REDD+ Benefit Sharing to Local Communities: Exploring Design Features and Contextual Factors of REDD+ Projects at the Global Landscape

Master Thesis

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Master's thesis

REDD+ Benefit Sharing to Local Communities: Exploring Design Features and Contextual Factors of REDD+ Projects at the Global Landscape

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List of Acronyms

ARR	Afforestation
BSM	Benefit Sharing Mechanism
CCB	Climate, Community & Biodiversity Standards
CCBA	The Climate, Community & Biodiversity Alliance
CDM	Clean Development Mechanism
FAO	Food and Agriculture Organization
GHG	Greenhouse Gases
ID-RECCO	International Database on REDD+ projects
IFM	Integrated Forest Management
M	Mean
NCB	Non-Carbon Benefit
PDD	Project Design Document
PES	Payment of Ecosystem Services
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDD+	the "plus" refers to "*the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.*"
SD	Standard Deviation
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

Abstract

This master's thesis explores the benefits and influencing factors of Reducing Emissions from Deforestation and Forest Degradation Plus (REDD+) projects in local communities. The study analyzes empirical data to gain insights into the benefits provided by REDD+ projects and their influencing factors (i.e., certification standards, legal tenure rights, finance sources, and regional factors). The research analyzes empirical data collected from REDD+ projects worldwide and examines the association between these factors and the benefits provided. The findings indicate that local communities primarily benefit from REDD+ benefit-sharing mechanisms through non-monetary and non-conditional monetary benefits. On average, projects provide four benefits: income-generating activities, employment, tree planting, and environmental education. The analysis also shows that community-focused certification standards such as Plan Vivo, CCB (Climate, Community & Biodiversity Standards), and Gold Standard positively influences the variation of benefits designed for the community, especially projects certified by VCS & CCB. Regarding contextual factors based on geographical location, Latin America is the prominent host of REDD+ projects associated with more tenure clarification benefits. At the same time, the African region positively influences well-being-related benefits. Projects with communities as land tenure rights and customary use holders have more tenure clarification benefits, unlike private sectors as holders. As a part of multiple rights holders (i.e., private & community, state & community), the community positively affects forest restrictions imposed on communities. The findings provide valuable insights for policymakers and project implementers to design and implement equitable REDD+ benefit sharing mechanisms.

I. Introduction

Climate change is a significant global challenge that poses risks beyond borders. Reducing carbon emissions and staying within our carbon budget is imperative to limit global warming to below 2 degrees Celsius. A multi-faceted approach is essential, encompassing technological advancements and nature-based solutions. In 2007, REDD+ was incorporated into the global climate change negotiation structure during COP13 of the UNFCCC held in Bali. Following this, several tropical forest nations have worked towards developing and executing a national REDD+ plan, deemed an economical method of addressing climate change at the time (Brockhaus et al., 2014; Stern, 2007).

REDD+ is a multipurpose mechanism utilized by subnational entities to promote better forest management practices via incentivization and restriction (Duchelle et al., 2017). The restriction involves limiting access to forest conversion based on existing laws. At the same time, the incentive includes quality of life improvement to compensate landowners for anticipated losses or improve their situation for activities supporting REDD+ goals (Duchelle et al., 2017).

REDD+ is a form of payment of ecosystem services (PES) mechanism. The concept of PES refers to the voluntary exchange of incentives, usually in the form of money, from those who benefit from ecosystem services to those who provide them, with the condition that the incentives are tied to the actual provision of the service and participation is done willingly (Corbera, 2012). Some REDD+ projects also operate under a voluntary carbon market, enabling companies or individuals to offset their emissions. In 2018, forestry and land use were the top categories with high transaction volumes in the voluntary carbon offset market (50.7 $MtCO_2eq$), followed by other projects, such as renewable energy (23.8 $MtCO_2eq$) and waste disposal (6.1 $MtCO_2eq$) (Donofrio S et al., 2019). There has been a significant surge in REDD+ volumes from 2020 to 2021, featuring a considerable magnitude of 166% in avoided unplanned deforestation projects and a remarkable increase of 972% in avoided planned deforestation (Donofrio et al., 2021).

While REDD+ is a viable measure to avoid GHG from deforestation, REDD+ might also limit forest-dependent communities in utilizing natural resources for their livelihood improvement, especially in developing countries where most REDD+ projects are located (Katerere et al., 2015). Livelihood-damaging outcomes of REDD+ include unequal income distribution, loss of access to forests and forest tenure rights, reduced land for farming, conflicts occurring within

and between communities, uncovered opportunity costs, and marginalization (Bayrak & Marafa, 2016). To address these concerns, the livelihood aspect can be part of REDD+ intervention on top of environmental, institutional, and socio-cultural (Bayrak & Marafa, 2016).

Cancun Safeguards introduced the term "non-carbon benefits" (NCBs). NCB expands the scope of REDD+ benefits beyond reducing and sequestering greenhouse gas emissions, thereby enabling REDD+ projects to address its potential risks to local communities. As per UNFCCC's interpretation of the social advantages, REDD+ activities can offer various benefits, such as enabling individuals and communities to become empowered, improving population security, and creating opportunities for prosperity and betterment (Conservation International, 2014).

In this master's thesis, I analyze the distribution of non-carbon benefits by using the notion of benefit sharing. Luttrell et al. (2013) define "benefit sharing" under REDD+ as benefit distribution resulting from implementing the REDD+ projects and policies among different stakeholders. Nevertheless, each REDD+ project has various designs to distribute the foreseen benefits to local communities (i.e., who gets rewarded, what type of benefits, and under what conditions). As more debates around benefit sharing emerge around what is perceived as a benefit (Rakatama et al., 2020), the rationale behind who should receive the benefit (Luttrell et al., 2013), and the distributive equity aspect in REDD+ (McDermott et al., 2013), in this master's thesis I explore the benefit sharing to the local community level by posing the following overarching question:

"How do local communities benefit from REDD+ benefit sharing mechanisms?"

Then, I specify the overarching research question into two components:

1. **Benefits**

   What types of benefits are foreseen to local communities from REDD+ projects worldwide?

2. **Potential influencing factors**

   How can design features and contextual factors of projects influence REDD+ benefit sharing to the local community?

II. Literature Review

Using keywords such as community, REDD+, and benefit on the Web of Science, the search yielded 208, showing that most academic articles on REDD+ benefit sharing were country or area-specific cases. There were only 43 articles discussing non-area-specific context. Studies on REDD+ projects at the global level, such as those done by Atmadja et al. (2022), are still limited. Such global snapshots can inform the international climate policy debate on climate action strategies, interventions, and geographic heterogeneity, and it is particularly relevant when considering that global climate strategies such as REDD+ are likely to have different effects in different contexts.

I would like to contribute to what has been built on the published studies about the community benefits of REDD+ in the global projects' context, as done by Luttrell et al. (2013), Tjajadi et al. (2015), Wong et al. (2019), and Lawlor et al. (2013). This master thesis updates what they published with new features that have emerged in the voluntary markets in the past three years. The updated features include understanding the influence of new standards, a higher number of projects and carbon credit trading volumes, and more specific benefit types. This study may contribute to the debate on non-carbon-related benefits to the local community by providing empirical analysis from global REDD+ project documents. By examining the relationships between certification standards, tenure rights, and other contextual factors with benefit distribution, this study contributes to a better understanding of how different factors influence the allocation of non-carbon benefits.

2.1 Conceptual framework for analyzing design features and contextual factors

I structure the analysis by utilizing and adapting a framework developed by Wong et al. (2019). Instead of using the framework to assess BSM's outcomes as in the original work, I use the framework differently to frame community benefits from the projects. The framework helps me to identify BSMs' design features and contextual aspects (Table 1). Aspects related to the extent to which BSMs reduce emission (effectiveness) (Wong et al., 2019), BSMs' relative costs to achieve emission reduction (efficiency) (Wong et al., 2019), and how equal and just are BSMs (equity) (McDermott et al., 2013) are beyond the scope of this study.

Table 1. Adapted framework to assess benefit sharing mechanisms and their contextual factors, adapted from Wong et al. (2019)

Benefit sharing mechanism	**Contextual factors**
Typology/Basic description • Objective of mechanism • Type of benefit • **Type of finance**	**Tenure and rights** • **Forest tenure** • **Rights and tenure reforms *(Tenure rights and customary use)***
Design features • **Types of activities involved** • **Types of payments or benefits** • **Conditionalities for payments** • Timing • Beneficiaries • Types of cost • Decision-making process • Safeguards & Monitoring • ***Certification standard*** • ***Restrictions***	Culture, social, and livelihood characteristics Governance and policy • Governing institution • Capacity of governing institution • Multi-level governance issues • Degree of decentralization • Enforcement • Supporting policy instruments • Linkage with other sectoral policy

The bold texts express components that are included in the study. The italic text represents aspects included in addition to the original framework. The regular text style and grey area represent the factors not included in the study.

The grey area on the adapted framework represents excluded components in this master thesis. The governance and policy factors are essential when analyzing REDD+ benefit sharing in a particular area or country. While this study compares projects globally, global comparative data on these factors is unavailable. Moreover, the design features of a project are tailored to the local context and can be influenced by local government and policy contexts. However, REDD+ projects that adhere to the Voluntary Carbon Mechanism typically follow global methodologies and standards.

In general, there are two scales of REDD+ initiatives: jurisdictional (i.e., administrative areas) and projects (i.e., site-specific REDD+ activities) (Granziera et al., 2021). Projects can be standalone or/and nested in larger jurisdictional initiatives (i.e., multiple accounting scales and governance levels within a country). In this study, I focus on the REDD+ project level to complement existing studies on jurisdictional approaches, as done by Wunder et al. (2020), Guerra & Moutinho (2020), and Irawan et al. (2019). I take advantage of the higher number

and diversity of REDD+ projects compared to jurisdictional projects at the global level to better contrast the role of different factors in shaping how projects attempt to benefit local communities (Wunder et al., 2020).

2.2 Design Features

Design features relate to targeting, activities, allocation of benefits, and decision-making processes of the BSMs for achieving the outcomes (Wong et al., 2019). While benefits are the center of this study, I also include forest restriction components hand in hand with the benefits. Restrictions could be limitations on land use, access to resources, or conditions for receiving benefits. By considering both benefits and restrictions, we can have a more complete understanding of the overall impact of REDD+ on the community. The analysis of restrictions helps identify the trade-offs and potential unintended consequences of REDD+ implementation. For example, while REDD+ may generate carbon sequestration benefits and financial incentives for forest conservation, it may also impose restrictions on traditional land rights or forest resource use (Bayrak & Marafa, 2016), negatively impacting local communities. Analyzing benefit and forest restriction helps identify potential inequities, power imbalances, and barriers to BSMs.

Benefits, restrictions, and conditionalities

There are ways to understand the types of benefits going to the local community. Following Pham et al. (2022) approach to classifying benefit types, there are three main categories: direct cash based on performance (conditional), direct cash not based on performance (non-conditional), and non-cash/in-kind. The conditionality of the first type can follow either an input-based or output-based approach (Angelsen, 2008). Payments for input-based schemes are conditional on the inputs, assuming that inputs produce expected outcomes, especially where outcomes are hard to measure directly (UN-REDD PROGRAMME, 2023). Meanwhile, output-based is conditional on the directly measured outcome (i.e., emission-based or/and stock-based). Credit or incentive is given for enhanced carbon stocks and maintaining baseline stocks. The non-conditional payment type can be in the form of seed funding or start-up costs that enable landholders to cover the initial cost of labor and opportunity cost of land-use change (Wong et al., 2022). In addition, the payment could include support to implement community projects that provide productive inputs (e.g., for agriculture, forestry, etc.). Even though project implementers and households perceive conditional payment as an effective intervention, its

utilization is still significantly under the non-conditional incentives (Wunder et al., 2020). I construct the hypothesis below by returning to the first research question (i.e., types of benefits planned for local communities from REDD+ projects worldwide).

H_{11}[1]: REDD+ projects are more likely to give non-conditional than conditional monetary benefits.

Furthermore, the local community expects to benefit from REDD+ projects in many ways. For instance, communities in a REDD+ project in Cameroon seek livelihood-improving benefits with employment as the most preferred form, followed by community development projects (i.e., water piping, financial aids for small business establishment, training on agriculture, and infrastructure) (Awung & Marchant, 2020). The community development projects fit into the third category (i.e., non-cash or in-kind). Aligning with the community's expectations, Soliev et al. (2021) observe that projects in several African countries complement monetary compensation with non-monetary, such as land tenure system, infrastructure, and agricultural productivity improvement. Accordingly, I expect REDD+ projects to be a tool to improve livelihood by giving more than one type of benefit to the community surrounding the projects. Then, I synthesize the second hypothesis for my first research question below.

H_{12}: REDD+ projects are more likely to give both non-monetary and monetary benefits than only one type.

Certification standard

A requirement of a REDD+ project to have a certification standard is why I include it in the design features (Table 1) (Merger et al., 2011). For that reason, a project needs to follow specific criteria, which can influence the design of a project. Many standards have been established to ensure the quality and credibility of the carbon credits generated from REDD+ projects (De La Fuente & Hajjar, 2013). According to the International Database on REDD+ projects and programs (ID-RECCO), the most common standards worldwide are Climate, Community, and Biodiversity (CCB), Verified Carbon Standard (VCS), Gold Standard, and Plan Vivo.

[1] H_{11}: The first "1" indicates hypothesis from the sub research question 1 and second "1" refers to the order so it means first hypothesis related to benefits.

Different certification systems in the voluntary carbon market emphasize various aspects of a project. For instance, CCB certification comprehensively covers biodiversity protection and community development. Plan Vivo (which means "Life Plan") promotes sustainable development involving marginalized communities in developing countries, while VCS emphasizes emission reductions (Merger et al., 2011). VCS and CCB certifications are under the same company called Verra and are pursued one after another (VCS being standard pursued first) or together (Granziera et al., 2021). Gold Standard has vital attributes of biodiversity conservation and sustainable community development (Schmidt et al., 2016). I will investigate whether there is some degree of association between the certification standard of each project and the types of benefits going to the community. To what extent certification standards, as part of the design features, can influence benefits going to the community is a part to answer my second research question (i.e., how design features and contextual factors of projects can influence REDD+ benefit sharing to the local community?). As some certification standards focus more on the community than others, I formulate my hypotheses below.

H_{21B}[2]: If projects with community-focused standards (i.e., CCB, Plan Vivo, and Gold Standard) plan to give more/fewer benefits to communities than the others, then certification standards influence benefits going to the community.

H_{21R}: If projects with specific standards plan to give more/fewer restrictions to communities than the others, then certification standards influence restrictions going to the community.

Finance

There are different views on how REDD+ projects should be financed, and it could be market-based (i.e., carbon credits sales), fund-based (fundraising, such as multilateral funds), or a hybrid between them (Vijge et al., 2016). Results-based finance is a foundation approach of REDD+, as outlined in the Paris Climate Agreement, concerning financial uncertainty and performance elements (Wong et al., 2016). When seeing REDD+ as a multi-level PES concept,

[2] H_{XYZ} – x indicates that hypothesis is related to sub research question 1 (benefits) or 2 (influencing factors), y indicates hypothesis order, and z indicates whether the dependent variables is related to benefit (B) or restrictions (R). Therefore, H_{21B} is the first hypothesis constructed to answer second sub research question regarding influencing factors with benefits as the dependent variables.

there are payment flows from international private or public buyers to the sub-national level, including communities (Wunder et al., 2020). Thus, as part of a sub-national level, the community would also be exposed to the results-based principle (Angelsen et al., 2009; Sunderlin & Atmadja, 2009; Wunder et al., 2020). I would like to investigate further whether the funding source has some degree of influence on conditional payments going to the community. Specifically, I expect those carbon-credits-generating projects to be highly associated with results-based payment to the community for incentivizing emission reduction by keeping the forests intact. Therefore, I propose another hypothesis as part of the second research question.

H_{22}: If projects with a specific source of finance (i.e., carbon credits) plan to give more/fewer conditional payment benefits than the others, then the source of finance can influence the conditionalities.

2.3 Contextual Factors

The outcomes of benefit sharing depend on the essential characteristics/typology and design features of BSMs and contextual factors (Wong et al., 2019). Contextual factors are necessary for providing a more profound interpretation and understanding of the specific environment in which the policy is being implemented.

Tenure rights

Many forest-dependent communities, especially in low-income countries, still face land tenure insecurity (Rakotonarivo et al., 2023). REDD+, as one of the policies to avoid deforestation, incentivizes those who make efforts, for example, to keep the forest standing (Sunderlin et al., 2009). Nevertheless, there is a risk that marginalized forest communities do not receive the benefit allocated as they are not legitimately registered as a right holder of the land. Third-party certification standards (such as those mentioned above) are also expected to mitigate the risks of social conflicts. For instance, the Community and Biodiversity Alliance (CCBA) standard requires projects to help resolve land tenure or use disputes within the project zone (Sunderlin et al., 2009).

When seeing REDD+ as payments for environmental services (PES) schemes, one of the pivotal preconditions is the land's exclusive right to deliver the service (Börner et al., 2010; Sunderlin et al., 2009). The exclusive rights mean that landholders as payment receivers must possess the right to exclude others who could use the forest in ways incompatible with

providing the contracted service (Sunderlin et al., 2009), which for the REDD+ case is avoiding deforestation.

The legal right holder of the land (*de jure)* is not always identical to the actual land user (*de facto)*. Even in the cases of communities possessing legal rights, they may not be able to exercise them (Sunderlin et al., 2009). Another case could be the state, as land/forest owners, only grant management rights to communities without giving the rights to sell the land (Ngakan et al., 2005). Customary tenure pertains to systems developed by local communities and have been used for a considerable time (Bradley & Fortuna, 2019). These systems encompass norms, rules, institutions, practices, and procedures that have gained social acceptance as they are effectively managed and modified by the local communities. National constitutions, legislations, or court decisions may not officially recognize customary tenure. That is why it is essential to acknowledge and include *de facto* land use as a contextual factor in BSMs, which could result in more inclusiveness or exclusivity of the benefit toward the forest community. I will refer to *de facto* land use as customary use and *de jure* as tenure rights, which follow a common term in forestry studies. The tenure rights may influence communities' ability to benefit from REDD+ activities, so I synthesize the hypotheses below.

H_{23B}: If projects with certain land tenure rights plan to give more/fewer benefits (i.e., land tenure clarification, livelihood, environmental education, etc.) than the others, then land tenure rights can influence benefits to the community.

H_{23R}: If projects with specific land tenure rights plan to give more/less restrictions than the others, then land tenure rights can influence restrictions going to the community.

H_{24B}: If projects with certain customary use rights plan to give more/less benefits (i.e., land tenure clarification, livelihood, environmental education, etc.) than the others, customary use can influence benefits to the community.

H_{24R}: If projects with specific customary use rights plan to give more/less restrictions than the others, then customary use rights can influence restrictions going to the community.

Region

Instead of completely ignoring the aspects in the grey box (Table 1), I capture the importance of translating BSM to the local community by exploring their influences on benefits or restrictions to the community. I expect that projects in different regions and countries have

distinct ways of delivering benefits to the community due to specific characteristics and political situations. For example, more than half of forest areas in China are legally owned by collectives (Xu et al., 2010), and indigenous communities in Latin American countries have been progressively claiming their land rights (Ngakan et al., 2005). Therefore, I formulate more hypotheses below.

H_{25B}: If certain regions/countries plan to give more/fewer benefits than others, then regions/countries can influence benefits foreseen to the community.

H_{25R}: If certain regions/countries plan to give more/fewer restrictions than others, then regions/countries can influence restrictions foreseen to the community.

III. Research Design

This master's thesis uses a deductive research design to analyze different benefits to local communities and their relations to several factors using an adapted framework developed by Wong et al. (2019).

3.1 Analytical Framework

The conceptual framework (Table 1) establishes the theoretical foundation and guides the selection of key variables and factors to be examined that are further referred to as *influencing factors*. It helps identify the main components and relationships relevant to the study. On the other hand, the analytical framework operationalizes the conceptual framework by specifying the study's variables, data sources, and analysis methods. It provides a structured approach to analyze the data and test the hypotheses derived from the literature review.

To target my attention to the community's interests and concerns, I have selected certain community-focused features under BSM as the core of the analysis. These features are referred to as *benefits* (i.e., related to research question 1), which include the type of benefit or payment, conditionalities for payment, and restrictions. Next, they serve as dependent variables for further association analysis (i.e., related to research question 2). The remaining selected BSM typology/features (i.e., type of finance and certification standard) and contextual factors (i.e., forest tenure and region), referred to as *influencing factors*, are considered independent variables. A simplified analytical framework, illustrated by Figure 1, depicts the association between *benefits* and the *influencing factors*.

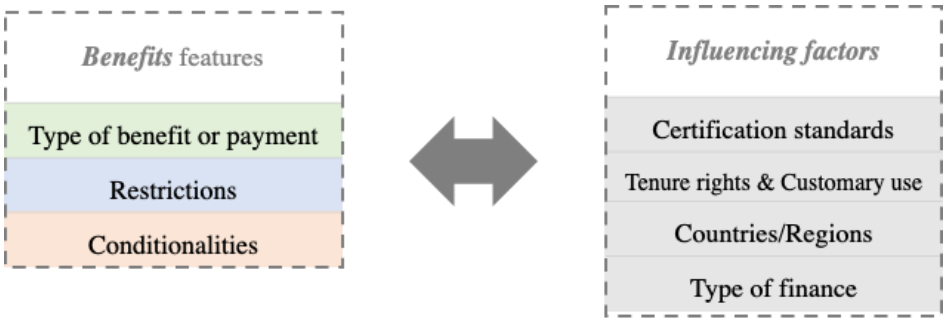

Figure 1. The analytical framework for exploring the association between benefits features and influencing factors.

Figure 2 depicts an association map for exploring the relationship between benefits features and influencing factors. The boxes in colors are my dependent variables that are further investigated by examining their associations with variables in grey boxes. I match them individually as a point of analysis, labeled with numbers and alphabet (i.e., 1A, 1B, etc.). Furthermore, the analysis points on the association map (Figure 2) would answer each hypothesis constructed above.

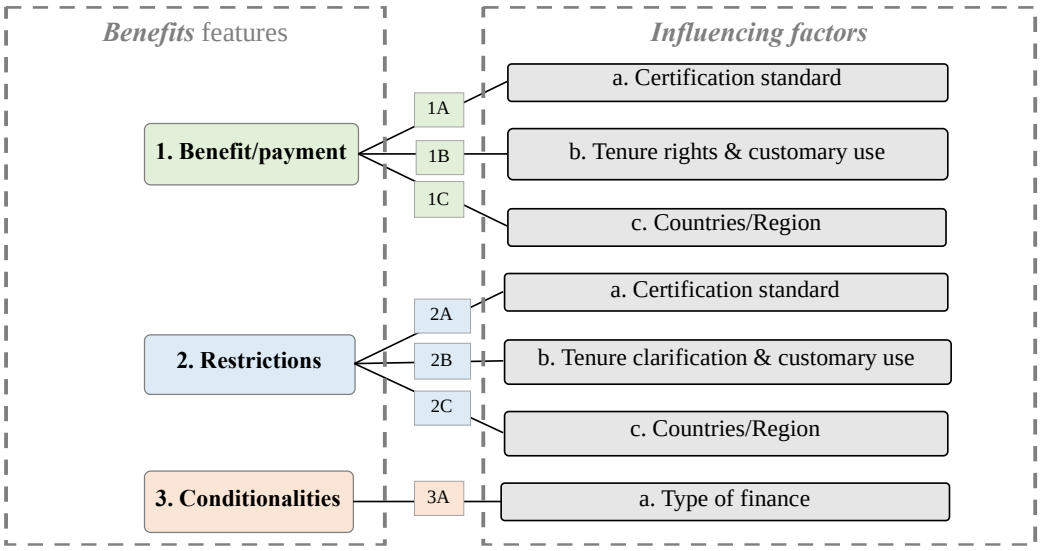

Figure 2. Associations map for analyzing the association between community-focused features and influencing factors. The analysis points attempt to test the hypotheses formulated above.

3.2 Materials

I use an Excel dataset developed by the Centre for International Forestry Research (CIFOR) on REDD+ projects called the International Database on REDD+ Projects and Programs – Linking Economics, Carbon, and Communities (ID-RECCO). CIFOR started the Global

Comparative Study (GCS) on the REDD+ project in 2009, and managing global REDD+ project evaluation documentation is part of the project. CIFOR has been managing the ID-RECCO database since 2018 and updated every two years, the last being in 2022. The database contains more than 600 projects/programs, which includes and characterizes REDD+ projects and programs across 110 variables on several aspects: carbon certification, sources of financing, community-level interventions, project proponents, and general features of the project.

The data gathered were sourced from publicly accessible documents, mainly from Project Design Documents (PDD). PDD is a document that includes detailed planning of a carbon project and how it meets each requirement of a particular carbon project standard (UN-REDD PROGRAMME, 2023). A project must have a PDD before applying for standard and certification schemes for project registration. These standards (i.e., CCBA, CDM, Plan Vivo, VCS) are required for REDD+ projects to sell carbon offsets. Certification standard documents also include detailed information about the project.

A way to analyze the projects' documents and transform them into Excel tabulation data is by conducting content analysis. Content analysis is a research tool to examine the presence of certain words, themes, or concepts within some given qualitative data (i.e., text) (Franzosi, 2008). The main objective is to examine the occurrence of explicit information about benefits going to the community by words based on pre-determined keywords (Table 2), and I will put them into types of benefit variables. However, I allow flexibility in iteratively adjusting more relevant codes and categories throughout the process. Next, a PDD document's content analysis is done by manually searching some keywords that belong to specific categories using a basic search feature on a computer. A project's texts in line with pre-determined keywords are coded as Yes, and those contrary to pre-determined keywords are coded as No in the categorized column on the Excel sheet. A project without information on the variables based on the pre-determined keyword is coded as ND (no data).

Table 2. ID-RECCO community-level benefit and restrictions variables' descriptions, keywords, and categories.

Benefits variable	**Description**	**Keyword**	**Category coded under the variable**
Monetary benefit	A statement on cash benefits to communities is identified in the project document.	-	Yes No
Employment	The project states that it will employ local community members.	Employ, hiring, recruit, salary, job.	Yes No
Direct cash	The project states that it will benefit the local community through cash payments.	Payment, income generation, fee, revenues.	Non-conditional Conditional Both
Non-conditional	Communities can receive benefits not conditional on performing activities that directly contribute to emissions reductions.	Without conditional.	Yes No
Conditional	Communities can receive benefits conditional on performing activities that directly contribute to emissions reductions.	Based on performance.	Yes No
Both	Benefits can be received by communities both conditional and non-conditional (e.g., non-conditional for employment and conditional for direct cash).	Employment and based on performance.	Yes No
Non-monetary benefit	There is a non-cash benefit going to the local community.	-	Yes No
Tenure clarification	There is recognition or clarification of tenure rights to the community by the project.	Carbon rights, land tenure clarification, land property certification, legal rights, secure land ownership, certificate/certification, participatory mapping.	Yes No
Livelihood	The project provides activities related to livelihood. The alternative activities provided might enhance the local economic development.	Agriculture, agroforestry, microenterprise, sustainable mining activities, ecotourism, economic interest groups, sport hunt, processing and commercialization, micro-credits, tree planting, fuel-efficient stoves, fishing, non-timber forest product (NTFP), capacity building.	Yes No
Environmental education	There is a component of environmental education, technical assistance or training, or inputs to support different productive activities included in the project.	Raising awareness, forest fire training, agroecology training, sustainable forest management, awareness campaign, workshop	Yes No

Benefits variable	Description	Keyword	Category coded under the variable
Tree planting	There is a component of forest enhancement in the project.	Tree planting, restoration, afforestation, reforestation, regeneration.	Yes No
Infrastructure	The project includes a component of community infrastructure improvement (e.g., road, market, school construction/building).	Access to roads, electricity, water distribution, infrastructure, connection network, small irrigation, school, building.	Yes No
Well-being/service	The project includes a component of well-being improvement (non-environmental, education service, health service, water filters/chlorine).	Health, education, happiness, early child education, ambulance service, water infrastructure, maintenance, water filter, community fund.	Yes No
Restrictions	There is a component of forest access restriction for the local community.	Forest patrol, forest protection, forest restriction, monitoring area, avoiding deforestation by protecting, prohibition, and conservation.	Yes No

I analyze the 359 ongoing projects in this study. Figure 3 depicts the data structure of the community-level benefits features. The boxes are labeled with some numbers as additional information on how many projects incorporate each type of benefit. Since one project can have more than one type of benefit, the number of projects overlaps among different variables.

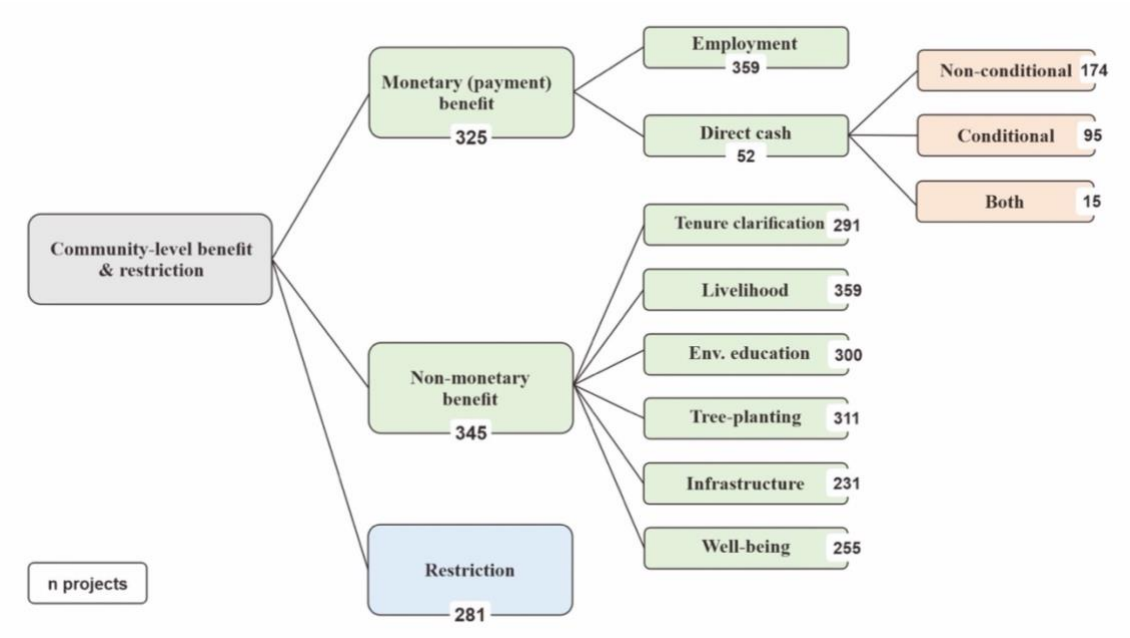

Figure 3. ID-RECCO community-level data structure (self-produced graph was interpreted from database structure)

While the community-level data structure (Figure 3) focuses on benefits features, it is also part of the general data structure (Figure 4), where variables related to influencing factors belong. The variables written in bold are included in the analysis as influencing factors.

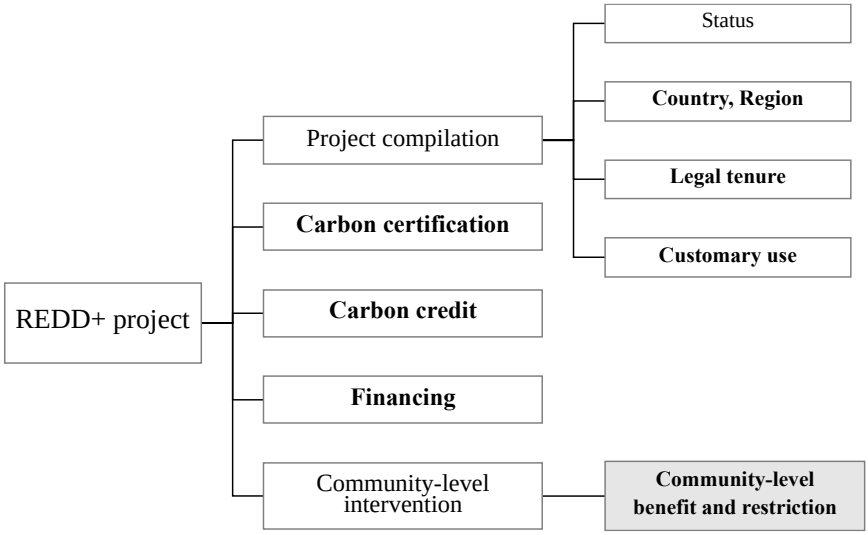

Figure 4. ID-RECCO general data structure (self-produced graph was interpreted from database structure and was adapted based on research scope)

I select several variables under the ID-RECCO data structure to become influencing factors as independent variables to estimate benefits going to the community. Table 3 shows details of each variable used further for association analysis. Nevertheless, there are some caveats in using the ID-RECCO database in this study. The dataset captures benefits going to the local community from project documents, so there is no validation regarding the outcomes. Hence, projects aim to benefit communities without knowing what has been given. In addition, there may be some inconsistencies across multiple coders since the ID-RECCO dataset is based on thematic coding

Table 3. Influencing factors' descriptions, keywords, and categories.

Influencing factor variable	**Description**	**Category coded under the variable**
Carbon certification	A certification standard that a project has.	CDM Gold Standard ND/None Plan Vivo VCS VCS & CCB Others
Financing	A kind of funding to be invested in a project.	Aid/grants Carbon credits Others
Region	A region grouping generalizes the locations of most REDD+ project hosts. Countries lie under three big region categories and represent 224 out of 359 total projects (Figure 7).	Asia (China, Indonesia, India) Africa (Kenya, Uganda, Tanzania) Latin America (Colombia, Brazil, Peru)
Legal tenure	The legal rights holder of the land.	Community Private State Private, state Private, community State, community Private, community, state
Customary use	The actual user of the land.	Community Private State Private, state Private, community State, community Private, community, state

3.3 Data Analysis

To answer the first research question on benefits foreseen to local communities from REDD+ projects worldwide, I use descriptive statistical analysis to describe what types of benefits go to the community. The analysis of benefits categorization includes variables' distribution and variability (range, variance). I use Microsoft Excel to organize data and Tableau for data visualization.

On top of the variables available on the dataset (Figure 3), I added a benefit score. The benefit score is a self-construct variable interpreted from the ID-RECCO database. It measures a variety of project interventions, not the number of interventions. The assumption is that projects with a more variety of interventions can cater to diverse community needs and contexts. Types of benefits included in the benefit score are in Figure 5.

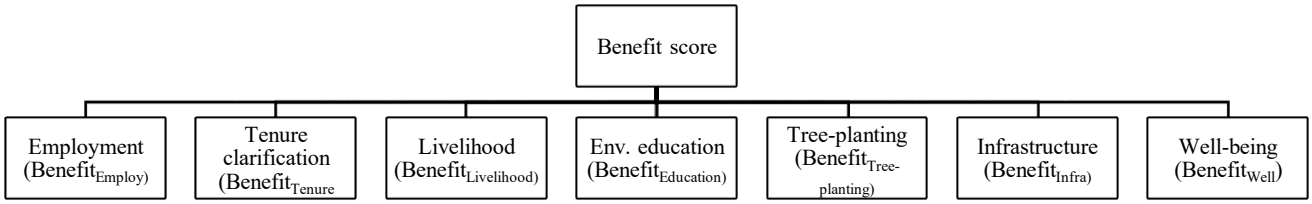

Figure 5. Benefit score structure.

Every type of benefit is valued 1 if coded Yes and 0 if coded No. Next, I measure the benefit score by summing the values so a project has a value ranging from 0 to 7. The exclusion of direct cash from benefit score calculation is because it has an aspect of conditionality (data structure Figure 3). Direct cash as a benefit has specific targets at the household unit with preconditions, such as legal tenure and customary use security, which are not always the case in the community. Benefit score aims to capture benefits foreseen to a larger community context.

I perform statistical analysis to answer the second research question about influence by using SPSS software. I use statistical association tests between categorical variables, such as Chi-square and logistic regressions (logit). These methods are suitable because most variables are categorical data with Yes, No, or No Data (ND) codes. In addition, I use negative binomial regression for association analysis between benefit score as a continuous variable and certification standard as a categorical data type. I use them to test if there is no association between a type of benefit and influencing factors variables as the null hypothesis (H_0). Even though there are data points with ND codes, I will exclude them from the analysis.

Logistic regression is the most commonly used technique for establishing a connection between a binary outcome and a set of explanatory variables (Sur et al., 2019). I use logistic regression for association analysis points between multiple independent variables (continuous or categorical) and binary dependent variables (e.g., is there employment benefit in the project? The answers are only between yes and no because I exclude ND as missing data in the analysis). Based on the analytical framework (Figure 1), I construct simple models to estimate the occurrence of benefit features (i.e., dependent variables): each benefit type ($Benefit_x$), restrictions (Res), and conditionalities (Conditional) depend on legal tenure rights (LT), customary use (CU), certification standard (CS), finance type (F), and country/region (C/R) as the influencing factors. *x* in $Benefit_x$ depends on the types of benefit, as seen in Figure 5. Model 3 is a negative binomial model that checks and analyzes which influencing factors have a significant connection to the benefit score (i.e., outcome variable).

$$Benefit_x = f\ (LT\ +\ CU\ +\ CS\ +\ F\ +\ R) \qquad \ldots\ldots\ (Model\ 1)$$

$$Restrictions = f\ (LT\ +\ CU\ +\ CS\ +\ F\ +\ R) \qquad \ldots\ldots\ (Model\ 2)$$

$$BenefitScore = f\ (LT\ +\ CU\ +\ CS\ +\ F\ +\ R) \qquad \ldots\ldots\ (Model\ 3)$$

Before the logistic regression procedure, SPSS also ran the Omnibus Test to ensure that the significance value of the current model is less than 0.05, which indicates that it outperforms the null model. The null model in SPSS is where the regression line strikes the Y axis when the independent variable has a value of 0 (i.e., intercept).

Benefit types and restrictions as dependent variables are categorical data and binary, so both chi-square and logistic regression can be utilized for association analysis. Whereas chi-square can provide a *p*-value indicating the strength of association between two variables, logistic regression can provide more detailed insights by estimating the odds ratios and predicting the probability of an event occurring based on the independent variables. Logistic regression can also handle multiple independent variables simultaneously. However, I use both methods to check whether the results from each of them are aligned with one another.

Negative binomial regression is for modeling count variables. It is one of the most common statistical analyses for an over-dispersed count or non-normal distribution data (Bono et al., 2017) when the conditional variance exceeds the conditional mean. It allows to test connections between multiple predictor variables on a count of outcome variables. As negative binomial regression allows multiple predictors for the model, the test of model effects in SPSS is critical

to check if the predictor's effect equals 0. Predictors with significance values less than 0.05 have some visible effects.

Returning to the second research question about influencing factors, I integrate analysis points from the analytical framework (Figure 1) to answer the hypotheses constructed from the literature review with the statistical methods and models (Table 4). Even though several analysis points have a typical model (e.g., 1A, 1B, and 1C), the difference is how I use different references for each influencing factor. When testing for analysis point 1A, for example, I will do the tests multiple times with a different reference each time, such as using No Certification, CDM, and so on, but keeping other references for influencing factors constant throughout the 1A analyses. Therefore, I can compare the results from different references and analyze whether the results are consistent.

In the next chapter, I present the results from performed tests in tables, most containing information about *benchmark, significant category, type of influence, estimated influence, and p-value*. *Benchmark* refers to a reference level used in logistic regression, the category with a zero value. The coefficients of the other categories are compared to this reference level, indicating how their probability of being in the outcome category changes relative to the reference level. *Significant category* refers to a category under a variable with $p < .05$, which also means that it significantly rejects the null hypothesis H_0 statement of "no association" between variables, so there is some degree of association between variables based on the tests. *Type of influence* refers to whether the logistic regression coefficient (β) is more or less than 0, indicating a positive or negative association between variables. It is a different case for analysis using chi-square where tests cannot obtain β. Therefore, the type of influence is observed by comparing the observed count and the expected count of the chi-square analysis. Positive association is when the observed number under the category 'Yes' significantly exceeds the expected number. A negative association is when the observed number under the category 'No' substantially exceeds the expected number. The expected number is a count if two variables are independent. *Estimated influence* is Exp(β), which is defined as the ratio change in the odds of the event of interest (i.e., dependent variables, e.g., tenure clarification, environmental education, benefit score, etc.) for a one-unit change in the predictor (e.g., certification standard, customary use, tenure rights, etc.).

Table 4. Integrating analytical framework, hypotheses, method, and model.

Analysis point	Hypotheses code	Hypotheses sentence	Method	Model
1A	H_{21B}	*If projects with community-focused **standards** plan to give more/fewer **benefits** to communities than others, then certification standards influence benefits to the community.*	Logit	*Model 1*
			Chi-square	*CS x Benefit$_x$*
1B	H_{23B}	*If projects with certain **land tenure rights** plan to give more/fewer **benefits** (i.e., land tenure clarification, livelihood, environmental education, etc.) than the others, then land tenure rights can influence benefits to the community.*	Logit	*Model 1*
			Chi-square	*LT x Benefit$_x$*
	H_{24B}	*If projects with certain **customary use rights** plan to give more/fewer **benefits** (i.e., land tenure clarification, livelihood, environmental education, etc.) than the others, customary use can influence benefits to the community.*	Logit	*Model 1*
			Chi-square	*CU x Benefit$_x$*
1C	H_{25B}	*If certain **regions/countries** plan to give more/fewer **benefits** than others, then regions/countries can influence benefits foreseen to the community.*	Logit	*Model 1*
			Chi-square	*C x Benefit$_x$* *R x Benefit$_x$*
2A	H_{21R}	*If projects with **certain standards** plan to give more/fewer **restrictions** to communities than others, then certification standards influence restrictions going to the community.*	Logit	*Model 2*
			Chi-square	*CS x Restrictions*
2B	H_{23R}	*If projects with specific **land tenure rights** plan to give more/fewer **restrictions** than the others, then land tenure rights can influence restrictions going to the community.*	Logit	*Model 2*
			Chi-square	*LT x Restrictions*
	H_{24R}	*If projects with specific **customary use rights** plan to give more/fewer **restrictions** than the others, then customary use rights can influence restrictions going to the community.*	Logit	*Model 2*
			Chi-square	*CU x Restrictions*
2C	H_{25R}	*If certain **regions/countries** plan to give more/fewer **restrictions** than others, then regions/countries can influence restrictions foreseen to the community.*	Logit	*Model 2*
			Chi-square	*C x Restrictions* *R x Restrictions*
3A	H_{22}	*If projects with certain source of **finance** (i.e., carbon credits) plan to give more/fewer **conditional payment** benefits than the others, then the source of finance can influence the conditionalities.*	Chi-square	*F x Conditional*

IV. Results

4.1 Design of benefits for communities

There are 284 projects with data on conditionality, and the other 75 projects are treated as missing data due to unavailable information on projects' conditionalities. Of 284, 61.3% of total projects (174) have no element of conditionality in their benefits, 33.5% (95) projects have conditionality and only 5.3% (15) have an element of both (Figure 6). Therefore, I can conclude that most REDD+ projects are more likely to give non-conditional than conditional monetary benefits (H_{11}).

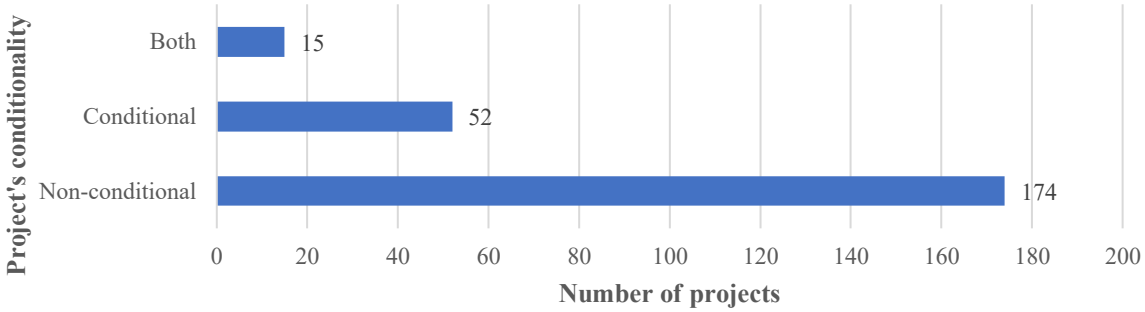

Figure 6. The number of REDD+ projects is based on the conditionality.

Of 359 ongoing projects in the ID-RECCO database, data on the type of benefits the project provides is available for 325 projects. Of this, 317 studied projects (97.5%) mentioned monetary as part of their benefits to local communities, and 332 (96.2%) projects mentioned non-monetary benefits. Of 359 projects, 83% have non-monetary and monetary/payment benefits (Figure 8). Thus, REDD+ projects are more likely to give both non-monetary and monetary benefits than only one benefit type (H_{12}).

Furthermore, I select nine countries (i.e., Colombia, Brazil, Peru, China, Indonesia, India, Kenya, Uganda, and Tanzania) within three regions (i.e., Asia, Latin America, and Africa) that are the biggest hosts of REDD+ projects (Figure 7). They represent more than 50% of ongoing REDD+ projects across the world.

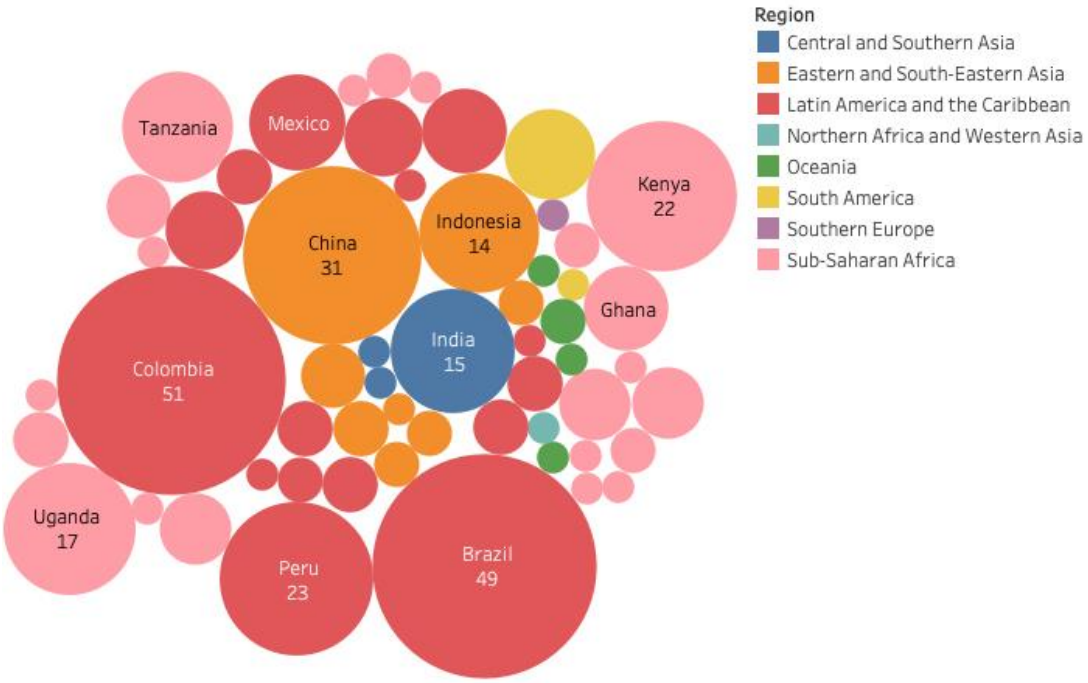

Figure 7. The most significant REDD+ projects' host countries. The size of the circles represents the REDD+ project's size within a country. The figure is constructed from total ongoing REDD+ projects documented in the ID-RECCO database by CIFOR in 2023.

I categorize the projects by countries, and it shows that there are only 13 countries that have more projects with non-monetary benefits than projects with monetary, including Colombia, Kenya, Indonesia, and Peru. On the other hand, only 7 countries, such as Uruguay, Bangladesh, Cambodia, and Costa Rica, are observed to have more monetary/payment benefits than non-monetary. Figure 8 shows that some of the top 3 Latin American countries, Colombia (51), Brazil (49), and Peru (23), host many REDD+ projects, and they account for 34.3% of total global projects. Followed by the top 3 Asian countries as REDD+ hosts: China (31), Indonesia (14), and India (15), they account for 16.7% of total global projects. Lastly, the top 3 African countries, Kenya (22), Uganda (17), and Tanzania (12), account for 14.2% of total global projects.

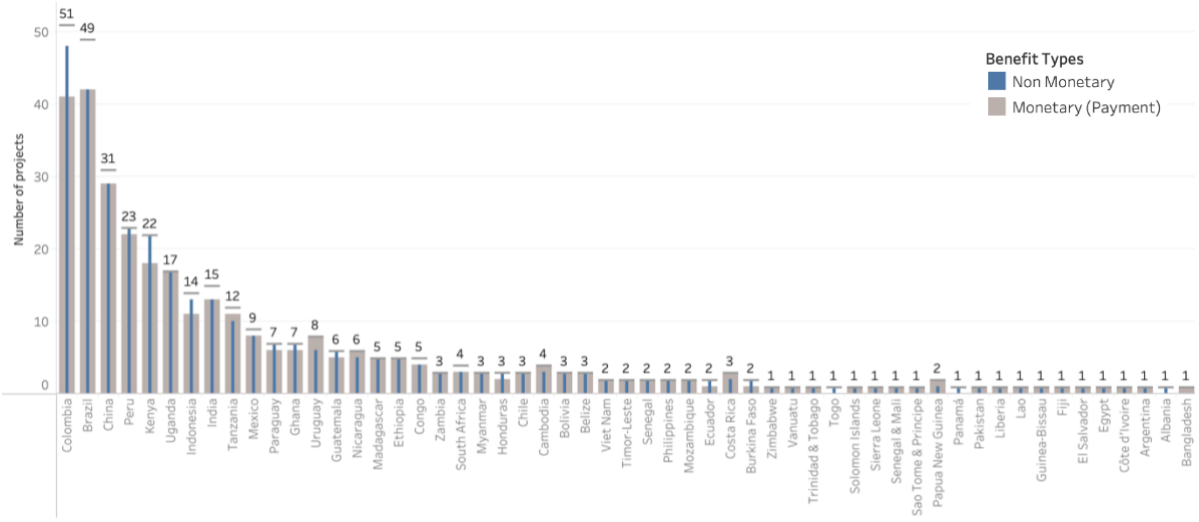

Figure 8. The number of REDD+ projects is categorized by country. The number labeled above the bar indicates the number of projects that each country has.

Furthermore, I categorize monetary and non-monetary benefits designed by projects into 8 categories (Figure 9). Almost all REDD+ projects have livelihood benefits (99.2%), while only 30% of projects include infrastructure as their benefit. Livelihood, employment, tree-planting, and environmental education as benefits exceed the average number of projects across categories (M = 215.71, SD = 87.77). In contrast, well-being benefits (e.g., health, education), tenure, clarification, infrastructure, and direct cash transfers as categories are lower than the average.

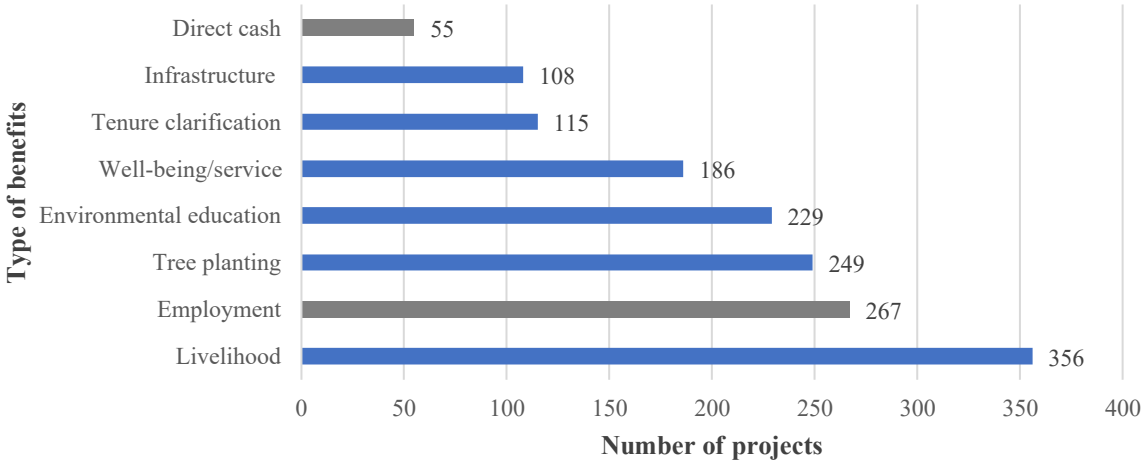

Figure 9. Number of REDD+ projects categorized by benefit types. Blue indicates non-monetary benefit, and grey indicates monetary benefit.

To assess whether projects give more than one type of benefit, I conceptualize seven benefit types into benefit scores. With a minimum score of 0 to a maximum of 7, the overall benefit score's average across projects and countries is 4.21 (SD = 1.47). Figure 10 shows the distribution of the benefit score. Furthermore, there is no significant difference in benefit scores among Asia (M = 3.91, SD = 1.45), Latin America (M = 4.21, SD = 1.46), and Africa (M = 4.29, SD = 1.46) groups.

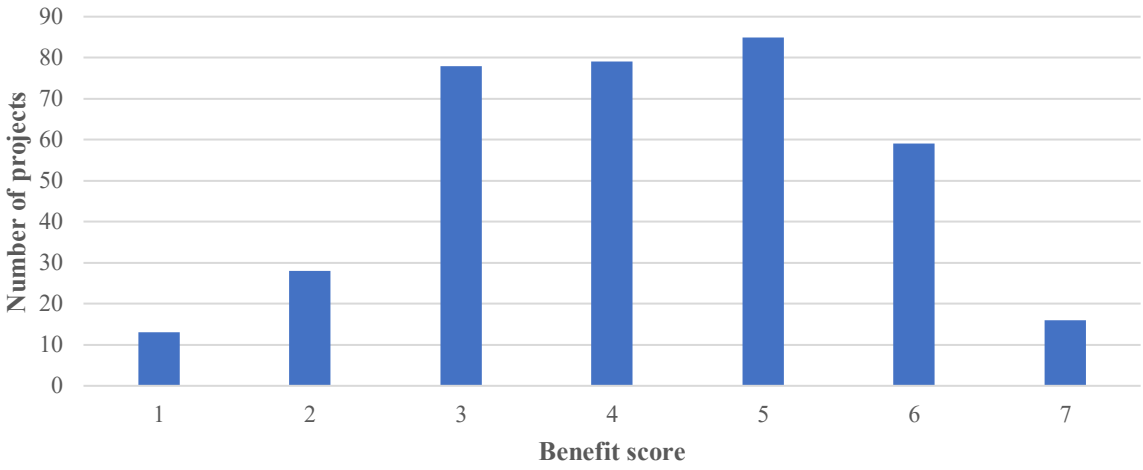

Figure 10. Number of projects categorized by benefit scores.

4.2 Influencing factors on the expected benefits to the community

Among influencing factors, only the certification standard significantly affects the benefit score based on a negative binomial model, and other influencing factors do not seem to have a meaningful effect on the model (Table A 8). The results in Table 5 indicate that carbon-focused (i.e., CDM, VCS, Others) and community-focused (i.e., VCS & CCB, Plan Vivo, Gold Standard) certified projects are more likely to have higher benefit scores than projects without certification. The opposite influence from different benchmarks also goes similarly, where non-certified projects negatively influence benefit scores. The community-focused certification standards have a more considerable influence on the benefits to the community, which is represented by its more substantial estimated influence than carbon-focused (H_{21B}).

Furthermore, the result shows that VCS, Plan Vivo, and VCS & CCB have influence on benefit score ($p < .001$). Projects certified with VCS & CCB have the strongest influence with an estimated value of almost 2 (Table A 9). Strong influence toward benefit score means that projects certified by VCS & CCB give more variation of benefits to communities (Figure 5).

Table 5. Estimated influence of certification standards groups on benefit score using negative binomial regression with different benchmarks.

Benchmark	**Significant category**	**Type of influence**	**Estimated influence to benefit score**	***p***
No certification	Carbon-focused	+	1.594	*****
	Community-focused	+	1.851	******
Carbon-focused	No certification	-	0.627	*
Community-focused	No certification	-	0.565	*

) p < .05; **) p < .005; *) p < .001*

The reason for using different grouping (i.e., by carbon/community-focused and by specific certification standard) for the outcome variables of the model is twofold. Firstly, the second grouping divides the certification standards into carbon-focused, community-focused, based on insights from the literature review, and no certification categories. Secondly, individually analyzing certification standards allows for a comprehensive examination of each standard's specific requirements and priorities. This approach enables a deeper understanding of how different standards may influence the benefits allocated to local communities.

I use logistic regression to analyze benefit types influenced by the specific certification standards. The results in Table 6 show that projects with Plan Vivo certification give fewer employment benefits to the community. In comparison, projects with VCS & CCB certifications are observed to provide more employment benefits. On the other hand, Plan Vivo has a contrasting result in providing tenure clarification benefits with a high estimated value of influence. CDM also influences infrastructure and well-being benefits, but the estimated influence value is relatively low, with less than 0.05.

Table 6. Estimated influence of certification standard to each benefit type using logistic regression. Only types of benefits with statistically significant results are listed here.

Benefit type	Significant category	Type of influence	*p*	Method	Estimated value (if logit)
Tenure clarification	Plan Vivo	+	***	Chi-square	*N/A*
Tenure clarification	Plan Vivo	+	**	Logit	23.555
Employment	VCS & CCB	+	***	Chi-square	*N/A*
	Plan Vivo	-	***		
Employment	Plan Vivo	-	*	Logit	0.184
Infrastructure	CDM	-	**	Logit	0.026
Well-being	CDM	-	**	Logit	0.003

) p < .05; **) p < .005; *) p < .001*

I observe from the results (Table 7) that projects with *communities* as tenure rights holders have more tenure clarification as benefits ($p > .05$). The number of projects with tenure clarification benefits observed is higher than expected if there is no association between legal tenure and tenure clarification. Results from logit regression show that *private and community* altogether as rights holders have a negative influence on infrastructure and environmental education benefits. Thus, land tenure rights influence benefits going to the community (H_{23B}).

Table 7. Estimated influence of legal tenure rights to each benefit type. Only types of benefits with statistically significant results are listed here.

Benefit type	Significant category	Type of influence	*p*	Method	Estimated value (logit)
Tenure clarification	Communities	+	*	Chi-square	*N/A*
Infrastructure	Private & communities	-	*	Logit	0.034
Environmental education	Private & communities	-	*	Logit	0.117

) p < .05; **) p < .005; *) p < .001*

The result (Table 8) shows that projects with *private* sectors as customary users negatively influence tenure clarification, infrastructure, and environmental education benefits. In contrast, projects with multi-user *private & communities* have more tenure clarification and infrastructure benefits. The difference is interesting because an element of *community* in the

rights holders can positively shift to more tenure clarification and infrastructure benefits to the *community*. Accordingly, customary use can influence benefits going to the community (H_{24B}).

Table 8. Estimated influence of customary use to each benefit type. Only types of benefits with statistically significant results are listed here.

Benefit type	Significant category	Type of influence	*p*	Method	Estimated value (logit)
Tenure clarification	Private	-	***	Chi-square	*N/A*
		-	*	Logit	0.196
	Private & communities	+	***	Chi-square	*N/A*
Infrastructure	Private	-	*	Logit	0.034
	Private & communities	+	***	Chi-square	*N/A*
		+	***	Logit	14.575
Environmental education	Private	-	*	Logit	0.057

) p < .05; **) p < .005; *) p < .001*

Region and country can influence benefits foreseen to the community (H_{25B}). I run chi-square and logit for association analysis between regions and each type of benefit. There is some association between regions and 4 out of 7 types of benefits (i.e., tenure clarification, tree planting, infrastructure, well-being). Even though there are four benefit categories associated, Table 9 only includes significant results from logistic regression analysis. Asia region has a negative association with well-being and infrastructure, while Latin America has more tenure clarification and fewer tree-planting benefits. The result also shows that the Africa region positively associates with well-being/service benefits.

Table 9. Estimated influence of regions to each benefit type using logistic regression. Only types of benefits with statistically significant results are listed here.

Benefit type	Influencing factor	Observed influence	Type of influence	*p*	Estimated value (logit)
Tenure clarification	Region	Latin America	+	*	2.391
Tree planting	Region	Latin America	-	*	0.039
Infrastructure	Region	Asia	-	**	0.028
Well-being	Region	Asia	-	**	0.215
		Africa	+	**	5.351

) p < .05; **) p < .005; *) p < .001*

I break down the region into 9 REDD+ projects' biggest host countries (Table 10). Peru and Indonesia have no significant association with any type of benefit. The result indicates that Kenya has less tenure clarification, tested by chi-square and logit with an odd ratio of 0.151. China has become the only country in Asia with the most negative associations with multiple benefit categories, particularly tenure clarification, environmental education, infrastructure, and well-being/service categories. Its negative association with environmental education has a considerable estimated value of those negative influences (0.2), among others.

Table 10. Estimated influence of top 9 countries to each benefit type. Only types of benefits with statistically significant results are listed here.

Country	Benefit type	Type of influence	Estimated value (logit)	*p* logit	Significant by
China	Environmental education	-	0.2	***	Logit & Chi-square
	Infrastructure	-	0.054	*	Logit & Chi-square
	Well-being	-	0.015	***	Logit & Chi-square
Kenya	Tenure clarification	-	0.151	*	Logit
	Infrastructure	-	0.265	*	Logit
Brazil	Environmental education	+	4.452	*	Logit

) p < .05; **) p < .005; *) p < .001*

4.3 Influencing factors on the foreseen forest restrictions imposed on the community

After I ran the chi-square test, the result (Table A 7) shows that certification standards and forest restrictions are associated ($p < .001$). Projects certified by CDM have fewer restrictions, whereas projects with no restrictions counted 2.7 times more than the expected count if there is no association between variables. On the contrary, projects with Plan Vivo, VCS, and VCS & CCB certification standards have influences on forest restrictions. Therefore, I conclude that certification standards influence restrictions going to the community (H_{21R}).

Two different statistical methods indicate some associations between legal tenure rights and restrictions (Table 11). While $p < .001$ from Chi-square analysis, an omnibus test of the logit model also shows $p < .001$. According to results using the chi-square method, if both variables are independent, the expected count of projects with restriction is 40.1 (Table A 1). However, the observed count from the dataset is 1.4 times higher than expected (56 projects).

Projects with *community* as the legal tenure rights holders have more restrictions regardless of the benchmarks. Conversely, projects with elements of *state* and *private* have a negative influence on restrictions. I observe that despite the *community*'s positive influence on restrictions, if combined with *private* (i.e., *private & community* category) and *state* (i.e., *state & community* category) as co-holder, in contrast, resulted in a negative influence toward restrictions. However, only 8.3% of the analyzed projects are in multi-holders' categories (Table A 1). In conclusion, land tenure rights can influence restrictions going to the community (H_{23R}).

Table 11. Estimated influence of legal tenure rights to restrictions.

Benchmark	**Significant category**	**Type of influence**	***p***	**Method**	**Estimated influence**
N/A	Private	-	***	Chi-square	*N/A*
Community	Private	-	*	Logit	0.234
	State	-	*	Logit	0.203
	Private & communities	-	*	Logit	0.099
	State & communities	-	**	Logit	0.017
Private	Community	+	*	Logit	4.282
State	Community	+	*	Logit	4.916
N/A	Community	+	***	Chi-square	*N/A*

) p < .05; **) p < .005; *) p < .001*

Two different statistical methods indicate some degree of associations between customary use and restrictions (Table 12), where $p < .001$ is the result of the chi-square analysis and omnibus test of the logit model. Projects with *private & communities* as customary use rights holders indicate having more restrictions with an estimated influence value of 3.3. On the other hand, projects with *state & community* rights holders have fewer restrictions. Similarly, projects with *private* rights holders have fewer restrictions according to the chi-square test (Table A 3). As projects with certain types of customary use plan to give more/fewer restrictions than the others, customary use rights influence restrictions going to the community (H_{24R}).

Table 12. Estimated influence of customary use to restrictions.

Benchmark	Significant influencing category	Type of influence	*p*	Method	Estimated influence
Community	State & communities	-	*	Logit	0.104
Private	Private & communities	+	*	Logit	3.319
State	Private & communities	+	*	Logit	3.319
N/A	Private	-	***	Chi-square	-

) p < .05; **) p < .005; *) p < .001*

After I run the chi-square association test, the result shows that region and restrictions are associated ($p < .001$). The result from the chi-square indicates that the projects in the Africa region have 2.1 times more projects with no restrictions than the expected count if the region and restrictions are independent variables. The logit test toward regions also shows similar results where Africa has fewer restrictions (Table A 5), particularly in Kenya among the nine countries (Table A 6). In contrast, projects in Asia have more restrictions (Table A 5), especially in China (Table A 6). Since certain regions/countries plan to give more or fewer restrictions than others, then regions/countries can influence restrictions foreseen to the community (H_{25R}).

4.4 Influence of financial type on conditional payment to the community

284 projects have data on conditionality and finance, and 75 projects are treated as missing data. As shown in Figure 11, 221 projects are financed by carbon credits (77.8%), 36 projects are funded by others (12.7%), and 27 projects are financed by aids/grants (9.5%). 140 projects out of a total of 284 projects (49.3%) financed by carbon credits have no conditionality. Even so, the test of independence chi-square shows that the finance types and conditionalities of the projects are independent ($p = .118$). It concludes that financing types do not influence conditional payment (H_{22}).

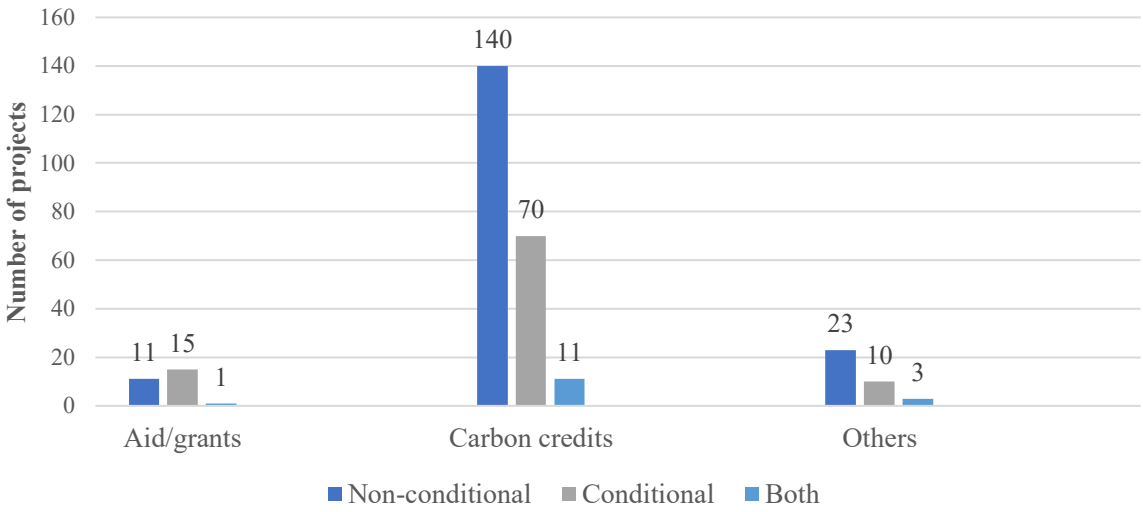

Figure 11. Number of REDD+ projects by projects' conditionalities.

Based on the results obtained from the analysis of the empirical data, the following conclusions can be drawn regarding the confirmation or rejection of each hypothesis:

- H_{11} - Most projects have no element of result-based (i.e., conditional) payment to the community. The results reveal that most projects, even those with monetary payment benefits, have no element of result-based payment to the community. Thus, it confirms the hypothesis.
- H_{12} - The hypothesis "*REDD+ projects are more likely to give both non-monetary and monetary benefits than only one type*" is confirmed. The analysis reveals that most REDD+ include non-monetary (i.e., income-generating activities, tree planting, and environmental education) and monetary benefits (i.e., employment opportunities).
- H_{21B} - The hypothesis "*If projects with community-focused standards (i.e., CCB, Plan Vivo, and Gold Standard) plan to give more benefits to communities than the others, then certification standards influence benefits going to the community*" is partially confirmed. The results indicate that projects certified by community-focused standards are positively associated with benefit scores compared to non-certified projects. However, there are no significant differences between community-focused and carbon-focused certifications.
- H_{21R}: The hypothesis "*If projects with certain standards plan to give more restrictions to communities than the others, then certification standards influence restrictions going to the community*" is confirmed. The analysis shows that projects certified by CCB, Plan Vivo, and Gold Standard have more forest restrictions, while CDM has fewer restrictions.

- H_{22} - The hypothesis "*If projects with a certain source of finance (i.e., carbon credits) plan to give more/fewer conditional payment benefits than the others, then the source of finance can influence the conditionalities*" is rejected. The results indicate that projects with any source of finance mostly have non-conditional benefits, so there is no significant influence on financing types.
- H_{23B} - The hypothesis that states, "*If projects with certain types of land tenure rights plan to give more/fewer benefits (i.e., land tenure clarification, livelihood, environmental education, etc.) than the others, then land tenure rights can influence benefits going to the community*" is partially confirmed. The results indicate that projects with communities as land tenure rights holders have more tenure clarification benefits. However, the analysis does not provide significant evidence regarding the influence on other types of benefits.
- H_{23R} - The hypothesis "*If projects with certain types of land tenure rights plan to give more/fewer restrictions than the others, then land tenure rights can influence restrictions going to the community*" is confirmed. The analysis shows private and community as customary users have more restrictions, while projects with state and community as customary use rights holders have fewer restrictions. The result suggests that land tenure rights can influence the level of restrictions imposed on the community.
- H_{24B} - The hypothesis "*If projects with certain customary use rights plan to give more/fewer benefits than the others, customary use can influence benefits to the community*" is partially confirmed. The analysis shows that projects with communities as customary users have more tenure clarification and infrastructure benefits. However, there is no significant results on livelihood and environmental education benefits.
- H_{24R} - the hypothesis "*If projects with certain types of customary use rights plan to give more/fewer restrictions than the others, then customary use rights can influence restrictions going to the community*" is confirmed. The results suggest that the type of customary use rights can influence the extent of restrictions imposed on the community.
- H_{25B} - The hypothesis "*If certain regions/countries plan to give more/less benefits than the others, then regions/countries can influence benefits foreseen to the community*" is partially confirmed. The analysis reveals that projects in different regions have varying associations with benefits. For example, projects in Latin America have more well-being-related benefits, while projects in Africa have more tenure clarification benefits. However, there is no significant influence on other benefits.

- H_{25R} - The hypothesis "*If certain regions/countries plan to give more/less restrictions than the others, then regions/countries can influence restrictions foreseen to the community*" is confirmed. The analysis indicates that different regions have varying levels of influence on restrictions foreseen for the community.

V. Discussion

5.1 Foreseen benefits to the local communities from REDD+ projects worldwide.

This study aims to understand the benefits going to the local community from empirical data, and the results indicate that most projects (83%) give both non-monetary and monetary benefits to the community. The most non-monetary benefit given is livelihood type (99.2% projects), which mainly involves income-generating capacity building and training, while the least given benefit is infrastructure (30% projects). On average, a project provides the community with 4 different benefits. The most common benefits are income-generating activities, employment, tree planting, and environmental education.

Providing the community with environmental education and capacity building is convenient as these activities do not require regular periodical contributions and maintenance. However, concerns about the inclusiveness of these benefits going to the community are questioned since they might be excludable. On the other hand, infrastructure benefit (i.e., school, road, and service center constructions) is often seen as public goods that naturally are non-excludable and non-rival. I build the argument based on how Araya & Hofstad (2016) perceive benefit transferred to the community, instead of the household unit, can be more inclusive and less prone to elite capture, especially for landless but forest-dependent communities.

Having 74% of projects with employment benefits could fulfill the community's preference for the monetary type of benefit. Nevertheless, there are worries from communities on whether they are eligible to be employed as it often needs certain education levels (Awung & Marchant, 2020). There is a risk that employment benefit does not address the forest-dependent community who see this opportunity as alternative livelihood activities due to land use change caused by the project.

Only 33.5% of projects have conditional payment to the community. Even though many experts and policymakers see that the results-based payment principle efficiently reduces deforestation emissions, its use is still limited. Angelsen et al. (2018) perceive result-based payment as highly challenging to implement, and those complex concerns include how much

to pay, whom to pay, and monitoring. For instance, a study in Tanzania by Araya & Hofstad (2016) shows that certain villages with few employment opportunities should require a higher level of compensation for the farmers. Then, the implementation might require prior careful and comprehensive socio-economic studies.

5.2 The influence of design features and contextual factors of projects to benefit sharing to the local community.

Influencing factors and benefit types

The result confirms that certification standards and benefits going to the community are associated. It suggests that projects certified by Plan Vivo, VCS, and VCS & CCB certification standards have a positive influence on benefit scores, which indicates how diverse the type of benefit project gives compared to non-certified projects. The result does not tell if one standard provides more variety of benefits to the community than the others. Contrary to the hypothesized association of some certification standards (i.e., VCS & CCB, Plan Vivo, Gold Standard) giving more benefit to the community than others, the results indicate that there are no significant results if they are compared with the benefit score of carbon-focused certification (i.e., CDM, VCS, Others).

I investigate specific types of benefit and their association with certification standards. Based on Merger et al. (2011), I expect projects certified by Plan Vivo to promote sustainable development involving marginalized communities, and CCB-certified projects have a comprehensive aspect of poverty alleviation. The results suggest that Plan Vivo gives more tenure clarification benefits and projects certified by VCS & CCB more employment benefits. However, the results do not entirely fit with the expectation that Plan Vivo promotes sustainable development since, on the contrary, it has a significant negative association (i.e., the expected negative influence of 0.184) toward employment benefits.

I also expect a strong association between tenure clarification and land rights. The result shows that projects with communities as tenure rights holders have more tenure clarification. Tenure clarification should be necessary to acknowledge and agree on community rights on the land that would be further included in the project. This stage is also a crucial precondition for the benefit-sharing mechanism to ensure who should receive incentives to keep the forest intact.

On the other hand, projects involving private as customary use holders give less tenure clarification because the areas should be clearly defined already. It is often the case that the

private holder is also the one who initiates the project. Tenure clarification may be most needed when there is a risk of contested and overlapped holders between communities and private, especially when customary use right is not legally recognized. Projects within the community and private areas resulted in more tenure clarification. These results can build evidence that the presence of the community as both land users and land rights holders can push the REDD+ projects for land tenure recognition and clarification.

Latin America is the most prominent host of REDD+, where projects in Colombia, Brazil, and Peru account for 34% of global projects. This finding supports the implication that Latin America has the lowest average opportunity cost of REDD+ (Rakatama et al., 2017). This region also positively influences tenure clarification, aligned with the history of solid indigenous people's recognition by the international community in Latin America and their wins back home over ancestral land, including forests (Larson & Petkova, 2011).

Projects in the African region have a positive association with well-being benefits (i.e., health, education, happiness, early child education, ambulance service, water infrastructure, maintenance, water filter, and community fund). Many projects planned to provide well-being benefits to African countries might be caused by the fact that many African countries are still vastly growing and have the highest unequal economies in the world, represented by their high GINI level (World Bank, 2022). Many emerging economies in Africa still have less access to basic needs (Clark & D'Ambrosio, 2019), and this is what project implementers may want to address by going beyond the carbon sequestration benefit through REDD+ projects.

Influencing factors and forest restrictions

Despite CCB, Plan Vivo, and Gold Standard's positive influence toward benefits, they also have more forest restrictions than other certification standards. Forest restrictions indicate an attempt to limit the community's access to forests. It further raises a question of how accommodating is the benefit of a project plan, especially to the forest-dependent community that is restricted from the forest.

Association analysis between restrictions and legal tenure rights shows that the community as a legal tenure rights holder has higher odds of having a forest restrictions component. The higher odds may contribute to a clearer understanding of REDD+ projects' risk of limiting forest communities to access ecosystem services. Nonetheless, restrictions to the community might also be part of monitoring compliance to ensure holders achieve deforestation targets,

especially for a binding result-based payment outcome. Besides, even though the community has the 'written' exclusive rights of the land, this is not always the case. Weakly recognized rights over forests might lead to 'land grabs,' which affects the community's accessibility to forests (Manda & Mukanda, 2023). It might lead to another interesting analysis result: the combination of community and private or state would lead to fewer restrictions than only the community as rights owner.

Recognizing and securing tenure rights for indigenous people and the local community as a precondition for benefit sharing is challenging. There is still a lot of land contestation between states and civil society, especially in developing countries where the state mainly claims ownership (Sunderlin et al., 2009). Forest community, for example, continues to assert their customary rights even though states do not recognize such claims to many forests (Sunderlin et al., 2011) as there is a difference in perception of customary rights between the two actors. The reason for contestation is not only the communities' dependencies on the forest but also the communities' long history of using the forest (Ngakan, 2005).

5.3 Limitations and outlook for future research

There are some limitations in this study. First, it is essential to note that the benefit score only allows me to observe the variety and the existence of benefits from categorization, not the quantity or measurement of the benefits going to the local community. It is beyond the scope of this study to analyze the utility or the satisfaction that the community receives from the benefit. Projects having less varied benefit to local communities (i.e., benefit score) does not necessarily mean giving less to the local community or community receiving less. Next, multiple coders may be biased when analyzing the contents of project documents and categorizing them into the ID-RECCO database based on the thematic codes. The information on benefits is gathered from project documents without knowing the implementation and the outcomes.

There is a limitation to capture a complete view of conditionality. The conditionality captured in the database refers to whether the community does the required activity to gain incentive or reward for emission reduction from deforestation in the form of payment, and the conditionality refers to output-based. Further and other research can complement this study to explore the utility and satisfaction of the community regarding the benefits provided by REDD+ projects.

While this study provides valuable insights into the benefits and influencing factors of REDD+ projects, some areas are worth further research. These areas can help deepen our understanding and improve the effectiveness of benefit sharing in REDD+ initiatives, such as conducting in-depth qualitative studies to explore local communities' perspectives, preferences, and priorities regarding non-carbon benefits. These studies can provide a more nuanced understanding of community needs and help tailor benefit provision strategies accordingly. Further study can also investigate the role of governance and institutional arrangements as contextual factors in facilitating the delivery of non-carbon benefits. They can include analyzing the influence of policy frameworks, legal frameworks, and multi-stakeholder platforms in promoting effective benefit-sharing and community engagement. A study can also be done on the next steps after delivery, such as assessing the long-term sustainability and resilience of non-carbon benefits in REDD+ projects. By addressing these research gaps, future studies can contribute to developing evidence-based guidelines, policies, and strategies for maximizing the positive impacts of REDD+ projects on local communities and promoting sustainable forest management.

VI. Conclusion

Local communities mainly benefit from REDD+ benefit-sharing mechanisms through non-monetary and non-conditional monetary benefits. REDD+ projects worldwide foresee various types of benefits to local communities. The most common types are income-generating activities, employment, tree planting, and environmental education. In this master's thesis, I also explore the benefits and influencing factors of REDD+ projects in local communities.

Through the analysis of empirical data, I gained insights into the different types of benefits provided by REDD+ projects and their associations with certification standards, legal tenure rights, finance sources, and regional factors. Certification standards, such as VCS & CCB, Plan Vivo, and VCS, are associated with diverse benefits. However, the results indicate no significant differences in benefit variety between community-focused certifications (i.e., Plan Vivo, CCB, and Gold Standard) and carbon-focused certifications (i.e., VCS and other standards). While Plan Vivo claims to promote sustainable development involving marginalized communities, the result shows that it negatively affects employment benefits. However, Plan Vivo still positively influences benefits, specifically tenure clarification.

Latin America is the most prominent host of REDD+, where projects in Colombia, Brazil, and Peru account for 34% of global projects. Projects in Latin America are associated with more tenure clarification benefits, which might be supported by its history of solid indigenous people's recognition by the international community and their wins back home over ancestral land, including forests. On the other hand, the African region positively influences well-being-related benefits (i.e., health, education, happiness, early child education, ambulance service, water infrastructure, maintenance, water filter, and community fund). Providing these benefits can be an attempt to provide accessible basic needs, which most people in the region still struggle with.

Projects with communities as land tenure rights holders are found to have more tenure clarification benefits. On the other hand, projects involving private as customary use holders give less tenure clarification because the areas should be clearly defined already. Tenure clarification may be most needed when communities and private are the users of the same area. Accordingly, the result shows projects within the area with community and private as customary users have more tenure clarification.

Acknowledging restrictions early in the planning process of REDD+ projects enables better risk management and integration of appropriate safeguards. Mitigation measures can be

implemented by identifying potential issues to ensure the successful and sustainable implementation of REDD+ activities. It is crucial to consider potential positive social impacts, such as poverty reduction, improved governance, and biodiversity conservation. Simultaneously, understanding restrictions helps to avoid trade-offs that might undermine other sustainable development objectives.

The analysis reveals that projects with private and community as customary use rights co-holders have more restrictions. In comparison, projects with state and community as customary use rights holders had fewer restrictions. This finding emphasizes the importance of tenure clarification to avoid the risk of forest-dependent communities' exclusion and conflicts toward contesting land, especially since customary use rights are still not legally acknowledged.

This study rejects one hypothesis regarding the influence of finance sources on results-based payment. Most projects, even ones with monetary payment benefits, have no element of result-based payment to the community. The results from global cases are conflicting with the arguments that perceive results-based payment as an essential principle in REDD+.

In conclusion, this study provides insights into the benefits and influencing factors of REDD+ projects in local communities. The findings highlight the importance of considering influencing factors for effective benefit sharing in REDD+ projects. These findings can guide policymakers and project implementers in designing and implementing equitable REDD+ benefit sharing mechanisms.

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Appendix

A1. Frequency and contingency tables

Table A 1. Legal tenure rights frequency table.

Legal tenure rights holder	Frequency (# of projects)	Valid %
Communities	81	23.9
Private	159	46.9
State	71	20.9
Private & communities	10	2.9
Private & state	5	1.5
State & communities	7	2.1
Private, state, communities	6	1.8
Total	339	100

Table A 2. Contingency table of land tenure rights holder and forest restrictions

Land tenure rights holder		Forest restrictions (# of projects)		
		No	**Yes**	**Total**
Communities	Count	7	56	63
	Expected Count	22.9	40.1	63
Private	Count	59	70	129
	Expected Count	47	82	129
State	Count	25	33	58
	Expected Count	21.1	36.9	58
Private & communities	Count	3	4	7
	Expected Count	2.5	4.5	7
Private & state	Count	1	2	3
	Expected Count	1.1	1.9	3
State & communities	Count	4	2	6
	Expected Count	2.2	3.8	6
Private, state, and communities	Count	0	6	6
	Expected Count	2.2	3.8	6
Total		99	173	272

Table A 3. Contingency table of customary use rights holder and forest restrictions

Customary use rights holder	**Forest restrictions (# of projects)**			
		No	**Yes**	**Total**
Communities	Count	19	77	96
	Expected Count	33.9	62.1	96
Private	Count	60	56	116
	Expected Count	41	75	116
State	Count	2	2	4
	Expected Count	1.4	2.6	4
Private & communities	Count	11	30	41
	Expected Count	14.5	26.5	41
Private & state	Count	1	2	3
	Expected Count	1.1	1.9	3
State & communities	Count	6	1	7
	Expected Count	2.5	4.5	7
Private, state, and communities	Count	0	13	13
	Expected Count	4.6	8.4	13
Total		99	181	280

Table A 4. Contingency table of payment conditionality and finance types

Payment conditionality	**Finance types (# of projects)**				
		Aid/grant	**Carbon credits**	**Others**	**Total**
Non-conditional	Count	11	140	23	174
	Expected Count	16.5	135.4	22.1	
Conditional	Count	15	70	10	95
	Expected Count	9	73.9	12	
Both	Count	1	11	3	15
	Expected Count	1.4	11.7	1.9	
	Total count	27	221	36	284

A2. Logistic regression results

for restrictions

Table A 5. Logistic regression model for restrictions, focusing on regions

*Model = Type + Legal tenure rights + Customary use rights holder + certification standards + Finance type + **Region***		
Independent variables	**Odds ratio**	**Significance**
Legal tenure rights		
State	*Reference category*	*0.031*
Private	1.458	0.584
Private, community	1.618	0.713
Private, state	0.222	0.494
State, community	0.009	0.002
Private, state, community	5.E+09	0.999
Community	2.334	0.289
Customary use		
Private	*Reference category*	*0.107*
State	2.603	0.719
Private, community	6.196	0.010
Private, state	165.723	0.029
State, community	3.680	0.518
Private, state, community	5.E+10	0.998
Community	4.536	0.076
Certification standards		
Others	*Reference category*	*0.01*
Gold standard	0.000	0.999
ND/None	0.000	0.999
CDM	0.000	0.999
Plan Vivo	0.000	0.999
VCS	0.000	0.999
VCS, CCB	0.000	0.999
Finance types		
Aid/grants	*Reference category*	*0.05*
Carbon credits	0.082	0.026
Others	0.039	0.013
Region		
Other regions	*Reference category*	*<.001*
Asia	7.118	0.001
Africa	0.163	0.008
Latin America	1.302	0.640

Table A 6. Logistic regression model for restrictions, focusing on countries

*Model = Type + Legal tenure rights + Customary use rights holder + certification standards + Finance type + **Country***		
Independent variables	**Odds ratio**	**Significance**
Legal tenure rights		
State	*Reference category*	*0.012*
Private	1.58	0.529
Private, community	1.56	0.758
Private, state	0.19	0.439
State, community	0.01	0.003
Private, state, community	8.33×10^{9}	0.999
Community	3.88	0.113
Customary use		
Private	*Reference category*	*0.088*
State	2.40	0.733
Private, community	8.44	0.005
Private, state	218.32	0.018
State, community	2.62	0.612
Private, state, community	3.74×10^{10}	0.998
Community	4.88	0.083
Certification standards		
Others	*Reference category*	*0.076*
Gold standard	0.00	0.999
ND/None	0.00	0.999
CDM	0.00	0.999
Plan Vivo	0.00	0.999
VCS	0.00	0.999
VCS, CCB	0.00	0.999
Finance types		
Aid/grants	*Reference category*	*0.054*
Carbon credits	0.08	0.022
Others	0.04	0.020
Countries		
Other countries	*Reference category*	*<.001*
Colombia	1.11	0.902
Brazil	1.03	0.969
Peru	1.01	0.988
China	25.63	<.001*
Indonesia	0.45	0.437
India	3.52	0.309
Kenya	0.02	<.001*
Tanzania	0.52	0.591
Uganda	0.39	0.396

Table A 7. Estimated influence of certification standards on restrictions using logistic regression with different benchmarks.

Benchmark	Significant category	Type of influence	*p*	Estimated value (logit)
CDM	Plan Vivo	+	**	97.265
	VCS	+	**	97.096
	VCS, CCB	+	**	104.813
No certification	VCS	+	*	22.135
	VCS, CCB	+	*	23.894
VCS	CDM	-	**	0.01
	No certification	-	*	0.045
N/A	CDM	-	***	*N/A*

) p < .05; **) p < .005; *) p < .001*

A3. Negative binomial results

Table A 8. Test of model effects using negative binomial regression toward benefit score. Each predictor is tested for whether it has any effect on the model.

Influencing factors (independent variables)	*p*
Certification standards	0.026*
Project types	0.115
Legal tenure	0.707
Customary use	0.645
Number of carbon credits generated	0.516
Region	0.775

Table A 9. Estimated influence of certification standards on benefit score using negative binomial regression with different categories as benchmarks.

Benchmark	Significant category	Type of influence	Estimated influence to benefit score	*p*
No certification	Plan Vivo	+	1.714	*
	VCS	+	1.605	*
	VCS & CCB	+	1.912	***
Plan Vivo	Non-certification	-	0.583	*
VCS	Non-certification	-	0.623	*
VCS & CCB	Non-certification	-	0.523	***

) p < .05; **) p < .005; *) p < .001*

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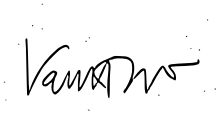
Zurich, 28 October 2023	

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