. The TDC mechanism is a payment-for-results program that offers a per-hectare payment for standing forests. While the TDC mechanism is not linked to carbon measurements, it contributes to the country's NDCs via forest landscape conservation.

MINAM has offered the TDC incentives in areas with a medium- to high-risk of deforestation to titled Native Communities (CNs, in Spanish). TDC-recipient communities must identify an area of their forest to conserve, receiving a payment of 10 soles (USD ~2.82 as of early 2025) per year per hectare. Economic studies have debated the adequacy of this level of payment, pointing to the high lost opportunity cost of conservation, both at the regional level [55] and specific to the program [56]. Communities sign 5-year agreements with the PNCB, with commitments on both sides: participants must stop deforestation, while the PNCB must make the promised payments. To receive incentives, participating communities must complete a financial planning process to allocate funds in priority areas, resulting in an Incentive Management Plan (PGI, in Spanish) with required community, business development, and forest monitoring activities (e.g., quarterly perimeter monitoring or "forest patrols" and responding to satellite-derived deforestation alerts). The

PNCB requires formal communication from CNs in the form of official letters, the PGI, quarterly reports, and written responses to satellite alerts of forest disturbance. For the business development activities, the TDC mechanism provides funds to develop “sustainable” economic activities that can in theory be pursued while protecting forests. There are five options: ecotourism, agroforestry, sustainable forestry, fish farming, and artisanal activities. While communities choose activities, they are limited by PNCB requirements and the overall top-down structure.

Between the years 2011 to 2020, the mechanism engaged communities overseeing ~2.9 million hectares, signing agreements with 274 communities (see Figure 1). The government calculated a resulting 30.2% decrease in the projected deforestation rate in these areas [57]. However, deforestation remains a grave issue, and the results fall significantly short of Peru’s goals. Further, communities struggling to perform and remain in compliance with the requirements become ‘suspended’, resulting in complications and disruptions for both sides. While previous studies of TDC recipients have focused on deforestation rates or high-performing communities, additional analysis that includes institutional arrangements and human dimensions could shed light on this high rate of discontinuity [58,59].

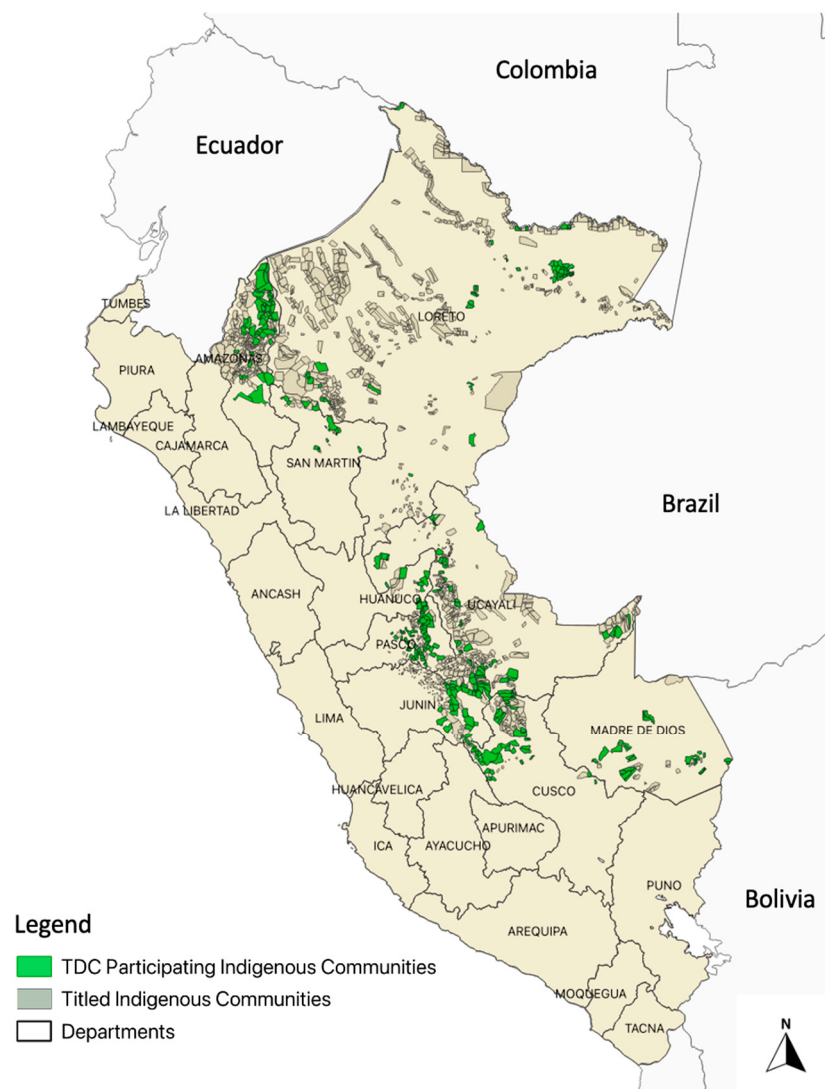


Figure 1. Map of all titled Indigenous communities in Peru with identified communities participating in TDCs as of 2020.

For the PNCB, the primary measure of success for the first ten years is the amount of deforestation avoided compared with projected trend scenarios. The PNCB must also demonstrate that TDC-funded activities meet criteria for viability and high return on investments, since the program finances economic activities and was approved by the Ministry of Economy and Finance (MEF). The MEF proposed from the onset that TDC investments be tracked to ensure that any income produced in communities during the 5-year term exceeds the original incentive amount. This created metrics established on Western economic models, including the investment type, expected financial returns, market value of commodities produced, and costs and value of labor. Combined with satellite-derived deforestation tracking, these measures of success focus almost exclusively on outcomes of deforestation prevention and economic viability, with little emphasis on social or cultural impacts in the near or long-term. Absent from these metrics were measurements of existing relationships to forests, traditional ecological knowledges, and preferred livelihood activities not related to external markets.

To define the scope of possible social impacts missing from the measures described above, we reviewed the literature on community-based forest management and conservation incentives, identifying four thematic categories: governance, economics, engagement, and social inclusion. Below, we present a brief introduction to each category, the main gaps in these studies, and their relevance to the TDC context.

Governance. Conservation incentives are a strategy of environmental governance [60,61] involving multiple levels of nested and scaled actions from national to communal [62]. At the community level, governance encompasses local institutions (including historic and ancestral ones) such as community assemblies, statutes, and the formal and informal rules they sustain. At the inter-institutional scale, governance entails regulatory processes and mechanisms across multiple organizations such as communities, businesses, and NGOs [63]. Across all levels, governance implies power relationships [64]. In Indigenous communal settings, incentive payments risk introducing new power dynamics and corruption, shifting from communal to self-interest, and distributing unequal benefits [65,66]. Gaps in this literature point to the need for a better understanding of how conservation incentives interact with existing community governing and administration structures, for example, local land zoning, planning, and leadership dynamics, and especially how community members themselves perceive these changes as desirable or problematic. In dialogue with Indigenous leaders, we formulated questions to address these issues as well as how TDC activities engage other institutional actors, and with what effects [67].

Economics. The economic dynamics of conservation incentives extend beyond direct payments and can include in-kind benefits (e.g., educational resources) and indirect benefits (e.g., security, property rights). Further, these dynamics can shift livelihoods and consumer patterns, bringing in questions of compatibility between economic development models and conservation objectives [68–70]. In the case of CDTs, payments are based on the area conserved and are not calculated to capture the variation in lost opportunity costs, which can be comparably much higher than conservation [55]. Moreover, influencing the local economy with infusions of cash, commodity production, and external goods and services risks causing deforestation over time [71,72]. This literature tends to overemphasize formal markets and cash economies. Beyond conventional income, there are additional well-being indicators of Indigenous production systems that are not measured in market-based economic indicators [70,73,74]. This “Indigenous economy” includes exchange relationships within and among communities involving Indigenous goods (e.g., foods, building materials) and reciprocal labor (referred to as *minga* in Peru), which have relevance for security, well-being, and cultural survival [75,76]. How and why this Indigenous

economy is impacted by conservation incentives, positively or negatively, continues to be an area that is under-explored empirically.

Engagement. In offering financial payment for forest conservation, the PNCB shapes the relationship between Indigenous communities and the state [77]. Such mechanisms introduce new points and types of communication and require the modification of existing community practices to align with state expectations [78]. This includes forest monitoring as well as bureaucratic tasks required to track budgets and document activities. The current literature documents a wide range of engagement strategies associated with conservation incentives, but it is unclear under what conditions specific requirements are effective, can be reasonably met by participants, and simultaneously contribute to their priorities. Communities enrolled for TDCs struggle with high rates of suspension and agreement termination. In one 4-year period, over 34% of all participating communities experienced at least one suspension, causing mutual frustration for both participants and the PNCB. To better understand this challenge, our methods analyzed engagement as a mutually constituted process between participants and implementers, exploring the factors that impact the ability of communities to commit to and complete program requirements.

Social Inclusion. Leveraging broad evidence, the academic and practitioner communities have converged on agreement that IPs and LCs are central conservation partners, and “not just beneficiaries of conservation initiatives” [79] (p. 545). The potential advantages of incentives include directly rewarding environmental protection, addressing equity and justice issues, and strengthening rights [11,80,81]. Thus, programs are often linked with equity goals [82]. Yet the current literature demonstrates that there is limited monitoring of the social inclusiveness of incentive programs when compared to biophysical (e.g., deforested hectares) and economic (e.g., total payments) tracking. The PNCB reflects this trend with a state mandate to advance gender equity and cultural inclusion, but with little coordination with the Ministry of Women and Vulnerable People and few gender metrics adopted after 10 years of operation. We explore the social inclusion policies and practices from both the planning and implementation perspectives, as well as the in-community experience in benefit distribution of and rights recognition.

Using these four categories to frame our inquiry and address key gaps in the literature, we designed research to assess TDC activities and highlight the concerns of Indigenous partners. The results inform the next phase of implementation for the Peruvian program and propose best practices for similar programs. In the next section we present our methods, followed by results and discussion sections that share insights into program successes and opportunities for improvement. In the conclusion, we overview generalizable recommendations highlighting best practices for establishing requirements and monitoring in existing and future programs.

2. Materials and Methods

We used a political ecology lens and insights from Indigenous collaborators to explore how the TDC mechanism operates amidst the complex relations between nature and society through an analysis of “the forms of access and control over resources and their implications for environmental health and sustainable livelihoods” [83] (p. 257). Political ecology highlights uneven costs and power relationships that result from environmental change and conservation interventions [84–86]. Political ecology provides a framework to research the relationship between society and nature at multiple scales and includes socio-politics, environmental conservation, human development, diverse valuations of nature, and political economy [87], while recognizing that these attributes are all subject to interpretation and are rarely interpreted consistently across actors and scales [27]. Indigenous knowledges have been consistently identified in scholarly work as essential to sustainable solutions with

adequate local socio-ecological context [88,89]. In the case of forest conservation incentives, both political ecologists and Indigenous scholars have challenged narratives of beneficence to reveal the detrimental effects to IPs and LCs and outright failures [90–93]. We drew from these concerns of conservation and development theory to identify the four categories that guide our inquiry into how conservation incentive programming functions. In doing so, we reach beyond conventional definitions of “success” (e.g., avoided deforestation) or economic benefit (e.g., per capita income) to interrogate a range of social and cultural effects that in turn influence environmental outcomes.

Our theoretical framework applied the four thematic categories described in the introduction to construct research questions, identify appropriate methods for data acquisition, and undertake data analysis. To begin, we established key questions for each category to guide the research process and analysis (see Table 1) and presented these questions in various settings to Indigenous partners. This included meetings with Indigenous federations (Indigenous Federation of Awajun people in Alto May—FERIAAM) and visits to communities in San Martín to workshop research questions that reflect the values and priorities of the communities. To answer these questions, we developed a dataset that included interviews with qualitative and quantitative components, TDC programmatic documents (e.g., policies, implementation guides, investment examples, community reports), and community data from multiple public sources as well as from fieldwork. We developed protocols for interactive interviews and data analysis with input from federations and community-level discussion.

Table 1. Categories of analysis defined, with key research questions.

	Governance	Economics	Engagement	Social Inclusion
Definition	Policies and practices across levels of government, including the state, Indigenous networks, land-use planning, alignment of authorities, and civil society.	Effectiveness and impact of incentive and productive activities on livelihoods, well-being, trade, financial returns, and security.	Implementer and participant strategies for negotiation roles, navigating requirements, and shaping outcomes, including through communications, new capacities, and data sharing.	Cultural context, Indigenous values, relationships among beneficiaries, and especially inequalities and impacts on vulnerable groups.
Key Question	How does TDC implementation disrupt, complement, and/or reinforce multilevel governance dynamics and with what effects for communities?	What are the economic consequences of TDCs (e.g., effectiveness, income, market access) and its risks?	Which program and community characteristics support and/or undermine successful, bi-directional engagement?	What are the impacts on communities in terms of cultural values, gender and inclusion, and internal conflicts?

To capture diverse and representative views and knowledge, we collected observations through interviews with both *implementers* and *participants* of different types. *Implementers* are those involved in program design and implementation from different levels and branches of government, NGOs, and development groups. *Participants* are individuals within the communities that have opted to participate in the TDC mechanism. Due to changes in communal governance, *participants* for the interviews may not have been the individuals that were leading the community at the time of opting into the program.

Implementers were selected through purposive chain-referral sampling from various institutions, based on their connections to development or conservation programming and

their knowledge of the TDC mechanism. They answered questions about the effectiveness, responsibility, and outcomes of development and conservation programming, with specific questions about TDCs. This resulted in a total of 58 interviews, with officials of the PNCB and MINAM ($n = 14$), officials of other ministries (e.g., Ministry of Agrarian Development and Irrigation—MINAGRI, Ministry of Production) ($n = 12$), and domestic and international non-profit/development organizations ($n = 7$), leaders of Indigenous federations ($n = 5$), and regional Amazonian government officials (Loreto, San Martín, Madre de Dios, Ucayali) ($n = 20$). These were almost exclusively completed remotely in 2021, due in part to the travel limitations during the COVID-19 pandemic.

Community participant data were collected from in-depth field visits in late 2021 through 2022 with interviews focused in 8 communities in two key regions of Peru—San Martín and Madre de Dios (see Figure 2). Both regions are dominated by humid tropical forests and part of the Amazon basin, though the region in San Martín is at a higher altitude and also features cloud forest, or montane tropical forest [1]. These two regions were selected to ensure diversity in our sample as CN land use and planning varies greatly across the Amazon. Further, these regions reflect distinct trends in overall community size, family farm parcel size, level and types of deforestation pressures, and historical deforestation trends. San Martín has higher deforestation to date, with massive losses of forests in the 1980s and 1990s. Between 2001 and 2021, San Martín lost 480,775 ha. (12.77%) from a total of 3,763,711 ha [55]. In contrast, Madre de Dios has relatively intact forests, but still experienced a loss of 277,295 (3.41%) ha. from a total of 8,109,867 ha. during the same period [55]. Parcelization (more common in San Martín) divides the territory into recognized plots for family or individual cultivation. In San Martín, many families rent these parcels to non-communal agriculturalists who grow cash crops like cocoa, coffee, and banana. Overall, this system of parcelization results in less communal land remaining for forest conservation. In contrast, Madre de Dios communities tend to have small individual or family plots, with most of the territory under collective stewardship for forest management, foraging, hunting, and other purposes. Madre de Dios communities generally have a higher percentage of self-identifying Indigenous peoples and languages, which include Mastiguenka (or Machiguenga), Yine, and Mascho. In San Martín, communities tend to have a higher percentage of migrants (generally Spanish-speaking non-Indigenous Peruvians); Indigenous languages include Awajún and Kichwa [94].

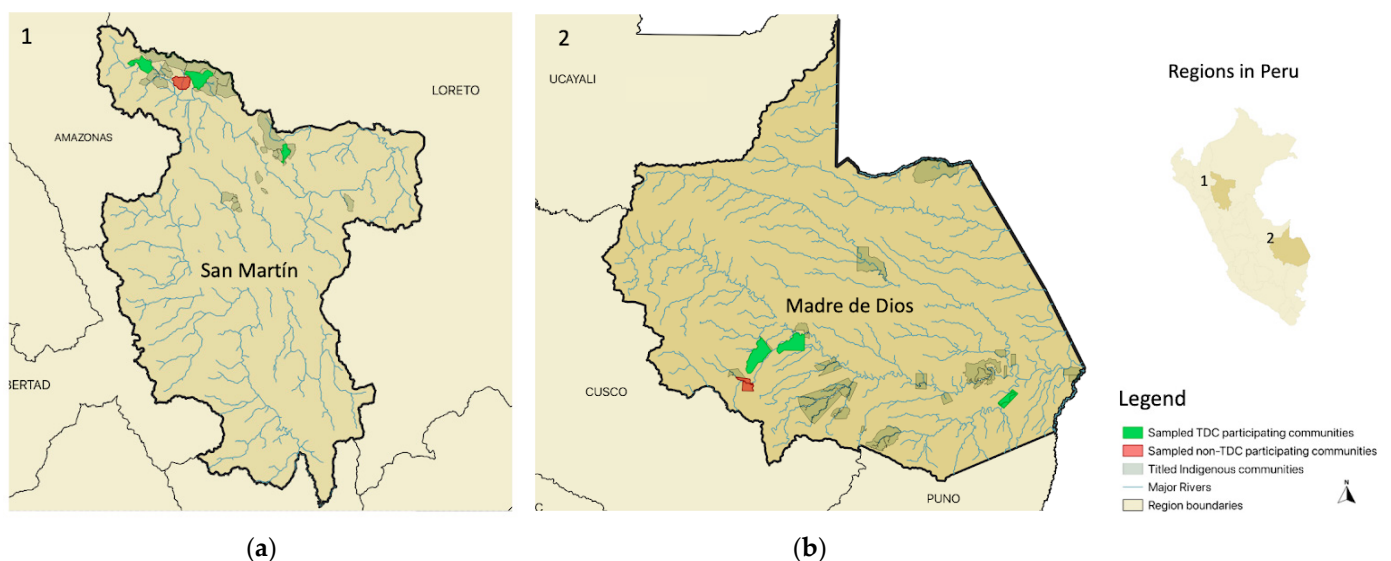


Figure 2. Study regions and sampled communities, including those participating and not participating in the TDC mechanism in both San Martín (a) and Madre de Dios (b).

The communities were also selected to represent different relationships with the TDC mechanism: active, graduated, suspended (at any point), and declined or were ineligible to participate (see Table 2). To capture a variety of experiences, we used purposive sampling for interviews. In each of the 6 communities that received TDCs, we interviewed community leaders that were knowledgeable about the TDC mechanism and its requirements (4–5), residents who participated in TDC activities such as sustainable businesses or forest monitoring (4–5) and residents who did not directly participate in TDC programming (4–5). In non-participating communities, we sampled leaders and residents with different roles and levels of expertise. In total, we conducted 108 interviews with Indigenous community members. These semi-structured interviews collected qualitative and quantitative responses using an interactive, manual slider scale for Likert questions (levels of Agreement, 1 to 5) to measure community member perception and satisfaction with TDC programming. Respondents were asked to provide explanations for their quantitative Likert responses, creating qualitative data for coding. This resulted in $n = 108$ for total participants and $n = 87$ for participants currently involved in the PNCB TDC mechanism.

Table 2. Sampled communities across both Madre de Dios and San Martín, status in the TDC mechanism, and the number of research participants interviewed.

Region	Community	Status at Time of Research	Study Participants (n)
San Martín	Shimpiyacu	Active	14
	Chirikyacu	Graduated	16
	Alto Mayo	Suspended	15
	Huascayacu	Ineligible	7 *
Madre de Dios	Infierno	Active	14
	Shipetiari	Graduated (nearly complete)	14
	Diamante	Suspended	14
	Shintuya	Declined the TDC	14
Total			108

* In Huascayacu, fewer interviews were conducted because the lack of forest cover made them ineligible for the TDC mechanism. Therefore, there was limited detailed knowledge of the program beyond community leadership.

We qualitatively coded interview data using thematic analysis of the texts in Atlas.ti and statistical analysis of Likert responses (R version 4.2.2). For qualitative analysis, we used deductive coding with a codebook developed around the four framing categories described in the introduction. We combined this with inductive coding (grounded theory) to reflect descriptive data more precisely. Using this combined and iterative coding process, we funneled descriptive codes into sub-themes and adjusted these accordingly. Using this combined approach ensured our adherence to the conceptual framework while still allowing for discoveries and the refining of themes. Statistical analysis involved evaluating the 1–5 quantitative responses, which were summarized using descriptive statistics including means and standard deviations to assist in the interpretation of variability. To ensure reliability, we triangulated evidence among Likert data, narrative responses, and programmatic documents. In 2023 to 2024, our results also underwent respondent validation with Indigenous federations, government officials, and participating communities during community meetings and results-sharing events. To supplement the interview data, we also analyzed the content of programmatic data including formal planning documents from MINAM and information on program implementation with coding drawing from the interview analysis process.

In Section 3, qualitative data from interviews are presented in text referencing the specific interview as “[Int_number]”, with more information available on each respondent

in Appendix A. For quantitative responses, we have separated N-values for participating and non-participating communities for key questions when appropriate.

3. Results

Within our four analytic categories, eight dominant themes emerged as having outstanding challenges or gaps in how success is assessed via indicators (see Figure 3).

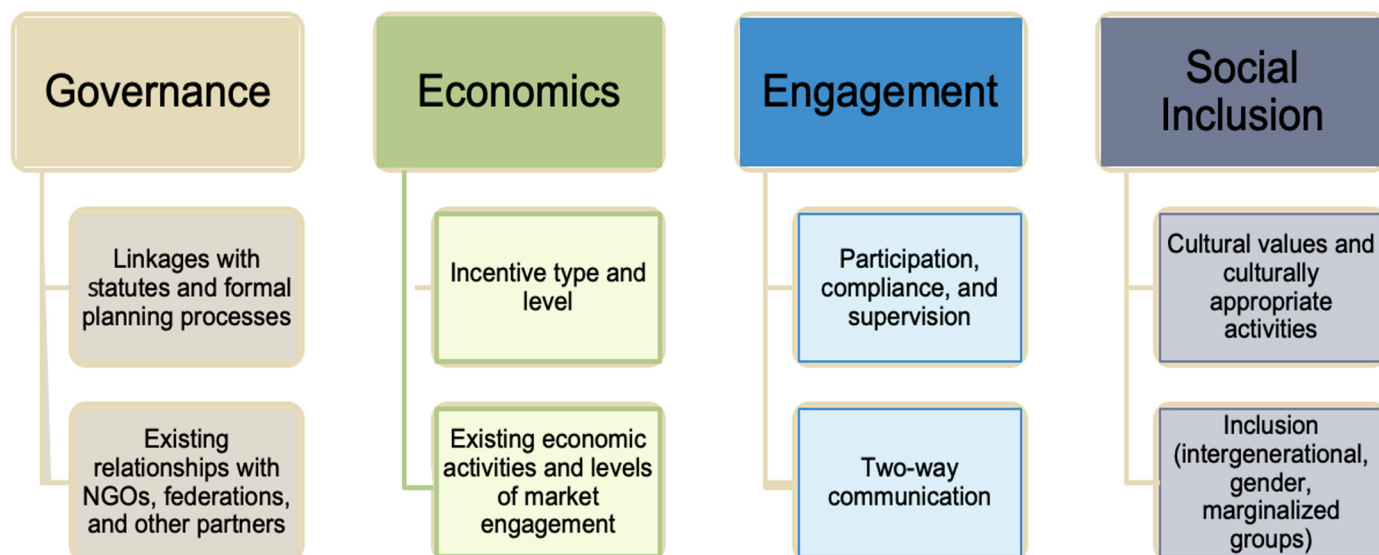


Figure 3. Themes that emerged in the study within the four analytical categories of the political ecology theoretical framework.

3.1. Governance

We examined the interactions between the PNCB and community governance dynamics, finding important linkages with statutes and formal planning processes and existing relationships with NGOs, federations, and other partners.

3.1.1. Linkages with Statutes and Formal Planning Processes

In survey results, 55% (n = 108) of the respondents Agreed or Strongly Agreed that the program aligned well with an existing community statute or a written plan; 27.5% responded Neutral/I don't know and 17.3% indicated some level of Disagreement (see Figure 4). In this way, TDC PGIs were inconsistently aligned with existing planning efforts that are important in communities, like communal statutes or their "Life Plan" (Plan de Vida in Spanish, which refers to a community's plans for development, resource use, and leadership documentation). One community leader recalled that the elaboration of the PGI had not included communal needs but instead prioritized having the PGI ready rather than gathering in-depth communal opinions and expectations [Int_1].

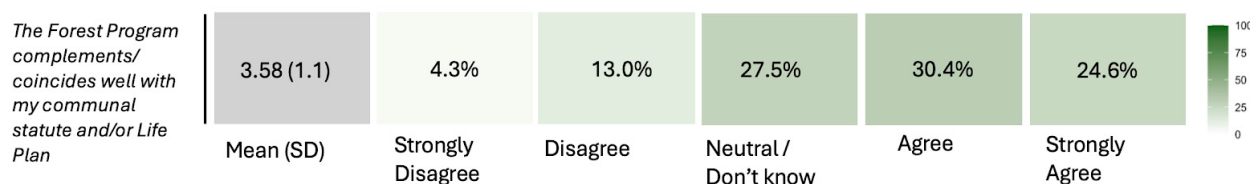


Figure 4. Participant responses relevant to governance prompt (n = 108; 1 = Strongly Disagree to 5 = Strongly Agree).

Communities suggested other needs (e.g., forest inventories, biodiversity assessments) that would support their participation in initiatives like carbon projects or international

research, beyond the market-based commodity production. Indigenous federation leadership suggested that more flexibility with funds would allow for investment in studies that could be used to support community goals. Federation leaders asserted that there should be studies that inform the Life Plans and PGI process to identify value in the forests and see what is threatened [Int_2]. *“For example, we’re working on a project on a research study of a frog that’s in danger of extinction. The community has seen it around, but they don’t give it value. But for the scientific world, that little frog has ecological and perhaps cultural value.”* [Int_3]. Such investments could support participation in other opportunities such as biodiversity conservation credits or research more in line with community goals than market-based commodity engagement.

3.1.2. Existing Relationships with NGOs, Federations, and Other Partners

During our interviews, we found that the interactions of communities with other institutions, including non-profits, government agencies, and Indigenous federations, influenced the outcomes and sustainability of the activities. Our research found many overlapping initiatives from multiple actors in the communities studied, pointing to a potential for greater coordination. For example, one field technician pointed out that implementation costs for training could be lowered with more collaboration (e.g., by streamlining trainings and visits [Int_4]), though it would also require more time for implementation staff to manage inter-institutional agreements.

Although it was not a strategic approach required by the PNCB, we found evidence that some communities were already streamlining investments and taking advantage of complimentary opportunities and resources. For example, the community of Infierno (Madre de Dios) combined an agreement with an international NGO in support of ecotourism with TDC payments and a carbon credit program to increase their overall budget. Income from ecotourism was used to support leaders, health, and education projects in the community, and to pay forest guards. One community leader asserted that for some community programs, *“now 50% comes from the Forest Program (TDC)”* [Int_5]. TDC funding also supported commercial agroforestry investments in Infierno. Combining these opportunities dramatically increased the number of residents able to benefit from forest conservation when considering their ecotourism business, sustainable farming, patrolling, and social service programming.

While federations were not always supportive of the PNCB or cooperative with communities, in positive cases, federations brokered relationships by helping to navigate trust and understanding of the program. In one Madre de Dios community, a leader described how they had rejected the PNCB several times before talking to their federation and deciding to try: *“We didn’t want [the program] at the beginning, when the program came, we didn’t accept. We even went to Lima. . . we went to talk with the Forest Program [PNCB]. And then to FENAMAD [the indigenous federation] and they told us ‘yes, no, it’s not like that, it’s like this!’ . . . in the end we said ‘yes, we’ll have to try. Let’s see how it goes.’”* [Int_6]

Overall, community-centered tools such as statutes and Life Plans along with the advisory role played by Indigenous federations point to the influential role of Indigenous governing mechanisms in the implementation and interpreting of the PNCB.

3.2. Economics

Economic interactions shape community experience and outcomes, not only in forest conservation but also cultural survival and livelihood strategies. The pivotal factors identified for broad economic influence in the community include incentive type and level and existing economic activities and levels of market engagement.

3.2.1. Incentive Type and Amount

We found that the TDC incentive type—in this case a flat payment based on area—works well for some communities, but communities with smaller forestland and a larger population received a lower benefit incentive per capita, which was reflected in the perspectives captured in the response data. Interviewees at professional levels (federal, NGOs, regional implementers, respectively) perceived the incentive level of 10 soles too low to achieve forest protection, particularly in high-risk and high population density areas [Int_7, Int_8, Int_9, Int_4]. This amount does not cover opportunity costs, which have been calculated as high as 700 soles/hectare in high-risk areas of the Amazon [95]. Our field observations recorded that some communities in San Martín earned as much as 500 soles/hectare annually by renting land to commodity producers. At either rate, this reflects a pronounced profit over the amount offered via the TDC mechanism [96].

Respondents shared that in some cases, the incentive was insufficient to cover the cost of program participation due to high administration costs. In San Martín, the cost of contracting experts to help with agroforestry created issues for community budgets [Int_10]. One federation president explained that TDCs were insufficient to fund plans and activities in their Life Plans [Int_11]. Officials in the PNCB confirmed that TDCs are not intended to cover all Life Plan activities but rather provide seed money for some activities that coincide with forest conservation. However, our data show that the low amount made it difficult for communities to substantially achieve a sustainable business model at this level and the activities in the PGI were not always congruent with their Life Plans, leaving communities to struggle to meet additional goals with limited resources.

3.2.2. Existing Economic Activities and Levels of Market Engagement

The type of existing market-based activities and market access were influential factors for perceptions of TDC economic interactions. When asked if the economically driven market-based activities promoted by the PNCB help them to limit deforestation, participants responded that ecotourism was the most Agreeable (91.7% Agree or Strongly Agree). The agriculture/agroforestry category has lower levels of Agreement and is more spread overall (11.5% Disagree/Strongly disagree and 14.8% Unsure or Don't Know, though still displaying high levels of Agreement at 73.7% Agree or Strongly Agree). Sustainable timber had the strongest Disagreement (23.1% Strongly Disagree) (see Figure 5).

Regional productivity of the specific commodities influences the success of PGI initiatives. Accessing markets, especially new markets, was one of the biggest challenges. For communities without road access and no current significant cash crop commodity production, both participant and implementer respondents expressed concerns that these types of investments may be inappropriate and harmful in the long term.

“The issue is that . . . communities never had money to deforest, and [now] they used the money to deforest, to plant things. Because they had made their business plans with the people from PNCB, they made plans to plant things that they had never planted before, and they deforested, right? . . . I think you must be very careful about how these funds are invested. . . .” [Int_12, conservation organization]

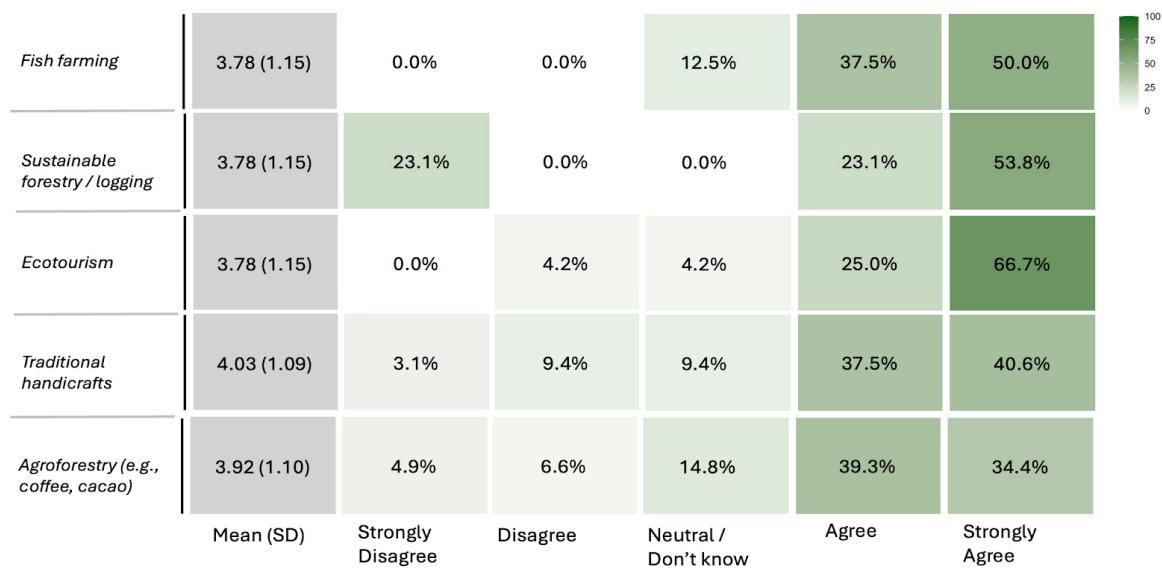


Figure 5. Community member participant responses to “The economic activities promoted by the Forest Program [PNCB] help us to limit deforestation.” (n = 108; 1 = Strongly Disagree to 5 = Strongly Agree).

Community members generally had different perspectives about initiating new production activities compared to enhancing established revenue streams. For example, Indigenous interviewees expressed skepticism of new agricultural improvement initiatives by external actors who are “always bringing plants” but at a cost to the forest as communities understand expanding permanent crops results in forest loss [Int_13; Int_14]. In forest management activities, the delay in forest recovery post-harvest has led some to feel that they are losing their forest in their territory [Int_15]. In other cases, where communities supported established activities with TDC funds, the improvement efforts were generally viewed as more acceptable and beneficial. In Shipetiari, for example, participants shared positive observations of TDC support for their ecotourism operations, since TDC finances allowed them to maintain the ecotourism structures during the pandemic. Participants in Shipetiari also described the interconnectedness of TDC support of ecotourism and recent improvements in forest health (e.g., forest recovery in the last 10 years, return of spider monkeys and other animals), which improved their ability to attract tourists. Implementers from non-profits and regional government voiced support for agroforestry as a sustainable strategy in San Martín, where there was already coffee and cacao production and market linkages [Int_16; Int_17].

Moreover, interviewees from both implementer and participant perspectives expressed concern that the TDC mechanism is, for some communities, ushering in or amplifying a shift from the rural, traditional, or Indigenous economic activities to a commercial one focusing on external markets. One NGO participant described that, “It’s something very commercial that breaks the structure or the cosmovision a bit. . . to a more commercial vision . . . that we are deepening this rupture from the more moral-cosmic economy to a more mercantile, capitalist economy. We simply look at the output of hectares of cocoa, hectares of coffee, and hectares of forests conserved. If that’s success, maybe. But I think the social, communal part must also be evaluated” [Int_18].

In Madre de Dios, a community member emphasized that even communities that have traditional connections to cacao are losing ancestral processing skills and knowledge as they assimilate into commodity production: “[Our grandparents] would make chocolate. But now we don’t know how to do that anymore.” [Int_19]. This demonstrates that where traditional

production activities already exist, they are at risk of disruption by altering those activities for external markets.

3.3. Engagement

We focus on two areas of engagement that emerged as pivotal for how communities experienced the incentive program: compliance and supervision and two-way communication between implementers and participants.

3.3.1. Compliance and Supervision

Indigenous community members across both regions generally described state oversight positively as an influence to increase transparency and safeguard against corruption. Fiscal oversight, when not a stumbling block, was framed by community members as a beneficial mechanism that helps leaders organize their funds and activities. One community leader described how *“it is better to have all the papers in order. . . sometimes you have easy money, and sometimes you don’t know what you’re spending it on”* [Int_20].

On the other hand, our data point to mismatches between community realities and program expectations in terms of implementation and administration, which resulted in a high rate of suspensions among enrolled communities. One such mismatch relates to PNCB requirements for budgeting and spending documentation. For example, 47% of all suspensions between 2017 and 2020 were for failure to submit a quarterly report, and another 20% were due to bank charges that did not correspond to the PGI. Only 17% were for “known deforestation,” according to PNCB records.

In terms of forest monitoring, response data also show that communities value the required monitoring activities and view TDC support of these activities as useful. 94.9% responded Agree or Strongly Agree to the statement “The information generated by the Forest Program [PNCB] and patrols is useful” (see Figure 6). Monitoring is viewed as a necessity for communal security in addition to being a PNCB requirement. This noted, communities suggested that forest guards are not receiving fair compensation for their labor. Further, a community leader requested additional information be shared back to the community (e.g., deforestation alerts on neighboring territories) [Int_21]. Respondents from community and government shared that monitoring also exposes participating community members to safety risks, including physical danger in remote areas, illegal drug production, and uncontacted tribes [Int_22; Int_23]. PNCB leadership asserts that community members should not handle risky situations themselves; the state should provide rapid responses [Int_24], but this is challenging because control activities are not part of PNCB regulatory competencies and would require strong coordination with other state agencies.

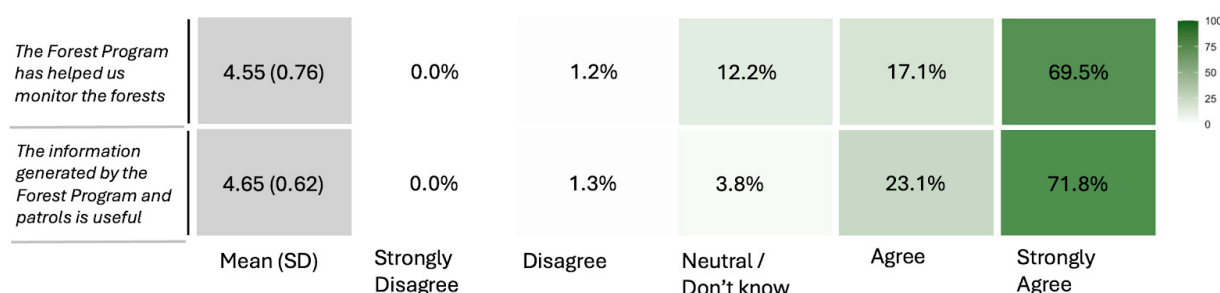


Figure 6. Community member participant responses to question series relevant to engagement (n = 87, 1 = Strongly Disagree to 5 = Strongly Agree).

3.3.2. Two-Way Communications

Both participants and implementers across regions perceive the presence of PNCB personnel to be insufficient. Communities have not been provided the time necessary to

discuss, resolve doubts, and build trust [Int_25]. One community participant explained, *“There are communities that sometimes don’t understand. . . many times [the state implementers] want to come and want the Program to be accepted. But no, we must evaluate”* [Int_26]. On the other hand, PNCB staff are generally highly motivated but lack the time and resources to provide more support. In Madre de Dios, a technician commented that three technicians for 16 communities were not enough [Int_27]. Another elaborated that the workload of technicians must be reorganized to correspond with the size of each community. During two-day visits, they went to individual houses but were unable to meet with the assembly. Meeting only with leaders was insufficient for transparency [Int_28].

Most respondents across both regions showed a high level of agreement with the prompt *“I understand the communication from the Forest Program [PNCB]”* (68% Agree or Strongly Agree, with 15.4% responding they Disagree or Disagree Strongly); see Figure 7. However, PNCB’s communication methods are not easily understood by everyone [Int_29]. While language is just one issue, technicians communicate in Spanish despite preferences for Indigenous languages by many, which are spoken at rates of 59% across all CNs [94]. Community members reported difficulties with the technical language used by PNCB technicians and requested practical framing, interaction, and imagery when possible. As one explained, *“The explanations and information should be simpler, because not all of us have the same educational level. So, few of us can understand, but most won’t understand what the project itself means. . . they just say, ‘Yeah, okay, yeah, that’s fine,’ but without any context”* [Int_30]. Qualitative data from interviews and observations indicated communication problems such as low awareness of contracts and conflation of different government programs.

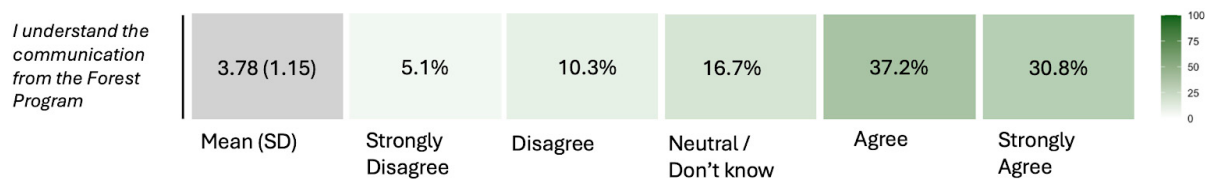


Figure 7. Community member participant responses to communication experience prompt (n = 108, 1 = Strongly Disagree to 5 = Strongly Agree).

3.4. Social Inclusion

We found that TDC investments are interfering with cultural values and failing to support culturally appropriate activities highlighted by participants. Gender inclusion was another key theme for this category, reflecting concerns of effective implementation.

3.4.1. Cultural Values and Culturally Appropriate Activities

Indigenous cultural identities and traditional knowledge are important factors for TDC investments, and the TDC requirements can use or influence knowledge and values of traditional plants, foods, and products. As some communities already engage in commodity production (generally in San Martín), and others less so (generally in Madre de Dios), participants across all communities discussed the value of maintaining ancestral practices and ecological knowledges in terms of forest protection. A community member from a Madre de Dios area that had lost a great deal of forest cover observed that traditional plants, like awiki (*pachyrhizus tuberosus* or jicama), are no longer cultivated: *“There are people who are forgetting about the plants and the good fruits we planted in the past”* [Int_31]. This has already resulted in diet changes due to agriculture for market versus for household consumption and changing social practices and adjusting to a labor economy has also impacted food security and nutrition [Int_32].

When responding to the statement, *“the funds and activities of the Forest Program helped to protect your culture,”* individuals in participating communities generally con-

sidered TDCs to be doing so (72.3% Agree or Strongly Agree) across all communities; see Figure 8. However, we found a distinction between regions: participants from Madre de Dios were much more Neutral or I don't know (26.9%), with 57.7% responding Agree or Strongly Agree, and a notable 15.4% Disagreeing. Contrarily, participants in market-linked San Martín responded with 82.1% in some level of Agreement, with lower Neutral or I don't know and with 10.3% respondents Disagreeing.

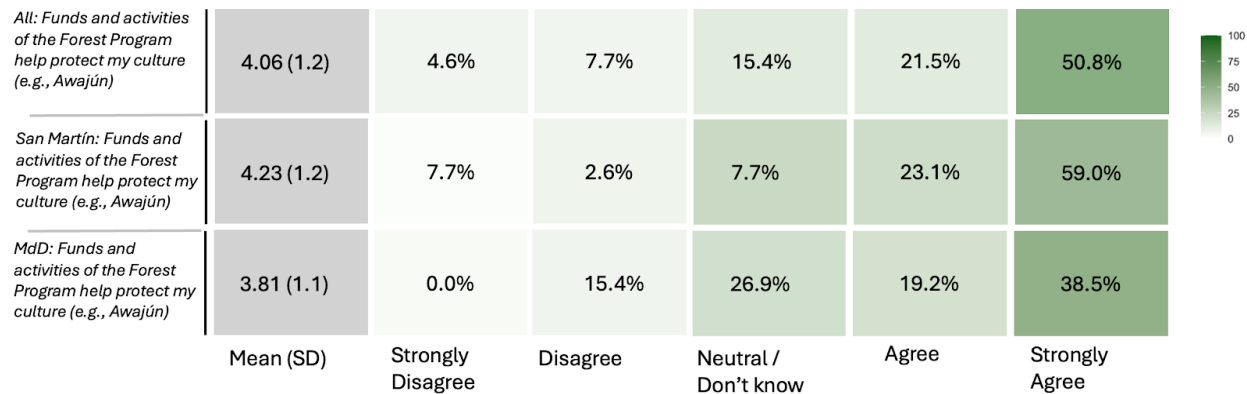


Figure 8. Community member participant responses to overall cultural alignment prompts (n = 87; 1 = Strongly Disagree to 5 = Strongly Agree).

When asked if the type of business activity allowable by the PNCB supported cultural values, the responses varied considerably. Artisanal activities prompted the strongest Agreement around cultural alignment (97.5% Agreement), while sustainable forestry and agroforestry for commercialization showed the most Disagreement and Strong Disagreement (31.6% and 27.1%, respectively) (see Figure 9). It is notable that ecotourism also has considerable Disagreement (26.3%), indicating a range of experiences in sample communities.

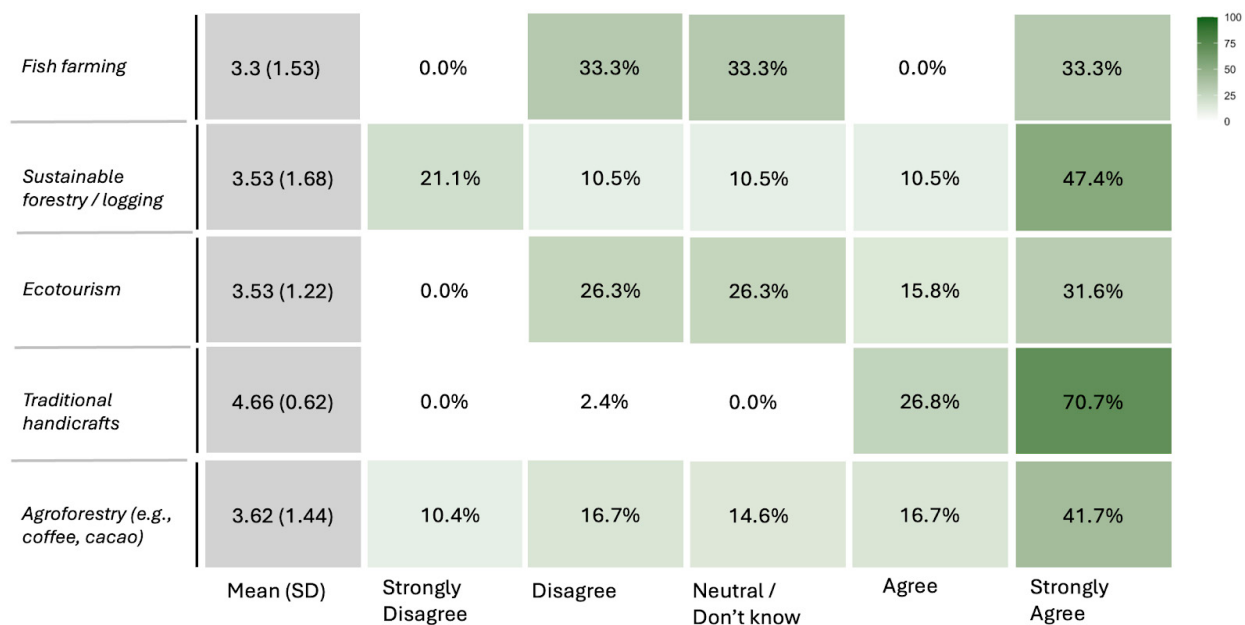


Figure 9. Community member participant response levels of Agreement to “The specific market-based activities help protect my culture” with the Indigenous language provided for context (e.g., Awajún), disaggregated by activity type (n = 87; 1 = Strongly Disagree to 5 = Strongly Agree).

Throughout interviews and across activities, participants described the importance of well-being, security of their territory, and general safety. Many emphasized maintaining their culture of wild food procurement [Int_33, Int_34, Int_35]. Interviews in both

TDC-participating and non-participating communities emphasized the value of hunting, fishing, and harvesting sustainably from the forest over having cash [Int_36; Int_37]. We encountered fears about loss of culture and way of life that could occur from deforestation or loss of access. One community respondent, when asked whether funds could persuade people to reduce use of the forests, remarked *“I think it’s more about taking care of the household and living as we did before, in a sustainable, peaceful way.”* [Int_38].

3.4.2. Gender Inclusion

We found that gender inclusion strategies have been inconsistent in implementation, and in some cases absent. While the TDC programming includes gender in promotional language and claims to conform with related national policies, program-wide gender inclusion strategies have been limited, a fact that both male and female state representatives acknowledged in interviews [Int_39, Int_40, Int_41]. However, some PNCB regional implementers aimed for improved gender inclusion practices, although they were constrained or lacked clear guidance on how to achieve this [Int_42, Int_43].

Further, we found that although some of the activities in the program clearly benefited women (e.g., artisanal activities), women and elders faced barriers to full participation in TDC activities due to stereotypes and gendered divisions of labor. The activity options for these groups were often less valuable in economic terms and thus less relevant for the success metrics of the program which values sustainable business models. For example, the association of women with artisan work, a popular choice for TDC investments, was a less lucrative endeavor than many currently male-oriented activities (e.g., forestry). Our data from interviews indicated there has been cultural value in some of these enterprises despite limited economic returns to women participants personally.

Despite these deficiencies, on average, community survey results show majority Agreement (68.7% Agree or Strongly Agree) that “Both men and women benefit equally in the program.” Even when disaggregated by gender, women separately reported slightly higher levels of Agreement (73.3%) than men (66%) (Figure 10). Participants also shared specific examples of gender inclusion the program supported. In Alto Mayo, women and elders shared knowledge and skills in support of ancestral activities that linked directly to the forest, such as the use of native tree seeds in jewelry making [Int_44]. We also found that some communities dedicated funds for specific activities that benefited key groups. For example, Chirikyacu (San Martín) funded a women’s cooperative for crafts, while Infierno (Madre de Dios) covered healthcare for elders with TDC funds. However, interviewees indicated that behind these positive examples were hidden problems such as negative beliefs about women’s abilities, increased labor burdens due to introducing new responsibilities on top of women’s existing reproductive and domestic roles, and restrictions on women’s mobility that hampered their ability to benefit from new activities [Int_45; Int_46; Int_47].

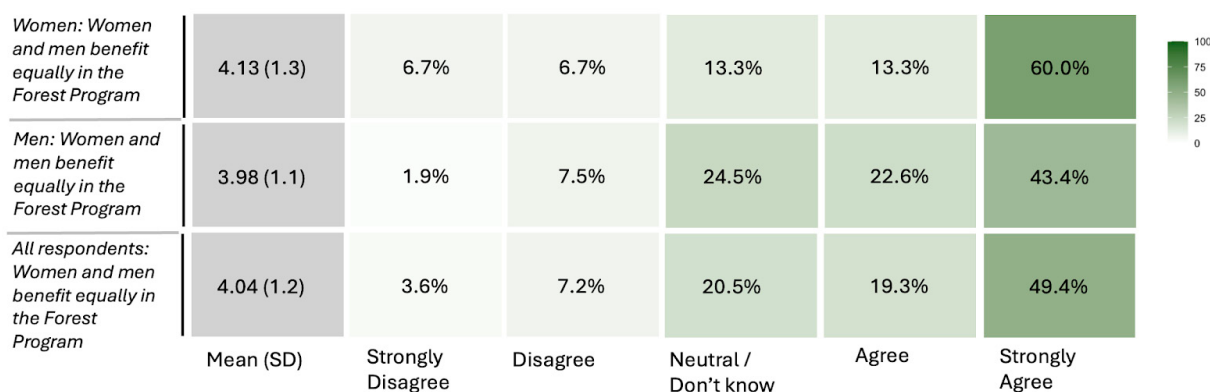


Figure 10. Community member participant response levels of Agreement related to gender equity in benefit-sharing (disaggregated by gender and reported as a whole) (n = 87; 1 = Strongly Disagree to 5 = Strongly Agree).

4. Discussion

These data reveal generalizable challenges in relying on narrow economic and social indicators for conservation incentive programs that exclude other aspects of well-being important for Indigenous peoples (Table 3). We argue that the indicators of success of this program do not adequately align with conservation or social realities on the ground, and that different indicators are needed to assess and ensure positive outcomes for communities and forests. Across our focal themes, we found clear examples of such misalignment, which undermine perceived benefits and their distribution. Our political ecology framing allows us to explore the governance, economics, engagement, and social inclusion implications of TDCs, both positive and negative, with an eye toward identifying practical improvements. As Osborne [87], Igoe and Brockington [69] and others have asserted, our data support the notion that continued commodification of nature and global market participation is risky and narrow in vision, reproducing extractive development approaches that have demonstrated history of environmental degradation and erasure of Indigenous knowledges and values.

Table 3. Summary table of challenges and solutions in the four categories of analysis.

	Challenges	Solutions
Governance	• Misalignment with community priorities • Multiple and conflicting planning processes and documents • Inconsistent coordination among different actors (e.g., Indigenous federations)	• Link investment plans with existing formal planning processes such as Life Plans • Build trust and communication to directly improve program results and to lay foundation for future initiatives • Ensure frequency and duration of technical visits and assistance is appropriate given cultural contexts • Communicate with institutions (e.g., Indigenous federations) to multiply and layer benefits for communities

Table 3. *Cont.*

	Challenges	Solutions
Economics	• Overemphasis on market-based activities and income production • Can be inappropriate or ineffective to encourage communities to engage in production for external markets • Payments too low; limited benefit distribution • Potential to create deforestation drivers	• Equally value self-consumption or self-sufficiency livelihood activities that align with conservation goals with market-based activities • Establish metrics of success with community input, focusing on conservation results and emphasizing the economic value of forest protection itself (e.g., environmental services or subsistence resources provided) • Consider diversified payment schemes to improve success in higher risk areas
Engagement	• Communication barriers and limited understanding of program features, in part due to language differences • Difficulty navigating documentation requirements • Community forest monitoring data is not often returned to the community except for deforestation alerts • Engagement not fully leveraged as a path to long-term, conservation collaboration	• Establish collaborative interactions between program implementers and incentive program participants • Communicate in local terminology, in native languages when possible, and use techniques that support comprehension (e.g., visual aids) • Increase emphasis on broadly valued activities like monitoring and share data with communities • Support administrative requirements with mutually beneficial accountability mechanisms and provide capacity building
Inclusion	• Inconsistent sensitivity to cultural values and traditional ecological knowledges • Lack of formal gender inclusion efforts and data, in part due to capacity and expertise constraints. • Program requirements benefit segments of society disproportionately	• Explicitly incorporate traditional ecological knowledges and conservation values of participants • Proactively require participation from underrepresented groups in the community • Train implementers in gender and culture topics relevant to the region • Track impacts using disaggregated methods (e.g., by age, gender)

The weaknesses of these programs are reflected in their assessment indicators and metrics, which focus on contractual obligations, short-term forest conservation achievements, and economic viability of new market activities, while generally overlooking the priorities of the people participating and engaging directly with the natural world around them [29]. These findings reinforce critiques of neoliberalism and capitalistic PES programs, and we agree that solutions can be found in “placing greater attention on entangled social-ecological contexts and the adaptations they engender” [31] (p. 315), including situating program incentives within Indigenous economies and cosmovisions. Here, we offer insights on additional metrics that can refocus attention of PES programs to limit undesirable effects, such as changes to socio-nature relationships (Table 3).

In terms of governance, there are opportunities to more consistently coordinate with existing community and development planning efforts and align benefits, which would honor the autonomy of IPs and LCs to shape their own priorities [97]. While present in the academic literature [98,99], existing Indigenous economic relationships and well-being indicators were generally overlooked by program implementers; they are not included in

the priorities, planning, or success metrics of the TDC mechanism. These priorities are often reflected in existing planning documents (e.g., Life Plans) and could be bolstered by engaging the professionals and consultants that are actively supporting a community. Identifying and utilizing more governance metrics such as measuring improved capacities among leaders, alignment with existing community plans, and tracking institutional relationships can facilitate cross-level environmental governance (e.g., Indigenous federations) [99,100].

Economically, the current metrics overemphasized external market engagement and income-driven economic development and do not capture the values or needs of many communities and individuals. We found that some TDC investments could undermine the primary program goal of reducing forest loss by increasing future deforestation risk, which is a well-documented phenomenon [101]. Further, nearly all actors agreed the incentive amount is too low, but especially so if the community has limited remaining land to conserve (for example, due to widespread land renting) confirming findings from other scholarly work and pointing to the need to explore diversified payment structures [101,102]. We also found that market-based mechanisms are introducing or strengthening external values and dependencies [103,104], potentially undermining the long-term program goal of conservation and resilience. This could be improved by recognizing the cultural and economic importance of Indigenous reciprocal systems of unpaid voluntary labor [85] as well as traditional plant processing knowledge and skills [105]. Further, our findings support the concern that commercial activities can replace or diminish Indigenous economies (e.g., intercommunity trade) and relationships with nature (part of their worldviews), and risk undermining beneficial and biodiverse subsistence practices [17,106]. Metrics could be enhanced with community input to identify the non-monetized value of labor and materials, local species essential for food security, and measurements of inter-communal trade [11].

Engagement challenges persist in communities due to communication barriers, limited understanding of the program, and difficulty navigating the various requirements. Fiscal supervision and forest monitoring are two aspects of TDCs that increase demands on community members but also produce outcomes valued by communities. Forest perimeter monitoring generates useful knowledge to protect Indigenous territories, but it is labor intensive and exposes community members to risks [107,108]. Bureaucratic supervision is valued by community members but, when overly complicated or unclear, creates a stumbling block for TDC compliance [109]. Ensuring that monitoring and deforestation data are shared with communities, including information on neighboring parcels, would strengthen the collaborative relationship. Despite the mutual benefits of engagement on monitoring results, the current program metrics on engagement are rudimentary (e.g., counting numbers of participants in a meeting). The program could expand a sense of conservation collaboration with metrics that assess the efficacy of two-way information flows, measure perceptions of collaboration within the community on conservation with the government, and track concerns related to monitoring (e.g., safety and security) to inform prioritization of technology and resources from the PNCB.

In terms of social inclusion, a lack of cultural alignment of programmatic economic activities creates missed opportunities to invest funds in ways that support long-term community development goals (e.g., cultural protection) [110,111]. Overall, we found that PNCB engagement with Indigenous communities lacks the necessary strategies for supporting existing cultural institutions for forest conservation. Indigenous communities approach forest conservation with culturally, linguistically, spiritually, and conceptually rich knowledge and values for land use and environment [112]. This does not easily fit into state systems for forest management, and PNCB actors are not currently equipped with the time, training, or data to assess and monitor topics like traditional ecological knowledges

and cultural ecosystem services. Like other scholars, we identify opportunities to increase gender inclusion in decision-making, benefit sharing, or central activities like monitoring and business development [113,114]. Drawing on disciplines like Indigenous sciences, critical geography, and anthropology would assist in producing program components and related metrics that better capture this essential and poorly understood connection to long-term forest conservation.

While our results offer widely applicable insights, there are limitations. TDCs exemplify a state-led mechanism with a static payment regime, therefore our data do not include examples of payment tiers, alternative incentives, or interventions led by non-governmental entities. Peru's TDCs, and this research, are limited due to their exclusive focus on communities with titled land. The program currently excludes Indigenous communities without formal land rights, which will require additional consideration in the future. Additional research should explore potential challenges that arise when payments are variable or led by private entities. Further, this work assessed the current indicators of an existing program whereas future work could identify and test conservation incentive program indicators preferred by Indigenous communities. Overall, longer-term and follow-up research is needed to better understand the fluctuating pressures facing Indigenous economies over time.

5. Conclusions

In this article, we demonstrated that, in the case of Peru's conditional direct transfer mechanism, programmatic success indicators are not adequately aligned with conservation goals or the social realities facing native communities and that alternative indicators are needed to avoid negative unintended consequences. The study draws on mixed methods and a systematic review of programmatic documentation that produced qualitative and quantitative data. We found that additional indicators related to governance, economics, engagement, and social inclusion can support monitoring of outcomes aligned with traditional values and well-being.

While the program was generally a welcome investment by Indigenous communities to support conservation activities, the participation requirements did not always align with priorities and values self-identified by communities in previous planning efforts. There are challenges with compliance requirements, a lack of alignment with previously identified community priorities, limited reach of the benefits to community members, and incongruence with Indigenous cultural values and traditional ecological knowledges. Most pertinently, Indigenous communities' reliance on non-market exchanges and forest-dependent subsistence practices is not adequately considered and can be harmed by the focus on businesses targeting external and even international markets. Broader social impacts within communities are not being sufficiently tracked by the PNCB and our results show that benefit distribution can be enhanced to improve outcomes in terms for women and elders.

Expanding—and collaboratively identifying—socioeconomic indicators of success beyond economic returns and compliance would improve the program's alignment with community realities. Potential indicators exist in development organizations and research, but these can be further developed in collaboration with Indigenous communities to ensure that climate and conservation funding supports the cultural, economic, and social values of the participants.

Interpreting the successes and challenges of the TDC mechanism is important at scales beyond Peruvian national policy. Our results contribute to a strong foundation for design, implementation, and subsequent monitoring of IPs and LC-focused conservation incentive programs, which are central to climate finance dialogues. Drawing from the

discussion section, we present strategies that are generalizable to other programs including the following:

- Align with current priorities established by existing community governance structures and formal planning processes to provide efficiency, buy-in, and reduce cultural risk.
- Plan incentives that explicitly support traditional livelihoods and their continuity to enhance sustainable behavior, cultural alignment, and security.
- Assess risks of promoting market-based commodity production to avoid unintended cultural and behavior outcomes (e.g., incentivizing future deforestation or eroding existing values around forests and biodiversity).
- Minimize complex programming requirements that can obscure conservation goals (e.g., requiring profitability in unrealistic timelines).
- Prioritize engagement, participation, and benefit distribution as they are central to understanding program impacts and assessing success.
- Support social inclusion to improve near-term performance as well as the long-term relationships needed to achieve conservation goals.

In this article, we demonstrated how conservation incentive mechanism indicators can be misaligned with the priorities and values of IPs and LCs being asked to provide the conservation service. By combining an analysis of the Peruvian TDC implementation practices with broader institutional and community contexts, the research provides insights on how to practically improve incentive program requirements and implementation with enhanced or alternative measures of success. Specifically, we highlight that alternative, non-monetary values for forest-based assets and cultural well-being that are, in fact, real and measurable. This work also advances an understanding of how a conceptual framing cognizant of alternative visions for economic development and multiple values of nature supports the holistic interpretation of conservation incentives.

Author Contributions: Conceptualization, L.T.C., R.B.K., C.M.-B., D.D.P., P.Z.V., A.M.L. and D.W.M.; Methodology, L.T.C., R.B.K., C.M.-B., D.D.P., C.A.C.P., P.Z.V., A.M.L. and D.W.M.; Validation, L.T.C., R.B.K., C.M.-B., D.D.P. and C.A.C.P.; Formal analysis, L.T.C., R.B.K., C.A.C.P. and P.Z.V.; Investigation, L.T.C., R.B.K., C.M.-B., D.D.P., C.A.C.P. and P.Z.V.; Data curation, L.T.C., R.B.K., C.A.C.P. and P.Z.V.; Writing—original draft, L.T.C. and R.B.K.; Writing—review & editing, C.M.-B., D.D.P., C.A.C.P., P.Z.V., A.M.L. and D.W.M.; Visualization, L.T.C. and R.B.K.; Supervision, D.W.M.; Project administration, L.T.C., R.B.K., C.M.-B. and D.D.P.; Funding acquisition, L.T.C., R.B.K., C.M.-B., D.D.P. and A.M.L. All authors have read and agreed to the published version of the manuscript.

Funding: The Tinker Foundation. Additional support provided by Michigan State University (Science and Society at State; International Studies and Programs) and the German International Climate Initiative (IKI) of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (Project number 20_III_108_Global_A_Transparent Monitoring Land Sector). Funders were not involved in any aspect of study design or analysis. Part of D.W. MacFarlane's time was paid for with funds from Michigan AgBioResearch and the USDA National Institute of Food and Agriculture.

Institutional Review Board Statement: This study is waived for ethical review as the PI assumes the responsibilities for the protection of human subjects in this study as outlined in Human Research Protection Program (HRPP) Manual Section 8-1, Exemptions, by Institution Committee.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Acknowledgments: We gratefully recognize our friends, acquaintances, collaborators, and colleagues in the communities and regions we visited. We specifically thank the Indigenous community members, community leaders, and federation leaders for sharing their invaluable time and insights and

deeply shaping our understanding. We would like to specifically recognize the leaders of the Indigenous Federation of Awajun people in Alto Mayo (FERIAAM), an organization that represents the interests of the Awajun in San Martín. Specifically, we recognize their president Edward Cahuaza Juep, and their members Sandra Coronado, Fernández Sejekam Ikam, and Cristian Wajajay Tentets who engaged with our research team to shape priorities and our research questions, made connections within communities, and provided input on our results. We recognize the extremely valuable contributions of the Coordinadora de Desarrollo y Defensa de los Pueblos Indígenas de la Región San Martín (CODEPISAM) as the base organization of Interethnic Association for the Development of the Peruvian Rainforest (AIDESEP) in the San Martín region, representing 128 native communities and eight federations of three peoples. We are grateful to Wilfredo Tsamach for his guidance on the project and for supporting us in sharing results to external audiences, including to the international biodiversity negotiations community. We are further thankful for the insights, expertise, and recommendations of Marisol García, of the Federación de Pueblos Indígenas Kechwa Chazuta Amazonía (FEPIKECHA), which informed conclusions of this work. Finally, we are grateful to Tabea Casique of AIDESEP for her dialogue and important insights that shaped our work and refined our interpretations. We thank our field experts Jose Luis Mego Panduro and Gino Giovanni Mego Guerra for their leadership, wisdom, and coordination, and for sharing their friendships and connections. We respectfully acknowledge the time of all the participants to inform the interviews and discussions and in providing feedback at various points in the research process.

Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

The following abbreviations are used in this manuscript:

AIDESEP	Asociación Interétnica de Desarrollo de la Selva Peruana
CDT	Conditional Direct Transfer
CODEPISAM	Coordinadora de Desarrollo y Defensa de los Pueblos Indígenas de la Región San Martín
FEPIKECHA	Federación de Pueblos Indígenas Kechwa Chazuta Amazonía
IPs and LCs	Indigenous peoples and local communities
IPCC	International Panel on Climate Change
MINAM	Peruvian Ministry of the Environment
PES	Payments for Ecosystem Services
PNCB	National Program for the Conservation of Forests
TDC	Tranferencias Directas Condicionadas
UNFCCC	United Nations Framework Convention on Climate Change

Appendix A

Table A1. Quoted interviewee matrix with information on region, affiliation, gender, and role.

Quote Number	Region	Institutional Affiliation	Gender	Role	Scale of Role	Interview Date
1	MdD	CN Diamante	Male	Community Leader	Local	2022-02-19
2	SM	Indigenous Federation	Male	Indigenous Federation Leader	Regional	2021-12-08
3	SM	Indigenous Federation	Male	Indigenous Federation Leader	Regional	2021-12-08
5	MdD	CN Infierno	Female	Community Leader	Local	2022-03-03
6	MdD	CN Shipetiari	Female	Community Leader	Local	2022-02-14
7	Other	Regional Government	Male	Peruvian State, Regional Official	Regional	2021-10-21
8	n/a	Central Government	Female	Peruvian State, Federal Official	Nacional	2021-09-03

Table A1. Cont.

Quote Number	Region	Institutional Affiliation	Gender	Role	Scale of Role	Interview Date
4	SM	PNCB	Female	PNCB Fieldworker	Regional	2022-12-12
9	n/a	Conservation NGO	Male	NGO representative	Nacional	2021-09-16
10	SM	PNCB	Female	PNCB Fieldworker	Regional	2022-12-12
11	SM	Indigenous Federation	Male	Indigenous Federation Leader	Regional	2021-12-08
12	n/a	Conservation NGO	Female	NGO representative	Regional	2021-09-23
13	MdD	CN Shintuya	Female	Community Member	Local	2022-02-25
14	MdD	CN Shipetiari	Male	Community Member	Local	2022-02-16
15	MdD	CN Shintuya	Female	Community Member	Local	2022-02-24
16	n/a	Conservation NGO	Male	NGO representative	Internacional	2021-10-20
17	SM	Regional Government	Female	Peruvian State, Regional Official	Regional	2021-04-12
18	n/a	Conservation NGO	Male	NGO representative	Nacional	2021-09-16
19	MdD	CN Diamante	Female	Community Member	Local	2021-02-26
20	MdD	CN Diamante	Male	Community Member	Local	2022-02-21
21	MdD	CN Shipetiari	Female	Community Member	Local	2022-02-16
22	MdD	CN Shipetiari	Male	Community Member	Local	2022-02-16
23	n/a	PNCB	Male	Peruvian State, Federal Official	Nacional	2021-11-16
24	n/a	PNCB	Male	Peruvian State, Federal Official	Nacional	2021-07-16
25	MdD	CN Diamante	Female	Community Member	Local	2022-02-21
26	SM	CN Chirikyacu	Male	Community Member	Local	2021-02-24
27	MdD	PNCB	Male	PNCB Fieldworker	Regional	2022-11-26
28	MdD	PNCB	Female	PNCB Fieldworker	Regional	2022-11-24
29	MdD	CN Shipetiari	Male	Community Leader	Local	2022-02-15
30	MdD	CN Infierno	Male	Community Member	Local	2022-03-04
31	MdD	CN Shintuya	Female	Community Member	Local	2022-02-25
32	MdD	CN Shintuya	Female	Community Member	Local	2022-02-24
33	MdD	CN Shipetiari	Male	Community Member	Local	2022-02-17
34	MdD	CN Diamante	Female	Community Member	Local	2022-02-21
35	MdD	CN Diamante	Female	Community Member	Local	2021-02-26
36	MdD	CN Diamante	Male	Community Member	Local	2022-02-20
37	MdD	CN Shintuya	Male	Community Leader	Local	2022-02-24
38	MdD	CN Shintuya	Male	Community Member	Local	2022-02-24
39	MdD	PNCB	Female	PNCB Fieldworker	Regional	2022-11-24
40	SM	PNCB	Female	PNCB Fieldworker	Regional	2022-09-16
41	n/a	PNCB	Male	Peruvian State, Federal Official	Nacional	2021-07-16
42	SM	PNCB	Female	PNCB Fieldworker	Regional	2022-12-12
43	MdD	PNCB	Male	PNCB Fieldworker	Regional	2022-11-23
44	SM	CN Alto Mayo	Female	Community Member	Local	2022-04-20
45	SM	CN Chirikyacu	Female	Community Member	Local	2021-02-25
46	MdD	CN Shimpiyacu	Female	Community Member	Local	2022-04-01
47	SM	CN Shimpiyacu	Male	Community Member	Local	2022-04-01

References

- Food and Agriculture Organization; United Nations Environment Programme. *The State of the World's Forests 2020*; Forests, Biodiversity and People; FAO: Rome, Italy, 2020. [CrossRef]
- Pan, Y.; Birdsey, R.A.; Fang, J.; Houghton, R.; Kauppi, P.E.; Kurz, W.A.; Phillips, O.L.; Shvidenko, A.; Lewis, S.L.; Canadell, J.G.; et al. A large and persistent carbon sink in the world's forests. *Science* **2011**, *333*, 988–993. [CrossRef]
- Pan, Y.; Birdsey, R.A.; Phillips, O.L.; Houghton, R.A.; Fang, J.; Kauppi, P.E.; Keith, H.; Kurz, W.A.; Ito, A.; Lewis, S.L.; et al. The enduring world forest carbon sink. *Nature* **2024**, *631*, 563–569. [CrossRef]
- Nobre, C.A.; Sampaio, G.; Borma, L.S.; Castilla-Rubio, J.C.; Silva, J.S.; Cardoso, M. Land-use and climate change risks in the Amazon and the need of a novel sustainable development paradigm. *Proc. Natl. Acad. Sci. USA* **2016**, *113*, 10759–10768. [CrossRef]
- Lovejoy, T.E.; Nobre, C. Amazon tipping point. *Sci. Adv.* **2018**, *4*, eaat2340. [CrossRef]
- Rojas, E.; Zutta, B.R.; Velazco, Y.K.; Montoya-Zumaeta, J.G.; Salvà-Catarineu, M. Deforestation risk in the Peruvian Amazon basin. *Environ. Conserv.* **2021**, *48*, 310–319. [CrossRef]
- Intergovernmental Panel on Climate Change—IPCC. Summary for Policymakers. In *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*; Shukla, P., Skea, J., Calvo, E., Masson-Delmotte, V., Pörtner, O., Roberts, D., Zhai, P., Slade, R., Connors, S., Van Diemen, R., et al., Eds.; Intergovernmental Panel on Climate Change: Geneva, Switzerland, 2019; pp. 1–36. [CrossRef]
- Griscom, B.W.; Adams, J.; Ellis, P.W.; Houghton, R.A.; Lomax, G.; Miteva, D.A.; Schlesinger, W.H.; Shoch, D.; Siikamäki, J.V.; Smith, P.; et al. Natural climate solutions. *Proc. Natl. Acad. Sci. USA* **2017**, *114*, 11645–11650. [CrossRef]
- Fa, J.E.; Watson, J.E.; Leiper, I.; Potapov, P.; Evans, T.D.; Burgess, N.D.; Molnár, Z.; Fernández-Llamazares, Á.; Duncan, T.; Wang, S.; et al. Importance of Indigenous Peoples' lands for the conservation of Intact Forest Landscapes. *Front. Ecol. Environ.* **2020**, *18*, 135–140. [CrossRef]
- Garnett, S.T.; Burgess, N.D.; Fa, J.E.; Fernández-Llamazares, Á.; Molnár, Z.; Robinson, C.J.; Watson, J.; Zander, K.; Austin, B.; Brondizio, E.; et al. A spatial overview of the global importance of Indigenous lands for conservation. *Nat. Sustain.* **2018**, *1*, 369–374. [CrossRef]
- Larson, A.; Frechette, A.; Ojha, H.; Friis, J.; Monterroso, I. In Enokenwa. Chapter 4: Land rights of Indigenous peoples and local communities. In *The Land Gap Report 2022*; Dooley, K., Keith, H., Larson, A., Catacora-Vargas, G., Carton, W., Christiansen, K.L., Enokenwa Baa, O., Frechette, A., Hugh, S., Ivetic, N., et al., Eds.; The Land Gap: Fitzroy, Australia, 2022; pp. 52–67. Available online: https://landgap.org/downloads/2022/Land-Gap-Report_Chapter-4.pdf (accessed on 8 June 2025).
- COP27: Leaders Boost Sustainable Forest Management. Available online: <https://unfccc.int/news/cop27-leaders-boost-sustainable-forest-management#:~:text=Government%20representatives%20meeting%20at%20COP27,further%20%244.5%20billion%20since%20COP26> (accessed on 14 November 2022).
- COP26: Pivotal Progress Made on Sustainable Forest Management and Conservation. Available online: <https://unfccc.int/news/cop26-pivotal-progress-made-on-sustainable-forest-management-and-conservation> (accessed on 17 February 2025).
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services—IPBES. Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES Secretariat, 2019. Available online: <https://www.ipbes.net/global-assessment> (accessed on 27 February 2025).
- Kalman, R.B.; Cooper, L.T.; Miranda Beas, C.; Delgado Pugley, D.; Castro Pacheco, C.A.; Larson, A.M. Making Conservation Incentives Work for Indigenous Peoples and Local Communities. Available online: <https://www.cifor-icraf.org/knowledge/publication/9136/> (accessed on 27 February 2025).
- Ramos-Castillo, A.; Castellanos, E.J.; Galloway McLean, K. Indigenous peoples, local communities, and climate change mitigation. *Clim. Change* **2017**, *140*, 1–4. [CrossRef]
- Cooper, L.; MacFarlane, D. Climate-Smart Forestry: Promise and risks for forests, society, and climate. *PLOS Clim.* **2023**, *2*, e0000212. [CrossRef]
- Kaiser, J.; Haase, D.; Krueger, T. Payments for ecosystem services: A review of definitions, the role of spatial scales, and critique. *Ecol. Soc.* **2021**, *26*, 12. [CrossRef]
- Schomers, S.; Matzdorf, B. Payments for ecosystem services: A review and comparison of developing and industrialized countries. *Ecosyst. Serv.* **2013**, *6*, 16–30. [CrossRef]
- Wunder, S. Payments for environmental services: Some nuts and bolts. *CIFOR* **2005**, *9*, 3–4. Available online: https://vtechworks.lib.vt.edu/bitstream/handle/10919/66932/2437_009_Infobrief.pdf?sequence=1&isAllowed=y (accessed on 27 February 2025).
- Salzman, J.; Bennett, G.; Carroll, N.; Goldstein, A.; Jenkins, M. The global status and trends of payments for ecosystem services. *Nat. Sustain.* **2018**, *1*, 136–144. [CrossRef]
- Durbin, J.; King, D.; Calderwood, N.; Wells, Z.; Godoy, F. *Benefit Sharing at Scale: Good Practices for Results-Based Land Use Programs*; World Bank: Washington, DC, USA, 2019. Available online: <http://hdl.handle.net/10986/32765> (accessed on 27 February 2025).

23. Sorice, M.G.; Oh, C.O.; Gartner, T.; Snieckus, M.; Johnson, R.; Donlan, C.J. Increasing participation in incentive programs for biodiversity conservation. *Ecol. Appl.* **2013**, *23*, 1146–1155. [\[CrossRef\]](#)
24. Montero-de-Oliveira, F.E.; Blundo-Canto, G.; Ezzine-de-Blas, D. Under what conditions do payments for environmental services enable forest conservation in the Amazon? A realist synthesis. *Ecol. Econ.* **2023**, *205*, 107697. [\[CrossRef\]](#)
25. Bachram, H. Climate fraud and carbon colonialism: The new trade in greenhouse gases. *Capital. Nat. Social.* **2004**, *15*, 5–20. [\[CrossRef\]](#)
26. Lohmann, L. Marketing and making carbon dumps: Commodification, calculation and counterfactuals in climate change mitigation. *Sci. Cult.* **2005**, *14*, 203–235. [\[CrossRef\]](#)
27. Escobar, A. After nature: Steps to an anti-essentialist political ecology. *Curr. Anthropol.* **1999**, *40*, 1–30. [\[CrossRef\]](#)
28. Kolinjivadi, V.; Van Hecken, G.; Almeida, D.V.; Dupras, J.; Kosoy, N. Neoliberal performatives and the “making” of Payments for Ecosystem Services (PES). *Prog. Hum. Geogr.* **2019**, *43*, 3–25. [\[CrossRef\]](#)
29. Robertson, M.M. The nature that capital can see: Science, state, and market in the commodification of ecosystem services. *Environ. Plan. D Soc. Space* **2006**, *24*, 367–387. [\[CrossRef\]](#)
30. Fletcher, R.; Büscher, B. The PES conceit: Revisiting the relationship between payments for environmental services and neoliberal conservation. *Ecol. Econ.* **2017**, *132*, 224–231. [\[CrossRef\]](#)
31. Van Hecken, G.; Kolinjivadi, V.; Windey, C.; McElwee, P.; Shapiro-Garza, E.; Huybrechts, F.; Bastiaensen, J. Silencing Agency in Payments for Ecosystem Services (PES) by Essentializing a Neoliberal ‘Monster’ Into Being: A Response to Fletcher & Büscher’s ‘PES Conceit’. *Ecol. Econ.* **2018**, *144*, 314–318.
32. Meuth, J.; De Roy, E.; Mokgano, E.; Mwandiri, P.; Narayan, T.; Prowse, M.; Puri, J.; Rafferty, W.; Rangarajan, A.; Usmani, F. Evidence Review on Results-Based Payments: Evidence Gap Map and Intervention Heat Map. Independent Evaluation Unit of Green Climate Fund, 2020. Available online: https://ueaeprints.uea.ac.uk/id/eprint/81021/1/Published_Version.pdf (accessed on 27 February 2025).
33. Hasund, K.P. Result-based and value-based payments—more efficient ways forward to promote grassland with multiple benefits. In *Grassland Resources for Extensive FARMING Systems in Marginal Lands: Major Drivers and Future Scenarios*; Porqueddu, C., Franca, A., Lombardi, G., Molle, G., Peratoner, G., Hopkins, A., Eds.; Instituto Sistema Produzione Animale Ambiente Mediterraneo: Portici, Italy, 2017; pp. 557–559. Available online: <https://iris.unito.it/bitstream/2318/1657936/1/EGF2017-proceedingsFULL-rid.pdf> (accessed on 27 February 2025).
34. Wunder, S.; Börner, J.; Ezzine-De-Blas, D.; Feder, S.; Pagiola, S. Payments for environmental services: Past performance and pending potentials. *Annu. Rev. Resour. Econ.* **2020**, *12*, 209–234. [\[CrossRef\]](#)
35. Nkhata, B.A.; Mosimane, A.; Downsborough, L.; Breen, C.; Roux, D.J. A typology of benefit sharing arrangements for the governance of social-ecological systems in developing countries. *Ecol. Soc.* **2012**, *17*, 17. [\[CrossRef\]](#)
36. Myers, R.; Larson, A.; Ravikumar, A.; Kowler, L.; Young, A. Messiness of forest governance: How technical approaches suppress politics in REDD+ and conservation projects. *Glob. Environ. Change* **2018**, *50*, 314–324. [\[CrossRef\]](#)
37. Schilling, J.; Saulich, C.; Engwicht, N. Introduction: A Local to Global Perspective on Resource Governance and Conflict. *Confl. Secur. Dev.* **2018**, *18*, 433–461. [\[CrossRef\]](#)
38. Maca-Millan, S.; Arias-Arevalo, P.; Restrepo-Plaza, L. Payment for ecosystem services and motivational crowding: Experimental insights regarding the integration of plural values via non-monetary incentives. *Ecosyst. Serv.* **2018**, *52*, 101375. [\[CrossRef\]](#)
39. Brownson, K.; Guinessey, E.; Carranza, M.; Esquivel, M.; Hesselbach, H.; Ramirez, L.M.; Villa, L. Community-Based Payments for Ecosystem Services (CB-PES): Implications of community involvement for program outcomes. *Ecosyst. Serv.* **2019**, *39*, 100974. [\[CrossRef\]](#)
40. Chen, H.L.; Lewison, R.L.; An, L.; Yang, S.; Shi, L.; Zhang, W. Understanding direct and indirect effects of Payment for Ecosystem Services on resource use and wildlife. *Anthropocene* **2020**, *31*, 100255. [\[CrossRef\]](#)
41. Song, C.; Bilsborrow, R.; Jagger, P.; Zhang, Q.; Chen, X.; Huang, Q. Rural household energy use and its determinants in China: How important are influences of payment for ecosystem services vs. other factors? *Ecol. Econ.* **2018**, *145*, 148–159. [\[CrossRef\]](#)
42. Guo, Y.; Zheng, H.; Wu, T.; Wu, J.; Robinson, B.E. A review of spatial targeting methods of payment for ecosystem services. *Geogr. Sustain.* **2020**, *1*, 132–140. [\[CrossRef\]](#)
43. Izquierdo-Tort, S.; Corbera, E.; Martin, A.; Lillo, J.C.; Dupras, J. Contradictory distributive principles and land tenure govern benefit-sharing of payments for ecosystem services (PES) in Chiapas, Mexico. *Environ. Res. Lett.* **2022**, *17*, 055009. [\[CrossRef\]](#)
44. Thu Thuy, P.; Campbell, B.M.; Garnett, S. Lessons for pro-poor payments for environmental services: An analysis of projects in Vietnam. *Asia Pac. J. Public Adm.* **2009**, *31*, 117–133. [\[CrossRef\]](#)
45. Hayes, T.; Grillos, T.; Bremer, L.L.; Murtinho, F.; Shapiro, E. Collective PES: More than the sum of individual incentives. *Environ. Sci. Policy* **2019**, *102*, 1–8. [\[CrossRef\]](#)
46. Godoy, R.; Reyes-García, V.; Byron, E.; Leonard, W.R.; Vadez, V. The effect of market economies on the well-being of indigenous peoples and on their use of renewable natural resources. *Annu. Rev. Anthropol.* **2005**, *34*, 121–138. [\[CrossRef\]](#)

47. Hayes, T.; Murtinho, F.; Cárdenas Camacho, L.M.; Crespo, P.; McHugh, S.; Salmerón, D. Can conservation contracts co-exist with change? Payment for ecosystem services in the context of adaptive decision-making and sustainability. *Environ. Manag.* **2015**, *55*, 69–85. [CrossRef] [PubMed]
48. Núñez-Regueiro, M.M.; Fletcher Jr, R.J.; Pienaar, E.F.; Branch, L.C.; Volante, J.N.; Rifai, S. Adding the temporal dimension to spatial patterns of payment for ecosystem services enrollment. *Ecosyst. Serv.* **2019**, *36*, 100906. [CrossRef]
49. Dunlop, T.; Corbera, E. Incentivizing REDD+: How developing countries are laying the groundwork for benefit-sharing. *Environ. Sci. Policy* **2016**, *63*, 44–54. [CrossRef]
50. Rodríguez, S.; Sarmiento Barletti, J.P.; Larson, A.M. Examining Support for the Rights of Indigenous Peoples in the Context of REDD+ in Peru. CIFOR, 2022. Available online: https://www.cifor.org/publications/pdf_files/Flyer/REDD-safeguards-2.pdf (accessed on 27 February 2025).
51. Servicio Nacional Forestal y de Fauna Silvestre—SERFOR. Cuenta de Bosques del Perú. SERFOR, 2021. Available online: https://www.inei.gob.pe/media/MenuRecursivo/publicaciones_digitales/Est/Lib1811/libro.pdf (accessed on 27 February 2025).
52. Plataforma GeoBosques. Available online: <https://geobosques.minam.gob.pe/geobosque/view/index.php> (accessed on 21 May 2024).
53. NDC Registry. Available online: <https://unfccc.int/NDCREG> (accessed on 18 February 2023).
54. [MINAM] Ministerio del Ambiente. *Estrategia Nacional Ante el Cambio Climático*; Ministerio del Ambiente: San Isidro, Peru, 2015.
55. Armas, A.; Tejada, F.; Cubas, C.; Mendoza, R. Pagos diferenciados de transferencias directas condicionadas a comunidades nativas: Implicaciones de equidad y costo-efectividad en el contexto del Programa Nacional de Conservación de Bosques. *Nota Técnica* **2015**, *1*. [CrossRef]
56. Giudice, R.; Börner, J. Benefits and costs of incentive-based forest conservation in the Peruvian Amazon. *For. Policy Econ.* **2021**, *131*, 102559. [CrossRef]
57. [MINAM] Ministerio de Ambiente. Supreme Decree N° 003-2020-MINAM. Decreto Supremo Que Amplía el Plazo de Vigencia Del Programa Nacional de Conservación de Bosques Para la Mitigación Del Cambio Climático, Creado Mediante El Decreto Supremo N° 008-2010-MINAM. Available online: <https://www.gob.pe/institucion/minam/normas-legales/460191-003-2020-minam> (accessed on 27 February 2025).
58. Giudice, R.; Börner, J.; Wunder, S.; Cisneros, E. Selection biases and spillovers from collective conservation incentives in the Peruvian Amazon. *Environ. Res. Lett.* **2019**, *14*, 045004. [CrossRef]
59. Kowler, L.; Pratihast, A.; Pérez, A.; Larson, A.M.; Braun, C.; Herold, M. Aiming for sustainability and scalability: Community engagement in forest payment schemes. *Forests* **2020**, *11*, 444. [CrossRef]
60. Adhikari, S.; Baral, H. Governing forest ecosystem services for sustainable environmental governance: A review. *Environments* **2018**, *5*, 53. [CrossRef]
61. Armitage, D.; De Loë, R.; Plummer, R. Environmental governance and its implications for conservation practice. *Conserv. Lett.* **2012**, *5*, 245–255. [CrossRef]
62. Kowler, L.F.; Larson, A.M. *Más Allá del Enfoque Técnico: El Proceso Político en el Desarrollo de un Sistema de MRV en Perú*; CIFOR: Bogor, Indonesia, 2016. [CrossRef]
63. Lemos, M.C.; Agrawal, A. Environmental governance. *Annu. Rev. Environ. Resour.* **2006**, *31*, 297–325. [CrossRef]
64. Foucault, M. Governmentality. In *The Foucault Effect: Studies in Governmentality*; Burchell, G., Gordon, C., Miller, P., Eds.; University of Chicago Press: Chicago, IL, USA, 1991; pp. 87–104.
65. Sommerville, M.; Jones, J.P.; Rahajaharison, M.; Milner-Gulland, E.J. The role of fairness and benefit distribution in community-based Payment for Environmental Services interventions: A case study from Menabe, Madagascar. *Ecol. Econ.* **2010**, *69*, 1262–1271. [CrossRef]
66. Cranford, M.; Mourato, S. Credit-based payments for ecosystem services: Evidence from a choice experiment in Ecuador. *World Dev.* **2014**, *64*, 503–520. [CrossRef]
67. Cronkleton, P.; Valencia, F.; Saldaña, J.S.; Larson, A.M. *Avances y Desafíos Para la Titulación de Comunidades Nativas en Perú: Perspectivas de Doce Comunidades en San Martín y Ucayali*; CIFOR: Bogor, Indonesia, 2019.
68. Wunder, S.; Angelsen, A.; Belcher, B. Forests, livelihoods, and conservation: Broadening the empirical base. *World Dev.* **2014**, *64*, S1–S11. [CrossRef]
69. Igoe, J.; Brockington, D. Neoliberal conservation. *Conserv. Soc.* **2007**, *54*, 432–449.
70. Miller, W. Making values visible and real, but not necessarily monetised. In *Locating Value*; Saville, S., Hoskins, G., Eds.; Routledge: London, UK, 2019; pp. 51–66.
71. Cunha, P.D.R.; Rodrigues, C.; Morsello, C. The effects on deforestation of conditional cash transfers: A study among the Khîsêjê Amazonian indigenous people. *Int. For. Rev.* **2022**, *24*, 330–344. [CrossRef]
72. Lliso, B.; Arias-Arévalo, P.; Maca-Millán, S.; Engel, S.; Pascual, U. Motivational crowding effects in payments for ecosystem services under alternative value frames: Instrumental versus relational values. *People Nat.* **2021**, *4*, 312–329. [CrossRef]

73. Lliso, B.; Pascual, U.; Engel, S.; Mariel, P. Payments for ecosystem services or collective stewardship of Mother Earth? Applying deliberative valuation in an indigenous community in Colombia. *Ecol. Econ.* **2020**, *169*, 106499. [CrossRef]
74. Manero, A.; Taylor, K.; Nikolakis, W.; Adamowicz, W.; Marshall, V.; Spencer-Cotton, A.; Nguyen, M.; Grafton, R.Q. A systematic literature review of non-market valuation of Indigenous peoples' values: Current knowledge, best-practice, and framing questions for future research. *Ecosyst. Serv.* **2022**, *54*, 101417. [CrossRef]
75. Ravikumar, A.; Uriarte, E.C.; Lizano, D.; Farré, A.M.L.; Montero, M. How payments for ecosystem services can undermine Indigenous institutions: The case of Peru's Ampiyacu-Apayacu watershed. *Ecol. Econ.* **2023**, *205*, 107723. [CrossRef]
76. Virtanen, P.K.; Apurinã, F.; Fernández-Llamazares, Á. Long-Term Ecological and Climate Changes Through Amazonian Indigenous Oral Histories. In *Climatic and Ecological Change in the Americas*; Routledge: London, UK, 2023; p. 195.
77. Biffi Isla, V. Los efectos de estado de la política pública ambiental en territorios indígenas. *Anthropologica* **2021**, *39*, 11–35. [CrossRef]
78. Bixler, R.P.; Dell'Angelo, J.; Mfune, O.; Roba, H. The political ecology of participatory conservation: Institutions and discourse. *J. Political Ecol.* **2019**, *22*, 164–182. [CrossRef]
79. Zanolini, L.; Knowles, N. Large intact forest landscapes and inclusive conservation: A political ecological perspective. *J. Political Ecol.* **2020**, *27*, 539–557. [CrossRef]
80. REDD+ Reducing Emissions from Deforestation and Forest Degradation. Available online: <https://www.fao.org/redd/areas-of-work/gender/en/> (accessed on 18 February 2025).
81. Karsenty, A.; Vogel, A.; Castell, F. "Carbon rights", REDD+ and payments for environmental services. *Environ. Sci. Policy* **2014**, *35*, 20–29. [CrossRef]
82. Pascual, U.; Phelps, J.; Garmendia, E.; Brown, K.; Corbera, E.; Martin, A.; Muradian, R. Social equity matters in payments for ecosystem services. *Bioscience* **2014**, *64*, 1027–1036. [CrossRef]
83. Watts, M. Political ecology. In *A Companion to Economic Geography*; Barnes, T., Sheppard, E., Eds.; Blackwell: Oxford, UK, 2000; pp. 257–275.
84. Batterbury, S.P.J. Political ecology. In *The Companion to Environmental Studies*; Castree, N., Hulme, M., Proctor, J., Eds.; Routledge: London, UK, 2018; pp. 439–442.
85. Bryant, R.L.; Bailey, S. *Third World Political Ecology*; Psychology Press: London, UK, 1997.
86. Robbins, P. *Political Ecology: A Critical Introduction*; John Wiley & Sons: Hoboken, NJ, USA, 2011; Volume 16.
87. Osborne, T. Tradeoffs in carbon commodification: A political ecology of common property forest governance. *Geoforum* **2015**, *67*, 64–77. [CrossRef]
88. Gadgil, M.; Berkes, F.; Folke, C. Indigenous knowledge for biodiversity conservation. *Ambio* **1993**, *22*, 151.
89. Turner, N.J.; Cuerrier, A.; Joseph, L. Well grounded: Indigenous Peoples' knowledge, ethnobiology and sustainability. *People Nat.* **2022**, *4*, 627–651. [CrossRef]
90. Asiyanbi, A.P. A political ecology of REDD+: Property rights, militarized protectionism, and carbonized exclusion in Cross River. *Geoforum* **2016**, *77*, 146–156. [CrossRef]
91. Smith, T.; Bulkan, J.; Zerriffi, H.; Tansey, J. Indigenous peoples, local communities, and Payments for Ecosystem Services. *Can. Geogr.* **2019**, *63*, 616–630.
92. Revders, N.; Chan, J.; Odochao, S.; Pratt, V.; Sim, J.; Gougsa, S.; Kobei, D.M.; Willetts, L. Carbon Markets: A new form of colonialism for Indigenous Peoples? *Lancet Planet Health* **2025**, *9*, e421–e430.
93. West, P. *Conservation is Our Government Now: The Politics of Ecology in Papua New Guinea*; Duke University Press: Durham, NC, USA, 2006.
94. Peruvian Ministry of Culture. Official Database of Indigenous Communities Pueblos and Indigenous Peoples. 2022. Available online: <https://bdpi.cultura.gob.pe> (accessed on 15 May 2022).
95. Armas, A.; Borner, J.; Marcos, R.; Licely, D.; Sandra, T.; Wunder, S.; Raymond, L.; Nascimento, N. *Pagos por Servicios Ambientales para la Conservación de Bosques en la Amazonía Peruana: Un Análisis de Viabilidad*; SERNANP: Lima, Perú, 2009. Available online: <https://sinia.minam.gob.pe/sites/default/files/siar-puno/archivos/public/docs/1147.pdf> (accessed on 8 June 2025).
96. [IBC] Instituto del Bien Común. Deforestación en comunidades nativas (CCNN): La necesidad de entender el contexto. *Hoja Informativa N.º 5*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). 2022. Available online: <https://landportal.org/library/resources/hoja-informativa-n-5-deforestaci-n-en-comunidades-nativas-ccnn-la-necesidad-de>. (accessed on 19 February 2025).
97. Dawson, N.M.; Coolsaet, B.; Sterling, E.J.; Loveridge, R.; Gross-Camp, N.D.; Wongbusarakum, S.; Sangha, K.K.; Scherl, L.M.; Phuong Phan, H.; Zafra-Calvo, N.; et al. The role of Indigenous peoples and local communities in effective and equitable conservation. *Ecol. Soc.* **2021**, *26*, 19. [CrossRef]
98. Daigle, M. Tracing the terrain of Indigenous food sovereignties. *J. Peasant Stud.* **2019**, *46*, 297–315. [CrossRef]
99. González, N.C.; Kröger, M. The potential of Amazon indigenous agroforestry practices and ontologies for rethinking global forest governance. *For. Policy Econ.* **2020**, *118*, 102257. [CrossRef]

100. Brondizio, E.S.; Ostrom, E.; Young, O.R. Connectivity and the governance of multilevel social-ecological systems: The role of social capital. *Annu. Rev. Environ. Resour.* **2009**, *34*, 253–278. [CrossRef]
101. Geist, H.J.; Lambin, E.F. What drives tropical deforestation. *LUCC Rep. Ser.* **2001**, *4*, 116.
102. Drucker, A.G.; Ramirez, M. Payments for agrobiodiversity conservation services: An overview of Latin American experiences, lessons learned and upscaling challenges. *Land Use Policy* **2020**, *99*, 104810. [CrossRef]
103. Arsel, M.; Büscher, B. Nature™ Inc.: Changes and continuities in neoliberal conservation and market-based environmental policy. *Dev. Change* **2012**, *43*, 53–78. [CrossRef]
104. Roth, R.J.; Dressler, W. Market-oriented conservation governance: The particularities of place. *Geoforum* **2012**, *43*, 363–366. [CrossRef]
105. Cámara-Leret, R.; Fortuna, M.A.; Bascompte, J. Indigenous knowledge networks in the face of global change. *Proc. Natl. Acad. Sci. USA* **2019**, *116*, 9913–9918. [CrossRef]
106. Pfund, J.L.; Watts, J.D.; Boissiere, M.; Boucard, A.; Bullock, R.M.; Ekadinata, A.; Urech, Z.L. Understanding and integrating local perceptions of trees and forests into incentives for sustainable landscape management. *Environ. Manag.* **2011**, *48*, 334–349. [CrossRef]
107. Cabieses, H. Coca, Forests, and Indigenous Amazonian Peoples. In *Peru: Deforestation in Times of Climate Change*; Chirif, A., Ed.; IWGIA, Servindi, ONAMIAP & COHARYIMA: Lima, Peru, 2019; pp. 25–52. Available online: <https://iwgia.org/en/resources/publications/3529-peru-deforestation-in-times-of-climate-change.html> (accessed on 8 June 2025).
108. Salisbury, D.S.; Fagan, C. Coca and conservation: Cultivation, eradication, and trafficking in the Amazon borderlands. *Geojournal* **2013**, *78*, 41–60. [CrossRef]
109. Hayes, T.; Murtinho, F.; Wolff, H.; López-Sandoval, M.F.; Salazar, J. Effectiveness of payment for ecosystem services after loss and uncertainty of compensation. *Nat. Sustain.* **2022**, *5*, 81–88. [CrossRef]
110. Isyaku, U. What motivates communities to participate in forest conservation? A study of REDD+ pilot sites in Cross River, Nigeria. *For. Policy Econ.* **2021**, *133*, 102598. [CrossRef]
111. Tacconi, L.; Williams, D.A. Corruption and anti-corruption in environmental and resource management. *Annu. Rev. Environ. Resource.* **2020**, *45*, 305–329. [CrossRef]
112. Peters, M.A.; Besley, T.A. Social exclusion/inclusion: Foucault’s analytics of exclusion, the political ecology of social inclusion and the legitimization of inclusive education. *Open Rev. Educ. Res.* **2014**, *1*, 99–115. [CrossRef]
113. Arora-Jonsson, S.; Agarwal, S.; Colfer, C.J.P.; Keen, S.; Kurian, P.; Larson, A.M. SDG5: Gender Equality—A precondition for sustainable forestry. In *Sustainable Development Goals: Their Impacts on Forests and, People*; Katila, P., Colfer, C.J.P., de Jong, W., Galloway, G., Pacheco, P., Winkel, G., Eds.; CABI: São Paulo, Brazil, 2019; pp. 146–177. [CrossRef]
114. Zulu, L.C.; Djenontin, I.N.S.; Darkwah, A.; Kamoto, J.; Kampanje-Phiri, J.; Fischer, G.; Grabowski, P.; Egyir, I. Realizing Inclusive SAI: Contextualizing indicators to better evaluate gender and intergenerational inequity in SAI processes and outcomes—cases from Southern and Western Africa. *Int. J. Agric. Sustain.* **2020**, *19*, 376–402. [CrossRef]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.