

ECOSYSTEM RESTORATION AND REHABILITATION IN DEGRADED SAVANNAS IN MOSQUITIA, HONDURAS

A Plan Vivo Project Design Document

Project Title	Natural and Assisted Restoration of Degraded Savannas in La Moskitia, Honduras.
Version	Version 5
Data of Issue	01/05/2024
Project Location	Puerto Lempira, Gracias a Dios, Honduras
Project Proponent (s)	Paskaia AB • magnus@paskaia.se • +46 70 268 38 07
Prepared by	Paskaia AB (Neil Powell) • neil.powell@uu.se Paskaia Honduras S.A. (Marvin Rodríguez) • marvin@paskaia.se • +504 9859-8203
Validation Body	AENOR Confía S.A.U. (José Luis Fuentes) • jfuentes@aenor.com • +34 914326000 Plan Vivo Standard V4.0
Project Lifetime	November 20, 2021 - November 19, 2041 (20 year lifetime)



Executive Summary

Between January 2021 and March 2021, Paskaia implemented a co-design process to develop the plan for the Gracias a Dios project located with the Honduran Moskitia. The process embraced a diverse constellation of participants from the local community, the Miskito and their territorial authority, and the unity of the Miskito people (MASTA). After this initial consultation phase, ongoing interactions supporting the project co-design have been hosted by workshops, focus groups, and interviews. Emergent insights from these sessions have been recorded through photographic documentation and note-taking. Rich pictures, participatory photography and other interactive methods have mediated the dialogue and co-inquiry process.

The project will focus on natural and assisted restoration in large areas of land covered by degraded *Pinus caribaea* pine savannas in the 12 Miskito territorial councils, with which the project will work through MASTA, starting with 3 in the phase of pilotage. This area covers more than 1 million hectares in the Gracias a Dios region, Honduras. The project aims to provide the financial capital (generated through PV certificates) and management capacity so that degraded pine savannas can be restored through the implementation of fire control measures or through a combined fire management and planting approach of *Pinus caribaea* seeds. In the 20 years it takes for the forest to mature, areas will be periodically logged to improve overall growth and biodiversity. This will also provide additional livelihoods for participating landowners, timber for local construction and other ecosystem services. Once the forest has matured, it will be used in local industries to produce wood products with long-term sequestration potential, such as high-quality furniture and boats.

More recently many members of the local community also expressed a wish for the project to include the planting of mahogany on the privately owned land circumscribing homesteads as a project component. Hence this intervention has now also been included in this the latest draft of the PDD. The areas targeted for Mahogany tend to be closer to waterways where the soil is more fertile. This intervention is expected to create critical habitats for a host of endemic species not found in the degraded pine savannas.

During the first phase, the project will be piloted in Truktsinasta, one of the 15 territorial councils (Concejos) in Gracias a Dios. MASTA and many leaders from other Concejos have expressed a wish for the Dios project to operate in their own Concejos. Once the project's governance structures are in place, and the forest restoration interventions are considered sufficiently implementable, the project will be scaled to restore degraded forest savannas throughout the Honduran Moskitia.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
1. PART A - AIMS AND OBJECTIVES	9
2. PART B - SITE INFORMATION	10
2.1 B1 PROJECT LOCATION AND BOUNDARIES.....	10
2.2 B2 DESCRIPTION OF THE PROJECT AREA	12
2.3 B3 RECENT CHANGES IN LAND USE AND ENVIRONMENTAL CONDITIONS	14
2.4 B4 DRIVERS OF DEGRADATION	14
3 PART C - COMMUNITY AND LIVELIHOODS INFORMATION	15
3.1 C1 COMMUNITIES AND INSTITUTIONS IN THE PROJECT SITE.....	15
3.2 C2 THE SOCIOECONOMIC CONTEXT	17
3.3 C3 LAND TENURE & OWNERSHIP OF CARBON RIGHTS	22
4 PART D - PROJECT INTERVENTIONS & ACTIVITIES	25
4.1 D1 PROJECT INTERVENTIONS.....	25
4.2 D2 SUMMARY OF ACTIVITIES UNDERPINNING PROJECT INTERVENTIONS	26
4.3 D3 THE PROJECTED IMPACT OF ACTIVITIES ON BIODIVERSITY AND THE ENVIRONMENT.	28
5 PART E – COMMUNITY PARTICIPATION	29
5.1 E1 Co-DESIGN OF THE PROJECT	29
5.1.1 <i>Introduction</i>	29
5.1.2 <i>The Co-Design Process</i>	32
5.1.3 <i>Summary of findings emerging from the Co-Design process</i>	37
5.1.4 <i>Health and Vulnerability</i>	42
5.2 E2 COMMUNITY-LED IMPLEMENTATION	44
5.3 E3 COMMUNITY GOVERNANCE OF THE PROJECT.....	47
6 PART F ECOSYSTEM SERVICES & OTHER PROJECT BENEFITS	48
6.1 F1 – CARBON BENEFITS	48
6.1.1 <i>Degraded Savannah Restoration</i>	48
6.1.2 <i>Mahogany Plantations</i>	51
6.2 F2 - LIVELIHOODS BENEFITS.....	52
6.3 F3 - ECOSYSTEM & BIODIVERSITY BENEFITS	55
6.3.1 <i>Mitigation measures to address any negative impacts on the ecosystem and biodiversity</i> ...	56
7 PART G: TECHNICAL SPECIFICATIONS	60
7.1 G1 PROJECT INTERVENTIONS AND ACTIVITIES.....	60
7.1.1 <i>Natural and Assisted Restoration, through fire control and planting</i>	61
7.1.2 <i>Planting Mahogany on privately owned land</i>	62
7.2 G2 ADDITIONALITY AND ENVIRONMENTAL INTEGRITY	63
7.2.1 <i>Laws and Regulations for Forests and Land Management</i>	63

7.2.2	<i>The impact of financial, technical, ecological, and social barriers on Project Implementation</i>	64
7.2.3	<i>Evidence that the project site has not been negatively altered prior to the project start.....</i>	65
7.3	G3 PROJECT PERIOD.....	66
7.4	G4 BASELINE SCENARIO	67
7.4.1	<i>The parameters and methodology used to define the baseline carbon pools in degraded Pine Savanna.....</i>	67
7.4.2	<i>The parameters and methodology used to define the reference carbon pool in mahogany plantations.....</i>	74
7.5	G5 ECOSYSTEM SERVICE BENEFITS	80
7.5.1	<i>CO2 calculations</i>	80
7.6	G6 LEAKAGE AND UNCERTAINTY	81
7.6.1	<i>Monitoring of Leakage</i>	83
7.6.2	<i>Uncertainties and Assumptions Underpinning the Calculations</i>	84
8	PART H: RISK MANAGEMENT	85
8.1	H1 IDENTIFICATION OF RISK AREAS.....	85
8.1.1	<i>Project Organization</i>	85
8.1.2	<i>Social risks.....</i>	85
8.1.3	<i>Biophysical risks.....</i>	86
8.2	H2 RISK BUFFER.....	87
8.2.1	<i>Introduction.....</i>	87
8.2.2	<i>Potential Risks to Carbon Stocks in Swietenia Macrophylla Plantations.....</i>	87
8.2.3	<i>Potential Risks to Carbon Stocks from the Restoration of Savannahs with Pinus caribaea. .</i>	89
9	PART I PROJECT COORDINATION AND MANAGEMENT.....	92
9.1	THE PROJECT'S ORGANIZATIONAL STRUCTURE.....	93
9.1.1	<i>Governance Level 1.....</i>	93
9.1.2	<i>Governance Level 2.....</i>	94
9.1.3	<i>Governance Level 3.....</i>	94
9.1.4	<i>Governance Level 4.....</i>	95
9.2	I2 RELATIONSHIPS WITH NATIONAL ORGANIZATIONS.....	95
9.3	I3 LEGAL COMPLIANCE	97
9.4	I4 PROJECT MANAGEMENT.....	98
9.5	I5 PROJECT FINANCIAL ARRANGEMENTS.....	99
9.6	I6 MARKETING	101
9.7	I7 TECHNICAL SUPPORT	102
10	PART J BENEFIT SHARING	103
10.1	J1 PES AGREEMENTS	103
10.2	J2 PAYMENTS AND BENEFIT-SHARING	103
11	PART K MONITORING	104
11.1	INTRODUCTION	104

11.1.1	Monitoring and evaluation to support local needs.....	104
11.1.2	Using the Sustainability Landscape Index Report on Project impacts.....	105
11.2	K ECOSYSTEM SERVICE BENEFITS.....	107
11.2.1	Carbon.....	107
11.2.2	Environment and Biodiversity.....	113
11.3	SOCIO-ECONOMIC IMPACTS	121
11.3.1	Indicators	121
11.3.2	Indicator 2 Number of additional wage days generated by the restoration project.....	126
11.3.3	Indicator 3 The percentage of families using their land to sustain livelihoods.	136
11.4	HOW MONITORING RESULTS WILL BE SHARED AND DISCUSSED WITH PARTICIPANTS.....	138
12	REFERENCES	140
13	ANEXSES	146

Table of Illustrations

Figure 1	Breakdown of the Project Region to Project Area.	13
Figure 2	Organisation chart of the Governance Structure in the Project Area	19
Figure 3	Gracias a Dios multi-hazard risk component scores compared to the average country score for Honduras. MHE refers to Multi-hazard exposure (PDC 2020).	21
Figure 4	The Sustainable Livelihood Framework (DfID 1999)	40
Figure 5	Summary of Co-design Process in Truktsinasta Concejo	41
Figure 6	An ecological fire regime model showing the relationship between fire frequency and changes in vegetation.	65
Figure 7	Typical Fire Regimes in tropical Pine: return interval and site productivity (Keely 1998)	66
Figure 8	Annual cycle of project activities to enable assisted restoration of degraded Caribbean Pine Savannas	67
Figure 9	The increase in the diameter of the stem at breast height (DBH) in cm over 25 years (años) in 5 sites with varying quality	74
Figure 10	The Projected accumulation of Forest Biomass per hectare in the project site. Note the decrease in biomass in year 14 is attributed to thinning to allow improved growth	77
Figure 11	The Projected Accumulation of Carbon in Forest Biomass per hectare in the project sites. Note the decrease in carbon after year 14 can be attributed to thinning.	78
Figure 12	The projected accumulation of CO ₂ in forest biomass per hectare in project site	79
Figure 13	Projected accumulation of forest biomass per hectare for <i>Swietenia macrophylla</i>	82
Figure 14	Projected Carbon Accumulation in Forest Biomass for <i>Swietenia macrophylla</i>	83
Figure 15	The projected accumulation of CO ₂ in forest biomass for <i>Swietenia macrophylla</i>	84
Figure 16	Paskaia's Organisational Structure	98
Figure 17	The four governance levels of the project in Moskitia, Honduras	100
Figure 18	Depiction of the flow of finances within the project	106
Figure 19	Components of the Sustainability Index for Landscape Restoration source (Cristales et al. 2020)	113
Figure 20	The SilvaPlan program interface	117
Figure 21	The FRAGSTATS user interface	122
Figure 22	The levels of image analysis that can be used in FRAGSTATS	123
Figure 23	Calculation of LPI at the landscape level	124
Figure 24	PAFRAC calculation at landscape level.	124
Figure 25	Calculation of NP and CONTAG at landscape level.	124

Figure 26 PLAND calculation at class level.	125
Figure 27 Results at Landscape Level	125
Figure 28 Results using classes.	126
Figure 29 Interface of the Aguas de Honduras platform	130
Figure 30 Record of data on water quality in the micro-basins. Aguas de Honduras Platform	131
Figure 31 Example of measuring water quality parameters in a micro-basin of Siguatepeque, Comayagua. The availability of information will depend on the monitoring in the micro-basin under study	132

Table of Maps

Map 1 The project site, the titled territories of Masta, is the territorial organisation for the Miskito peoples. The shaded grey areas depict the degraded pine savannas where the project interventions are proposed. Source (Mollett 2010)	12
Map 2 Indigenous, non-indigenous communities, and Consejos territories in Honduran Moskita, 2018 source: (Herlihy and Tappan 2019)	26
Map 3 Truksinasta Consejo, the site where the project co-design process was implemented.	40
Map 4 Plan Vivo connected to the planting of Mahogany on Privately owned land in Truksinasta.	47
Map 5 Map of Plan Vivo in degraded Pinus Caribaea Truksinasta Concejo	47
Map 6 Standing map from 2022 of an intensive protection zone in Truksinasta.	118

Table of Photos

Photo 1 A typical productive home garden	23
Photo 2 A Pine Savanna targeted for ecosystem restoration.	27
Photo 3 General Assembly" in TIPI Lalma. Prior consultation to allow the PASKAIA to enter the territory of Truksinasta to begin a discussion with the community about the proposed project.	31
Photo 4 Tiki Rama's village map of elements of importance to their livelihoods	41
Photo 5 Picture depicting the vulnerability of local infrastructure to storms that are increasing in frequency and intensity.	42
Photo 6 The photo to the left depicts a pine savanna area where the annual burning regime has been excluded for several years (Truksinasta, Feb 2022). The photo on the right shows a pine savanna degraded due to the annual burning regime.	42
Photo 7 This is a picture of a boy who is unable to walk, which is often used to exemplify vulnerability.	43
Photo 8 Creating a map on the ground beginning with boundaries around different form of land use on their property as part of the process in developing a Plan Vivo	46
Photo 9 Nursery established in Tikiurra, CTI Lainasta.	58
Photo 10 Carrying out forest fire prevention activities (rounds) in Truksinasta.	59
Photo 11 Fighting forest fires in Truksinasta.	59
Photo 12 Natural regeneration in areas protected by PASKAIA	60
Photo 13 First meeting in Puerto Lempira with MASTA leaders, and Lainasta and Truksinasta territorial councils	129
Photo 14 First meeting where project staff with inhabitants Truksinasta Concejo	129

Table of Tables

Table 1 Concejo Territoriales where the project will be operating.	13
Table 2 Results from a rapid biological survey undertaken in 2017 within Gracias a Dios, Honduras	15
Table 3 Census Results in the Tipi Zone	22
Table 4 Census Results by Community	22
Table 5 A Seasonal Calendar showing the distribution of seasonally varying livelihood activities.	24
Table 6 Concejos Territoriales of the Honduran Moskitia, 2017 (Herlihy and Tappan 2019).	25
Table 7 Description of Project Activities	29
Table 8 Addressing Common PES Project Critiques. This table outlines the various critiques of environmental and PES projects whilst providing a means to reconcile these and how the Gracias a Dios employed these solutions.	34
Table 9 Results from the Stakeholder Analysis emerging from the Co-Design Process	37
Table 10 Carbon benefits per hectare for Savannah restoration during the project's crediting period beginning in 2022.	53
Table 11 Projected carbon benefits derived from the incorporation of mahogany into existing farming systems.	56
Table 12 Anticipated livelihood benefits derived from the project.	57
Table 13 Anticipated negative livelihood outcomes from the project and actions taken to mitigate these.	59
Table 14 Envisaged ecosystem impacts derived from the project.	61
Table 15 Calculations and estimates of Volume, Biomass, Carbon and Carbon Dioxide Co ₂ for <i>Pinus caribaea</i>	80
Table 16 Calculations and estimates of Volume, Biomass, Carbon and CO ₂ in the established forest of Honduran Mahogany	86
Table 17 Identified sources of leakage in the savannah and mitigation measures	88
Table 18 Identified sources of leakage in the Mahogany plantations and mitigation measures	89
Table 19 Project timeline	105
Table 20 Breakdown of the payments derived from eco-system services within the community for a 250-hectare plot of restored <i>Pinus caribaea</i> Savanna.	108
Table 21 Forest and Landscape restoration scales and stakeholders (Reytar et al. 2020)	112
Table 22 Indicator for Carbon related Ecosystem Service Benefits	114
Table 23 CO ₂ calculation table for <i>Pinus caribaea</i> over 20 years	117
Table 24 Explanation of the equations used to calculate CO ₂ .	118
Table 25 Example of how convert values of the contagion index (CONTAG) to a value between 0 and 1	128
Table 26 Parameters used to calculate the water quality index (WQI)	130
Table 27 Socio-Economic Indicators	127

1. Part A - Aims and Objectives

Gracias a Dios, one of Honduras's poorest regions, is primarily inhabited by the Miskito peoples. Historically, this indigenous community has been socio-economically marginalised, and this situation persists until this day. This has been amplified by poor access to adequate healthcare and education. The vulnerability of the Miskito's subsistence economy has been exacerbated by an increasing frequency and intensity of storms attributed to climate change. Combined with forest clearance in the upstream reaches of the catchment, these episodes have increased the frequency and intensity of flooding in lowland coastal areas. The flooding results in saline intrusion and destruction of infrastructure, which affects agriculture and leads to increased leaching of sediments and nutrients that undermine the integrity of the marine resources, which presently constitute the Miskito's most crucial livelihood asset.

La Moskitia is characterised by a history of encroachment from settlers, leading to significant forest clearance and degraded natural habitats. This can be attributed to several activities, including migratory agriculture, plantations, ranching, drug trafficking, hydroelectric schemes, and oil exploitation. Historically, deforestation has been challenging to control because the government failed to enforce regulations and corruption and insecure land tenure. In 2015, approximately 1.2 million ha, comprising the project area, was demarcated and titled to Unity of the Miskito People (MASTA), the Miskito's territorial authority. The Miskito's newly won property rights over large tracts of their ancestral territories can be instrumental in securing a sustainable livelihood for over 60,000 people.

This project aims to contribute to a sustainable livelihood for the inhabitants of Moskitia through the generation of multiple ecosystem services by supporting the natural and assisted restoration of degraded savannas and broadleaf plantations.

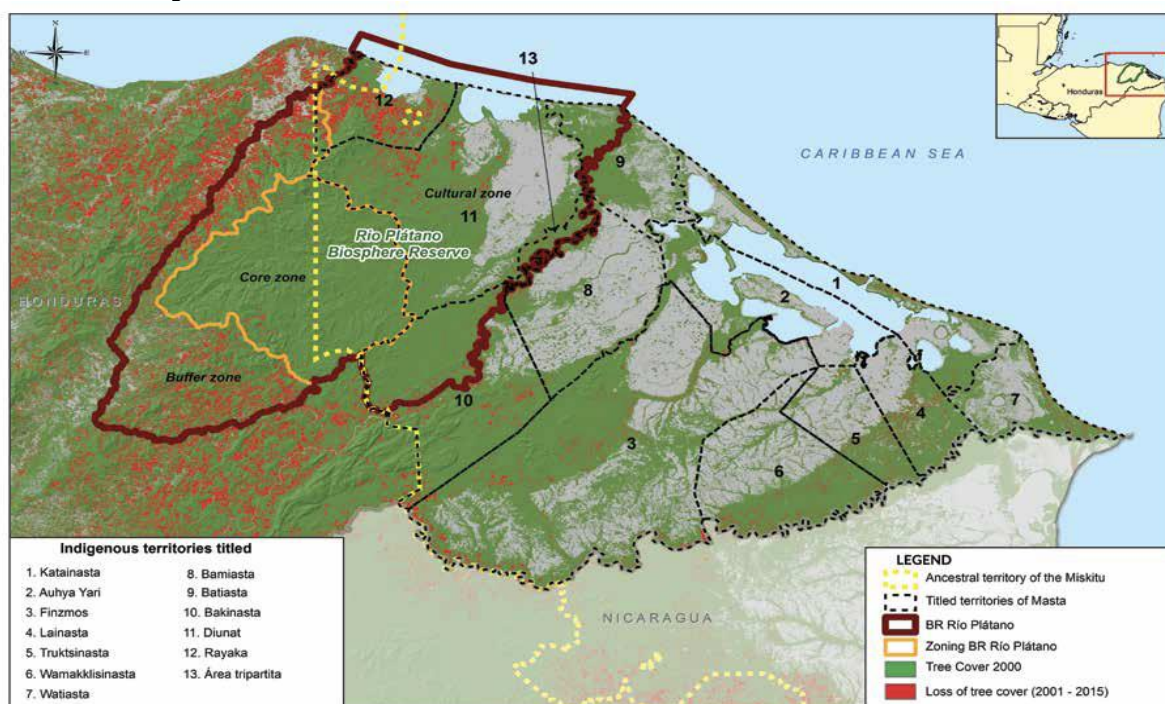
This project is a joint venture between MASTA and Paskaia and has the following specific objectives:

- to *build* local capacity in the restoration of forests in degraded habitats;
- to *secure* a sustainable livelihood for the Honduran Miskito by generating a host of ecosystem services;
- to *improve* local climate change adaptation;
- to *enhance* the Miskito's territorial claims and property rights over land and local resources;
- to *promote* gender equity within local governance structures and;
- to *reduce* CO2 emissions and enhance carbon sequestration by adapting existing and introducing new land management practices.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

2. Part B - Site Information

2.1 B1 Project Location and Boundaries



Map 1 The project site, the titled territories of MASTA, is the territorial organisation for the Miskito peoples. The shaded grey areas depict the degraded pine savannas where the project interventions are proposed. Source (Mollett 2010)

The project area is located in the Gracias Dios region in the extreme northeast of Honduras. The project site is also located in a larger area called La Moskitia, which extends into part of Nicaragua. The project area currently encompasses 3 (Lainasta, Truktsinasta and Wamakklisinasta) of the 12 Miskito territorial councils, titled in 2015 (see Map 1) and is approximately 1.2 million ha. These Concejos have intercommunity titles that acknowledge the overlapping land uses and functional habitats of Miskito communities (Herlihy and Tappan 2019). Two territorial councils within the Rio Plátano Biosphere Reserve have been divided into a cultural zone, a buffer zone, and a core zone where all human activities are prohibited. The area is known amongst the community and is identifiable on the map above. This protected area hosts one of the most pristine areas of lowland rainforest in Central America (Larsen 2019). The area that falls outside the biosphere consists of diverse habitats, including lowland tropical forests; extensive wetlands that sustain a wide variety of mangrove forests; pine forests, mixed pine, broadleaf forests, and large tracts of degraded Caribbean pine savannas. Initially, the project will focus on restoring and rehabilitating degraded Caribbean pine savannas in Truktsinasta Concejo, which

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

subsumes 566 km² with 30 hamlets, Lainasta Concejo, 538 km² and 34 hamlets and Wamakklisinasta Concejo, 1100 km² and 16 hamlets (see Table 1). In addition, privately owned land or land with long-term leasehold circumscribing community (hamlet) sites will be reforested with Mahogany

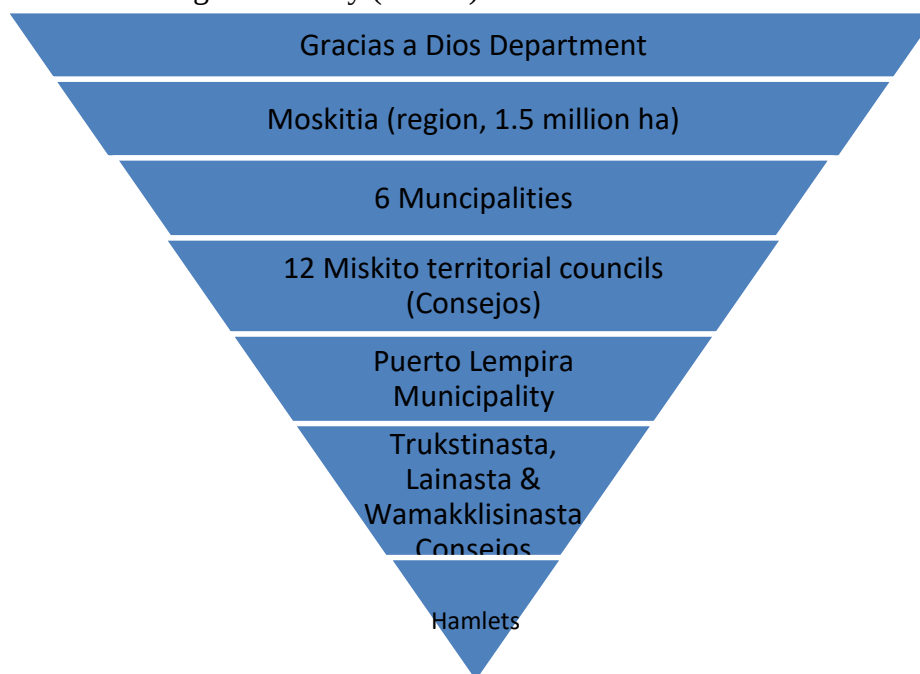


Figure 1 Breakdown of the Project Region to Project Area. The project region represents where the project aims to expand to, the project area represents where the project is taking place as of writing this PDD in 2022/2023.

Table 1 Concejo Territoriales where the project will be operating.

Territorial Council	Lainasta	Truktsinasta	Wamakklisinasta
council area	53,848 ha	56,588 ha	110,585 ha
Total population	6300	3000	
Number of communities	34	30	16
Act. Subsistence	Small-scale agriculture, Animal husbandry, Artisanal fishing, Livestock farming	Small-scale agriculture, Animal husbandry, Artisanal fishing, Livestock, Wood sales	Small-scale agriculture, Artisanal hunting and fishing, Livestock, Sale of wood
Type of coverage	Wetlands, Mangroves, Broadleaf Forest	Wetland, Broadleaf Forest, Plain or Savannah with pine.	Broadleaf Forest, Plain or Savannah with pine.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Types of communication path	Terrestrial and Aquatic	Terrestrial and Aquatic	Terrestrial and Aquatic
Communities	Rancho Chico, Sih Honduras, Turah Laya, Usan, Krahkra , Swabila , Tanslaya , Pukru , Yulu , Tuburus , Suba Tingni , Kuri, Warbantara , Batilkira , Tikiurrraya , Umru , Liwa , Ahuas Lupia, Paruta , Kiaras , Tumtumtara , Munatara , Lakatara , Dakratara , Tailiyari , Tabila , Lur , Daiuras , Taritawan , Ahuas Tingni , Kinia , Suba.	Tipi Lalma, Tipi Muna, Blihlilaya, Lisagnipura , Bipklarka , Milk Daukan , Umantawan , Nahkunta , Uhanata , Tapamlaya , Ipiritigni , Kuirkuplapan , Yabaltara , Maku , Baikan , Lakunka , Klukumlaya , Paru , Tukrunlaya , Waklin Alkan , Masa Auhika , Ranks Dimwan , Landin , Ilsilpi , Uhun Tangni , Kuah tangni , Kara, Minakla , Mistrust Kiahsi , Warbra Clown	Kaurskara , Wis. Wis , Corinth, Karskira , Silm , Yulu Tara, Yulu Almuk , Sihnak Kriwan , Kalon , Prahbani Pura, Srumlaya , Warbantara , Liwakuria , Lisania , Auka, Callo Sirpi

2.2 B2 Description of the Project Area

The annual rainfall in the region ranges between 2600 and 3500 mm, with a distinct dry season between February and May. The average annual temperature varies from 24.9 to 25.6° C, with the warmest periods from December to February. There is a slight variation in the annual temperature, which ranges between 24 and 25° C. Moskitia is the wettest part of the neotropics with savanna vegetation and receives sufficient rain to support tropical broadleaf forests (Parsons 1955). The presence of savanna points to the role of fire in maintaining this climax vegetation-type (Myers 2006).

The topography is flat to gently undulating, not rising above 200m above sea level. The pines are restricted to the ridges in the waterlogged areas near the coast. The broadleaf tropical forest can be found in locations protected from fire, predominantly narrow riparian zones along watercourses. If protected from fire, broadleaf hardwoods can invade the pine savannas (Taylor 1963). However, historical accounts suggest that the pine savannas are cultural landscapes that have persisted even before the region was first colonised. Soils are generally nutrient-poor sands and gravel with overly heavy clays. Historically more extensive broadleaf forests occurred on alluvial soils; however, pine savannas can also be found in these sites (Myers 2006).

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

A biological survey was conducted in the project area in 2017, and 43 species were identified to have conservation concerns (Larsen 2019)(see Table 2). Additionally, two endangered plants (a palm *Reinhardtia gracilis* and a fern *Adiantum pulverulentum*) and several endangered animals (the Great Green Macaw, Geoffroy's Spider Monkey and Baird's Tapir). During the same survey, three species were rediscovered, the pale-faced bat, the false coral snake and the tiger beetle.

Gracias a Dios¹ has the highest poverty rate in Honduras. It is inaccessible by land, and all the roads are unpaved. The remoteness of the region also largely explains why it is considered to be Honduras's most exposed region to multi-hazards on account of its very high vulnerability and very low coping capacity scores (PDC 2020).

Table 2 Results from a rapid biological survey undertaken in 2017 within Gracias a Dios, Honduras
(Source, Larsen et al. 2019)

	Total Species	New Species	Threatened Species	Species New to science
Plants	183	3	14	
Orchids	19			
Butterflies and moths	246	15		
Other arthropods		3	1	
Fishes	13			1
Amphibians	22		4	
Reptiles	35		8	
Birds	198		9	
Rodents	10			
Bats	30	1	1	
Large mammals	30		6	
Total	779	22	43	1

The region is also vulnerable because of the increasing frequency and intensity of storms attributed to climate change. In combination with forest clearance in the upstream reaches of the catchment, these episodes have exacerbated the incidence of flooding in lowland coastal areas. The flooding results in

¹ Gracias a Dios is one of 18 political regions in Honduras and has six municipalities.

saline intrusion and infrastructure destruction, affecting agriculture. Moreover, it leads to increased leaching of sediments, pesticides and nutrients that undermine the integrity of marine resources (Cochran Jr, Reese, and Liu 2009).

2.3 B3 Recent changes in land use and environmental conditions

Limited scientific attention has been given to assessing the status of the habitats that fall outside the biosphere. Caribbean Pine Savannas are the dominant habitat, and they cover approximately 600 000 hectares of the project area (Myers 2006). The integrity of these habitats depends on the varied fire regime traditionally implemented by the Miskito to sustain swidden cultivation, another term for slash and burn or shifting cultivation (O'Brien and Morrison, 2006). However, the illegal migration of Landino populations that occurred before the land titling process began led to indiscriminate annual burning and the deterioration of these savannas, and in many cases, reversion to unproductive treeless grasslands.

Today the landuse consists of home gardens circumscribing their homestead and Guamlies. The adult men in households spend several months a year at camps where they hunt, fish and cultivate by managing the secondary re-growth (guaumiles) Our field research suggests in Truktsinasta, communities maintain their guaumiles within a day's walking distance of the village to cultivate beans and rice. Men spend up to 3 months a year at these temporary camps.

2.4 B4 Drivers of degradation

Historically deforestation in Gracias a Dios has been challenging to control because the government failed to enforce regulations, corruption, and insecure land tenure. This paved the way for a history of colonisation by *ladino* settlers, lumber barons and *narcos*, with competing development interests in the Miskito (Mollett 2011). The colonisation of Gracias a Dios began most actively during the 1980s, leading to significant forest clearance and degraded natural habitats from migratory agriculture, plantations, and ranching. Due to the intense conflicts during this period, Gracias a Dios was considered the 'most aggressive agricultural frontier' within the Latin American continent (Herlihy and Leake 1992).

A series of satellite images suggest that deforestation accelerated after 2006 with the intensification of drug trafficking both within the cultural zone of the Rio Plato Bioreserve and in the adjacent territories (see zones, 12, 11 and 10 on Map 1). McSweeney and Pearson (2013) write that "Time Series satellite images reveal how the biodiverse patchworks of field, fallow, and forest—characteristic of native landscapes—give way to a narco-scape marked by massive, hastily cleared pastures proliferating cancer-like in the heart of indigenous homelands". According to the National Institute of Forest

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

conservation and development, the intense appropriation of land by drug traffickers has been a crucial driver of deforestation in Gracias a Dios. Cattle farms were established on this land to store drugs and serve as a money-laundering front (accessed <https://insightcrime.org/news/narco-highway-honduras-national-news/>). Thanks to the slowing of this practice, the degradation caused may now be addressed. It should also be noted that narcos, lumber barons and encroachment from Ladino settlers are no longer present in Concejo where the project will be implemented.

It also envisaged that the multinational Patuca III hydroelectric dam project, which began operations at the end of 2020, will have profound consequences on the river ecology and the livelihoods of downstream indigenous communities (Herlihy and Tappan 2019).

3 Part C - Community and Livelihoods Information

3.1 C1 Communities and Institutions in the Project Site

Gracias a Dios is one of 18 political regions in Honduras and has six municipalities. The entire project area falls within the Puerto Lempira municipality. According to the National Institute of Statistics, in 2019, the population of Gracias a Dios was 94,450 inhabitants. The Miskito make up 95% of the population. Approximately 3% are Garífunas and Tawahkas, and the remaining population comprises other indigenous groups, namely the Pech, Nahuas, Tolupanes, Chortis, Lencas and the Ladino settlers. 51% of the total population are female and are mainly involved in household activities within the region.

Gracias a Dios is considered to have the highest multi-hazard risk score in the country (see figure 2). This is attributed to a combination of high multi-hazard exposure (MHE), high vulnerability and lack of coping capacity (PDC 2020) (see figure 2). The high multi-hazard exposure score is attributed to regular exposure to cyclones (100% of the population), coastal floods (52% of the population), and inland floods (66% of the population).

MASTA is a political organisation representing the Miskito in the project area and stands for Moskitia Asla Takanka' which means 'Unity of the Moskitia'. It was established in 1976 to help the Miskito obtain the rights to govern their ancestral lands collectively. MASTA also became the first Indigenous organisation in Central America to develop its own Biocultural Protocol as a mechanism to defend the collective right of the Miskito to free, prior consultation and informed consent on proposed development projects in their territories (Herlihy and Tappan 2019). The MASTA also supports the other minority groups listed above.

MASTA's principal role is to protect indigenous territorial rights and culture, strengthen local governance and natural resource management, and improve regional health and education systems. The federation has helped the Miskito defend their territories from ranchers, drug traffickers, palm oil and

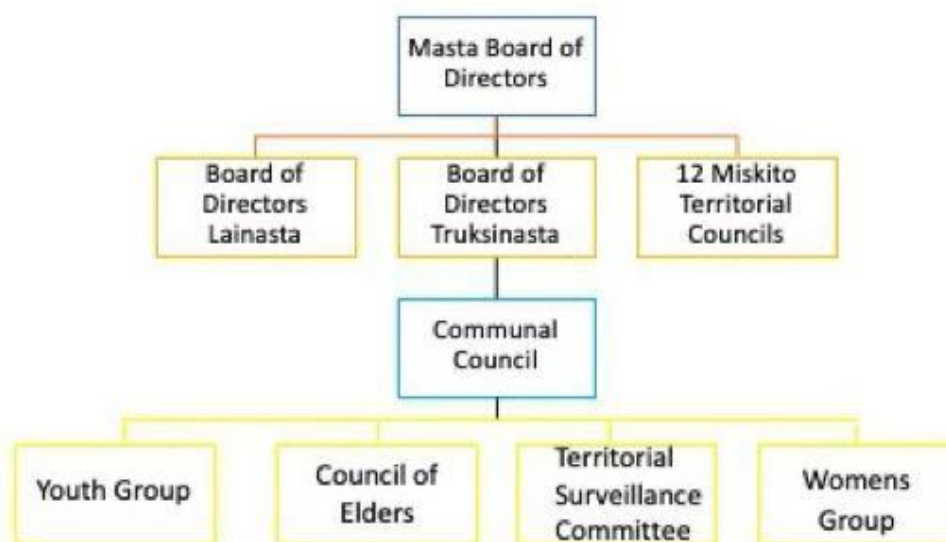
*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

petroleum companies. The group protects a large part of the remaining intact rainforest in Honduras, approximately 1.2 million hectares or 7 % of the national territory of Honduras. MASTA represents all 60,000 Miskito's people and has used social mobilisation, dialogue, creative communications strategies, and alliance building to secure titles for Miskito's territories. Thus far, 17,500 families have benefited from the intercommunity land titling (Cordova Arauz 2020).

In the process of formally defining Miskito territories, MASTA implemented a participatory mapping initiative to understand the communities' land uses in Gracias a Dios. This resulted in cartographic depictions of subsistence land use zones (functional habitats) (Herlihy and Tappan 2019). By using these maps, MASTA could more precisely articulate the conflicts of interest and the impact of accelerating colonisation in their traditional territory.

Based on the outcomes of the participatory mapping initiative, MASTA led to the development land legalisation model in which the ancestral functional habitats of the Miskito were proposed to serve as its internal governance units, Concejos Territoriales. This model was approved at the MASTA Congress in 1997. In conjunction with the Honduran Land Administration programs (PATH (2004-2014), a Miskito sub-commission was established and chaired by the National Agrarian Institute to operationalise the titling of the Concejo Territoriales. (Herlihy and Tappan 2019).

Today, MASTA's territory is subdivided into 12 Miskito Territories, each governed by an elected territorial council (Concejo). This council must be endorsed by MASTA and registered under the Directorate of Regulation, Registration, and Monitoring of Civil Associations (DIRRSAC). Elections are held annually to appoint the regional president of MASTA and the Concejos. Only indigenous Miskito from 18 years of age is permitted to vote. In 2020 the elections were deferred until 2021 because of the COVID pandemic. The Honduran government ratified this decision.



L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Figure 2 Organisation chart of the Governance Structure in the Project Area

The Department of Gracias a Dios is the regional authority that encompasses the project area. It is mainly staffed by indigenous groups and predominantly by the Miskito. This region is considered Honduras's most remote region due to the absence of roads and poor communication, such as the internet and mobile telephone coverage. Despite this neglect, it is notable that vulnerable groups are well represented in Gracias a Dios's administration, such as disabled divers, the elderly and single mothers.

Figure 2 depicts the governance structure in the project area. To ensure fair representation, MASTA's board of directors includes the village heads from each of the 12 territorial councils (Concejo). The Territorial Council comprise of representatives chosen in an annual general assembly. Typically, the board of directors consists of community leaders. These representatives have a duty to address emergent issues in their respective territories to ensure the collective good of the communities. The Territorial Council holds the highest authority within the territory. As the Councils are autonomous and possess their own legal entity, MASTA cannot and should not interfere in their decisions. However, MASTA can provide advice on the actions they plan to take.

The Communal Council consists of citizens who represent and lead their communities within the territorial council's jurisdiction. Only candidates from the community are eligible for election, excluding foreigners and non-Creoles. These leaders resolve community conflicts and maintain order between the population and other actors within the territory. The Communal Council follows the Territorial Council's orders and reports on any significant unresolved conflicts.

The leadership within the Communal Councils is diverse and includes various bodies representing different societal intersections. These bodies include a youth group and a women's group. Additionally, there is a surveillance committee tasked with monitoring the Territory and its resources and ensuring their proper use. Members of this committee have received training in GPS usage, map reading, identifying forest fires and pests, and reporting methods. In addition to their other duties, they are responsible for safeguarding the area against trespassers who may try to take over the land. The Council of Elders provides advice since the Miskito people greatly respect the wisdom of older individuals when making decisions that affect the community.

3.2 C2 The Socioeconomic context

Men predominate in the main economic activities, namely seasonal fishing, including diving for lobsters, sea cucumbers and couch. Many divers have experienced severe health issues because of poor equipment and exploitative labour conditions (Bank 2019). The Hamlets (community areas) are the main base for the Miskito's socio-economic activity. However, families also spend several months a year at camps where they hunt, fish and cultivate by managing the secondary re-growth (guaumiles)

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

(Sauls 2019). Herlihy and Tappan's (2019) field research suggests that inland communities maintain their guaumiles within a day's walking distance and travel much further afield to intact rainforest areas and open pine savannas to hunt fish and collect wild foods. There is plenty of vegetation immediately around the villages, which can be used as fuel wood.

Traditionally the Miskito have a matrilineal inheritance system. However, this does not necessarily mean that the women have control over family land. Moskitia has had a long history of patriarchal institutions, such as the state and the church, encouraging nuclear families, male-headed households, and patrilineal inheritance. For Miskito women who rely on customary access to communal lands, a risk exists that the ongoing individualised land titling process in the project area will structurally disadvantage women in favour of men, both in their families and at the community level (Mollett 2010). To address gendered inequities, MASTA has allied with an independent women's organisation, Miskito Indian Mairin Asla Takanka (MIMAT) (Fund 2015).

Today Landino families primarily inhabit those areas within Concejos that surround the core zone of the Rio Plátano Biosphere Reserve (see Map 2). Their livelihoods are sustained by commercial crops such as coffee, maize, beans, rice, and the rearing of cattle and pigs. Within Miskito culture, borrowed land is always returned. This practice is underpinned by a different set of tenure relations to Western property arrangements and explains why the Miskito often accuse ladino settlers of stealing their property (Mollett 2013).

Gracias a Dios has the highest vulnerability of all 18 regions in Honduras. This can be accounted for by economic constraints (0.79 economic dependency ratio and 90% of inhabitants in poverty), population pressure (2.9% annual population change), and clean water vulnerability (27.7% have access to treated water and 8.4% of households are connected to sewer or septic systems). Gracias a Dios also has the lowest coping capacity of all regions in Honduras. This can be attributed to weak governance (28 homicides and 234 sexual violence and assault cases per 100 000 persons); poor infrastructure, and in particular, communication (2.9% of the population with fixed telephone lines and 39% with mobile phones) and poor roads which constrain access to the market; and economic capacity (30% economic capacity rate).

Living in the Honduran Moskitia is expensive due to its remote location and difficult access. As a result, this region's development is slower than the rest of the country, which is reflected in lower indicators for health, education, employment, and productivity. The Human Development Index (HDI) for Gracias a Dios is 0.635, while the Human Poverty Index (HPI) stands at 53%. Moreover, only 40% of the local population can access water and electricity (Carrasco, y Caviedes. 2014). Recent data from the Instituto Nacional de Estadística Honduras reveals that poverty is rampant in Gracias Dios, with a staggering 93% poverty rate. On average, households in the area consist of 6-8 family members and spend 4,500.00 lempiras on food. However, due to limited and seasonal income, one in five people in rural areas live in extreme poverty, surviving on less than US\$1.90 per day (Confederation 2022). Thus,

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

the livelihoods of the Miskito are heavily reliant on subsistence such as fishing, agriculture and livestock, in addition to generating a little income.

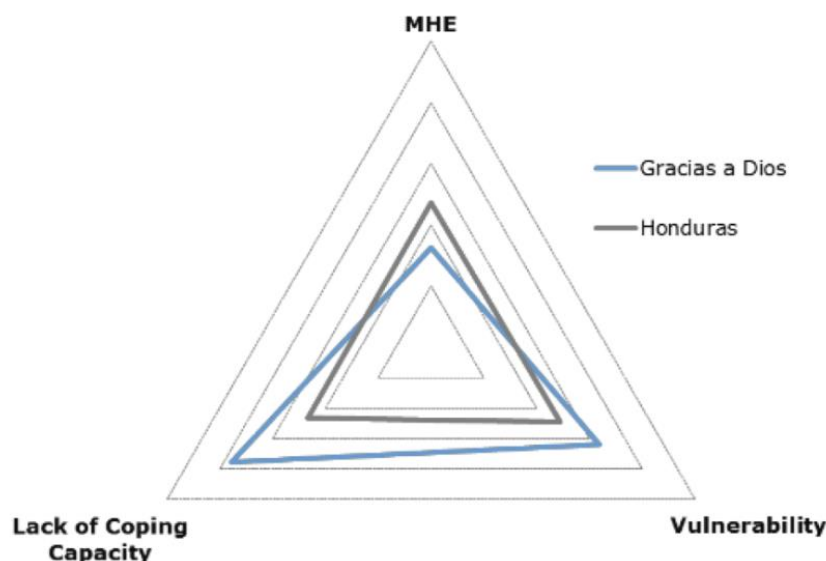


Figure 3 Gracias a Dios multi-hazard risk component scores compared to the average country score for Honduras. MHE refers to Multi-hazard exposure (PDC 2020).

3.2.1. Specific Socio-economic insights pertaining to Truktsinasta Concejo

Whilst the section above provides a general outline of the socio-economic status in Moskitia, there is great diversity across the different Concejo. In the following section, more detailed information is provided that specifically accounts for Truktsinasta and the Tipi zone, where the project's first phase is being piloted. Data was gathered from the local Census in the Tipi area, with priority given to information from communities heavily involved in the project's initial phase, along with input from the territorial council. Tables 3 and 4 summarize the most pertinent findings.

Table 3 Census Results in the Tipi Zone

Description	Quantity	Percentage
Established families	370	100%
Total population in the area	1779	100%
Adult population in the area	682	38%
Population of Children in the area	1097	62%
People per familia	4.8	
Home-owning families	293	79%
Families with Latrine	41	11%
Families with Water Filters	0	0%

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Families that own a water tank	0	0%
Families/source of energy	2	0.5%
Families with vegetable garden	363	98%
Families with shop	0	0%

According to the survey, 77 families live in shared housing with siblings, in-laws, or other relatives because they don't have a home. They can get wood for construction from the communal savanna, but it's a long journey to obtain it. Furthermore, not everyone has easy access to basic housing supplies like gasoline, roofing, and nails.

Table 4 Census Results by Community

Description	Tipi Lalma	Tipi Muna	Lisagni- Pura	Blibli- Laya	Bip- Klarka
Established families	82	151	94	34	9
Total population in the area	393	734	461	152	39
Adults in the area	163	249	187	66	17
Children in the area	230	485	274	86	22
People per family	4.8	4.9	4.9	4.5	4.3

Upon investigation into sanitation practices, it was discovered that only 11% of the community has access to a latrine or designated area to meet their basic bodily needs. In order to avoid water pollution and the risk of disease for humans and animals, many families are forced to use open spaces to dispose of waste. Unfortunately, this can lead to contaminated water and harm to both humans and animals. To combat this issue, it is important to have the capability to store rainwater in containers that can be filtered and used for human consumption, ensuring access to clean water.

The Tipi Zone is a remote area that has yet to undergo significant development. Only two households have access to electricity, but visiting teachers, doctors, and nurses can charge their torches and store perishable food in small refrigerators. The churches in the area have installed solar systems to provide lighting during evening meetings.

The case of the Eta and Iota Hurricane exemplifies how the high vulnerability and lack of capacity within the project site amplify impact. Household interviews undertaken in Truktsinasta Concejo in 2022 and 2023 revealed that the vegetables and grains produced in their home gardens normally comprise a significant portion of subsistence needs. In 2020, Eta and Iota destroyed their home gardens before they could harvest and put aside seeds to plant new crops. Respondents suggest that most households still haven't recovered from the hurricane because they have no seeds to plant new crops and home gardens. Although seeds can be purchased, limited financial resources prevent most households from doing so. This was confirmed by a household survey conducted in February 2023,

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

which revealed that only 35% of households with home gardens were growing staple crops such as beans, manioc, chatas (local plantains), papaya and sugar cane. A minor proportion of their subsistence needs comes from fruit trees. These include avocado, coconut, breadfruit, manzanitas and oranges.



Photo 1 A typical productive home garden

Table 5 A Seasonal Calendar showing the distribution of seasonally varying livelihood activities.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Okt	Nov	Dec
Temp (C)	27 C	28 C	29 C	31 C	30 C	30 C	30 C	30 C	31 C	30 C	29 C	28 C
Rainfall (mm)	103	62	42	36	106	141	172	153	112	168	129	95
Sowing rice												
Harvesting rice												
Sowing beans												
Harvesting beans												
Sowing Yuca												
Harvesting Yuca												
Fishing artisanal												
Fishing industrial												
Hunting												
Timber harvest (x marks extra intensity)		x	x	x	x	x				x	x	x

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

In a good year, some of this fruit can be sold in local markets in Puerto Lempira. When households can't make ends meet, the collectively owned pine savannah becomes more important to sustain families. Community members of the Concejo are permitted to cut mature pine trees in the savanna and sell the timber in Puerto Lempira. This provides much-needed cash to buy the food that they would have otherwise produced in their home gardens.

3.3 C3 land tenure & ownership of carbon rights

In 2012, the Honduran government launched a program to transfer land rights in the Gracias a Dios department to the Miskito. These lands were demarcated and titled under the Second Land Administration Project (PATH II). As of 2015, more than one million ha of land had been titled (formal land ownership) in the Honduran part of Moskitia. By the end of the land titling process, it is envisaged that the total land area will amount to 1.5 million ha. The land titling process within the Honduran Moskitia has had a different approach from the National Agrarian Institute's standard practice.

Under the traditional system, an indigenous community is considered the legal recipient of tenure rights. The land titles are granted for relatively small areas (an average of 590 ha) of agricultural and cattle land that circumscribes indigenous settlement. However, in Moskitia, the title holders are the Concejo. Titles encompass vast areas that cover the entire functional area of a group of communities (see Table 2).

The Mosquitia region is comprised of 15 territorial councils, of which 12 are derived from Miskito settlements, a Garífuna council, a Tawahka council and a Pech council. 13 territorial councils (see map 2) have their property titles endorsed in their name. The same right subsumes all the inhabitants of the territory. It is worth clarifying that the 12 territorial councils with which we are working on the project have their property title.

Residents of the Concejo have the right to buy land and receive individual land titles that guarantee their property rights and give them the freedom to use the land as they see fit. They can also borrow/lease land from the Concejo for agricultural or tree-planting purposes. If they use the borrowed land productively, their family members may inherit the right to continue using it and possibly even receive a land title. However, the lack of financial resources among Concejo residents is currently causing difficulties with the process of obtaining land titles and purchasing seeds for cultivating the borrowed land (pers. com focus group with Truktsinasta Territorial Council, March 2023).

Table 6 Concejos Territoriales of the Honduran Moskitia, 2017 (Herlihy and Tappan 2019).

Name	Identity	Year Titled	Area km ²	Communities	Households
1) KATAINASTA	Miskito	2012	553	52	1323
2) AUHYA YARI	Miskito	2013	520	18	1488

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

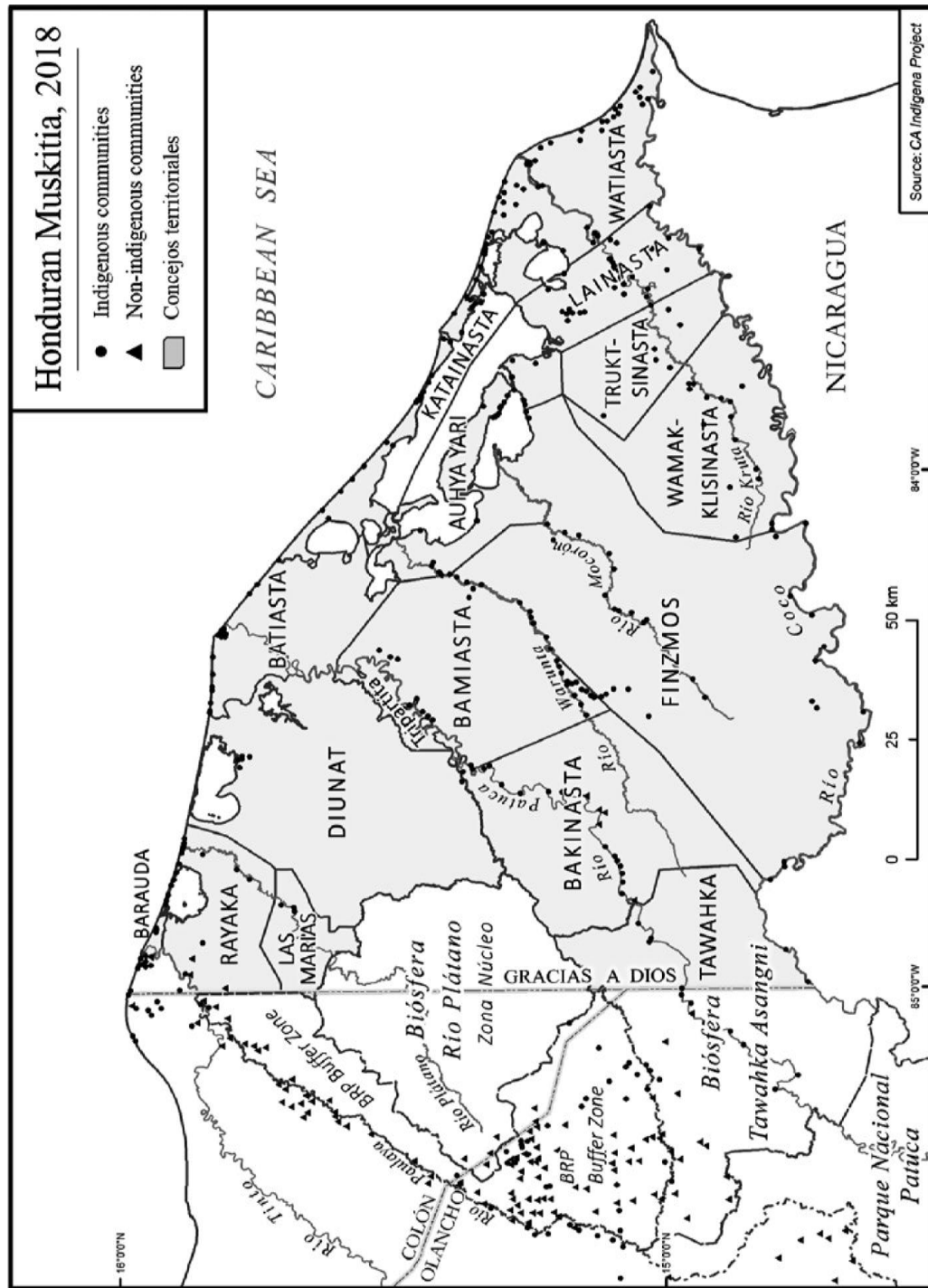
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

3) FINZMOS	Miskito	2013	3,733	30	997
4) LAINASTA	Miskito	2013	538	34	1036
4) TRUKTSINASTA	Miskito	2013	566	22	432
6) WAMAKKLISINASTA	Miskito	2013	1,158	16	423
7) WATIASTA	Miskito	2013	523	21	1552
8) BAKINASTA	Miskito	2015	1,680	17	718
9) BAMIASTA	Miskito	2015	1,188	9	854
10) BATIASTA	Miskito	2015	685	17	310
11) DIUNAT	Miskito	2016	1,307	17	466
AArea: Tripartita ²	Miskito	2016	124	0	n/a
12) RAYAKA	Miskito	2016	549	18	373
13) LAS MARIAS	Pech	2016	281	6	n/a
14) BARAUDA	Garifuna	pending	23	3	n/a
15) TAWAHKA	Tawahka	pending	842	4	n/a

In June 2022, the Ministry of Energy, Natural Resources, Environment and Mines (SERNA), Honduras, in coordination with the National Institute for Forest Conservation and Development, Protected Areas and Wildlife (ICF), within the framework of the process of updating the national forest regulations, announced that, to reduce the potential social, environmental and economic risks and conflicts associated with the recent escalation of speculation in the illegal sale of carbon credits in its national territory, declared, a national moratorium on the sale of forest carbon credits, which are not duly recognised by the United Nations Framework Convention on Climate Change (UNFCCC), or the Paris Agreement. The moratorium's objective is to avoid the colonisation of the commerce of carbon from its forests.

Once SERNA and the ICF have completed the new forest carbon inventory, updated the REDD+ safeguards and strategy, consolidated the institutional arrangements and legal regulatory frameworks, implemented the carbon accounting system (which allows non-duplication), and the process of accreditation and regulation, it will proceed to lift the Moratorium.

² Intercommunity title shared by BAMIASTA, BATIASTA, and DIUNAT.



Map 2 Indigenous, non-indigenous communities, and Concejos territories in Honduran Moskitia, 2018 source: (Herlihy and Tappan 2019)

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

4 Part D - Project Interventions & Activities



Photo 2 A Pine Savanna targeted for ecosystem restoration.

4.1 D1 Project Interventions

The project will focus on natural and assisted restoration in 3 of the 12 misquito territorial councils of the Gracias a Dios department during the pilot phase. During the first phase, the project will be piloted in the Truktsinasta council and will subsequently be expanded to the Lainasta and Wamakklisinasta councils – extensions will be detailed in the annual reports and updates to the PDD will be made as necessary over time. According to MASTA, communities within these territories have expressed a desire to initially focus on forest restoration on the large tracts of land covered by the degraded *Pinus caribaea* pine savanna (those areas of land shaded gray on Map 1).

To secure a sustainable livelihood for individual landowners with large tracts of degraded savannas, the proposed project aims to provide the financial capital (generated through PV certificates) and management capacity so these areas can be either restored by implementing fire control measures or by way of a combined approach of fire management and the planting of *Pinus caribaea* seeds.

In the 20 years it takes for the forest to mature; the areas will be thinned periodically to enhance the growth and overall biodiversity. This will also provide additional livelihood assets for participating landowners, such as timber for local construction and other ecosystem services that are described in more detail in section Part E. Finally, once the forest has matured, it will be used in local industries to produce timber products with long-term sequestration potentials, such as high-quality furniture and boats.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

4.2 D2 Summary of activities underpinning project interventions

Table 7 Description of Project Activities

Description of project activities				
Intervention type	Project Activity	Description	Target group	Eligible for PV accreditation
Assisted Restoration	Enrichment plantations in degraded forests and savannas	If fires are controlled, some pine forests can naturally regenerate through seeds from mature trees. However, if the distance between trees is too great or grass competition is severe, restoration assistance is necessary. This involves preparing the soil for improved seed and seedling survival, while minimizing disturbance to the soil and undergrowth to prevent nutrient and CO2 loss. In some cases, additional seeds from neighbouring areas may be needed, and measures to control competing grass will also be implemented.	The priority groups to be reached are those dedicated to the illegal extraction of wood, cattle grazing that implies burning of savannas in the area where the project is carried out.	Yes
Natural Restoration	Fire protection measures to allow the natural regeneration of the pine forest in savannas.	• Fire-fighting brigades, equipped with backpack pumps with water. • Training in landscape and fire management techniques. • Introduce new local agreements that serve to regulate the use of fire in different seasons, i.e., no burning / barbecuing during periods of high fire risk. • Protect areas from illegal logging.	People living in remote areas will work part-time as forest fire guards Community Leaders	Yes

Reforestation with Mahogany	Planting of Mahogany	• Undertake screening Plan Vivos to identify potential clients and sites. • Collect seeds from local trees. • Sometimes seeds are also purchased. • Establish nurseries for sapling production. • Preparation of the chosen sites. • Planting and management • Monitoring and Evaluation	Households with privately owned land and or land with long-term leaseholds	Yes
Capacity building	Managing community funds	• Improve the community's economy and financial management by providing training to its leaders. • Establish a cooperative with a transparent business model. • Support young people to pursue education and create job opportunities for those who have studied. • Ultimately, make the area a more attractive place to live and work.		No
	Training in fruit and vegetable production	• Workshops in horticulture. • Build community orchards as a source for vegetative material for grafting. • Introduce new varieties of fruits and vegetables that can be duplicated locally. • Workshops in different ways to preserve produce like drying, making jam etc. • Develop channels to the local and regional markets.		No

	Value adding business development for locally produced timber (with long term sequestration potential)	• Introduce appropriate technologies to process wood with less waste and lower energy consumption. • Introduce appropriate technologies to utilize a larger part of the tree and not only the first part of the trunk. • Introduce smarter ways to transport the wood. • Develop a small-scale wood process industry. • Develop channels to the local, regional, and national markets.		No
--	---	--	--	----

4.3 D3 The projected impact of activities on biodiversity and the environment.

Years of frequent fires have transformed much of this landscape into degraded grasslands. By reducing the frequency of fire and even precluding it during the initial re-establishment of trees and shrubs, our approach will lead to an overall increase in the species richness of flora. Restoring these habitats will also pave the way for increased fauna species richness and soil microbial diversity.

The world's second-largest reef ecosystem is at the southern end of the Gracias a Dios. Due to deforestation and increased agricultural activities at the project site, runoff of nutrients, pesticides and sediments has increased dramatically. This has had a severe impact on the integrity of the reef ecosystem. It is envisaged that the increased tree cover resulting from the project will significantly reduce the leaching of these pollutants into the reef system. Please see, Ecosystem and Biodiversity Benefits, for more information on the direct effects.

5 Part E – Community Participation



Photo 3 General Assembly" in TIPI Lalma. Prior consultation to allow the PASKAIA to enter the territory of Truktsinasta to begin a discussion with the community about the proposed project.

5.1 E1 Co-Design of the Project

5.1.1 Introduction

Carbon Offsetting projects are typically implemented in complex socio-ecological systems that are dynamic and exhibit non-linear, emergent and random properties. Interdependencies can lead to the export of vulnerabilities and compound or reproduce inequalities across and between sectors and societal intersections such as gender, class, and ethnicity.

Compensating for one's emissions, in high-income contexts, by supporting carbon-offsetting forestry projects in lower-income countries is a controversial field (table 4). Some argue that we cannot combat climate change without such projects. Others draw on a justice critique and say that the local social costs that stem from the inequities associated with these projects are just too high. There are reasonable grounds for both arguments. However, it is essential to acknowledge that there is great diversity in the approach that underpins the implementation of these projects.

The Gracias a Dios project area is characterised by a history of colonisation, which has led to significant forest clearance and degraded natural habitats. Historically deforestation has been challenging to

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

control because the government failed to enforce regulations, corruption, and insecure land tenure. The vulnerability of the Miskito's subsistence economy has been exacerbated by an increasing frequency and intensity of storms attributed to climate change. In short, issues in Gracias a Dios are wicked, and there is a risk that the project might lead to outcomes that were not initially envisaged. Instead, there is a risk that the status quo can be reproduced and amplified: power holders gain more agency and the marginalised become even worse off.

Although it has been widely acknowledged that the participation of local rural stakeholders is considered crucial for the success of forest restoration projects, they rarely participate (van Noordwijk et al. 2020). If they do it is not in the project design but rather in activities such as field labour (Ceccon, Méndez-Toribio, and Martínez-Garza 2020). We argue that many of the justice issues associated with carbon offsetting can be avoided by actively co-designing these projects with the potential clients, in our case, local communities in Gracias a Dios and the private actors who will purchase the Plan Vivo credits.

Building on lessons learnt from other projects, Paskaia, with the support of the Mistra Environmental Communication Programme, has developed a co-design process to support the development of the Gracias a Dios project. Co-design draws on the collective creativity of stakeholders enacted across the entire design process (Sanders and Stappers 2008). This approach embraces stakeholders as “co-designers” who contribute real-world knowledge, values, perceptions, and interests. This will minimise the risk of failure due to blind spots, designer bias, or the misinterpretation of context-specific content (Ampatzidou 2020). Systemic co-inquiry, a Soft System Methodology (SSM), is being drawn on to support the co-design process. SSM is a structured approach to engaging stakeholders in issue formulation, co-inquiry, learning, and concerted action to support the desired transformation.

Table 8 Addressing Common PES Project Critiques. This table outlines the various critiques of environmental and PES projects whilst providing a means to reconcile these and how the Gracias a Dios employed these solutions.

Climate Compensation Critique	Addressed by Project Co-Design	How the Project will Accomplished This
Greenwashing: Companies buy themselves free in countries with cheap labour instead of taking responsibility at home.	By including companies in the co-design process, they become aware of the issues they need to address to improve their social and	To bridge the spatial and social boundaries between project clients, community-generated media has provided the context to mediate ongoing interactions with companies Sweden. Photo and film have fostered a more systemic and nuanced understanding of the complexities and uncertainties associated with implementing the Moskitia project. These

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

	environmental accountability at home.	media have sparked ongoing conversations about the historical imbalances and interdependencies between the North and South, and how companies can take additional actions within their own operations to address these issues.
Contextual insensitivity: The land use associated with climate compensation is often incompatible with the social, cultural, and ecological context.	Relevant contextual insights are infused into the project co-design process by local communities.	A host of different approaches have been used to create a safe space for different societal intersections within the community. One important approach has been use of imaginaries to support creation of Plan Vivos and development of indicators of project performance. Socio-ecological uncertainties and controversies have been uncovered in the act of project co-design. The cognisance of this diverse landscape has led forms of landuse that can sustain multifunctionality.
Local relevance: Climate compensation projects occupy land and produce goods sold on a global market when this land could have been put into much better use locally.	Project co-design leads to co-benefits that have relevance to the local context.	Community members considered it important that more people participate in the fire brigade to promote learning and awareness about the impacts of the fires on the landscape. As a result, the fire brigade structure was modified to allow more people to join, despite the increased administrative workload. This change has resulted in more households earning an income during a period of economic hardship for the community due to unpredictable weather conditions.
Lack of Transparency: It is difficult to understand: the climate compensation business and how investments are related to reduced emissions.	Co-design provides a unique insight into a company's investment.	The project is presently using community generated media (photo voice and participatory videos) to unpack the potential transformation companies' investment can lead to

Carbon storage uncertainty: There is a risk that the stored carbon will be released due to changing land-use strategies	Local co-benefits emerging out of the co-design process are dependent on the measures implemented to increase carbon sequestration and permanence of the project.	This project is primarily seen by local stakeholders as a rural development initiative that receives support through carbon credits. Project interventions were selected in the co-design process based on their potential to promote local rural development in the long term, with carbon sequestration being a secondary consideration.
---	---	--

It is important to acknowledge that involving stakeholders in project co-design and implementation can face multiple obstacles. Common obstacles include lack of resources and poverty, as well as imbalances in technical knowledge between the organization in charge and the communities being served. Political instability, corruption, and varying regulations can also pose challenges. Additionally, communities may not fully understand the benefits of forest restoration, such as job opportunities and access to diverse resources. To overcome these barriers, a genuine effort was made to create a socially just playing field for all participants during the project co-design process. Below are some insights into the project co-design processes.

5.1.2 The Co-Design Process

At the outset of the co-design process, key informants were consulted to initiate the stakeholder identification process. Key informants are the initial stakeholders identified through pre-existing networks, local knowledge, and a desktop review. Additionally, many of the stakeholders we encountered served as informants for identifying new stakeholders, an approach referred to as snowballing (Colvin, Witt, and Lacey 2016) (see Table 9 for the results of the Stakeholder analysis emerging from the co-design process) A key informant identified at this time was MASTA.

Before the first set of community consultations, the Paskaia team had a meeting with the MASTA leadership to decide upon where the project work should be initially piloted. The criteria used to support the deliberations included:

- The stability, efficiency, and democracy of a territory's leadership.
- A territory that has significant amounts of highly degraded areas of forest.
- An area where the community urgently needs alternative forms of livelihood to sustain themselves and cope with vulnerabilities and shocks.
- A territory that has relatively good accessibility to Puerto Lempira.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

These criteria supported the deliberations between the Paskaia team and the MASTA leadership between December 2019 and January 2021. It was subsequently decided to pilot the project work in Truktsinasta and Lainasta Concejos, and in February 2021, a planning meeting was held between the MASTA and Concejo leadership. The inhabitants of the Concejo democratically elect a Concejo leader. Truktsinasta has had the same leader for 20 years, whereas Lainasta's leader is only newly elected. The main topic of this meeting was connected to how stakeholders of the project should be involved through the process of free and prior consent that MASTA demands. To ensure the principle would be applied, it was agreed that general assemblies would be held in the two Concejos. Two general assemblies were held at different times in each of the Concejos to maximise the diversity and participation of the local community. Owing to remoteness and poor communication, the meetings were announced on the local radio. After that, back-to-back meetings and focus groups were held in smaller groups to discuss issues more deeply. When certain group members had difficulty engaging, the groups were reconfigured to ensure all voices were heard.

After this initial consultation phase, ongoing interactions supporting the project co-design have been supported by workshops, focus groups, and interviews. Emergent insights from these sessions have been recorded through photographic documentation and note-taking. Rich pictures, participatory photography, and other interactive methods (community mapping, asset understanding, transect walks and interviews) have mediated the dialogue and co-inquiry process; they are detailed in the following paragraphs. Rich picture refers to a graphical technique that represents complex situations, problems, or concepts through images, texts, symbols, and icons (Checkland and Poulter 2006).

Table 9 Results from the Stakeholder Analysis emerging from the Co-Design Process

FIRST TIER STAKEHOLDERS	Responsibilities, Tasks and Roles	Project influence (1= weak 5 = strong)	Influenced by Project (1= weak 5= strong)
MASTA National	• Maintain all Concejos informed about the Paskaia project • Mitigate any conflict between Concejos • Ensure community interests and free prior informed consent for new projects • Represent all Concejos in Moskitia • Maintain good governance in the Gracias a Dios department • Utilize project revenue for community benefit and development • Support the villages and communities in project activities	4	3
MASTA Concejo Truktsinasta, Lainasta and Wamakklisinasta	• Comply with the PES agreement • Carry out responsibilities based on PES agreement • Maintain good governance in the community • Utilize project revenue for community benefit and development	5	5
Comunity Tipi, Tikiraya and Auka	• Comply with the PES agreement • Carry out responsibilities based on PES agreement • Inform Paskaia of challenges and problems that may arise • Participate in the ongoing co-design process	5	5
ICF Puerto Lempira	• Provide ICF with information on forest fires and reforestation activities	3	3
Paskaia Honduras	• Coordinate the project • Provide technical support • Report to Paskaia Sweden and MASTA	5	5
Paskaia Sweden	• Coordinate the project • Participate in the ongoing co-design process • Develop activities together with researchers and universities • Provide technical support • Bring the project and its credit to market	5	4

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Local churches	• Mitigate conflicts • Organize meetings	4	3
Local Schools	• Inform about the project and the work • Educational gardens and nurseries	4	4
Local NGOs	• Mitigate conflicts of interest between different projects • Exchange experiences and information	3	3
SECOND TIER STAKEHOLDERS			
Puerto Lempira Municipality	• Provide permits needed for the project • Maintenance of infrastructure	3	2
National Government	• Maintain legal frameworks and policies that promote community-based and private conservation and climate compensation initiatives • Register and certify reforested areas	5	2
ZeroMission Sweden	• Bring the project and its credits to market • Participate in the ongoing co-design process	4	3
Buyers of the PVs	• Provide feed-back • Participate in the ongoing co-design process	2	2
Plan Vivo Foundation	• Certify the project and provide feed-back • Bring the project and its credits to the market	4	2

In SSM, rich pictures support the reframing of a wicked situation. The rich pictures also have served as a basis for identifying additional stakeholders. Many studies consider that examining imaginaries is a crucial component of co-creation innovation processes (Felt et al. 2016; Welsh and Wynne 2013). In this co-design process, we have drawn upon imaginaries, defined as “collectively held, institutionally stabilised, and publicly performed visions of desirable futures, capable of being performed, yet temporally situated and culturally particular” (Jasanoff and Kim 2015). Imaginaries can be fundamental in understanding how heterogeneous stakeholders envision their future, risks, and opportunities in sustainability transitions.



*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Photo 4 Meeting with Leaders of MASTA, Truktsinasta, Lainasta and Paskaia. Hotel "Yu Baiwan"
Puerto Lempira

To gain deeper insights into how the project could potentially contribute to sustainable livelihoods in Truktsinasta, the Paskaia team undertook open-ended interviews with five households from the villages of Tipi Lalma, Tipi Muna, Lisagnipura, Bliblilaya, and Blip Klarka. The interviews aimed to gain insights into the relative status of their livelihood assets and how they maintain a sustainable livelihood within the vulnerability context (shocks, trends, and seasonality) that characterises Moskitia. The interviews' themes closely align with the DfID (1999) sustainable livelihoods framework (see Figure 4). To choose interviewees, the knowledge of key informants was drawn upon to identify a diverse cross-section of households with different livelihoods for interviews. Interviewing female-headed households was prioritised.



Photo 5 Truktsinasta Tipi Muna Assembly, president of the council, presenting Paskaia to the local community.

The sustainable livelihoods framework is commonly used to interpret stakeholder agency as demonstrated by livelihood assets employed and negotiated with transforming structures and processes. The framework depicts how structure and agency, in the contexts of vulnerability characterising rural lives, lead to differentiated livelihood outcomes. As defined by different types of capital (e.g., human, social, natural, financial, and physical), human agents employ livelihood assets to respond and develop in the face of vulnerability. These assets are nested in structures and transformative processes, enabling, or obstructing the asset-inspired agency.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

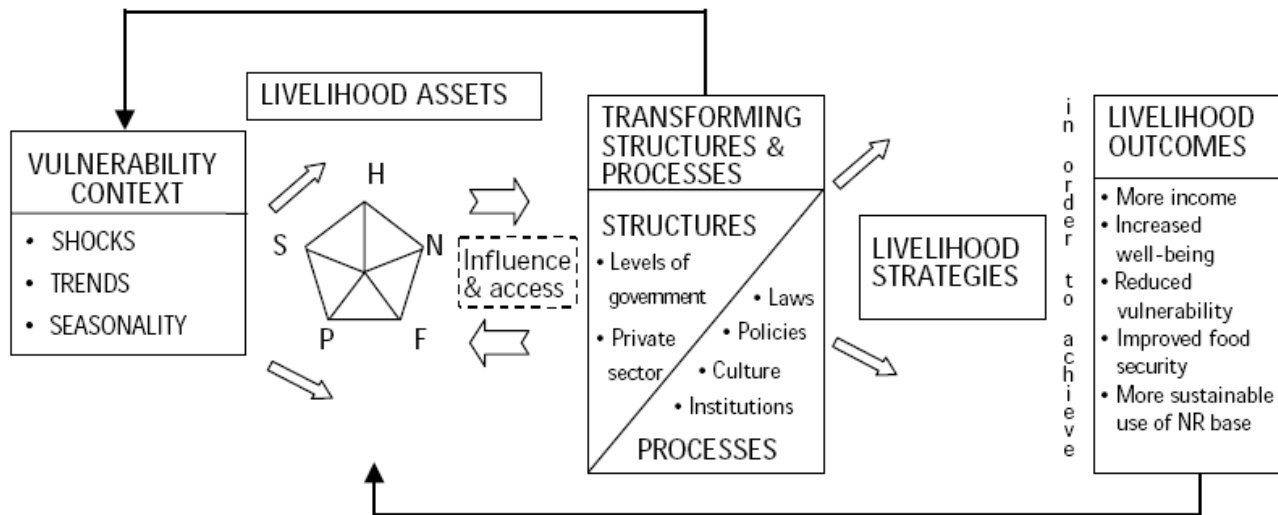


Figure 4 The Sustainable Livelihood Framework (DfID 1999)

5.1.3 Summary of findings emerging from the Co-Design process.

The co-design process was first piloted in Lainasta Concejo. After that, it was implemented in 7 phases (see **Figure 5**) in Truktsinasta (see Map 3), the Concejo, where the project is piloting most of its interventions. Truktsinasta is in the southeastern part of Gracias a Dios. The Co-design process was centered around the settlements of Tipi Llama, Tipi Muna, Bliblilaya, Lisagnipura and Blip Klarka and recently the same methodology has been implemented in Auka, the main community of the Wamakklisinasta territory, in the drafting of a work agreement and planning activities to reverse the damage to the savannah (see **Map 3**).

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

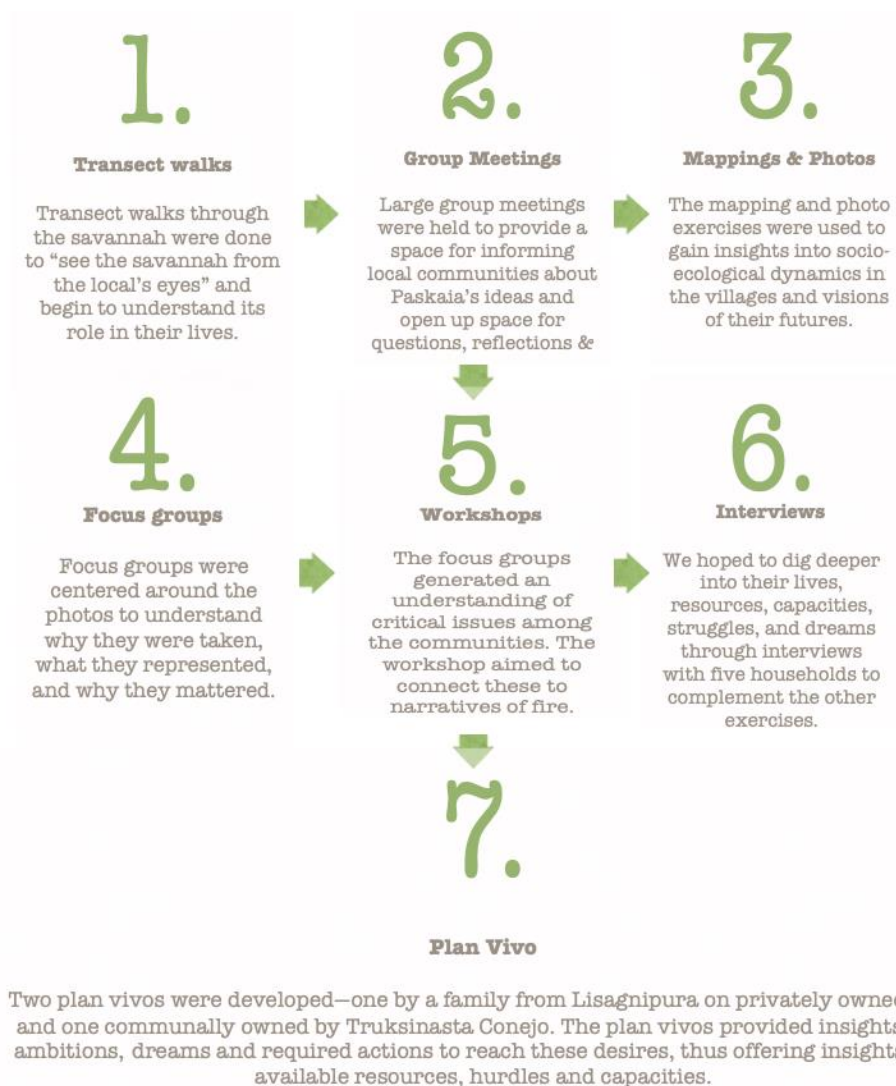
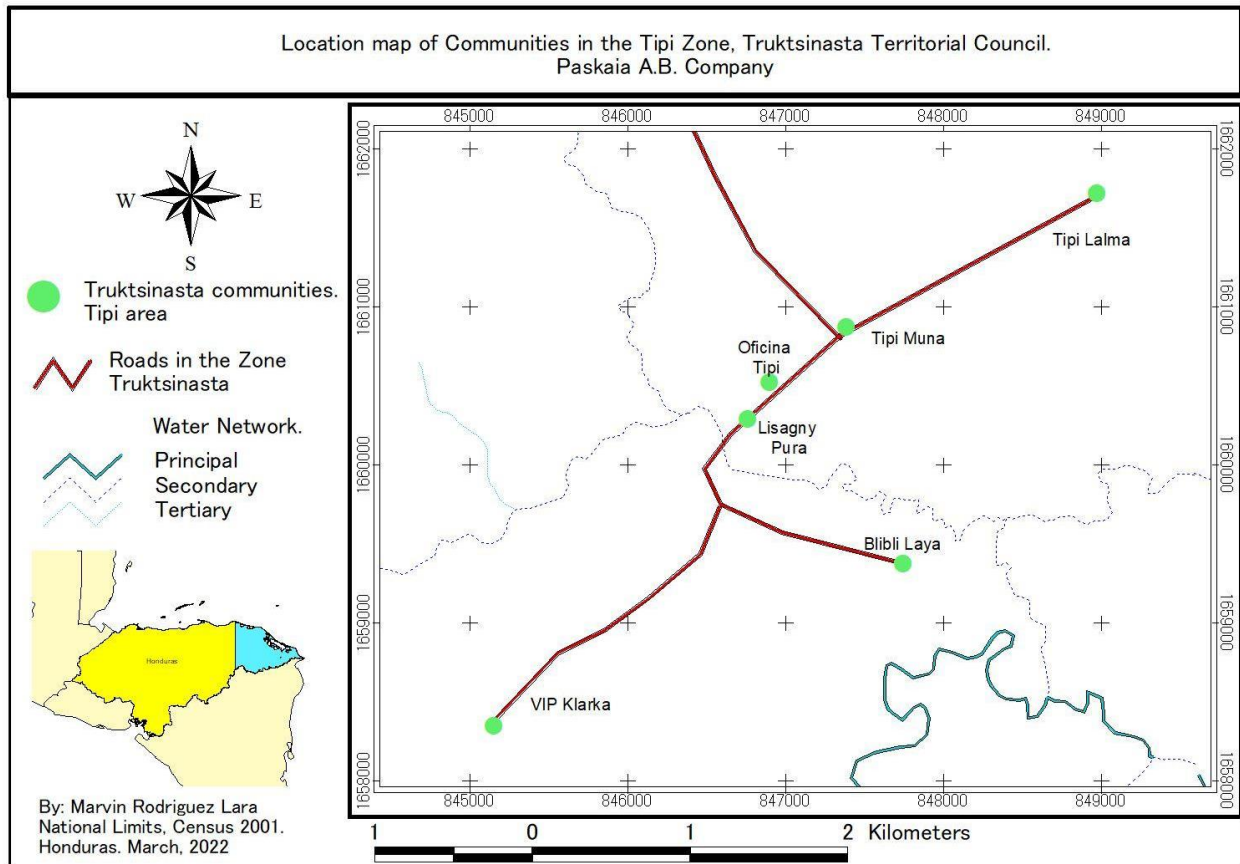


Figure 5 Summary of Co-design Process in Truktsinasta Concejo (a detailed description of the findings can be found in Annex 7)

During the first phase, groups were formed of 5-6 members (of mixed ages and gender) from Truktsinasta’s villages. These groups were invited to develop imaginaries with the Paskaia team to support a common understanding of how they envision their future, both in terms of barriers and opportunities, should the restoration project be implemented in the area. At the outset, each group drew a map of the village and immediate surroundings and included features necessary for their livelihoods.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*



Map 3 Truktsinasta Concejo, the site where the project co-design process was implemented.

After that, the groups were provided with cameras and given two days to take pictures of future envisioned co-benefits and constraints growing out of the project implementation. In recognition of the diversity of perspectives within the community, individuals were free to take photos of elements without reaching consensus as a group. The photographs were subsequently loaded onto a laptop, and the participants from the group had the opportunity to compare each other's future imaginaries. During the group discussion, it became clear that the groups had used fire exclusion and its management as a proxy for restoration activities in the pine savanna. This, in turn, supported a deliberative process whereby groups clustered their diverse imaginaries into more focussed themes that described the co-benefits and constraints associated with the project intervention.

Three dominant themes emerged across the different groups, "What would the exclusion of fire from the landscape mean for 1) *Infrastructure and Communication*; 2) *Food & livelihoods* and 3) *Health*? These themes, embodied in a constellation of photographs from all five groups, were presented using a portable projector at a photo screening in the Truktsinasta. More than 50 community members participated. In conjunction with the photo screening, a workshop was set up as three-speed talk stations, orchestrated by one of the above themes. Workshop participants rotated in groups of three

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

between these stations. A summary of the key points emerging from the speed talks is summarised by theme in the bullet points below:

5.1.3.1 Infrastructure & Communication

- Communication plays a significant role in understanding why wildfires occur frequently. People who travel on foot between Lainasta and Puerto Lempira or in Nicaragua often smoke along the way and inadvertently set the grass on fire. Similarly, people who drive between Tipi and Puerto Lempira or those who search for mobile signals can also trigger fires. These areas are often littered with garbage, which further increases the risk of fire.
- The fires affect the relationship between inhabitants of the savannas and people who travel through them as the inhabitants see the travellers as more responsible for the fires. This dynamic, participants claimed, creates enemies between villages and the territorial counsels and disrupts communication between people by causing disharmony.
- The fires destroy pathways through the savannas, making it harder to walk.
- The fires affect the infrastructure in Tipi as they harm the regeneration and thus their source of raw material by causing the loss of millions of trees. The group said, no trees, no wood. No wood, no new infrastructure or even the opportunity to repair existing infrastructure like bridges, houses and churches. The group asked, “Where will we get our wood from?”
- The group concluded that the fires threatened their way of life and their futures. Without the forest that they believe the fires are destroying, there is no refuge for animals, and they will lose their essential resources such as water in the creeks, wood to sell and wood to build houses and bridges.



Photo 6 Tipi Lalma village map of elements of importance to their livelihoods Food & livelihoods

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

- Controlling the fires would allow the trees to come back. One group recognised the potential to start a cooperative to sell the trees as a unit rather than as individual families.
- Controlling the fires would be great for the survival of many animals. It would provide more food and more timber to build bridges and other infrastructure that would make it easier to cut and transport trees or make it easier to access areas where we cultivate or forage.
- One man said that if there were no more fires, eventually there would come no new trees as the seeds wouldn't get through the grass, meaning the next generations wouldn't have the forest as a resource. The group agreed that some fires might have to occur, but these must be managed.
- One man argued why the fires were beneficial and necessary. He said fires are good because they make walking through the savanna easier, killing dangerous animals and growing new seeds. Furthermore, he claimed that burning increased rice production from 15 bags as a child to 40 bags. However, this man was in lonely opposition to the rest of the group.



Photo 7 Picture depicting the vulnerability of local infrastructure to storms that are increasing in frequency and intensity.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia



Photo 8 The photo to the left depicts a pine savanna area where the annual burning regime has been excluded for several years (Truktsinasta, Feb 2022). The photo on the right shows a pine savanna degraded due to the annual burning regime.

5.1.4 Health and Vulnerability

- There are no formal structures in place to help vulnerable people with disabilities, the aged or families without income.
- The fires create much smoke, which leads to several issues such as problems breathing (during fires), flu, coughing, and red eyes through the ashes that pollute the air and water. These ashes also give rise to lung and stomach problems.
- The fires also mean that they are losing their stock of natural medicines, and without them, they will be sicker. This point was elaborated on further by pointing out that in the absence of a functioning clinic and with a government that doesn't care about them, the savanna with its herbs is their hospital. If another disease like covid came but more severe, they reckon that surviving without the medicines in the savanna would be difficult. The savanna takes care of them, and they must start taking care of the savanna by controlling the fires.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*



Photo 9 This is a picture of a boy who is unable to walk, which is often used to exemplify vulnerability.

5.1.4.1 Summarised findings from in-depth household Interviews

The number of family members belonging to the interviewed households ranged from 6 to 13. The quality and size of their home varied significantly, and three of the five households were generally considered poor livelihood assets. The children in the three more impoverished families do not go to school. All families, except one, have lived in Truktsinasta for many generations. The so-called newcomer was relocated by the government from the adjacent Miskito territory of Lainasta after cyclone Mitch in 1998 and given rights to a land parcel in Truktsinasta. Despite living in the area for 24 years, this family still feels alienated from the rest of the village. This sense of not belonging also reflects other households' views on their social capital more generally. Namely, they consider there to be limited interaction and reciprocity between families and during shocks, they must deal with the consequence on their own.

All households indicated that men and women participate in natural resource management and agricultural activities. A household's rights to land varied from 100 ha for the most affluent household and 6 ha for the most asset poor. The families must walk between two and three hours from their homestead most days to cultivate their guamiles. The families we interviewed cultivated rice, cassava, plantains, and beans in their guamiles. The more entitled family also cultivated pineapple, which they sold in Puerto Lempira. During the rainy season, when it is difficult to access their guamiles and the savanna, they rely on harvesting fruits from the Batana palm, which is close to the homesteads, and they are sold for cash.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

The savannas are a crucial natural resource for low-income families and all families when the area is exposed to extreme storm episodes such as cyclone Mitch and, more recently, cyclones Eta and Iota. The flooding that coincides with these episodes destroys local infrastructure and their gardens. Low-income families must complement what they grow in their garden from the savanna by fishing in creeks and hunting and collecting firewood. Post-flood, when the community cannot depend on their gardens to provide for their subsistence needs, larger trees are harvested from the surrounding savanna, and the timber is sold for cash in Puerto Lempira. The savanna can be viewed as insurance that reduces vulnerability during shocks. “We survived that Eta and Iota Cyclone because of the fish we found in our creeks” (pers. com. Truktsinasta 2022).

Every family aspired to have a cow, coconut and cashew trees and a car. The more entitled households would also like to have a gas stove. Two families wish to have a mahogany plantation, and all families, except the most entitled family, would like to buy agricultural tools. All families want to for more pine and wildlife in the savanna and water in creeks all year round that are teaming with fish. More specifically, in reference to the relationship between fire and the savanna, the following statements were made by the five respective household respondents:

- Household 1: “Fires kill the turtle, young pine and other animals. The reason for the fire is ignorance, as many people walk across the savannas”.
- Household 2: “Fire kills the baby deer and young. Some need to be allocated to look after the savannas.”
- Household 3: “Fires are destroying the possibility for future generations; they destroy medicines, bird eggs and the pines.”
- Household 4: “Fires are bad because it stops the rejuvenation of the savanna, which provides us with everything we need.”
- Household 5: “Fires make it easier for us to walk through the savanna.”

5.2 E2 Community-Led Implementation

During the co-design process described in section E1, findings suggested that restoration activities should occur in privately owned and communally owned areas (Truktsinasta Concejo). To pilot the community-led planning process for a project intervention, a Plan Vivo was implemented within a privately-owned site and in an area of communally owned land. See images 1, 2 and 3 for a map, action plan, and envisaged results.

Once Plan Vivos were developed, they were submitted to Paskaia’s technical team for review and evaluation. Feedback was then provided to the developers. Insights from process design implemented in pilots were harvested, and the methods by which the project assigns and registers Plan Vivos were developed. In short, if the development of Plan Vivo is on privately owned land, then the responsibility

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

for the development of the first draft is the responsibility of the owner. Regarding sites on communal land, a designated community representative is responsible for co-designing the Plan Vivo in consultation with diverse community interests within the respective Concejo. Feedback is provided and based on this: The Plan Vivo is amended in an open and transparent dialogue between the developer and project staff. Lessons learned from piloting Plan Vivo's with households interested in integrating Mahogany into their existing farming systems indicates that, the developer (the household) must ascertain if they are likely to remain in the area for an extended period (at least 20 years). One way to gauge this is by considering if the household has children or younger family members who intend to stay in the area for the long term. The proximity of the site to the family home is an important consideration. The site must be frequently scrutinized; otherwise, insects, wildlife, vines and other pests will rapidly destroy young trees. During the establishment phase, it is highly beneficial to combine mahogany with other crops. This shows that developers are capable and interested in cultivating a variety of crops, and also results in more frequent site visits. Below is a short description of the methodology we have piloted been to support the development of Plan Vivos. This process takes place over two days:

Day 1, Our project field staff visit the family's plot and explained the purpose of Plan Vivo and how it will be implemented. The developers (the household) answer several questions, including their history of land use, family situation, and current livelihoods. We also seek permission to take drone images and explain why they are needed. Five images are taken in total, one straight from above and one from every corner at a 45-degree angle. We agree on a time for the next day and encourage the family to discuss their visions in preparation for Day 2.



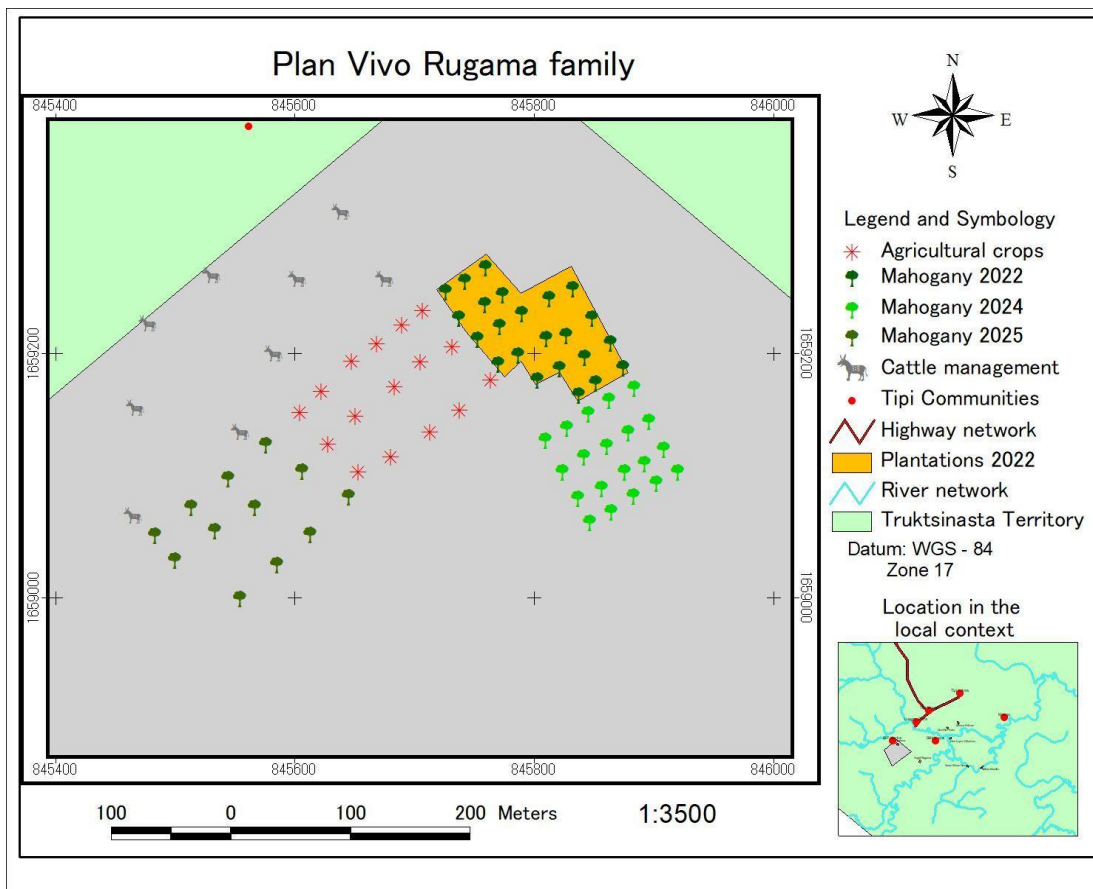
Photo 10 Creating a map on the ground beginning with boundaries around different form of land use on their property as part of the process in developing a Plan Vivo

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Day 2,

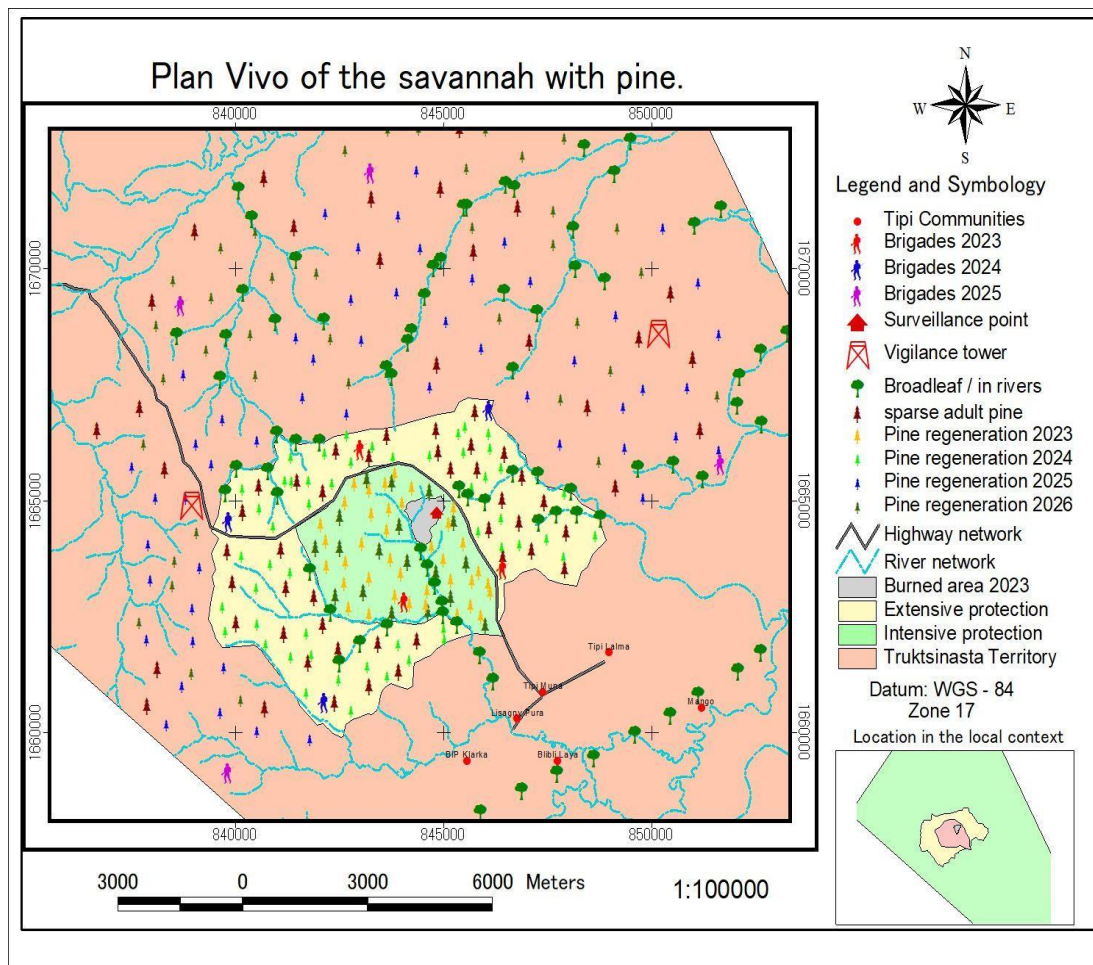
Gather the family and invite them to mark the boundaries of their land on the ground. Using the ground as dynamic map, begin by discussing the current land uses and identifying areas where they would like to see changes in the future. Take a walk around the property to get a better understanding of its features and return to the mapping area on the ground to adjust the plan accordingly (Photo 8). Ask the family to draw out their vision of the future of the land. What would they like to see in 5-10 years? Throughout this process, discuss what the project can and cannot assist with to create a shared understanding. Once the plan is finalized, transfer it onto paper and review it with the family, incorporating information observed from looking at the drone images if the household considers it relevant. Finally, ask the family if they have any further questions or concerns before signing off on the plan. Additionally, during this process, a GPS is used to record the spatial coordinates of the area where the intervention will take place (see Map 4 & Map 5)

The plan vivo will subsequently be entered and registered within the project database located on Paskaia's servers in both Honduras and Sweden and on the Markit registry. Once registered, the site will be eligible for carbon credit accreditation and monitoring



Map 4 Plan Vivo connected to the planting of Mahogany on Privately owned land in Truktsinasta.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia



Map 5 Map of Plan Vivo in degraded *Pinus Caribaea* Truktsinasta Concejo

5.3 E3 Community Governance of the Project

Based on insights from the co-design process, the community greatly appreciated being actively involved in the planning process underpinning the project's development. Once the project is up and running, Paskaia plans to continue actively involving a diverse cross-section of community interests in decision-making connected to the implementation of the project.

The pre-existing democratic structure will be drawn on to enact the community governance system (see C3 for more information pertaining to governance of the project). A project board will be established. It will be composed of the elected leader of the Concejo and other democratically elected bodies, including leaders of the groups representing the interests of women, youth and the elderly, etc. Additionally, there will be a representative of the farmers participating in the project and a fire brigade representative.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

The board's role is to ensure the decisions taken regarding project implementation reflect the diverse interests within the Concejo. The project manager will compile the agenda for board meetings, and meetings will be held three times a year. If an urgent decision needs to be taken, the board members can be summoned for an extra session. Community members can approach the board members and voice their opinions or complaints about project implementation. However, we acknowledge that it is often difficult for an individual to lodge a public complaint. Therefore, even after the project kicks off, we will continue using different participatory approaches to capture views on the project's performance on an ongoing basis.

6 Part F Ecosystem Services & Other Project Benefits

6.1 F1 – Carbon benefits

Two different land cover types generally characterise the savanna landscape in Moskitia: the first type comprises interspersed mature Caribbean pine on acid soils that can provide the seed stock to enable the forest's restoration if fire is excluded from the system. The second type comprises large tracts of grassland on acid soils entirely devoid of pine trees. To reforest these areas, it will be necessary to plant pine seeds immediately after annual fires in the grassland are over, and to exclude fire from these areas until the new pines can withstand its impact.

6.1.1 Degraded Savannah Restoration

Table 10 shows the projections of the carbon benefits derived from managing forest fires and promoting regrowth in two types of land cover - savannah forest with pine trees and open savannah without trees. The projections are derived from primary data collection in Truktsinasta and secondary sources. These land cover types are abundant throughout the entire project site. Particular attention will be given to those areas with seed tree cover in the savannah.

Table 10 Carbon benefits per hectare for Savannah restoration during the project's crediting period beginning in 2022.

Table F1 - Carbon benefits (Note 1. <i>Pinus Caribea</i>)						
	0	1	2	3	0.828 x [Y - (0+1)]	4
Type of intervention (technical specification)	Current carbon reserves (ton-CO ₂ /ha)	Capture/Emission of carbon references, that is, without project (ton-CO ₂ /ha)	Expected losses due to leaks (ton-CO ₂ /ha)	Deduction for the risk buffer (ton-CO ₂ /ha)	Net carbon benefit, at the end of the cycle (ton-CO ₂ /ha)	CO ₂ storage capacity currently used (%/ha)
Fire control and assisted regeneration management in pine-free savanna	1.14	1.65	5%	12.2%	255.5	0.9%
Fire Control and Assisted Regeneration Management in Savannah with Intermediate Pine Density	25.40	1.72	5%	12.2%	235.4	8.8%
Average Total	13.27	1.69	5%	12.2%	245.5	4.9%
	(Note 1)	(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)
Note 1: The amount of initial CO ₂ is calculated for each of the land cover types; Reference is made to the type of coverage and densities of trees per hectare in the area of influence; 1.- Areas of open savannas without trees. 2.- areas with average densities of 25 trees/ha that accumulate, according to ICF in ENF 2017, 23.5 tons CO ₂ /ha						
Note 2: According to the ICF in its 2017 ENF, it establishes that the forest at the national level has a recovery of 1.65 tons CO ₂ /ha, so it can be defined that the savannah areas are a fraction of this average (0.45 tons CO ₂ /Ha).						
Note 3: 5% of leaks are considered, this is due to extraction and death of trees, opening of roads, etc.						
Note 4: In the execution of the project, a risk cushion of 12.2% has been considered for loss of coverage due to fires, pests or other accidents.						
Note 5: The net benefit of CO ₂ capture and storage/has expected at the end of the 20-year cycle.						
Note 6: CO ₂ storage capacity used by said sink.						
Y = 311.4 tons of CO ₂ /ha						

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Additional Notes

The most suitable growth model for the pine forest in the Honduran Moskitia is the one proposed by the INSTITUTO NACIONAL DE BOSQUES of the Republic of Guatemala. This model identifies five productivity levels for the *Pinus caribaea* species in plantations across the territory, ranging from worst to excellent. A local study conducted in the two forest types where the project will be established indicates low productivity levels, specifically in site II on the Guatemalan study's five-level scale. This low productivity is due to the soil's poor condition, including a lack of organic matter, shallow soil, and little or no natural regeneration in the coniferous forest.

To calculate the amount of CO₂ that can be captured in the pine forest located in the Honduran Moskitia region, we considered national and regional studies. These studies focused on the *Pinus* species in their natural environment and plantations in various Central American regions with similar environmental and climatic conditions. The soil in the Moskitia region has a low site index compared to plantations in Costa Rica and Guatemala. This is due to the overexploitation of the forest and the annual burns that prevent any build-up of organic matter in the soil.

Local growth tables for *Pinus* sp. were created in the Honduran Moskitia to develop an equation for predicting CO₂ sequestration. This approach mirrors that of Costa Rica and Guatemala. The growth table for the It was discovered that the *Pinus caribaea* species in the Republic of Guatemala has a growth table that accurately predicts its growth in diameter at breast height (DBH) and height based on soil conditions and site. *Pinus caribaea* in Guatemala was found to exhibit the best growth in DBH and height in relation to the soil conditions and site index. To determine the volume of the *Pinus* species at an early age, an equation was used that considers a shape factor. According to Prados (2022), "the Shape Factor is responsible for correcting the overestimation of the volume of each tree since each tree has a "tendency much more similar to the geometric figure of the cone than a cylinder". SilvaPlan (2017) The growth rates of forest biomass in trunks and branches have been determined using the biomass calculation model implemented by the SILVA PLAN software and the root biomass has been defined according to the proposal of MacDicken (1997) to use a value of 0.10 to 0.15 in relation to the total aerial biomass.

To address the elevated risk of forest fires in the project's area, an added safety measure of 12.2% risk margin is being considered for the net reforestation area designated for CO₂ capture. Furthermore, the region is safeguarded with a buffer zone and fire prevention brigades to ensure additional protection. Additionally, since the start of the project, it has created maps that highlight risk areas, locations with high fire incidents, and places with heavy human traffic.

To evaluate the progress of forest plantations and reforestation efforts, we will set up forest inventory plots and track them regularly. This will allow us to gather important information such as the diameter of trees at chest height (DBH), their overall height (Ht), and density (number of trees per hectare). We

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

will also calculate the amount of stored biomass (in Kg/ha) and carbon dioxide (in tons of CO₂ per hectare).

The project adheres to established processes and methodologies when developing projects related to carbon credit sales. We continuously update our procedures to meet the standards set by the state and other organizations responsible for preserving natural resources. To achieve this, we create a Plan Vivo for each location where we plan to sell voluntary carbon credits. These plans outline the existing biomass during reforestation and are regularly updated as the new forest develops. It's important to keep in mind that projections may differ based on factors such as microclimate, soil quality, and management practices in various areas.

6.1.2 Mahogany Plantations

The Miskito will also derive carbon benefits from incorporating Mahogany plantations into their existing farming systems. This will be done in two farming systems: the areas around homesteads where annual crops are grown and the areas where perennial crops can be found, such as plantains.

Table 11 Projected carbon benefits derived from the incorporation of mahogany into existing farming systems.

Table F1 - Carbon benefits (Note 2. Mahogany)						
	0	1	2	3	$0.828 \times [Y-(0+1)]$	4
Type of intervention (technical specifications)	Current carbon stock (ton-CO ₂ /ha)	Carbon capture/emission references, i.e. without project (ton-CO ₂ /ha)	Expected losses due to leaks (ton-CO ₂ /ha)	Deduction for the risk cushion (ton-CO ₂ /ha)	Net carbon benefit, at the end of the cycle (ton-CO ₂ /ha)	of CO ₂ currently used (%/ha)
(Regeneration Assistance Management in Broadleaf) - in annual crop areas	20.58	1.65	5%	12.2%	402.13	4.2%
(Regeneration Assistance Management in Broadleaf) - in Permanent Crop areas	38.38	1.72	5%	12.2%	387.34	7.5%
Total average	29.48 (Note 1)	1.69 (Note 2)	5% (Note 3)	12.2% (Note 4)	394.7	6%

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Note 1: The amount of initial CO ₂ is calculated for each of the soil types, that is; The item refers to the type of activity carried out by the owner _ 1.- Surfaces used for agricultural activities. 2.- Areas with perennial crops such as cassava, banana and plains
Note 2: According to the ICF in its ENF 2017, it establishes that the forest at the national level has a recovery of 1.65 and 1.72 tons of CO ₂ /ha in areas without forest.
Note 3: 5% of leaks are considered, this is due to extraction and death of trees, opening of roads, etc.
Note 4: A 12.2% risk buffer has been established. considered in the execution of the project, due to loss of coverage due to fires, pests or other accidents.
CO ₂ capture and storage is expected to occur at the end of the 20-year cycle.
CO ₂ storage capacity used by said sink.
Y = 507.9 tons of CO ₂ /ha in Mahogany at 20 years

Additional Notes

The project site exhibits a clear distinction between two types of land cover: open areas covered by grass species and areas covered with widely dispersed pine trees. The PDD states that the areas chosen for Mahogany reforestation were previously used for farming and raising animals. To calculate the amount of CO₂ that can be sequestered, several studies have been conducted on forest plantations located on the Atlantic coast of the country to determine the growth in Diameter at Breast Height (DBH) and Height.

6.2 F2 - Livelihoods benefits

In the second phase of the co-design process, Paskaia staff collaborated with members of the Lainasta and Truktsinasta communities to review proposed natural and assisted restoration actions. Together, they considered the multifunctional benefits and drawbacks of these actions. They identified that the gradual recovery of pine savannah would significantly contribute to their natural capital, particularly in terms of restoring habitats for local fauna and regulating water flow and quality. Participants emphasised the importance of excluding annual fires as a necessary step towards savannah restoration and the potential health benefits, such as reducing respiratory diseases in children. A detailed list of the anticipated livelihood benefits can be found in Table 12.

Table 12 Anticipated livelihood benefits derived from the project.

Livelihoods benefits				
Food and agricultural production	The water quality will be improved in the lower part of the basin	Increase in the production of fruit trees (Mango, Banana, Cocoa, coconut).	The production of basic grains, corn, beans, rice, etc. is improved.	It contributes to improving food security in the area
Financial assets and income (Sale of Plan Vivos and forest products)	The average HH income will improve, and particular for those with low incomes.	Improvement in the production of pine resin, and firewood.	Investments can be made in the existing farming systems to increase agricultural production	
Environmental services (water, soil, etc.)	Water filtration and infiltration leading to better groundwater, increased recharge. and flood reduction	Soil erosion and emissions of nutrients and chemicals will be reduced.	Carbon storage in soil and plant tissue. Decreased fire frequency will lead to CO ² reduction	The biodiversity in flora, fauna and soils will increase.
Energy	Increased forest coverage will lead to access to more energy rich forest biproducts	Additional financial capital allowing for purchase of solar panels to substitute kerosene and candles.		
Timber & non-timber forest products (incl. forest food)	Increased production of seeds, firewood, pine resin, medicine and Batana oil.	Improvement of air and water quality in the area.	New fruit bearing species can be integrated as an underlayer into restoration areas	
Land tenure & security	Restoration can help secure new land titles and protect existing land titles on communal and private land.	The project will be developed in accordance with international agreements and state laws		
Use-rights to natural resources	Free use of water sources for human consumption	Controlled usage of the restored forests.		
Social cultural assets	Identify local cultural groups and support their empowerment of the project	Opening of jobs that include vulnerable sectors of local society	Encourage the planning and execution of activities through which the culture is kept alive	Respect local customs and traditions to promote a fairer and healthier society

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

In February 2023, 6 Plan Vivos were implemented in Truktsinasta and Lainasta Concejo. They included both areas designated for Mahogany plantation and Savannah restoration. As part of the co-creation process, participants and project staff deliberated over potential negative outcomes of the project's interventions and anticipated actions to mitigate these. The outcome of this activity is summarised in Table 13.

Table 13 Anticipated negative livelihood outcomes from the project and actions taken to mitigate these.

Anticipated negative livelihood outcomes from the Project	Anticipated actions taken to mitigate negative outcomes
The risk of broadleaf species outcompeting coniferous species by populating wetland areas.	This risk can be averted by deploying a varied fire regime as a long-term management intervention (Myers 2006) (see Figure 6). Recent studies have shown that infrequent controlled fires (prescribed burning) can increase carbon sequestration in savannahs and grasslands. According to Pellegrini et al. (2022) such a regime not only reduces the risk of wildfires but can also stabilise or even increase soil carbon levels.
The inconvenience of travelling long distances to reach workplaces	As the community's financial capital grows, we anticipate an increase in transportation options within the project site.
Reduction in the availability of forest resources that communities rely on, such as wood for houses, poles, and firewood.	We don't envisage that all areas will fall under the Plan Vivo scheme and designated areas will provide forest resources on an ongoing basis.
The requirement for permits to extract wood from the forest.	Those areas designated for ongoing wood extraction are not expected to demand permits.
The possibility of conflicts arising over land use among populations not benefiting from the income generated by carbon credits.	This risk will be mitigated as it is envisaged that most of the revenue from Plan Vivos will come from communally owned land. This revenue will be used for the benefit all the community in contrast to the sale of Plan Vivo's from privately owned land.
The potential for mismanagement of the new economic resources generated by the project.	The management of project resources will be scrutinised by the project board which consists of local, regional and national interests.

6.3 F3 - Ecosystem & biodiversity benefits

Table 14 lists the project interventions and their impact on different ecosystem services. Based on a deliberative process with the local community, findings suggest very few weaknesses with the interventions. The most notable is that an increase in ground biomass would make it more challenging to walk through the landscape. Additionally, preventing forest fires may lead to the colonisation of invasive species that could out-compete species of interest and affect the overall integrity of the Savannah habitat. This risk can be averted by deploying a varied fire regime as a long-term management intervention (Myers 2006) (see Figure 6).

Table 14 Envisaged ecosystem impacts derived from the project.

Ecosystem Impacts				
Intervention type (technical specification)	Biodiversity impacts	Water/reef/water shed impacts	Soil productivity/ conservation impacts	Other impacts
Natural Ecosystem Restoration through fire Control in pine savannas	Preventing the spread of forest fires will allow for the regeneration of native species that promote wildlife and flora.	Forest Regeneration will improve water retention and reducing sedimentation.	Forest helps the formation of a soil rich in organic matter, increasing soil productivity and prevents soil erosion	The capacity per area for carbon sequestration, both in above ground biomass and soil carbon will be increased.
Assisted Ecosystem Restoration by planting Caribbean pine seeds in treeless savanna	Planted pine will create ecological corridors between forest patches and thereby enhance plant and wildlife biodiversity and heterogenous landscapes.	The loss of soil due to wind erosion and/or runoff that reaches the rivers will be reduced.	Induced regeneration improves the soil's ability to retain water and nutrients.	The carbon storage area will be increased.
Planting of Mahogany on privately owned land	Mahogany will be planted closer to waterways where the soil is more fertile. This will create critical	Mahogany can withstand intense flooding episodes, thereby reducing erosion after heavy rains. This will minimise	Mahogany can survive flood episodes and therefore create a permanent vegetation cover that will drastically	These plantations on rich soils close to where people live present a good opportunity for agroforestry combining

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

	habitats for other species	nutrient leakage and prevent the emission of sediments into water bodies including the ocean.	reduce erosion after heavy rains. This will reduce nutrient leakage and prevent the emission of sediments	mahogany with e.g. Musaceae or cocoa.
--	----------------------------	---	---	---------------------------------------

6.3.1 Mitigation measures to address any negative impacts on the ecosystem and biodiversity

The Paskaia team has carefully analysed the necessary measures to mitigate any negative impacts that may arise on the ecosystem and biodiversity. This analysis was done in compliance with the Plan Vivo requirement which stipulates that project interventions must be designed to maintain or improve biodiversity while addressing any potential threats. Additionally, any loss of biodiversity caused by the project intervention must be identified and mitigated.

It is noteworthy to state that the project's objective is to use restoration as a means to combat climate change. As our restoration activities are regenerative, it has been challenging to identify any negative impacts of the project's mitigation measures on ecosystems. For example, the project aims to stimulate natural regeneration in pine forests and plant native species on farms that have undergone degradation due to extensive agriculture and livestock. Therefore, in this section, we have chosen to answer the question by outlining the mitigation measures and their expected impact on the ecosystem.

As part of the project's efforts to mitigate climate change, forest nurseries have been established in each territorial council. These nurseries prioritize the production of native species that are suitable for the region. Later, these species will be used in the plantations of each forester. This will help to prevent soil erosion, ensure adequate moisture levels, and increase tree vegetation, which will, in turn, help to capture carbon.

Note 1 Re-establishing the fire management regime is a primary approach to support the restoration of the Savannah please refer to [Annex 3.1.1](#) for documentary evidence of the legality of prescribed burning in Honduras.

Note 2 The restoration of the Savannah and forest plantation will support the increasing presence of high conservation value species. Please refer to [Annex 3.1.4](#) for a description of these species



Photo 11 Nursery established in Tikiurrraya, CTI Lainasta.

Fighting forest fires in pine forests requires consideration of three important factors: community awareness, hiring of brigades, and participation of local actors in fire prevention and extinction efforts. The objective is to reduce the incidence of fires and loss of forest area, which results in greenhouse gas emissions. This can be achieved by improving agricultural and forestry practices, enhancing fire prevention and early response activities, improving coordination among stakeholders and increasing awareness in communities about fire management.



Photo 12 Carrying out forest fire prevention activities (rounds) in Truktsinasta.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia



Photo 13 Fighting forest fires in Truktsinasta.

To ensure the availability in quality and quantity of water, Paskaia considers that, as the forest mass increases, there will be more fresh and brackish water in their environments, since trees serve as purifiers for many pollutants that are discharged into the environment and help to prevent them from reaching the water. In the La Mosquitia area this problem is not so considerable because of the location in a non-industrialized area where subsistence activities do not generate chemical contaminants that reach water sources.



Photo 14 Natural regeneration in areas protected by the project

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Aside from natural regeneration, planting native species in agroforestry systems is another way to increase forest mass. This method allows foresters to produce their food alongside the plantations. Agroforestry systems are a valuable mitigation measure as they diversify land use, incorporate forest cover for carbon sequestration, and offer access to food for foresters and their families.

A way to reduce the negative impact on water sources is by using natural fertilizers and pesticides. This is because residues of chemical fertilizers and pesticides can contaminate water sources. To address this issue, foresters have established agroforestry systems that utilize natural fertilizers and pesticides. This is especially important since some of the plantations are in close proximity to water sources.

Note: The Sustainability Index for landscape restoration is being reviewed by the Project team with the goal of adding more indicators to it. One of the indicators being considered is the Vulnerability Reduction Index. This index enables us to estimate the reduction of vulnerability across three large components: danger and exposure, vulnerability, and lack of ability. By using this index, we can measure the reduction in vulnerability that results from the restoration activities implemented by the project. However, the team needs to determine which components are relevant to include in this index.

7 Part G: Technical Specifications

7.1 G1 Project interventions and activities

The expansion and degradation of Caribbean pine savanna areas are predominantly shaped by anthropogenic activities and diverse fire management regimes (Richardson 2000). These areas would return to tropical hardwood forests in the absence of disturbance. The mechanisms by which fire leads to this climax vegetation type include post-fire seed dispersal, vegetative regeneration of young and adult trees; fire-resistant bark; fire-induced thinning of lower branches, and open canopies that allow for heat dissipation and flammable needles that facilitate the spread of fire (Myers 2006). Different anthropogenically induced fire regimes lead to different habitats, climax pine savanna, open pine savanna without regeneration, and treeless grasslands (see **Figure 6**).

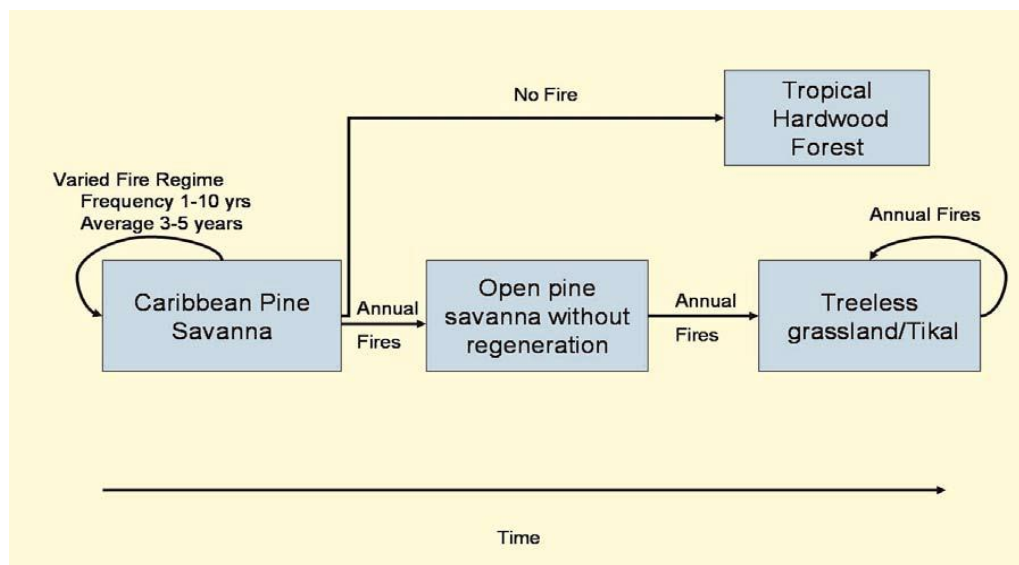


Figure 6 An ecological fire regime model showing the relationship between fire frequency and changes in vegetation. The present annual burning regime will eventually lead to the loss of pines. Complete fire suppression leads to the conversion of pine savannas into tropical hardwood forests. (Source: (Myers 2006)).

After a fire episode, *Pinus caribaea*'s serotinous cone releases its seeds and induces germination. After that, they develop a dense tuft of needles along the ground, which protect the seedling bud. During the first 3-5 years, the sapling growth is minimal as all the energy is directed to develop its root system. During the first year, saplings are susceptible to fire. A varied fire regime with a frequency between 1-10 years and an average between 3-5 years sustains the Caribbean pine savanna as a disclimax ecosystem. Repeated annual fires lead to the substantial mortality of pine seedlings and reduce the abundance of pines (Munro 1966). If a yearly fire regime persists, the pines will gradually disappear

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

because it inhibits the recruitment of seedlings. Because of the annual fires in Truktsinasta Concejo, our study revealed large tracts of two vegetation types: open pine savanna without regeneration and treeless grassland. To bring about the transformation desired by the communities in Truktsinasta, i.e., a pine savanna that exhibits high biodiversity and a capacity to sequester relatively high amounts of carbon, it will be necessary to implement a fire regime that allows for stand thinning at a ten-year interval (see **Figure 7**).

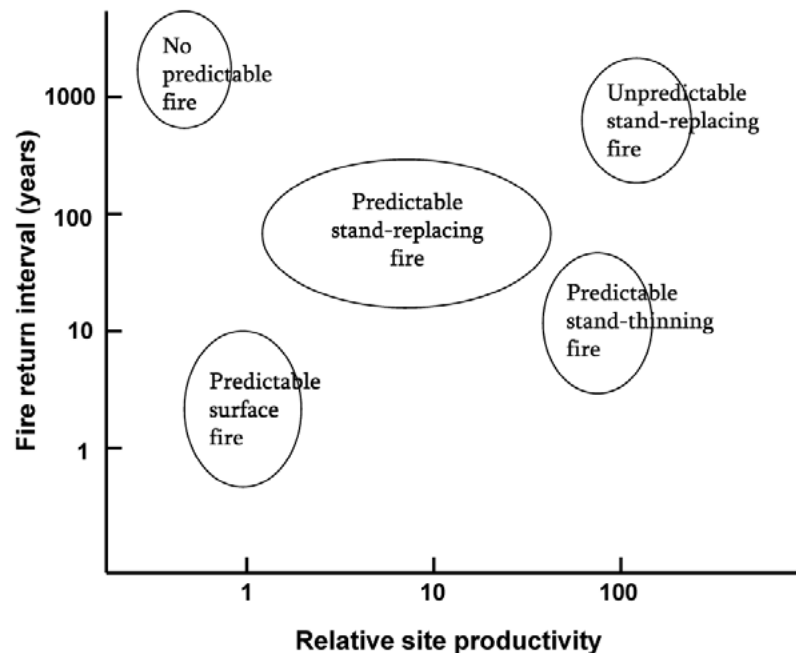


Figure 7 Typical Fire Regimes in tropical Pine: return interval and site productivity (Keely 1998)

7.1.1 Natural and Assisted Restoration, through fire control and planting

Natural restoration, through fire control, will be implemented in sites where there is sufficient stock of mature *Pinus Caribbean* (a distance between trees of no more than twenty meters) to allow for restoration of the ecosystem through natural seed dispersal. Once the annual fire regime is controlled, this will enable new pine recruitment in these areas (Munro 1966). To prevent the fires, fire brigades, composed of 5 people hired full time during the dry season, will construct and maintain fire breaks and protect restoration sites from fire. Every ten years, the brigade will implement a prescribed burn to thin lower branches and stimulate the recruitment of seedlings in areas where there are gaps in forest coverage. These gaps commonly arise after severe storms. A group of firefighters have been trained by Verdens Skove, a Danish NGO that works in four Latin American countries with forest conservation.

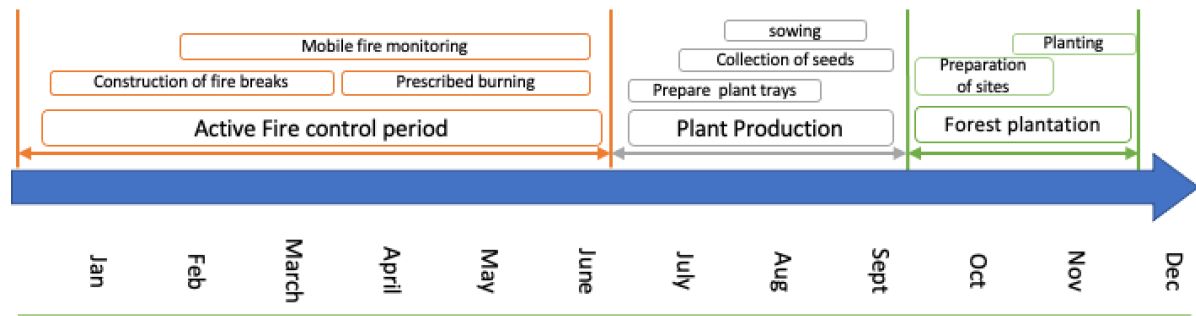


Figure 8 Annual cycle of project activities to enable assisted restoration of degraded Caribbean Pine Savannas

Pine forests will regenerate naturally with the seeds from mature trees if a fire is controlled in some areas. However, if the distance between existing trees is too considerable or the competition from existing grass vegetation is severe, the project will intervene with assisted restoration. Pinecones are collected in September - October (before the pine cones drop naturally) from sites with high-quality pine forests. Pinecones are dried in the sun to induce the release of seeds. Measures are taken to control competing grass vegetation, and the seeds are sown in November at the beginning of the wet season. Between years 1-3, weeding and cleaning will be undertaken twice a year. These sites will be protected from fire. At 10-year intervals, prescribed burning will be conducted to thin lower branches and stimulate seedling recruitment where there are gaps in forest coverage. the annual cycle of activities to enable assisted restoration.

7.1.2 Planting Mahogany on privately owned land

Plantations of mahogany will be established on privately owned land or land with longer-term leasehold close to where people live. The plants will be produced in small local plant nurseries using locally collected seeds and growing trays that can be reused over many years. Before planting in November-January, the planting site will need to be weeded to prevent competition and make finding the plant for the necessary weeding in the coming years easier. Due to the favourable climate and fertile soils, weeding is undertaken at least twice a year during the first 2-3 years. This also creates an opportunity to replace all the dead saplings with new trees. If the farmer wants to combine Mahogany with another agricultural crop in the first years, this helps the mahogany plants due to the constant presence of the farmer. Weeding frequency diminishes from years 3-6, but it is still important to control vines and other pests. Pruning and thinning will begin in year 4.

Additional notes:

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

To successfully develop the project, we have considered both cultural and technical considerations. Our team consists of individuals with technical expertise and ancestral knowledge, ensuring that every activity is supported by both. We also prioritize gender representation and authoritative figures within the group, while ensuring that all personnel involved are properly trained and equipped with necessary resources.

- The firefighting brigade includes members from legal and communal authorities, trained in fighting forest fires, as well as community members and a forestry technician. They are equipped with essential tools such as fire extinguishers, hoes, machetes, helmets, eye goggles, masks, water pumps, pulaski axes, GPS, and maps to effectively deal with forest fires.
- Producing tree saplings in nurseries requires trained nursery staff and the presence of a forestry technician. Multi-cell growing trays with a long-life cycle, shade nets to control sunlight, and rainwater irrigators are utilized for plant production.

7.2 G2 Additionality and environmental integrity

7.2.1 Laws and Regulations for Forests and Land Management

7.2.1.1 Special Law on Forest Carbon Transactions for Climate Justice

This law contemplates that “The use of carbon markets serves as a mechanism to reduce and compensate for Greenhouse Gas (GHG) emissions, included by countries as an instrument to counteract emissions.”

- In its first chapter on General Provisions, it addresses some definitions: carbon bonus, carbon credit, and carbon market, among others.
- The objective of this law is to establish legal, administrative, technical, and financial standards for the use and distribution of environmental, social, and economic benefits that arise from the sustainable management of results-based carbon forestry. The first article of this law lays down the framework for achieving this objective.
- Articles #7 and #8 establish the creation of the National Committee for Carbon Transactions, which will act as a regulatory body for the processes outlined in the Law. Its main function will be to create regulations and manuals necessary to execute the Law. Additionally, the Committee will be responsible for deciding on applications related to forest carbon transactions.
- Articles #10 and #11 discuss the establishment of the Technical Entity under the National Committee that is attached to the Secretary of Natural Resources. This entity will be responsible for receiving, evaluating, and making decisions on the feasibility of forest carbon transaction requests. It will develop and implement a registration system for forest carbon transactions and register these transactions with the United Nations Framework Convention on Climate Change (UNFCCC). Additionally, it will keep track of the amount of carbon available and committed in the market.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

- In article #18, after the National Committee approves the transaction request, a contract is established that guarantees ecological integrity and prevents double counting.
- Since its recent enactment on October 30, 2023, there are regulations and manuals in place to govern certain processes. However, articles 7 and 8 of the law define a committee that will be responsible for regulating and creating further guidelines for these processes to be applied effectively.
- Likewise, the law provides for the creation of an evaluation entity that will maintain a registry for forest carbon transactions in the country and their respective accounting.
- Article #18 of this law emphasizes the importance of Carbon Contracts and viability criteria. Carbon Contracts guarantee ecological integrity and avoid double counting.

Additionally, Special Law on Forest Carbon Transactions for Climate Justice contains articles 10 and 11 that provide for the establishment of a regulatory body. The body will be responsible for receiving, assessing and determining the feasibility of requests for forest carbon transactions. Additionally, it will create and implement a registration system for forest carbon transactions, as well as register those transactions with the UNFCCC. It will also be responsible for keeping track of the carbon available and committed in the market. However, since the law is recent (approved in October of this year), the regulatory body is not yet operational, which is why Honduras currently does not have a carbon credit registry.

Furthermore, Article 18 of the Special Law on Forest Carbon Transactions for Climate Justice states that a contract is created only after the National Committee approves the transaction [request](#). This contract ensures that ecological integrity is maintained, double counting is avoided, and benefits are distributed fairly to all parties involved. The contract also includes a mechanism for scalability, compliance guarantee, and other regulated criteria. This system ensures that carbon credits are not mistakenly attributed to other projects. However, since this law is very recent, there is currently no National Committee or registration verification system in place for carbon credits.

7.2.2 The impact of financial, technical, ecological, and social barriers on Project Implementation

Table 8 Barrier analysis

Type of Barriers	Specific Barriers	How barriers will be overcome
Financial/economic Barriers	• Insufficient financial resources to develop the project • No system of community payments for ecosystem services	• Funding is secured to develop initial project • Ongoing project management and transaction costs related to the production of payments for ecosystem services will be funded through carbon credits

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Technical barriers	• Communities without awareness and skills in some areas of project development	• The project will support communities with training and capacity building
Ecological Barriers	• Fires and some areas prone to flooding	• Fire control measures will be deployed. We will focus on reforestation in areas that are not flood prone.
Social Barriers	• Poor infrastructure and roads, • While the Miskito are historically matrilineal, the prevalence of patriarchal structures means women do not necessarily have access to resources. • Low social capital (see field notes)	• Decentralisation of nurseries. • During the project we have used design phase we have used a diverse set of co-creation methodologies to create a safe environment to ensure that women are active participants. This approach will continue in the implementation of the proposed intervention.

7.2.3 Evidence that the project site has not been negatively altered prior to the project start

After conducting a literature review and thorough study of the project area, we have not found any evidence suggesting there are other restoration activities taking place in the forest-savanna. As a result, the project is additional and safe from double-counting, and it will enhance the environmental integrity of the restoration sites. It is worth noting that the Honduran forestry law requires replanting of areas that have been harvested. However, the tree cover in the Moskitia pine savannas has been lost due to an annual fire regime that has persisted for a long time. Consequently, owners are not obligated to restore the forests. This further exemplifies the additionality of the Paskaia project.

In the area where the project operates, other programs have tried to engage the local community in resource conservation without offering incentives, and therefore have not succeeded. Before starting the project, a survey was conducted to establish the baseline conditions of the targeted savannah areas. This revealed that the local forest conditions were similar to those recorded in the national forest assessment and inventory prepared by the state institution responsible for forest management and protection. We also used recent satellite imagery to map the area where we will capture CO₂, and it revealed a severely degraded forest. To ensure the protection of broadleaf forests underpinned by Plan Vivos, participants will be closely monitored to ensure they do not engage in deforestation within the project. Forests within the area will be documented and must remain intact throughout the project. Each forester will develop a Plan Vivo to serve as a control measure.

Once Plan Vivos are registered in the national database managed by the ICF through the certification of the newly established forest, no person or other legal body can claim future benefits (timber, carbon credits, etc.) from the area (see Annex 6 for the ICF document) _The person or institution that made

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

the notification and certification will be the only beneficiary of the usufruct derived from the new forest.

Other sources of additionality include: please refer to [Annex 2.4](#) for a detailed description of other sources of additionality).

The project will reduce vulnerability due to shocks, floods and storms and promote sustainable livelihoods as described in Annex 8. The program also supports environmental integrity found in several national policies.

7.3 G3 Project Period

November 20, 2021 is the official start date of the project, this will have an execution period of 20 years starting from November 20, 2021 to November 19, 2041. The accreditation period coincides with the start of the project and will close on November 19, 2041), with the option to extend for five more years. until the restored savanna and mahogany reach their ecological climax. Given that *Pinus caribaea* and the Honduran mahogany *Swietenia macrophylla* take about 25 years to mature in the tropical forest, the 20-year crediting period seems reasonable. However, if pine and mahogany are to be used to produce high-quality products such as furniture, crafts, and boats that require higher quality wood, the harvest time may need to be extended to 30 years. This flexibility at the back end of the crediting arrangement (post 20 years' mandatory period) is aligned to the co-design philosophy that underpins the project and allows the landholder to have more control over the process. Once the new forest has been established and the mandatory cycle for the project is complete, the participants can decide whether to remain in the project for another period or switch to a different method of forest management and care.

There is a potential for disagreement over the use of the restored forest. To address this, a management plan will be implemented and overseen by the territorial council. The profits from the sale of credits and the use of wood will be managed by democratically elected organizations rather than individuals.

Prior to planting mahogany, the site will undergo an evaluation to prevent the removal of trees before reforestation. Furthermore, the pre-assessment will identify if the participant has other areas available to continue producing subsistence food for their family.

If families decide to cut down trees in semi-forested areas to plant timber species, they won't be included in the project because this would go against its objectives of preserving the ecosystem. As a precautionary measure, satellite images will be used to monitor the area.

During the CO₂ capture period, the areas under regeneration and plantation control will be protected and managed using environmentally friendly practices, weed cleaning, and removal of diseased and suppressed trees that affect the proper development of the trees will be carried out. During this period, organic matter from the trees that are felled will be incorporated into the soil, this biomass will be converted into COS (organic carbon in the soil) which currently cannot be accounted for or measured.

7.4 G4 Baseline scenario

As described in section G1, the baseline is the extensive expanses of degraded pine savannas and areas that have been converted to treeless grasslands in Moskitia. There is no pine regeneration in these areas due to an annual fire regime driven predominantly by anthropogenic factors (Myers 2006). The savannas are communally owned, and the project aims to reduce the frequency of fires and implement different measures to support natural and assisted restoration in coniferous forests and assisted restoration through plantations in areas degraded by agriculture and logging for extraction. of tall species. -assess species. The first phase of the project involves two areas: (1) all degraded communal pine savannas in Truktsinasta Council (as shown on map (1), and (2) any privately owned or borrowed land in Truktsinasta and Lainasta Council that have the potential to integrate broadleaf species (starting with Mahogany) into the existing agricultural system. However, these areas should not be dedicated to intensive cultivation or food production.

In the following sections, we will provide the reference parameters to define carbon pools, as well as project CO₂ capture over a 20-year cycle. Carbon pools include those generated through the restoration of degraded pine savannas and the integration of mahogany into existing and abandoned farming sites.

7.4.1 The parameters and methodology used to define the baseline carbon pools in degraded Pine Savanna

To calculate the total biomass of the dominant species in pine savannas, *Pinus caribaea*, and its CO₂ sequestration rate, it is necessary to determine its biomass accumulation properties over time. The components of the tree included in the calculation are its stem, branches, and roots. Pine needles also make up a proportion of the total biomass; however, due to seasonal variation in their relative abundance, they have been excluded from the baseline.

To determine the CO₂ capture capacity of the Moskitia savanna, we draw on data from national studies carried out by the institutions in charge of managing and conserving Honduras's natural resources. Two of the most important studies we considered include (Resultados del Inventario de Bosque y Árboles, 2005-2006) and (Resultados de la evaluación Nacional Forestal de Honduras, 2017)

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

In addition to the data collected in previous studies, in 2021 the project conducted a forest inventory and a natural regeneration inventory to determine the initial condition of the forest before starting the project. This will allow us to monitor the savannas' progress toward recovery. According to the National Institute for Forest Conservation and Development's 2017 forest assessment within the project site, tree density ranged from 0 to 100. The project inventory recorded an average of 57 trees per hectare.

After sampling the Honduran Mosquitia, we reviewed several studies related to the growth characteristics of *Pinus Caribaea*. Lemckert (1980) carried out a study in *Pinus caribaea* plantations in Costa Rica. Their study findings suggest that trees are growing much faster than we imagine at the project site. Flick and Sachtlar (1980) conducted a study in Moskitia, and their findings indicated that there was a high correlation between age, diameter and height. However, the equation underlying this study was considered unreliable since it produced negative values during the first 6 years of *Pinus Caribaea* growth (FERREIRA ROJAS 1994).

We have evaluated the growth model for *Pinus caribaea* plantations, suggested by the National Forestry Institute of Guatemala, and we found that it is the most appropriate. (Forests 2017). This model classifies species into five levels of development based on site quality, ranging from Excellent (I) to Terrible (V) (see Figure 9). After our sampling, we found that the trees at the project site are poorly developed and are in site index IV, which corresponds to a value of 12 in range between bad, less than 10.4, and excellent is greater than 18. This poor site value is attributed to the shallow soil with little organic matter and the low height of the trees.

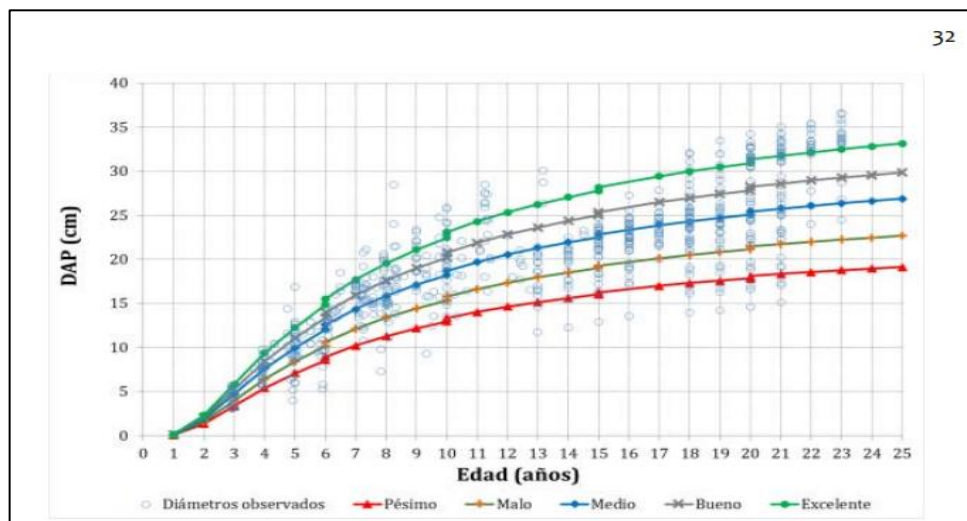


Figure 9 The increase in the diameter of the stem at breast height (DBH) in cm over 25 years (años) in 5 sites with varying quality, bad (Pesimo), poor (Malo), average (Medio), good (Bueno) and excellent (Excelente) source (Forests, 2017)

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

7.4.1.1 Growth projection for diameter and height

To achieve the growth projection in DAP, according to a study carried out by the National Forest Institute of Guatemala.

$$\text{DAP} = \text{Exp} (2.673197 - 5.545766/T + 0.056028*S - 0.000142*N)$$

Where:

T: Age in years

S: Site index (S=12)

N: Tree density/hectare

To project height growth, studies by the National Forest Institute of Guatemala were considered.

$$\text{HT} = \text{EXP}(\text{Ln}(S) - 7.458911 * (1/T - 0.1))$$

Where:

Y: Total height (m)

S: Site index (12)

T: Age in years.

To calculate the volume of *Pinus caribaea*, multiple studies were considered. In 1981, the National Forest Inventory Project (INFONAC) created an equation to estimate the volume of *Pinus sp.*, but underestimated the actual volume. In Ferreira and Stiff (1989) of the National School of Forest Sciences developed another equation, but it has not been widely adopted (FERREIRA ROJAS 1994). Suarez Cerrato (2012) proposed a more precise expression, $\text{Vol} = a + b * D^2 H$, to estimate the volume of *Pinus oocarpa*, which has stem properties similar to those of *Pinus caribaea*. Finally, it was decided to adopt the formula proposed in SILVAPLAN (SilvaPlan 2017).

Silva Plan was selected as a corrective measure because approved approaches are requested for the calculations, therefore, it was decided to implement software used and approved and created by the ICF, the institution in charge of the management and administration of the country's forest resources. It should be noted that the platform includes formulas and equations for calculating the volume and biomass of the main forest species in Honduras. This formula is currently approved by the Honduran Forest Service ICF for its application in operational plans and rescue plans. This equation was selected because there is currently no specific volume equation for the species of interest in the area where the study is being applied.

7.4.1.2 Volume Calculation

The equations used by the Honduran forest service are not appropriate for young plantations or regeneration of *Pinus caribaea* between 0 and 12 years old.

- The equation used at the national level was developed in 1981 by INFONAC, a generic expression of the volume properties for all 7 species of pine that exist in Honduras.
- The equation is designed for productive ages (From the age of 20 in Honduras)
- According to Suarez Cerrato (2012), the equation proposed by INFONAC underestimates the real volume of the species by up to 27%.

That said, we conducted a review of the scientific literature and did not find any proposed alternative. As a result, we have used a widely accepted volume equation for a cylinder with a shape factor of 0.5; This form factor is used in the SILVAPLAN program for volume calculation.

The volume calculation of the tree has been using the equation $Vol=((dbh/100)^2) * (0.7854) * ht * FF$ included for ages between 0 to 20 years, the equation includes the volume of a cylinder using a factor in the form of 0.5

Vol: volume in cubic meters,

dap: represents the diameter in meters.

ht: total height also in meters

FF: form factor

To project the growth of *Pinus caribaea* up to age 20, we used growth projections for both DBH and height based on a study conducted by the Guatemalan Forest Service. This study has been the most reliable in forecasting the growth of *Pinus caribaea* at our project site. It contains detailed information specific to the *Pinus caribaea* species, which is crucial since studies in Honduras mainly focus on *Pinus oocarpa* or generic formulas that cover all seven species of pine found in Honduras.

7.4.1.3 Biomass Calculation

The basic principle to calculate the stem biomass (BMF) of the tree is by multiplying the volume of the stem by the density of the wood (Ruiz and Vichot 2014). The total biomass of a tree is equal to the sum of the biomass of all its components (stem, branches and roots). According to Alberto and Elvir (2008) the roots constitute 21% of the total biomass, while the stem and branches constitute 79%.

For coniferous species, the specific density of biomass in the stem and bark can be between 0.55 (g/cm³) and 0.53 g/cm³ respectively (Alberto and Elvir 2008).

To calculate the biomass, the project will use the equation proposed by the SILVAPLAN Software, which defines it based on the DAP and total or stem height variables:

$$\text{Total biomass} = (0.11264421 * (DBH^2 * ht) ^{0.85091168}) / 1000$$

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Where DBH is the diameter at chest height and ht is the total height. The equation calculates the biomass of the stem and branches, considering the density for coniferous species. To estimate the biomass accumulated in roots, MacDicken (1997) suggests using a factor of 0.10 to 0.15 for conservative results. Therefore, our total equation is:

$$\text{Total biomass} = ((0.11264421 * (\text{DBH}^2 * \text{ht})^{0.85091168}) / 1000) * 1.15$$

The results are also depicted in Figure 10.

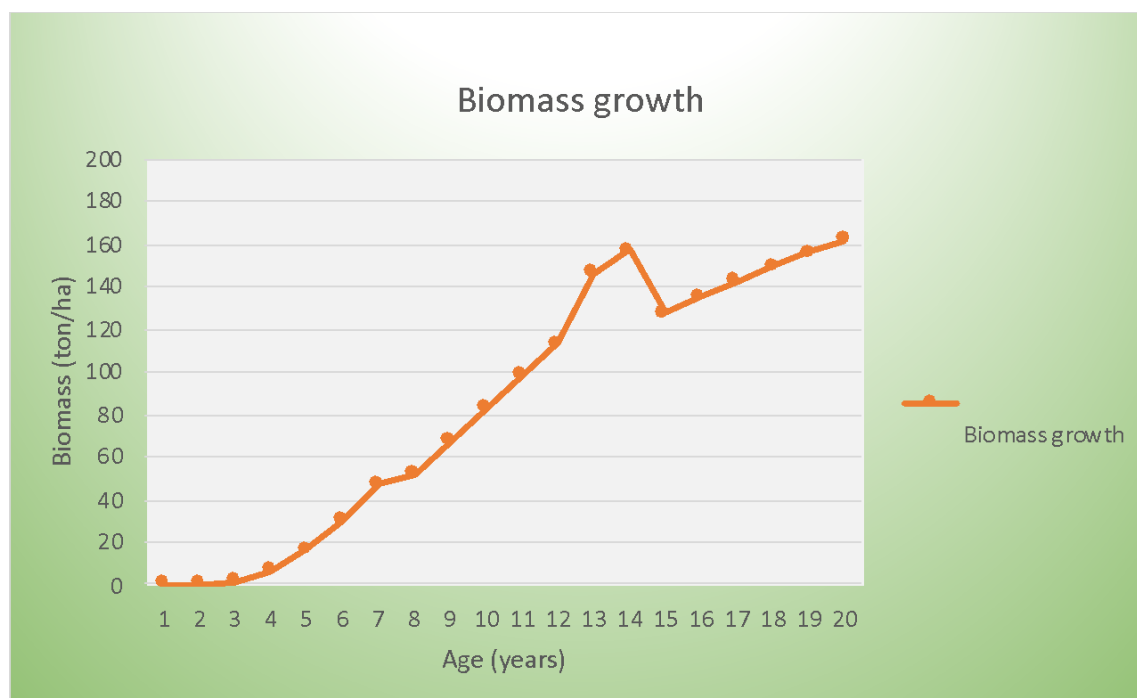


Figure 10 The Projected accumulation of Forest Biomass per hectare in the project site. Note the decrease in biomass in year 14 is attributed to thinning to allow improved growth

7.4.1.4 Calculation of Carbon in Biomass

According to Ruiz and Vichot (2014) to achieve the estimation of carbon stored in forest biomass, by using the Average Carbon Content Factor in total biomass of the Pinus (0.50). To calculate the total carbon in a given area, we used this formula: $C_t = BMT/ha \times FCMCM$. In this equation, C_t represents the total carbon in tons per hectare, BMT is the total biomass in tons per hectare, and FCMCM is the average carbon content factor. The projected accumulation of carbon in forest biomass per hectare in project site can be found in **Figure 11**.

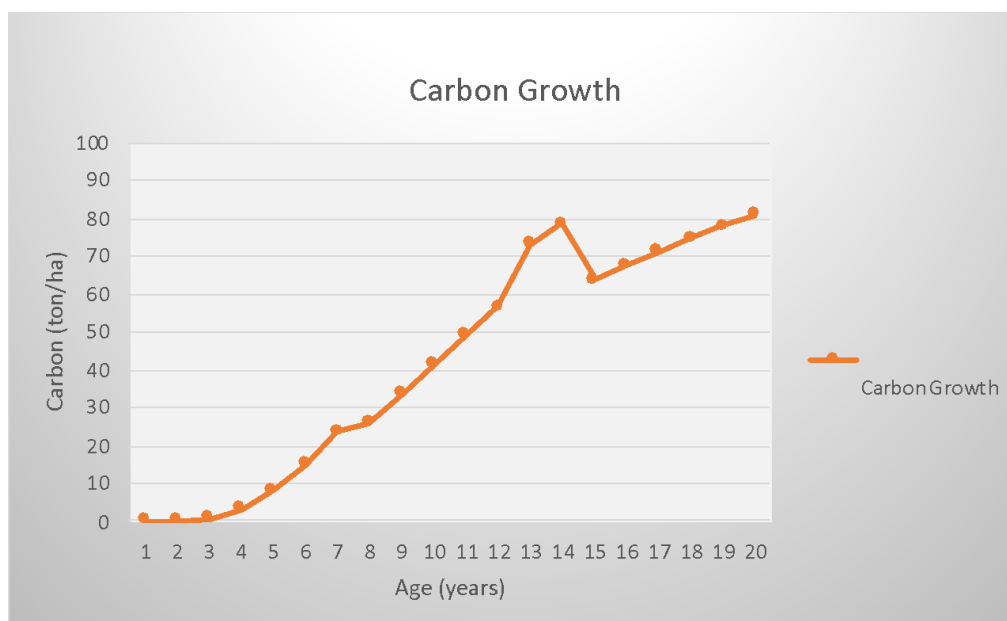


Figure 11 The Projected Accumulation of Carbon in Forest Biomass per hectare in the project sites. Note the decrease in carbon after year 14 can be attributed to thinning.

7.4.1.5 CO₂ calculation

To determine the amount of CO₂ captured in forest biomass, a constant is used. This constant is derived from the ratio between the weight of a CO₂ molecule, which is 44 g, and the 12 g of carbon contained in each kg of dry wood. The fixed value of this ratio is 3.67 kg of CO₂. Therefore, to estimate the amount of CO₂ captured, the carbon content is multiplied by the constant 3.67 Norverto (2006). To calculate the amount of carbon dioxide captured per hectare, use the following formula: $CO_2 = C_t * K$. "CO₂" represents the amount of carbon dioxide captured in tons per hectare, "C_t" represents the total carbon in tons per hectare, and "K" is a constant value of 3.67.

The projected accumulation of CO₂ in forest biomass per hectare in the project site can be found in **Figure 12**. The results are also depicted in **Table 15**.

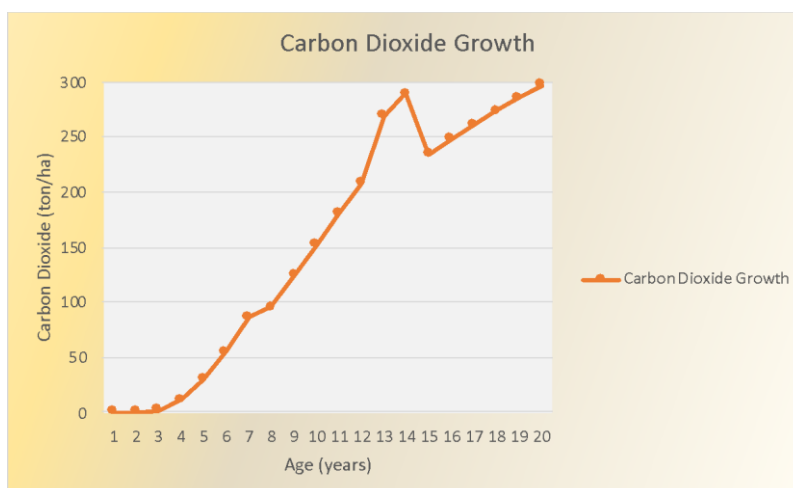


Figure 12 The projected accumulation of CO₂ in forest biomass per hectare in project site

Table 15 Calculations and estimates of Volume, Biomass, Carbon and Carbon Dioxide Co₂ for *Pinus caribaea*

Calculations and projections for <i>Pinus caribaea</i>							
Age	Density	Diameter	Height	Volume	Biomass	Coal	CO ₂
Years	Trees/ha	DBH (cm)	Ht (m)	m ³ /ha	ton/ ha	ton/ha	ton/ ha
1	1414	0.1	0.0	0.00	0.0	0.0	0.0
2	1367	1.5	0.6	0.07	0.2	0.1	0.4
3	1321	3.7	2.1	1.50	3.0	1.5	5.5
4	1278	5.9	3.9	6.88	10.9	5.5	20.0
5	1235	7.9	5.7	17.03	23.4	11.7	43.0
6	1194	9.5	7.3	30.91	38.7	19.4	71.1
7	1154	10.9	8.7	47.00	55.1	27.5	101.0
8	1116	12.1	10.0	63.98	71.2	35.6	130.7
9	1079	13.1	11.0	80.88	86.5	43.3	158.7
10	1043	14.1	12.0	97.07	100.5	50.3	184.5
11	1008	14.9	12.8	112.18	113.1	56.6	207.6
12	975	15.6	13.6	126.01	124.3	62.1	228.0
13	942	16.2	14.3	138.48	134.0	67.0	245.8
14	911	16.8	14.9	149.57	142.3	71.2	261.2
15	881	17.3	15.4	159.31	149.4	74.7	274.2
16	852	17.8	15.9	167.78	155.4	77.7	285.1
17	823	18.2	16.3	175.06	160.3	80.1	294.1
18	796	18.6	16.7	181.22	164.2	82.1	301.4
19	769	19.0	17.1	186.36	167.4	83.7	307.1
20	744	19.3	17.4	190.56	169.7	84.8	311.4

L'ngsiktigt klimatarbete, Socialt hållbart
 Trabajo climático a largo plazo, socialmente sostenible
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

7.4.2 The parameters and methodology used to define the reference carbon pool in mahogany plantations.

The *Swietenia macrophylla* King or very commonly known as Honduran mahogany is a large tree, this species can reach more than 30 meters in height and up to 1.5 m in diameter in the trunk when it is many years old. It is distributed throughout Central America, including Mexico, Colombia, Venezuela, and other countries in the region. In all the countries where it is found, it has generated substantial interest due to the quality of its wood. There are, however, limited studies regarding its development to high ages. To develop the parameters and the methodology proposed for the reference carbon pool for mahogany plantations in the project site, multiple studies undertaken in the Atlantic region of the Republic of Honduras were reviewed, with the objective of obtaining data related to their growth expressed in DBH and height. The number of trees in mahogany plantations varies based on how they are planted and maintained. To ensure healthy growth, periodic thinning is scheduled to remove any diseased or damaged trees, which may decrease the total number of trees in the area. If there are fewer trees than desired during the first few years, they will be replaced or added to maintain the desired density.

7.4.2.1 Growth projection for diameter and height

To project the growth in diameter and height of the Mahogany species, growth data recorded for the species in plantations established in the country's Atlantic corridor have been extracted. The studies cited belong to the scientific journal Tarascan, from the National University of Forestry Sciences (UNACIFOR), and the compilation of data from a thesis prepared at the same University was also considered.

To create a growth relationship in DAP and Height, data from 23 different plantations, cited in studies related to growth, were considered. To determine the growth relationship in DAP, age was considered as a predictor variable, resulting in the following:

$$Y = -0.0162x^2 + 2.1419x - 1.5068$$

Where:

Y = DBH (cm)

X = Age (years)

The Polynomial equation was adjusted with an R^2 of 96.

The height growth relationship was considered age as a predictor variable, resulting in the following:

$$Y = 9.1066\ln(x) - 5.2514$$

Where:

Y = Height (m)

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

X = Age (years)

The logarithmic equation was fitted with an R^2 of 92.

Because the species reflect an accelerated growth in the first years of its establishment, other equations must be considered to project its growth after 20 years. The diameter at breast height and height was calculated based on two regressions derived from reviewing several studies carried out in the Atlantic corridor including (Elvir and Alvarado 2007; Elvir et al. 2010; Elvir 2015; Nuñez 2011; Sánchez and Dubón 2007) (Sanches and Dubon 2011).

7.4.2.2 Volume Calculation

The volume of the tree is a function of the shape factor. For the period between years 1 and 10, the methodology of calculating the volume based on its shape has been considered, due to the shape of the tree in the first years. For the species *Swietenia macrophylla*, an FF of 0.41 has been defined at young ages, therefore the Volume can be calculated according to the expression.

$$\text{Vol} = (\pi * r^2) * HT * FF \text{ (Ferreira)}$$

Where:

Vol = Total volume (m³)

r= radius (m)

HT= Total height (m)

FF= Tree Form Factor

Between the ages of 11 and 20, the equation developed by COHDEFOR-ACDI (Canadian Agency for International Cooperation) was used.

$$\text{Vol} = 4.44909 * 10^{-5} * (\text{DAP}^2 * HT)^{1.005447155} \text{ (Ferreira 2005)}$$

Where:

V: Total volume (m³)

DAP: Chest height diameter (cm)

HT: Total height (m)

7.4.2.3 Biomass calculation

To determine the biomass of *Swietenia macrophylla* it is necessary to perform a calculation combining the biomass of its main components: stem, branches and roots. This calculation is carried out using the formula implemented in the SILVA PLAN Platform (SilvaPlan 2017).

$$\text{BMT} = (0.05382593 * (\text{dap}^2 * \text{ht} * 0.5106)^{0.99}) / 1000 * \text{FEBr}$$

Where:

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

BMT= Total biomass of the tree (t)

BMA= Aerial biomass (t)

FEBr = Root Biomass Expansion Factor (1.15)

MacDicken (1997) proposes implementing a value of 0.10 or 0.15 to consider the biomass gained in the root system, which would generally be adequate for this purpose. The biomass equation implemented by the SILVA PLAN Software considers the density of the wood for the species, the biomass of the tree trunk and the branches, which constitutes the aerial biomass, but does not consider the biomass sequestered in the roots. So, the expansion factor root biomass, according to MacDicken, is considered to compromise 15% of the aerial biomass.

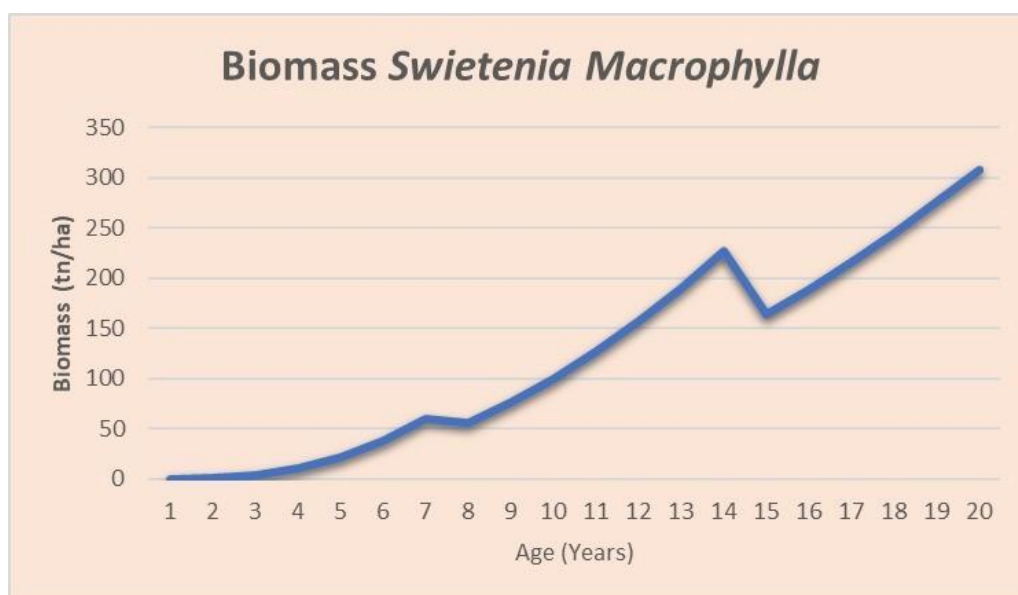


Figure 13 Projected accumulation of forest biomass per hectare for *Swietenia macrophylla*

7.4.2.4 Calculation of Carbon

In most literature, 50% of biomass is assumed to be carbon, but for broadleaf species, smaller fractions are used. Ruiz & Vichot (2014) implemented a methodology to determine the carbon content in forest biomass in Cuba. It was carried out using the Average Carbon Content Factor in wood (FCMCM), using the following expression:

$$\mathbf{CR = BMT \times FCMCM}$$

Where:

CR = Retained carbon

BMT = Total Biomass

FCMCM = Average carbon content factor in wood 0.45 for hardwoods. It is important to highlight that the factor of 0.5 is used in literature inside and outside the country, so it is accepted, the Silva Plan platform uses this value for reasons of being conservative in the calculations, the fraction of 0.45 will be used.

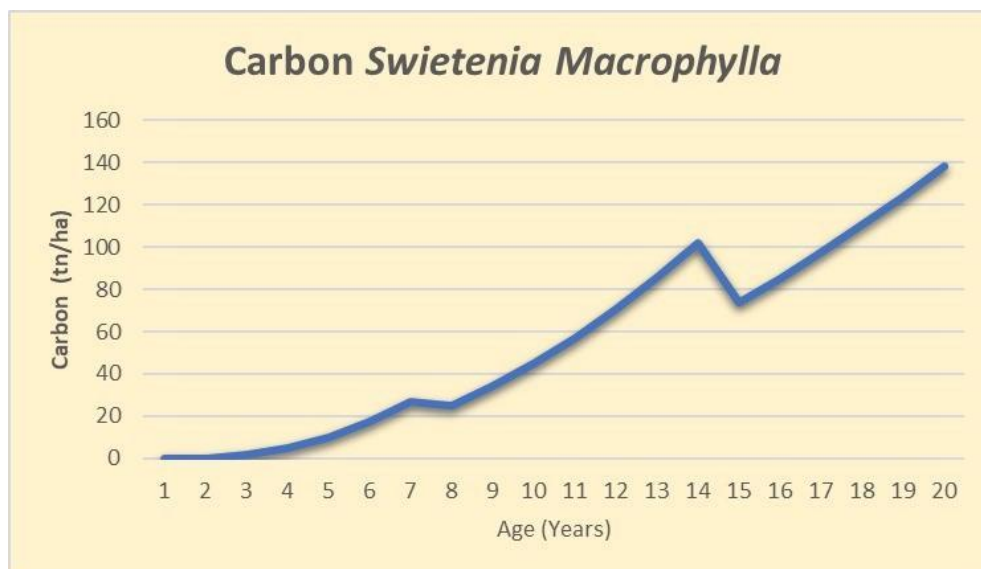


Figure 14 Projected Carbon Accumulation in Forest Biomass for *Swietenia macrophylla*

7.4.2.5 Calculation of carbon dioxide CO₂

The equation was selected based on several considerations. Firstly, it has the support of the Honduran forest service. Secondly, the SILVA PLAN manual recommends multiplying the average carbon content in wood by a constant factor of 3.67. This equation is universal in estimating CO₂ in wood biomass, as it is based on the calculated carbon content. Lastly, the constant factor depends on the molecular weight of the elements that form CO₂ and their proportion, specifically Carbon and Oxygen.

$$\text{CO}_2 = \text{CR} * 3.67 \text{ (C.a 2006)}$$

Where:

CO₂ = Carbon dioxide captured (tons/hectare)

CR= Total carbon retained (t/ha)

K= Constant (3.67)

Since the gram-molecule of CO₂ weighs 44 g compared to the 12 g of carbon that CO₂ contains for each kg of wood, measured in dry matter, $44/12 = 3.67$ kg of CO₂ are set. (1 carbon = 12) +(2 Oxygen = 32) = 44. Ratio: 44 g of CO₂ molecule / 12 g of the C molecule = 3.67

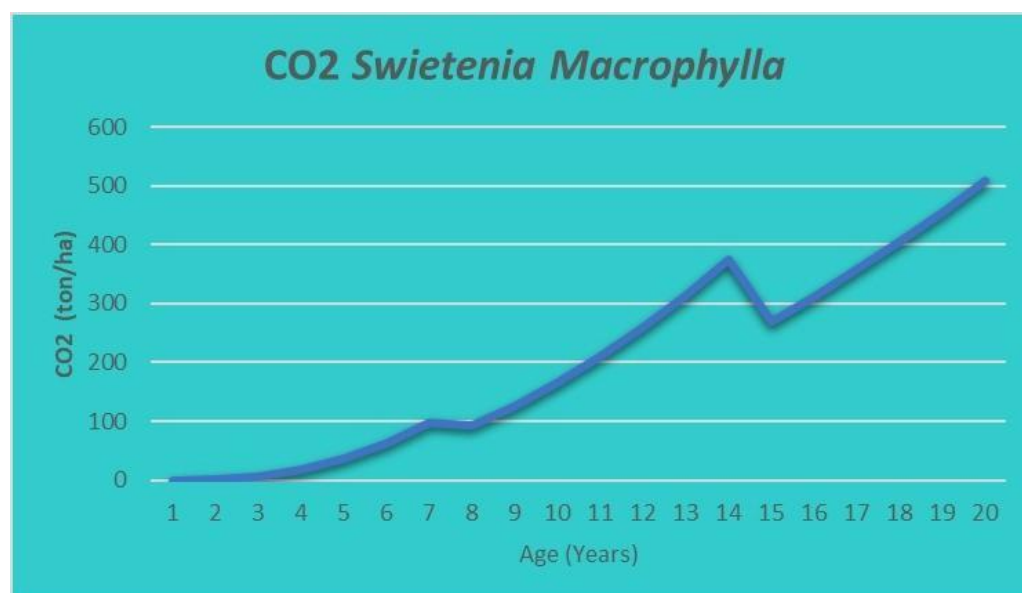


Figure 15 The projected accumulation of CO₂ in forest biomass for Swietenia macrophylla

Notes and comments

The densities of the trees per hectare can vary according to the species in natural conditions, the Pinus usually presents high densities, and the Swietenia species usually has very low densities. Due to the fact that Paskaia will establish plantations and manage the natural regeneration of the proposed species, it will have control of the density of trees, making periodic tree extractions in order to establish a healthy forest, with the best phenotypic characteristics and biomass concentration in the least amount of individuals from a higher stratum, creating a window of opportunity for the establishment of crops in the lower stratum that would allow additional CO₂ capture and carbon fixation in the soil. Tree removals are scheduled every six or seven years, the first removal is for the removal of diseased, malformed, and damaged trees. This carbon will be incorporated into the soil allowing the recovery of the soil by adding organic matter. In the second intervention, the extraction of suppressed individuals and damaged trees is carried out, most of them are trees that will be left lying in the forest, incorporating more organic matter into the soil, but it is estimated that 25% - 30% could be used by the population of nearby communities in the repair of homes, which can be interpreted as at least 25% of the CO₂ extracted in the second thinning will remain stored as carbon in wood for many years. In the third extraction of trees by thinning, it is estimated that an amount of approximately 100 tons of CO₂/hectare in the mahogany forest, in pine, it could be up to 85 tons per hectare will be cut down. It is estimated that from this extraction, no less than 50% of the CO₂ will be used by the local population to build and repair homes, furniture manufacturing and other practices that ensure that CO₂ will remain captured and stored for decades, the rest will be incorporated to the soil through decomposition, adding carbon to the soil by enriching it with organic matter and a smaller percentage will be used as an energy source by nearby communities as firewood.

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

The local population uses wood as a primary energy source since there are no other sources like electricity or gas for light and cooking food. The thinning will make it possible to supply the demand for firewood for household activities such as firewood for cooking and burning wood for lighting, directly reducing the extraction of wood from the natural forest, and allowing more CO₂ to remain in natural forests. Due to the protection, restoration and adequate management of the restored forest, the incorporation of Carbon into the soil will increase the Organic Carbon (SOC), transforming the soil into a Carbon sink, a place where carbon sequestered from the atmosphere remains for a longer time.

Table 16 Calculations and estimates of Volume, Biomass, Carbon and CO₂ in the established forest of Honduran Mahogany

Calculations and projections for <i>Swietenia macrophylla</i>							
Age	Density	Diameter	height	Volume	Biomass	Coal	CO₂ _
Years	Trees/ha	DBH (cm)	Ht (m)	m³/ha	ton/ ha	ton/ha	ton/ha
1	1000	0.0	0.0	0.00	0.0	0.0	0.0
2	1000	2.7	1.1	0.25	0.2	0.1	0.4
3	1000	4.8	4.8	3.49	3.3	1.5	5.4
4	1000	6.8	7.4	10.98	10.2	4.6	16.9
5	1000	8.8	9.4	23.44	21.7	9.8	35.8
6	1000	10.8	11.1	41.26	38.0	17.1	62.7
7	1000	12.7	12.5	64.69	59.2	26.7	97.8
8	650	14.6	13.7	60.99	55.6	25.0	91.9
9	650	16.5	14.8	83.67	76.1	34.2	125.7
10	650	18.3	15.7	110.08	99.8	44.9	164.9
11	650	20.1	16.6	203.18	126.8	57.1	209.4
12	650	21.9	17.4	252.32	157.0	70.6	259.2
13	650	23.6	18.1	306.66	190.2	85.6	314.1
14	650	25.3	18.8	366.05	226.4	101.9	373.9
15	400	27.0	19.4	264.81	163.4	73.5	269.9
16	400	28.6	20.0	307.25	189.2	85.1	312.4
17	400	30.2	20.5	352.46	216.5	97.4	357.6
18	400	31.8	21.1	400.30	245.4	110.4	405.3
19	400	33.3	21.6	450.66	275.8	124.1	455.5
20	400	34.9	22.0	503.37	307.6	138.4	507.9

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

7.5 G5 Ecosystem service benefits

7.5.1 CO₂ calculations

Within the project there are the two interventions that contribute to the carbon pool, natural regeneration of pine in the savannah and planted mahogany on privately owned or leased land.

7.5.1.1 Savannah

The project envisages having a density of at least 1100 plants per hectare in areas reforested with mahogany, but there are accounts of higher densities in savanna areas through natural regeneration. In the savannah pilot site, after 2 years of restoration, the average plant density is around 2500 plants/ha. Therefore, it is probable that a much higher density can be obtained in savannah sites where there are seed trees with good phytosanitary conditions. During the first two years of restoration, the accumulated biomass is not considered because it is marginal, and calculations cannot be made without a notable margin of error.

Through Savannah restoration we estimate that that 180 tCO₂/ha will be stored will be at a density, using our projection 1050 plants per hectare after year 10. The site will be then thinned, and by year 20, it is estimated that the forest will store around 300 tCO₂/ha with 750 trees per hectare. In years 20, it is envisaged that a significant number of trees will be harvested, representing the removal of 200 tCO₂/ ha. This harvesting will enhance the growth of the remaining trees in the area and induce a new generation of healthier trees on account of better phenotypic conditions. The restoration of *Pinus caribea* under similar conditions in Empresa Forestal Cienfuegos, Cuba, captured CO₂ of 1124 t/ha (Ruiz and Vichot 2014). Consequently, we consider our calculations to be conservative. Should the trees remain until year 30, the site will have stored up to 800 tCO₂.

7.5.1.2 Mahogany

The plant density will be of at least 1100 plants per hectare in areas reforested with mahogany. During the first two years of restoration, the accumulated biomass is not considered, and after year 10 the amount of CO₂ stored will be around 165 tCO₂/ha at a density equal to 650 plants per ha. The biomass from the trees taken out of the system in the first thinning will be incorporated in the soil as branches and leaves and the rest as firewood or for local constructions.

Between the years 10 and 20 there will be another thinning, and a larger part of the wood from this thinning will be used for construction and furniture etc. In year 20, the site will have stored over 500 tCO₂/ha. The project envisages that there will be another thinning after year 20 that will generate high quality timber and income to the owner and since the growth in diameter and quality will be substantial between year 20 and 30, it is estimated that the total capture capacity of CO₂/ha over 30 years will be greater than 800 tonnes.

7.6 G6 Leakage and uncertainty

The risk of leakage is derived from two potential sources: the continuation of accidental annual burns and intentional fires and the illegal cutting of pines for timber and firewood in the project area.

The degraded forest savannah's baseline condition is a fire at least once a year. The frequency of this regime precludes the regeneration of Caribbean pine. According to Myers (2006), if fire is excluded from a site for approximately 5 years, this will allow enough time for pine saplings to re-establish and grow to a height of approximately 1-1.5m in height which allows them to withstand moderate fires. At this point, the project plans to implement a low-intensity prescribed burning at the beginning of the dry season to ensure the fire-dependent biodiversity of the perennial ground cover is not compromised. Prescribed burning will continue to be implemented until the end of the project period. The baseline condition of uncontrolled high-intensity annual fires consumes greater biomass than the low-intensity, low-frequency prescribed burning planned during the project period. After considering the savannah's baseline emissions, we have determined that implementing the planned prescribed burning during the project will decrease CO2 leakage.

Table 17 Identified sources of leakage in the savannah and mitigation measures

Identified leaks	Mitigation measures
Fires caused by loggers	The individuals responsible for transporting wood (loggers) through the forest often start fires to keep the roads they use clean. To prevent this, the transportation of wood will be prohibited in the area that is currently being restored. Surveillance teams will be monitoring to ensure compliance with this measure.
Hunting aided using intentional fires.	Intentional fires are sometimes set to help with hunting. To prevent hunting and fires within the restoration area and surrounding areas, we will launch awareness campaigns. This measure will discourage people from burning, and compliance will be monitored by surveillance brigades.
Burning by ranchers.	Ranchers and horse owners often burn the savanna in the area to create grazing areas for their animals. However, this practice is harmful to the environment and will no longer be allowed. Instead, cattle grazing will be restricted to designated areas within the restoration area and its surroundings. To ensure compliance with this measure, surveillance brigades will be monitoring the area.
Fires caused by arsonists.	Ever since the beginning of the project, it has become evident that neglecting involving local communities in the protection activities can lead to conflicts among the population, primarily by depriving them of employment opportunities. Some individuals, driven by negative motives, resort to setting fires as a form of

	protest. The protection campaigns are carried out to interact with community leaders and representative groups to achieve equitable job distribution. The brigades will be responsible for raising awareness to reduce the incidence of intentional burns. The brigades will also be responsible for the construction of patrols, firefighting, and surveillance for compliance with the additional measures taken to keep the restoration area intact.
Wood extraction (chainsaw operator)	People who cut down trees often burn the areas surrounding the tree(s) which can cause forest fires. As a measure, the felling of trees will not be allowed within the restoration area and the brigades will be responsible for ensuring that trees are not cut within the area.

Table 18 Identified sources of leakage in the Mahogany plantations and mitigation measures

Reason	Measures
Floods due to flooding of the Cruta River.	It has been observed during several visits to Laka Rio, Lainasta, and near the Tipi River in Truksinasta that many people have their family plots on the banks of the Cruta River. These are flat areas where floods occur every year, with more intense flooding happening approximately every five years, causing the death of minor plants and crops. To prevent this from happening, plantations will be prohibited in low-lying flooded areas as the water flow could cause the death of the plants.
Poorly drained soils	In the lower regions of Lainasta, the slope is much gentler, and the horseshoe-shaped lagoons in these areas retain water for several weeks and even months. Consequently, living plants cannot grow in these areas due to waterlogging, which results in the death of trees and plants due to root suffocation. Therefore, it will be recommended not to plant in poorly drained areas.
Planting roadsides	Plantations situated alongside roads run the risk of being severely affected by pedestrians and travellers. The trees located closer to the road were being cut down, which was causing damage to the plantations. As a result, it has been decided that no plantations will be allowed on the verges of main and secondary roads.
Plantation Fire	Plantations located near the savannah are affected by fires that originated in the savannah. To avoid such incidents, it is necessary to refrain from planting on the plain or near it without the owner of the live plant carrying out necessary control measures such as patrols or controlled burning in the environment.
Disputed land	During the initial phase of forest plantations in Truksinasta and Lainasta, it was discovered that certain individuals attempted to take over the use of the land.

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

	This resulted in the incomplete development of the plantations. As a mitigation measure, a more thorough investigation will be conducted in the prior to the establishment of plantations.
Aged participants	Aged community members struggle with the upkeep of their plantations. To address this issue, priority will be given to aged participants who have family members that can work collectively to maintain their plots.
Plantations in remote locations	Plots located in remote areas are not usually visited by their frequently. As a result, weeds tend to grow and suffocate the seedlings. However, if the owner of a plantation owns a house on the farm where the plantation will be established, it would indicate that the family frequently visits the plot. This will be taken into consideration in plantation planning.

Recent studies have shown that infrequent controlled fires can increase carbon sequestration in savannahs and grasslands. According to Pellegrini et al. (2022), such a regime reduces the risk of wildfires and stabilises or even increases soil carbon levels. This is accounted for by fire-driven changes in decomposition, mediated by altered soil organic matter stability, which is an important compensatory process for offsetting declines in aboveground biomass pools. Starting in 2024, a 4-year research project will be conducted at the project site to evaluate the assertions put forward by Pellegrini et al. (2022).

In 2021, a pilot project was implemented to prevent forest fires and the cutting of seed trees in a 1000 ha savannah area. Despite limited project resources, after two years, an average of 2500 new pine saplings per hectare have grown to an average height of 1.2m. Notably, no seed trees were removed, and only 4.8% of the pilot site was affected by fire, resulting in a 95% success rate.

To accommodate for the uncertainties associated with the potential leakage from prescribed burning and episodes of uncontrolled fires in the restoration sites, we will use a risk buffer of 12.2% as a precautionary principle. This buffer will be recalibrated when we have further data from ongoing research from the project site in year 5.

7.6.1 Monitoring of Leakage

The hiring of surveillance and protection teams to monitor potential sources of fire leaks will help to quickly identify when a leak occurs. As the project grows, there will be multiple visits to plantation sites to support the implementation of new Plan Vivos. This will facilitate and reduce the cost of travel. Annual measurements will also be taken on the plots to identify any leaks or changes in carbon sequestration levels. This will allow the project to take corrective measures if necessary.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

7.6.2 Uncertainties and Assumptions Underpinning the Calculations

The assumptions of losses due to leaks in the different climate compensation programs are based on the experience gained in the last two years.

7.6.2.1.1 Savannah Restoration

In 2022, the company began the savannah restoration program by fighting forest fires. Losses remained below 1%. In 2023, intensive forest fire fighting was continued. The construction of 24 kilometres of firebreaks was also carried out to prevent the spread of fires in the savanna. Losses for the year 2023 remained below 5%. The loss was caused by an accident resulting from the poor handling of a campfire by a brigade. This incident highlights that losses resulting from fires can be minimized below the 12.2% leakage buffer used in calculations, by addressing external factors.

7.6.2.1.2 Mahogany Plantations

To determine the risk buffer in the climate compensation program for forest plantations, it was considered that of every ten planted plots, one could be lost due to poor administration or poor management and climatic events. During the 2021 plantation establishment, losses occurred due to poor management and lack of credibility on the part of the foresters. In 2022, the losses were mainly due to external forces such as fires and jealous residents in the area. As a countermeasure, silvicultural practices will be carried out to maintain the desired number of plants per hectare and reduce the loss of planted plots. Based on the above considerations, we consider a 12.2% leakage buffer to be appropriate.

8 Part H: Risk Management

8.1 H1 Identification of Risk Areas

8.1.1 Project Organization

Risk factor • Poor project management on site
Mitigation • The communication process between field project staff must be robust. • Project staff receive extensive training in the use of the methods applied within the project.
Feasibility of mitigation actions. • The project is responsible for the execution of necessary activities to maintain the operation of the carbon credit sales project. It has built a close relationship between the coaching staff, managers, partners, and people involved, which allows maintaining constant communication, which allows for a solid relationship, so maintaining constant and solid communication is feasible according to experience. • The project assumes the responsibility of keeping its technical staff, local coordinators and participants who help maintain the project trained in procedures, methods, surveillance, monitoring, follow-up, or other information. Currently, the project has trained the administrative technician as TFC (Trained Forestry Technician) to achieve better management of the natural resources of the area, so this mitigation measure is highly viable.

8.1.2 Social risks.

Risk factor • Land grabs thanks to better infrastructure in the area • Arsonists deliberately set fires. • Jealousy and disputes related to the distribution of profits, triggered by surrounding communities outside the immediate project area.
Mitigation • The project board should be made up of actors who have the capacity to regulate land grabbing. • Promote project ownership and greater inclusion through joint activities such as football development and broader joint activities in Mosquitia. • The project development plan must correspond closely with the local government development plan (MASTA) to be aligned with local democratic principles.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Feasibility of mitigation actions.

- Currently, in Moskitia, a land sanitation program is being launched, which consists of removing people who occupy land in an ill-gotten manner. This will allow the project to have greater confidence that the surrounding land is not being taken by third parties.
- The forest landscape restoration project has been carried out constantly and without problems for two consecutive years. The inclusion of people from all the nearby communities and their constant rotation allows people to remain satisfied and remain vigilant against arsonists. The project is also opening up to new types of relationships, through support for requests for help in the face of climate catastrophes such as hurricanes, support for youth groups organized into soccer teams, and others.
- The project has forged a close relationship with the leaders of the MASTA organization, some leaders of the territorial councils and much closer with the participants. Good relationships have been fostered with people from different strata of government, which allows you to maintain greater harmony with the parties and avoid discrepancies between the parties with whom the resources are going to be divided.

8.1.3 Biophysical risks.
Risk factor

- Storms and hurricanes destroy infrastructure and family gardens in the area

Mitigation

- Ensure the pine savanna is re-established as quickly as possible to reduce vulnerability by providing wildlife and fish and wild foods and to reduce flooding and soil leaching.
- Wood can also be harvested and used to restore infrastructure and is sold so that food can be purchased.

Feasibility of mitigation actions

- The hypothesis of the project is that the savannah has the capacity to regenerate the forest, over the course of five years the natural regeneration for a new forest can be established, in the course of 10 years there may be a young forest capable of ensuring the continuity of the forest. With the regenerated forest, the conditions of the area will improve, the soil will have a greater water retention capacity, which will reduce flooding, prevent the leaching of nutrients, and improve the quality of water in the area. The habitat of wild species of rodents, mammals, birds and fish will be restored.
- After the CO2 capture cycle has elapsed, the remaining forest may be managed or administered as established by the owner. The new forest may be managed under the principles of sustainability, where the owner is responsible for management, use and marketing.

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

- This will allow sufficient financial resources to be obtained to be able to make direct purchases of seeds for food production, and processed foods for those social groups that are incapable of producing them due to physical disabilities.
- The Plan vivo standard allows the owner to decide what type of management will be given to the established trees or forest after completing their CO2 sequestration cycle.

8.2 H2 Risk Buffer

8.2.1 Introduction

The risk value of a project refers to the likelihood of it suffering a partial or total loss within a specific timeframe. It can be assessed by assigning values based on the probability of an event that could result in such a loss and by considering the preventative or mitigative measures that can be developed and implemented to avoid any incidents. In determining the risk buffers, Paskaia Honduras SA took into account the experience gained during the project's piloting phase. This includes experience in both Forest Plantations and in protecting the savanna to encourage the natural regeneration of pine.

8.2.2 Potential Risks to Carbon Stocks in Swietenia Macrophylla Plantations

Between 2021 and 2023, Paskaia gained experience in establishing forest plantations in coordination with Miskito groups. This was the first project of its kind for the Miskito. Paskaia has identified potential sites for the establishment of these plantations and has identified leaders who understand the objectives of the project. People involved in the project understand that it is a long-term project.

8.2.2.1 Potential risks within the forest plantations

During the period that the project has been established in the pilot phase, the following potential risks could be observed:

- Risk of flooding due to excess rainfall on the banks of the Cruta River.
- Risk of planting in poorly drained areas, which can cause the death of established plants due to root asphyxiation.
- Risk of trees being cut or uprooted by planting too close to paths where people travel most frequently.
- Risk of the plantation burning due to its close proximity to the plain or savanna.
- Risk of planting on land that is in a family dispute.
- Risk of establishing Plan Vivos with older people who lack support from their children or relatives to maintain the established plantation.
- Risk of planting in very remote plots which will not be given sufficient attention.

8.2.2.2 Probability and impact of each potential risk

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

The probability that each of the causes of plant losses will occur, according to the experience gained by the technical staff and the Paskaia, can be defined as follows:

Cause	Probability of occurrence	Risk of loss
Floods	20%, once every 5 years	Lost 50 – 80% of plantations less than one year old
Poorly drained soils	60%, every year.	Less than 50% in young plantations
Planting roadsides	30 – 50%, every year.	Losses 20 – 50% of young plantation.
Plantation Fire	10 – 30% every year	Loss between 20 and 100%
Disputed land	Less than 10%	Less than 20%
PV, Older adult	30% every year	Between 30 and 70% losses
Pv, retired	10 – 20% each year	Between 30 and 50% losses

8.2.2.3 Plan to manage risk

As a measure to counteract or reduce the risk, decisions will be made based on the following considerations:

Identified risks	Measures	Risk reduction
Floods	Do not plant in the lower areas of the Cruta River	Losses 0 – 10% of plantations less than one year old
Poorly drained soils	Do not plant in poorly drained areas.	Losses 0%
Planting roadsides	Do not plant along roadsides	Losses 0 – 5%.
Plantation Fire	Do not plant on the shore or on the flat.	Loss 0%
Disputed land	Do not plant in conflictive terrain.	Loss 0%
PV, Older adult	Check if they have family members to work collectively.	Loss 5 and 10%
Pv, Retired	Check if the family constantly visits the plot.	Loss 10 and 20%

The decisions made regarding the choice of plantation sites will be made with local leaders, prior to the discussion of maintaining the project with few losses because its profitability will depend on this.

8.2.2.4 Risk Buffer in Swietenia Macrophylla Plantations

It is assumed that one in every ten plots may be lost due to inadequate administration or mismanagement, which is why a risk management plan was developed to reduce the loss of plantations each year. We do not expect to achieve 90% effectiveness in the initial years of the project. However, we will implement silvicultural practices to maintain the desired number of plants per hectare and minimise the loss of planted plots.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

8.2.3 Potential Risks to Carbon Stocks from the Restoration of Savannahs with *Pinus caribaea*.

The project has been working on protecting and restoring the savannah forest landscape with pine for the last two years, from 2022 to 2023. The project has been working closely with the territorial and communal leaders of the Tipi, Truktsinasta area. Although there are several other projects in the area that support the forestry component, their level of commitment is often very low. As a result, the impact of these projects has not been as great as promised. On the other hand, the project we are working on has been very effective in the areas where it has focused its work. This is due to the high level of involvement of tribal leaders and the community. In fact, the project's effectiveness level has been maintained at 96% since its start and will continue throughout 2023.

8.2.3.1 Potential risks associated with savannah restoration.

During the period that the project has been executed in the pilot phase, the following potential risks could be observed:

- Risk of forest fires by loggers.
- Risk of forest fires by hunters.
- Risk of burning grass plants by ranchers.
- Risk of forest fires from arsonists.
- Risk of illegal timber extraction.

8.2.3.2 Probability and impact of each potential risk

The project has been operational for some time, and during this period, they have identified the risks and the probability of their occurrence within the area under protection for landscape restoration and carbon credit generation. The project technical team has gained valuable experience, which has helped them define these risks. The following table lists the identified risks, their probability of occurrence, and projected forest loss.

Identified risks	Probability of occurrence	Projected Forest loss
Fires caused by loggers	10% for each logger each year	Losses of 20 – 50 ha due to fire
Fires started by hunters.	Between 0 - 30% per group.	Loss of 50 -100 ha due to fire
Burning by ranchers.	Between 30 - 70% per farmer	Lost 50 – 150 ha due to fire.
Fire by arsonists.	70 - 100% per year	Lost between 500 - 1000 ha due to fire
Wood extraction (chainsaw)	100% to make it happen.	Less than 5 ha.

8.2.3.3 Plan to manage risk

It has been observed that individuals from communities near the Savannah engage in various forest-based activities to earn their livelihood, such as extracting wood for sale in the nearby city, burning the savanna to graze livestock, harvesting poles, and hunting mammals and rodents. However, it has been observed that only a small fraction of people depends entirely on the forest for their subsistence.

As a precautionary measure, the project will counteract the risk by directing the activities carried out by local people to sites located outside project site. The following actions are considered as a precautionary measure:

Identified Risk	Precautionary measures	Risk reduction
Fires caused by loggers	The extraction of wood will not be permitted within the restoration area.	Losses 0 - 2%
fires by hunters.	Awareness campaigns will be launched to decrease the number of houses in the restoration zone.	Losses 0 - 1%
Burning by ranchers.	The burning of savannahs for cattle grazing will not be permitted within the restoration area.	Losses 0 – 2%.
Fire by arsonists.	Awareness campaigns will be created to reduce fires, fire breakers will be built and surveillance brigades will be established within the restoration area.	Loss 0 - 3%
Wood extraction (chainsaw)	The felling of trees will not be allowed within the restoration area.	Losses 0%

The decisions made in relation to restrictions within the restoration area will be made in coordination with local leaders, prior to the expansion of activities and areas with the objective of reducing losses and maintaining the profitability of the project.

8.2.3.4 Risk Buffer in Savannah Restoration Sites

After careful consideration, the appropriate value for the risk buffer was discussed and it was decided that a conservative value of 12.2% would be assigned for the estimation of expected losses each year. It is expected that this value will decrease over time.

The following information has been considered for the analysis: experience in fighting fires and surveillance against illegal wood extraction from the area under restoration. In 2022, several forest fires occurred near the area of interest, but the loss was less than 1%. In 2023, forest fires were fought more intensely than in 2022, and many firebreaks were constructed to prevent the spread of fires in the savanna. The losses for the year remained below 5%, and this loss was due to an accident caused by poor handling of a campfire. This shows that external factors can cause losses due to fires, but they can still be kept below 12.2%.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

The objective of the project is to achieve an effectiveness level greater than 90% from the first year. To do so, forestry and fire management practices will be carried out to maintain the largest amount of area without damage from fires.

Based on the previous considerations, a conservative value of 12.2% has been assigned to the risk buffer for the estimate of expected carbon stock losses each year. It is expected that this value will decrease over time.

9 Part I Project Coordination and Management

The project coordinator is Paskaia. Paskaia is a limited liability company with a vision to support the provisioning of existing ecosystem services, such as carbon sequestration, and participate in developing a market for new ones. Paskaia means to build for the future in the Miskito language. Even though the name has a local significance in Miskitu, the company's long-term objective is to host projects in other regions and countries. Paskaia was founded in 2020 and grew from a long history of engagement in rural development and reforestation in Honduras. Although Paskaia is a new company, it has grown out of Vision Forestal, working with reforestation in Honduras since 2007.

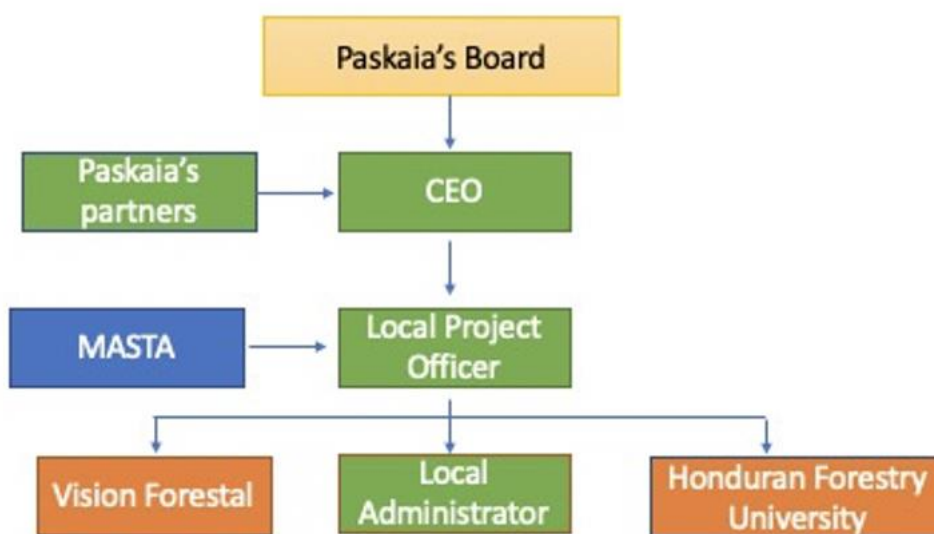


Figure 16 Paskaia's Organisational Structure

Magnus Bergstrom, the CEO of Paskaia, has been working with Vision Forestal to establish nurseries and test various afforestation methods in Honduras since 2007. Vision Forestal has already implemented plant production and reforestation techniques in two other pilot areas. The project is ongoing, and 200 hectares of land have been reforested. The company is currently experimenting with rehabilitating oil palm plantations by using native tree species. They are also collaborating with local communities, schools, indigenous groups, and the military to undertake reforestation activities. In recent years, the first thinning operations have been conducted, and the company is developing technologies to extend the life cycle of wood by processing smaller wood dimensions.

The personnel who will be working with the Gracias a Dios project include:

- Marvin Rodriguez (MSc) is a Forest Engineer. He grew up in Gracias a Dios in Honduras and has worked as a project manager for Vision Forestal's afforestation project since 2013. Parallel to his

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

work with Vision Forestal, Marvin has been studying several courses at the Honduran Forestry University. He is currently studying a web-based course, a master's in climate change. Marvin Rodriguez was appointed as the project manager and will support Paskaia Honduras with the on-the-ground management of the project as well.

- Magnus Bergström (MSc) is a Forest Engineer who has worked with social/forestry projects for over three decades. Magnus has been active in Honduras and has worked with rural development and people with disabilities since 1995. He is the founder and CEO of Vision Forestal in Honduras and has expertise in afforestation methodologies. In Moskitia, Magnus has worked closely with the Misquito for over five years.
- Stina Powell (PhD) has a background in gender equity and natural resource management. Her two current research projects include "The Value of Stakeholder Participation in Collaborative Projects for Sustainable Development: A Gender and Intersectional Analysis" and "To Stop Counting Bodies: New Ideas for a Gender-equal Forest Sector".
- Neil Powell (PhD) has a rural development. He has coordinated numerous development and research projects in multiple contexts, including Sub-Saharan Africa, the Mekong Region, and Europe. His systemic action research focuses on developing methodologies that foster knowledge co-creation in situations characterised by uncertainty and controversy.
- Hilda Madrigales is from Honduras and has a marine biology and ecotourism background. She has been working actively in Moskita since 2015.

9.1 The Project's Organizational Structure

The project is organised by way of 4 governance levels (see figure 13)

9.1.1 Governance level 1

The project developer, Paskaia Sweden (see Annex 8 Agreement between Paskaia Sweden and Paskaia Honduras) is responsible for coordinating the project. This includes:

1. Ensuring the project meets the requirements of the certification body Plan Vivo;
2. Generating financing to support the project operation and development via research and development assistance funding and managing the relationship with project clients, for example, ZeroMission.
3. Safeguarding the scientific rigour of the project and developing new socio-ecological innovations by managing a close relationship with local and international scientific advisors, i.e., Universidad

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Nacional de Ciencias Forestales, Honduras, Uppsala University, Sweden, University of the Sunshine Coast and Loughborough University UK.

9.1.2 Governance level 2

The Project Board has the overall responsibility for the project governance. It consists of actors with a crucial stake in the local communities' livelihoods and forest conservation within the proposed project site. The project board will direct, and monitor activities related to the project plan, including the budget, and supervise its execution. It will meet 3-5 times a year. The board will also guide, oversee, and monitor the project manager.

The proposed board members will include MASTA, a representative from those territorial councils who have members participating in the project, a representative from the Forest Conservation Institute (ICF), and the CEO of Paskaia Sweden.

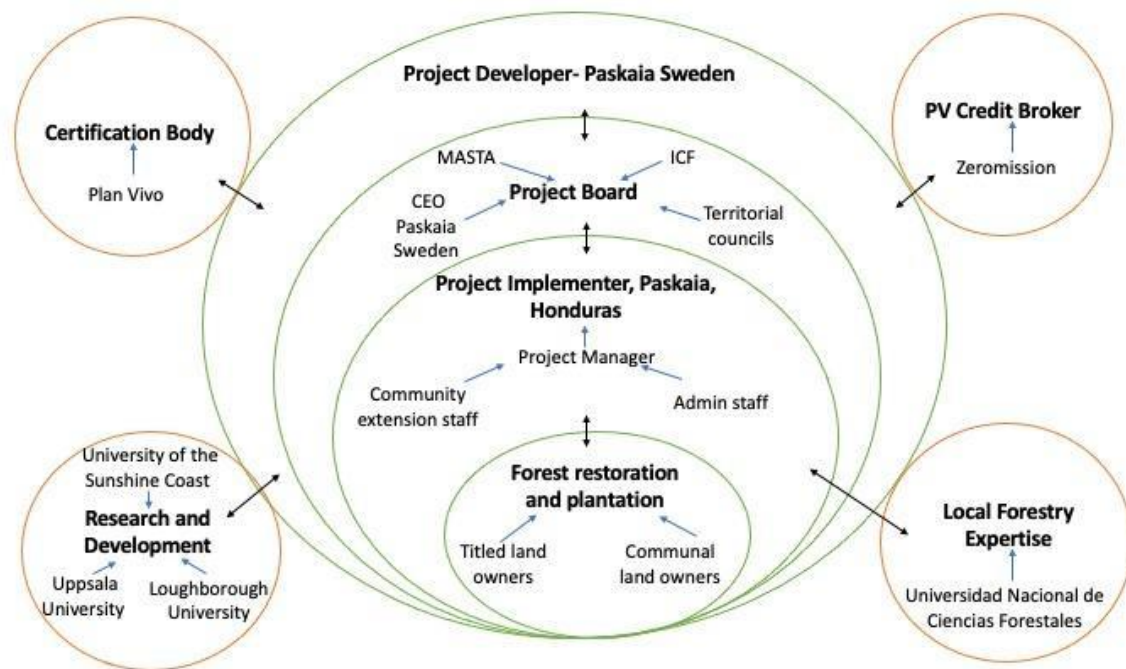


Figure 17 The four governance levels of the project in Moskitia, Honduras

9.1.3 Governance Level 3

The third governance level is enacted by Paskaia Honduras and subsumes the implementation of the project. This level includes the project manager, who is responsible for the overall execution of the project. The project manager is accountable to the project board and draws on the management structure to create optimal conditions for all participants to work collaboratively toward the project's aims and ensure the best possible short- and long-term impacts.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

The project manager oversees the community extension officers. They provide the landowners with technical assistance and help execute and monitor the project interventions. Their local knowledge and language skills are essential in facilitating knowledge co-creation and co-inquiry with landowners and other local stakeholders to ensure the project meets the diverse local interests. The project manager is supported by a management structure that includes an administrator with experience in financial control.

9.1.4 Governance Level 4

The fourth level of governance is manifest at the local level, where the direct enactment of forest restoration occurs (fig. 2). It is envisaged that the community extension staff will provide technical support to local landholders and be involved in monitoring and evaluation. As both areas that have been individually and collectively titled are being considered within the context of the project, the community extension function will cover both areas.

9.2 12 Relationships with National Organizations

National organisations that have actively participated in the development of the project include:

MASTA is a national political organisation representing the Miskito in the project area, and it serves as their highest representative level in connection with local and national government authorities. No state institution, NGO, or private company may develop any activity within its territory without seeking MASTA's approval. In 2015, MASTA was awarded the prestigious equator prize, from UNDP's equator initiative, in recognition of working to reduce poverty, protect nature and strengthen resilience in the face of climate change. Today, MASTA's territory is subdivided into 12 Miskito Territories, each of which is governed by an elected territorial council (Concejo). This council must be endorsed by MASTA and registered under the Directorate of Regulation, Registration, and Monitoring of Civil Associations (DIRRSAC). Elections are held annually to appoint the regional president of MASTA and the Concejos. Only indigenous Miskito from 18 years of age is permitted to vote. In 2020 the elections were deferred until 2021 because of the COVID pandemic. The Honduran government ratified this decision.

Paskaia and the leadership of MASTA have agreed to meet regularly to discuss the development of the project as part of the co-design process. Representatives from Paskaia are also invited to the MASTA regional meetings to inform all Concejos in the region about the projects progress in the two pilot areas in Truktsinasta and Lainasta. MASTA and Paskaia jointly represent the project in most contacts with national institutions.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

The National Institute of Forest Conservation and Development, Protected Areas and Wildlife

(ICF) is a national agency responsible for implementing forestry and nature protection policy. It has two local offices in Moskitia and is accountable for issuing permits for woodcutting, wood transport, sawmills, certifying the establishment of plantations and patrolling for illegal cutting and hunting. ICF also assists in the design of forestry projects and certifies sustainable forestry projects.

ICF has been actively involved in the co-design of the project, and Paskaia maintains frequent communication with them at the local, regional, and national levels. All reforestation activities are recorded in a national database by ICF, and ongoing discussions with the project regarding fire protection activities in the area are held. Additionally, the legal representatives of Paskaia and MASTA frequently meet with ICF officials at their headquarters in Tegucigalpa to discuss different project related issues.

The Agency for the Development of the Moskitia (MOPAWI) is a national environmental NGO that has worked for more than 30 years in Moskitia with a rights-based approach to biodiversity conservation. MOPAWI has a particular focus on sustainable agriculture and agroforestry. Their current program covers more than 48 communities, involves 700 families, and engages 20 primary schools. MOPAWI shares its field headquarter with Paskaia. MOPAWI participates in all the larger community meetings to ensure activities are synergised. Project staff also participate in the regional meeting held by MOPAWI.

Forests of the World is a Danish NGO with global hubs in East Africa, South America and Central America. Their approach is to enable the conservation of forests through rights-based, civil society and indigenous, and nature-based solutions. Honduras is a focus country, and they are presently implementing conflict resolution over land tenure, and firefighting equipment activities in two territories in the project site, Truktsinasta and Wamakklisinasta. We have seen no evidence of them engaging with this. We see no risks that the Forests of the World are engaged in will overlap with the project activities.

Universidad Nacional de Ciencias Forestales, have provided expert advice in terms of carbon sequestration and its monitoring.

9.3 I3 Legal Compliance

Several federal Honduran laws and policies that have the potential to foster an enabling environment for the project. They are listed below:

- Law on Climate change, decree no. 291-2013 (Méndez 2020). This law seeks to foster practices to reduce environmental vulnerability and improve adaptation capacity and develop proposals for the prevention and mitigation of the effects produced by climate change and other causes of poor environmental management.
- National Climate Change Strategy, 2015 (Sanders, McLean, and Manueles 2015). This strategy works toward projecting climate scenarios in Honduras. It also estimates national emissions and sectoral vulnerabilities to climate risk and sets mitigation and adaptation objectives.
- National policy for forests, protected areas and wildlife 2013-2022 (Busch and Engelmann 2015). The policy aims to curb forest cutting illegally and protect the country's forests from climate risks and enhance mitigation capacity.
- National Policy for Women and Second Plan for Gender Equality and Equity of Honduras 2010-2022 (Howland et al. 2021). This policy seeks to promote the adoption of gender equity in strategies related to climate change, forestry management plans, energy, biodiversity, water, risk management and protected areas.
- Social Protection Policy, approved by executive decree PCM 008-2012 (Martinez Franzoni 2013). This policy seeks to protect the population from climate-related risks
- National Programme for the recovery of Degraded Ecosystems' Goods and Services 2018 (Schweizer et al. 2018). This programme is a strategic planning instrument to support compliance under the general environmental law in relation to the international commitments under the Framework Convention on Climate Change. It is specifically direct at fostering the recovery of degraded ecosystem goods and services in Honduras.
- National reforestation programme (resolution DE-MP-069-2010): the resolution underpinning the programme's goal is to recuperate degraded lands and develop sustainable forest management.
- Additionally, the Government of Honduras has defined and approved a National Biodiversity Strategy and an Action Plan. Honduras has also committed to the United Nations Framework Convention on Climate Change (UNFCCC) to reduce GHG emissions by 15% by restoring one million hectares of degraded land, including agricultural landscapes.

To ensure equal opportunity for employment within the project, Paskaia's equal opportunity policy will be adopted. Paskaia's equal opportunity policy stipulates:

" Regardless of gender, ethnic origin, belief, sexual orientation, age, gender identity or disability, should participate in working life on equal terms. Differences should be seen as an asset and used in active gender equality work to strengthen efficiency and creativity. The company believes that groups

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

with the representation of many different people are more dynamic, which will lead to a better working environment, increased efficiency and thereby, increased profitability. Gender equality means that everyone, regardless of gender, must have the same rights, obligations, and opportunities. This demands equal conditions in work, career and development opportunities. A work environment that promotes diversity, regardless of gender, ethnic origin, belief, sexual orientation, age, gender identity or disability, must have the same rights, obligations and opportunities in all areas of life.”

Honduran government is signatory to the International Labour Organization’s (ILO) Standards. ILO’s mandate it to advance social justice and promote decent work. See this weblink for a detailed explanation of the employees right that covered by the standard <https://www.ilo.org/dyn/travail/docs/947/Labour%20Code.pdf>

9.4 I4 Project Management

The project manager will work under the guidance of the project board. More specifically, the role of the project manager will be to:

- ensure compliance with Plan Vivo standards as stipulated in the project agreement.
- establish reliable overall coordination with the Concejo, project board, and community
- ensure appropriate methods for decision-making and conflict resolution are implemented.
- ensure timely and accurate execution of administrative and financial tasks.
- optimise the use of resources available within the project.
- monitor progress and support integration within the area of the project (see an example of data recording template in annex 4).
- ensure efficient communication within and beyond the project.

Table 19 Project timeline

2018-2019	A series of meetings with different levels of the Miskitu community to ensure the fulfilment of the ILO Convention 169 concerning the rights of indigenous people
2020-2022	Implementation of a project co-design process, identification of the first areas of intervention and establishment of pilot plots, first in Truktsinasta and thereafter Lainasta
2021-2022	Implementation of a project feasibility study financed by NEFCO
Feb 2022	The official launch of the project in the Tipi community.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Feb 2022	Initiate intervention activities to control fires in two areas where Plan Vivos have been developed (260 hectares outside Lisagnipura, Tipi and 20 hectares within Tasba Pain farm).
May 2022	Presentation of the NECFO Feasibility study to different stakeholders in Honduras
June 2022	Presentation of the NEFCO Feasibility study to different organizations in Sweden.
2022-2024	Reforestation of the areas where the fire regimes are controlled
2023	On-site third-party validation.
2023	Commercialisation of the first carbon credits
2023-2032	Management of the first two sites and upscaling to neighbouring areas.

The project manager will keep records of all Plan Vivos submitted by participants, PES agreements, monitoring results and all PES disbursed to participants.

Project records and PES agreements, Plan Vivos and monitoring results will be backed up every 3 months and held in as hard copies at Paskaia's headquarters in Puerto Lempira. Additionally, digital copies will be stored both in Honduras and Sweden. PES disbursements will be documented along with banking records and stored in the same way.

9.5 I5 Project Financial Arrangements

Figure 18 shows the expected financial flows of the project, even though it is not currently making any money from the sale of Plan Vivo credits. In accordance with the Plan Vivo Standard, 61% of the income generated by the credits will go to the community, while the remaining 39% will be allocated for project coordination and administration. Within the 61%, the Community Trust and Production of Ecosystem Services payments are included, while the 39% will cover financing for Paskaia Sweden and Paskaia Honduras, verification funds, Plan Vivo fees, and additional project development. For insights into the background to reaching the split of finances depicted in Figure 18. Please refer to Annex 9 for a description of the collaborative process leading up to the agreement.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Paskaia Sweden will retain 5% of the finances to cover running costs, and the remaining 95% will be used for direct project-related costs. 11% of the income will go to actors who don't reside within the project context. 5% of this will be used for the independent verification of the project, 6% as fixed fees to Plan Vivo for the sale of carbon credits, and an additional 5% will be reserved for research and development support for the project.

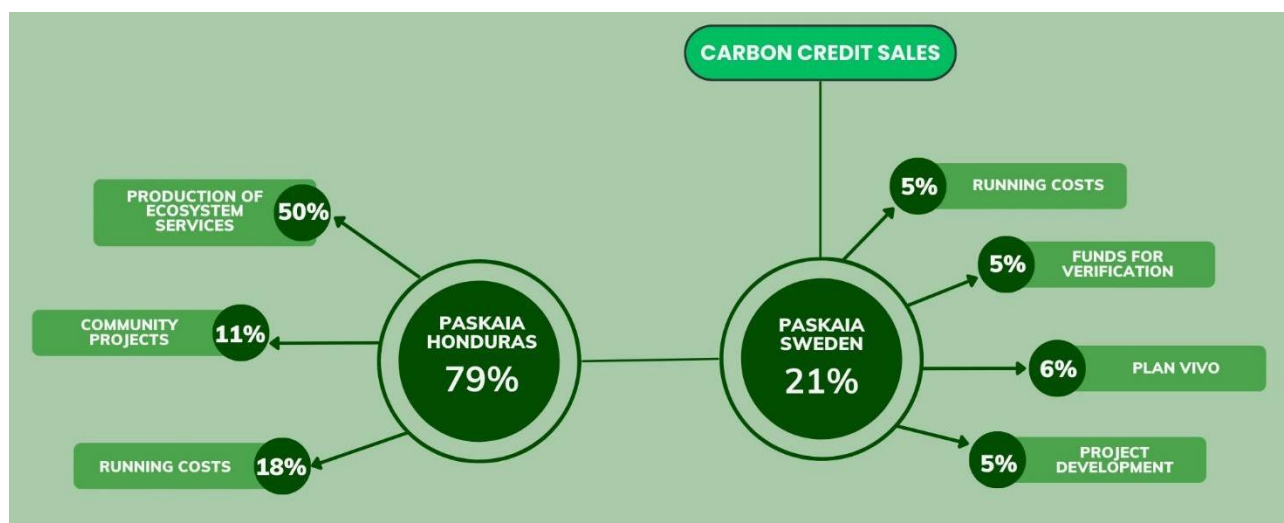


Figure 18 Depiction of the flow of finances within the project

A large proportion (79%) of the total income will be used directly to support activities and actors in Honduras. Paskaia Honduras will retain 18% of this to cover salaries for the field staff, including the coordinator, costs for transport, travel and the office. 50% of the total income will be used to cover forest restoration costs at the community level, including salaries for the community extension officers and local fire managers. 11% of income will be put into a community trust fund that can be used to support local rural development initiatives.

The expenditure of the finances with the community trust fund will be decided upon by the local community. Masta will manage the community consultation process to ensure the decisions taken are considered legitimate and equitable.

Table 20 Breakdown of the payments derived from eco-system services within the community for a 250-hectare plot of restored *Pinus caribaea* Savanna.

An area of 250 hectares USD	2022	2023	2024 - 2028	2029 - 2033	2022 - 2033	2034 - 2047	2022 - 2047
Expenses in the communities:							
- Breakdown of eco-system service Expenditure							
Plant production	4 350	500			4 850		4 850
Reforestation	2 700	300			3 000		3 000
Management	8 500	10 000	8 000	12 000	118 500	40 000	158 000
Meetings and administration	3 600	1 000	1 000	1 000	14 600	12 000	26 600
Fire protection and management	9 100	6 000	4 000	4 000	55 100	6 500	61 600
Investment in infrastructure	1 000	1 000	2 000	2 000	22 000	6 500	28 500
Equipment	1 100	600	3 000	5 000	41 700	20 000	61 700
Community Projects Fund		26 000	10 000		76 000		76 000
Total	30 350	45 400	28 000	24 000	335 750	86 000	421 750

Revenues from the sales of PVC's from 250 hectares at a price of 6,5

USD/PVC **691 000 USD**

61 % of that sum will go to the community, equals **422 000 USD**

9.6 I6 Marketing

Startup funding for the implementation of the project has been provided by NEFCO for the feasibility study and other costs, research has been conducted and funded by Paskaia and Mistra Programme, and initial funding for the first year of intervention activities until revenue from PVCs come in will be supplied by Paskaia Sweden. ZeroMission is presently managing the sales and transactions on behalf

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

of the project. To facilitate this arrangement, we have a license agreement that grants ZeroMission the right to market and sell carbon offset certificates generated by the Moskitia project as part of its customer services. The agreement also stipulates that ZeroMission shall ensure that Plan Vivo certificates sold under this agreement are retired in the register in which they are delivered to ZeroMission. This means they can't be sold again after ZeroMission's clients have used them. Under the agreement, Paskaia must transfer all emission reduction certificates purchased by ZeroMission to its account on Markit. This shall be done annually when certificates are purchased as forwarding contracts, in conjunction with the issuance of the certificates, *or* directly after receipt of each payment by *Paskaia AB*.

9.7 17 Technical Support

Paskaia will be responsible for the technical training required to work with the restoration of the pine savannas. There are already a group of 6 individuals who are trained in fire control and management within Truktsinasta. Additionally, the community extension officers will be trained in the silvicultural techniques used to implement assisted restoration and monitor performance in the pine savannas. This will include plant production techniques such as collecting seeds, preparing plant trays, and sowing. Additionally, they will receive training in preparing restoration sites and planting. Individuals will also be trained in setting up and managing nurseries to produce hardwood species.

In 2022 Paskaia employed two staff from the local community, who are presently being trained to monitor the project's ecosystem service benefits and socio-ecological impacts. As the project scales up, more local community staff will be employed to carry out this function.

10 Part J Benefit Sharing

10.1 J1 PES Agreements

The PES agreements have been developed over several years in which many individual stakeholders and organisations have been involved. The process began during the deliberations between MASTA and Paskaia and the leaderships of all Concejo between 2019 and 2021. The critical components of the proposed agreement were then presented for feedback from the community at general assembly's held in the three territorial councils, where the project would be piloted, Truktsinasta, Wamakklisinasta and Lainasta.

In 2021 a workshop was held between the leadership of MASTA, Truktsinasta, Lainasta and Masta's Lawyer in Puerto Lempira to draft an outline of the PES agreement. The draft of the PES agreement was then presented at three luk luk ³(a public citizen review meeting), each of which attracted between 400-500 participants.

The PES agreement is currently being tested in the villages of Tikiraya, Zona Laka Rio Concejo Lainasta. Tipi Zone, Truktsinasta Council and Auka Zone, Wamakklisinasta Council with the aim of ensuring that it is implementable for those considering entering into an agreement with the project.

Since the agreements did not satisfy all the requirements demanded by Plan Vivo, modifications have been made to comply with all the necessary conditions. The agreements with the territorial councils and foresters are in the process of being signed with both parties and are included in the annexes section of this document

See annex: [Agreements with territorial councils and foresters](#)

10.2 J2 Payments and Benefit-sharing

MASTA Truktsinasta will be compensated with the revenue generated from carbon sales at a rate determined by the carbon market at the time if the results-based payment plan meets conservation targets. If targets are achieved, deposits to the MASTA Truktsinasta community Fund account will be made annually by the payment distribution plan. To ensure equitable and transparent benefit sharing by the project, MASTA Truktsinasta will be required to create a committee to distribute benefits according to the community priorities and the forest management plan.

³ A Luk Luk in the Miskito language refers to community gathering mediated by special food, which supports dialogue and deliberation.

11 Part K Monitoring

11.1 Introduction

The forest and landscape restoration envision by the Gracias a Dios project monitoring is essential for the local community to understand the relationship between project interventions and their imaginaries of a desirable Moskitia landscape. Likewise, monitoring is crucial for external project stakeholders to verify that the project is delivering promised eco-system services and project co-benefits. In short, we need an approach that can service the interests of diverse project stakeholders ie, individual farmers, the local community, project implementors, regional, national and global level stakeholders.

11.1.1 Monitoring and evaluation to support local needs.

To service the needs of the community, the monitoring of the performance of project interventions that aim to restore the degraded *Pinus caribaea* savannah and integrate the mahogany farming system on privately owned land with long leaseholds, indicators have been developed via a co-creation process with the community. These indicators will be used to assess performance towards the collective imaginaries (outcomes) developed as part of the co-creation process.

Numerous studies suggest that examining imaginaries is essential for creating innovative processes (Welshand & Wynne 2013, Felt et al. 2016). In this project, we focus on sociotechnical imaginaries, which are collectively held and publicly performed visions of desirable futures that are institutionally stabilised (Jasanoff & Kim 2015, 4). These imaginaries are also culturally specific and time bound. Understanding the role of imaginaries is crucial in sustainability transitions as it helps stakeholders envision their future and assess risks and opportunities. Imaginaries can play a fundamental role in understanding how heterogeneous stakeholders envision their future and the risks and opportunities in sustainability transitions.

In acknowledging the controversies, uncertainties and power asymmetries that characterise the project site, we elicited and deliberated upon imaginaries, together with a diverse of group from the community in the safe and inclusive settings fostered by the methodologies described in Part E in this PDD. Through analysis of the concepts and ideas embodied in the imaginaries, components were categorised according to Plan Vivo's standards for evaluating project performance. These standards evaluate the project's impact on carbon and non-carbon ecosystem services and its ability to address socioeconomic impacts.

The first imaginary pertains to restoring the degraded Pine Savannah to its original state, supporting diverse and abundant wildlife populations, provision of host bushfoods and traditional medicines, and regulating water flows during dry spells and rainfall. Connected to this imaginary the communities also

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

envision generating income from the sale of Plan Vivos. This will be used to pay a cohort of local firefighters and other local community members to work in restoring the savannah. The income generated from employment will be used by households to purchase seeds to start using land for subsistence agriculture that was abandoned after they lost their seed stock during the Eta and Iota Cyclone in 2020. The remaining income will be placed in a community fund that will be used to improve the livelihoods of all those living with the Concejo.

The second imaginary pertains to the integration of Mahogany into the communities existing farming systems on privately owned land and land with long leaseholds. The community sees the incorporation of Mahogany into their farming system as a wise investment for their children and young adults in the future. Once the trees have matured, they can sell the valuable timber. This investment generates financial capital and encourages the youth to remain in the area due to their vested interest. Households with leaseholds also envision the presence of mahogany plantations as proof of long-term investment on leased land, which will entitle them to transfer their leaseholds to land title. Again, as in the former imaginary, households envision that the income they receive from the sale of Plan Vivos will be used to buy seeds and cultivate their abandoned land to meet their basic subsistence needs.

11.1.2 Using the Sustainability Landscape Index Report on Project impacts

Project monitoring is also important for verifying that the project is delivering the ecosystem services, manifest as PV credits and at the same time providing co-benefits within the environmental and socio-economic realms. It is therefore important to adopt a monitoring approach that serves to convene a diverse set of stakeholders, manifest at local, national, and global See Table 21

Table 21 Forest and Landscape restoration scales and stakeholders (Reyter et al. 2020)

Scale	Objectives	Audiences	Example indicators
Global	- Measure progress relative to a globally consistent index of improved/degraded land cover - Provide international context and “discover” new successes and lessons	- Bilateral and multilateral donors - International non-governmental organizations	- No. of hectares restored towards Sustainable Development Goal 15.3, the Bonn Challenge, the NYDF and other global targets - Comparative assessment of positive, neutral and negative progress on a jurisdictional scale
National/Landscape*	- Measure progress towards the goals specified in an FLR strategy or shared vision in a landscape - Provide data for FLR zoning and spatial planning and resultant investment plan	- National and subnational governments - Non-governmental organizations - Regional initiatives	- No. of hectares with increased tree cover - Assessment of positive, neutral and negative progress at the landscape scale
Project	- Measure progress within a specific project boundary relative to the goals or tree-cover targets outlined at the project planning stage - Provide context for the “intentionality” of FLR and for the level of investment	- Project funders - Project implementers - Corporations - Local communities	- No. of trees planted or regenerated, and survival rates - Estimated carbon sequestration (carbon-dioxide-equivalent per year) - Risks to trees and jurisdictional trends

Given that project site exhibits complex interactions within and between socio-ecological and biophysical components across a relatively large geographical space, it is important the monitoring is implemented at the landscape scale. According to Minang et al. (2014) a landscape approach refers to

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

a given starting point (baseline), which allows one to see the bigger picture and consider alternative configurations of interests, goals, and land use actions within a particular space (the landscape). This approach is better in achieving multiple goals and objectives, leading to a common desired multifunctional state. The landscape approach demonstrates the benefits of using a larger scale, where the local meets the global, accounting for both individual units within the landscape (both social and biophysical) and the emergent patterns and processes.

In recognition that project will mediate a change at a landscape scale we have therefore chosen a framework that is holistic enough to support feedback, learning and decision making at the project scale and the verification and reporting needs at national and global scales. The Sustainability Index for Landscape Restoration (SILR) is a framework for monitoring landscape restoration. To test the methodology, the World Resources Institute worked with the Government of El Salvador, the Regional Program for Research on Development and Environment (PRISMA), and the German Corporation for International Cooperation (GIZ), to create a SILR in a 1200 square kilometre landscape (Cristales et al. 2020). These organisations are now working towards enabling SILR in other parts of Latin America including Honduras.

SILR involves creating an index that considers the restoration process's biophysical and socio-economic impacts. The index score ranges from 0 to 1, reflecting how well the project achieves its goals. SILR comprises eight indexes that monitor different aspects of restoration impact within the context of climate change and climate adaptation (see figure). We have chosen to develop our monitoring plan using 4 Indexes. The criteria we used for selecting these specific indexes was based on the following:

- 1) capacity to elicit data that supports enabling the visions embodied in the communities' imaginaries.
- 2) capacity to support decision-making and planning connected to the project implementation.
- 3) capacity to elicit data that will be used in reporting and verification of the project.
- 4) Cost-effectiveness.
- 5) ease by which the local community can participate in its monitoring and evaluation.

Using these criteria, we selected the Carbon Equivalent Index and the Landscape Biodiversity Index as our ecosystem services indicators. We have also selected the Additional Workday Index and the Water Quality Index as our socio-economic indicators. Additionally, we included an additional socio-economic indicator that is not part of SILR but is crucial in relation to community imaginaries: the amount of productive land owned or borrowed.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

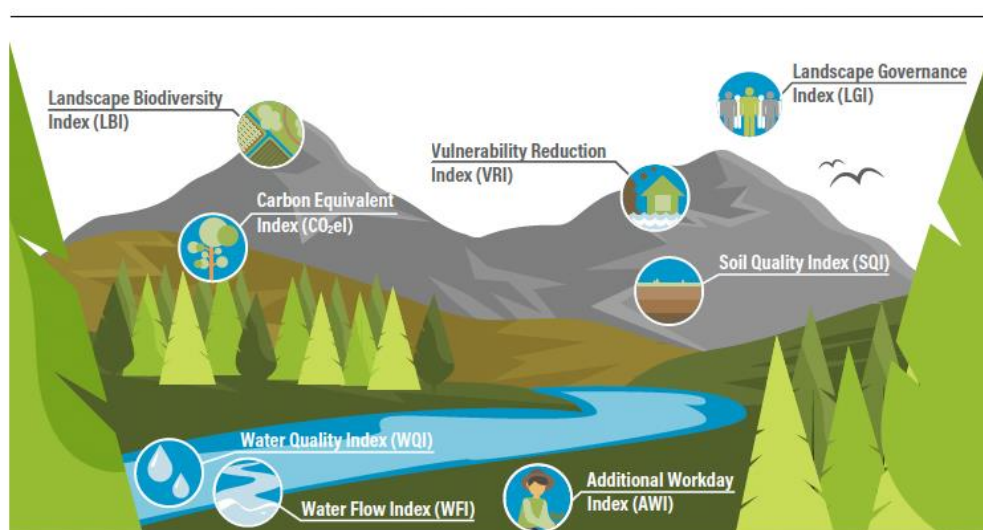


Figure 19 Components of the Sustainability Index for Landscape Restoration source (Cristales et al. 2020)

11.2 K Ecosystem Service Benefits

11.2.1 Carbon

Capturing CO₂ through the carbon sequestration in forest biomass in both the project interventions and generating financial capital from the sale of Plan Vivo's, featured in the imaginaries as a means to meet the communities' basic subsistence needs. Section G describes how the CO₂ will be measured in the forest biomass. The monitoring plan for carbon will be implemented using two indicators: the carbon equivalent index and the increase in *Pinus caribaea* on degraded savannah sites. These indicators are summarized in the table below. A more detailed description of the methodologies and monitoring plan associated with these indicators can be found in the section below.

Table 22 Indicator for Carbon related Ecosystem Service Benefits

Indicator	Baseline Year	Year 20	Performance Measures	Method
Carbon Equivalent Index for savanna restoration sites and Mahogany plantations	The minimum value is the baseline and represents the carbon equivalent if no restoration or plantation actions were taking place	The maximum value is the amount of carbon equivalent if the entire project area in hectares is restored.	The gain of stored carbon equivalent will be calculated using the location and area of the hectares being restored. The number of restored hectares will be multiplied by the analysed period in years.	Primary information: inventory survey with plots in the project site.

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Carbon Dioxide Sequestration in the Pine Savannah	As a baseline, the amount of CO ₂ stored in the existing trees in the savannah will be quantified (a pre-sampling identified that there are 44 trees and 28 tons of CO ₂ /ha).	After the savanna restoration cycle has been completed, it will be possible to have a population of more than 500 trees per hectare and a cumulative total of 311 Ton-CO ₂ /ha.	The total amount of CO ₂ captured will be equal to the average amount sequestered per hectare times the number of hectares that are under the regime of areas under restoration or areas of carbon sequestration.	The evaluation or monitoring will be carried out every year, a network of permanent plots will be used to monitor the increase in CO ₂ captured.
Carbon Dioxide Sequestration in Mahogany Plantations	As a baseline, the amount of CO ₂ stored in forested areas and in traditional agricultural use is considered. Forest recovery rate at country level. ENF-ICF-2017-p. 60 (0.47 ton-C/ha)	After completing the CO ₂ sequestration cycle, it will be possible to have a population of 400 trees per hectare and a cumulative total of 500 Ton-CO ₂ /ha.	The total amount of CO ₂ captured by plantations will be equal to the average amount of CO ₂ sequestered/hectare times the number of hectares reforested.	Monitoring will be carried out every year permanently, permanent plots will be established for each planted hectare to monitor the increase in CO ₂ .

11.2.1.1 Monitoring using the Carbon Equivalent Index

The carbon equivalent index refers to the impact of ecosystem restoration actions aimed at sequestering carbon within the savannah and projected Mahogany plantations on the balance of equivalent carbon. The is given by:

$$CO_2eI = \left(\frac{\text{Current } CO_2e \text{ gain} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}} \right) i/ha$$

To calculate CO₂e, it is necessary to determine the minimum and maximum values. The maximum value is the amount of carbon equivalent if the entire project area in hectares is restored. The minimum value is the baseline and represents the carbon equivalent if no restoration or plantation actions occurred (PRISMA, 2019). The CO₂e gain is given by the amount of CO₂e attributed to the two project interventions within a given time:

$$\text{Gain } CO_2e = \text{Year}_{\text{study}} - \text{Year}_{\text{base}}$$

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

11.2.1.2 Our method for calculating CO₂e.

Maximum value:

A current land use map identifies the areas in the project site that need restoration. The projected number of restored hectares is then calculated. The amount of carbon captured per year is determined using the "equivalent carbon balance per hectare" metric. The maximum value of equivalent carbon stored at the end of the period can be obtained by multiplying this value by the total number of years that the restoration process lasts. The "equivalent carbon balance per hectare" is a factor that is expressed in TCO₂e/ha/year and allows us to estimate the amount of carbon captured per hectare per year. See Table 23

Table 24 below that present the formulas for calculating carbon per hectare for a period of 20 years (to obtain the "equivalent carbon balance per hectare" the total carbon/ha/20 must be divided by 20 years to obtain a CO value²/ha/year) for *Pinus caribaea* and *Swietenia macrophylla* in Honduras (Rodriguez, 2023).

The Minimum Value

The minimum value represents the amount of carbon equivalent stored if restoration actions were not carried out, which is theoretically 0 (zero).

11.2.1.3 The current gain of stored Carbon

The current gain of stored equivalent carbon will be calculated using the location and area of the restored hectares. The number of restored hectares will be multiplied by the number of years of restoration, and this will determine the amount of carbon stored during the analyzed period. SilvaPlan (see Figure 20), a program that generates a value for carbon capture per hectare, will be used to process this data (SilvaPlan 2017).

Table 23 CO2 calculation table for *Pinus caribaea* over 20 years

Calculations and projections for <i>Pinus caribaea</i>							
Age	Density	Diameter	Height	Volume	Biomass	Coal	CO ₂
Years	Trees/ha	DBH (cm)	Ht (m)	m ³ /ha	ton/ ha	ton/ha	ton/ ha
1	1414	0.1	0.0	0.00	0.0	0.0	0.0
2	1367	1.5	0.6	0.07	0.2	0.1	0.4
3	1321	3.7	2.1	1.50	3.0	1.5	5.5
4	1278	5.9	3.9	6.88	10.9	5.5	20.0
5	1235	7.9	5.7	17.03	23.4	11.7	43.0
6	1194	9.5	7.3	30.91	38.7	19.4	71.1
7	1154	10.9	8.7	47.00	55.1	27.5	101.0
8	1116	12.1	10.0	63.98	71.2	35.6	130.7
9	1079	13.1	11.0	80.88	86.5	43.3	158.7
10	1043	14.1	12.0	97.07	100.5	50.3	184.5
11	1008	14.9	12.8	112.18	113.1	56.6	207.6
12	975	15.6	13.6	126.01	124.3	62.1	228.0
13	942	16.2	14.3	138.48	134.0	67.0	245.8
14	911	16.8	14.9	149.57	142.3	71.2	261.2
15	881	17.3	15.4	159.31	149.4	74.7	274.2
16	852	17.8	15.9	167.78	155.4	77.7	285.1
17	823	18.2	16.3	175.06	160.3	80.1	294.1
18	796	18.6	16.7	181.22	164.2	82.1	301.4
19	769	19.0	17.1	186.36	167.4	83.7	307.1
20	744	19.3	17.4	190.56	169.7	84.8	311.4

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

Table 24 Explanation of the equations used to calculate CO2.

Calculations and projections for <i>Pinus caribaea</i>								
1	Age	Density	Diameter	Height	Volume	Biomass	Carbon	CO2
2	Years	Trees/ha	DAP (cm)	Ht (m)	m3/ha	ton/ ha	ton/ha	ton/ ha
4	1	1414	0.1	0.0	0.00	0.0	0.0	0.0
5	2	1367	1.5	0.6	0.07	0.2	0.1	0.4
6	3	1321	3.7	2.1	1.50	3.0	1.5	5.5
7	4	1278	5.9	3.9	6.88	10.9	5.5	20.0
8	5	1235	7.9	5.7	17.03	23.4	11.7	43.0
9	6	1194	9.5	7.3	30.91	38.7	19.4	71.1
10	7	1154	10.9	8.7	47.00	55.1	27.5	101.0
11	8	1116	12.1	10.0	63.98	71.2	35.6	130.7
12	9	1079	13.1	11.0	80.88	86.5	43.3	158.7
13	10	1043	14.1	12.0	97.07	100.5	50.3	184.5
14	11	1008	14.9	12.8	112.18	113.1	56.6	207.6

Marvin Rodriguez:
 $CO_2 = CR * 3.67$
 Donde:
 CO_2 = Dióxido de carbono capturado (ton/ha)
 CR = Carbono total retenido (ton/ha)
 K = Constante (3.67)



Figure 20 The SilvaPlan program interface

11.2.1.4 Data Sources

- Primary information: inventory survey with plots in the project site.
- SilvaPlan program installed on the computer.
- Formulas Excel documents, attached in [annex](#).

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

11.2.1.5 Interpretation of Results

Quality	ICO 2
Excellent	0.75 - 1
Very good	0.51 - 0.75
Good	0.26 - 0.50
Regular	0.11 - 0.25
Deficient	0 - 0.10

11.2.1.6 Reporting

See the [Carbon Equivalent Index](#) Annex for the data recording template.

11.2.1.7 Monitoring frequency

- Annual

11.2.1.8 Follow-up duration

- 20 years

11.2.1.9 Required resources and capacity

- Tools for inventory gathering: diameter tape, clinometer, GPS, etc.
- Forestry technician and at least two assistants for collecting data in the field.
- Computer, Silvaplan Software installed on the computer.
- Economic resources that cover costs of mobilization, acquisition of tools or other necessary costs that will be described in a budget. Said budget will be included in the reports that PASKAIA periodically provides to Plan Vivo. See the attached document .

11.2.1.10 How communities will participate in monitoring

- Collection of field data, since they will have the opportunity to participate in the collection of inventories.
- Socialization of information, See attached document
- Data processing and information validation: to involve the communities more, people will be trained so that they can understand and process the information and thus they can validate the

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

process before the community.

11.2.1.11 How monitoring results will be shared and discussed with participants

- See attached document

11.2.2 Environment and Biodiversity

Abundant bushfood (including fish) and wildlife, traditional medicine, and the health of the rivers and streams underpin the co-created imaginary of the restored pine savannah. These can be considered as Plan Vivo's environmental and biodiversity standards.

11.2.2.1 Indicators: Monitoring using a Landscape Biodiversity Index

The Landscape Biodiversity Index (LBI) is a composite index that assesses the landscape's composition, configuration, and fragmentation, including the morphology of its elements and the connectivity between them (Cristales et al. 2020). Decades of research within landscape ecology have established that there is a strong relationship between connectivity and species richness, and habitat integrity. Owing to the rather slow change in Biodiversity, monitoring will occur every five years for the duration of the project period.

The composite includes five landscape indices:

- PAFRAC: Perimeter-Area Relationship index
- PLAND: Percentage of Landscape
- NP: Number of Fragments or Patches
- LPI: Largest Patch Index
- CONTAG: Contagion Index

Where:

$$LBI = (PAFRAC + PLAND + NP + LPI + CONTAG) / 5 \text{ (Cristales et al. 2020)}$$

The LBI takes values between 0 and 1. The maximum value is 1 and indicates that the landscape is capable of hosting high biodiversity. As the value decreases towards 0, the landscape's capacity to host high biodiversity decreases (MARN, 2018).

The equations to calculate the five different indices can be found below:

11.2.2.1.1 Indicator 1 Perimeter area relationship index (PAFRAC)

PAFRAC is equal to 2 times the logarithm of the patch perimeter (m) divided by the logarithm of the patch area (m²); the perimeter is adjusted to correct the deviation of the trace in the perimeter. (PRISMA, 2018)

Where:

$$PAFRAC = \frac{2 \ln (.25 p_{ij})}{\ln a_{ij}}$$

- pij: Perimeter (m) of patch ij.
- aij: Area (m²) of the park ij.

11.2.2.1.2 Indicator 2: Percentage of landscape (PLAND)

PLAND is equal to the sum of the areas (m²) of all patches of the corresponding patch type, divided by the total landscape area (m²), multiplied by one hundred; In other words, PLAND is equal to the percentage of the landscape composed of the corresponding patch type. (PRISMA, 2018)

$$PLAND = P_i = \frac{\sum_{j=1}^n a_{ij}}{A} (100)$$

Where:

- Pi: Proportion of landscape occupied by patch type (class) i.
- aij: Area (m²) of the park ij.
- A= Total area of the landscape (m²)

11.2.2.1.3 Indicator 3: Number of fragments (NP)

The number of fragments of a particular type of fragments, it is a simple measure of the extent of subdivision or fragmentation of the fragment type. (PRISMA, 2018)

Where:

$$NP = n_i$$

- ni: number of fragments in the landscape of fragment type (class) i.

11.2.2.1.4 Indicator 4 Largest patch index (LPI)

LPI is equal to the area (m²) of the largest patch of a given patch type, divided by the total landscape area (m²), multiplied by 100; In other words, LPI is equal to the percentage of the landscape comprised by the largest patch. (PRISMA, 2018r)

$$LPI = \frac{\max_{j=1}^n (a_{ij})}{A} (100)$$

Where:

- n = number of patches in the landscape
- a_{ij} = area (m²) of the park ij
- A = total landscape area (m²)

11.2.2.1.5 Indicator 5 Contagio Index (CONTAG)

CONTAG considers all patch types present in an image, including any present at the edge of the landscape, if present, and considers similar adjacencies (i.e. cells of patch types adjacent to cells of the same type). For this, it is recommended to use the FRAGSTATS program, which is another method of calculating each of the subindices explained above. (PRISMA, 2018).

Where:

$$CONTAG = \left[1 + \frac{\sum_{i=1}^m \sum_{k=1}^m \left[P_i \circ \frac{g_{ik}}{\sum_{k=1}^m g_{ik}} \right] \circ \left[\ln \left(P_i \circ \frac{g_{ik}}{\sum_{k=1}^m g_{ik}} \right) \right]}{2 \ln(m)} \right] (100)$$

- P_i = proportion of landscape occupied by patch type (class) i.
- g_{ik} = number of adjacencies (junctions) between pixels of patch type (classes) i and k based on the double-count method.
- m = number of patch types (classes) present in the landscape, including the edge of the landscape if any.

11.2.2.2 Method: Calculating the landscape biodiversity index using FRAGSTATS

FRAGSTATS is a spatial pattern analysis program for quantifying the structure (i.e. composition and configuration) of landscapes. The landscape subject to analysis is defined by the user and can represent

any phenomenon. FRAGSTATS simply quantifies the spatial heterogeneity of the landscape as represented in a categorical map. (Cushman, 2002).

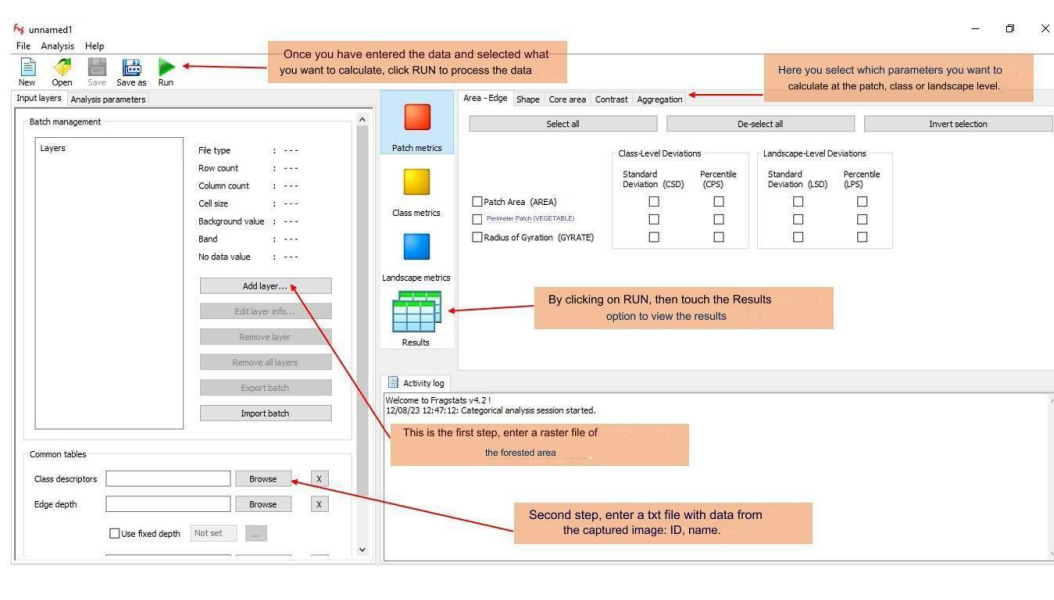


Figure 22 The FRAGSTATS user interface

The FRAGSTATS program analyzes raster files; categorized maps or stand maps generally. This allows us to elicit the parameters required to calculate the LBI. The program can perform analysis at the patch level, at the class level, and at the landscape level, as shown in **Figure 21**. To obtain sub-indices within the LBI such as PAFRAC, PLAND, NP, LPI and CONTAG, it is necessary to use TIF images that cover the project site.

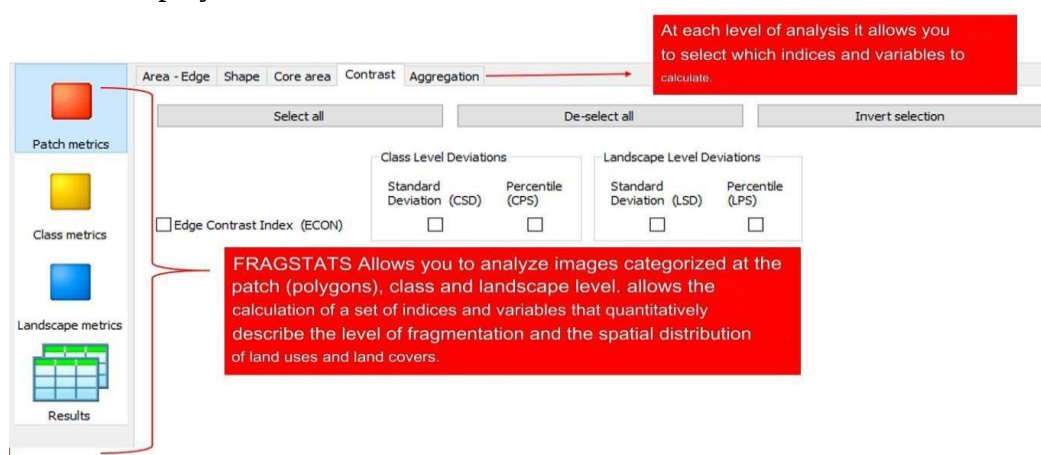


Figure 23 The levels of image analysis that can be used in FRAGSTATS

All the data used in the project must be properly mapped with an appropriate name and ID in its attribute table. Additionally, this data must be written in the same format within a text file. To obtain TIF images,

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

which are satellite images with the required resolution, you can download them for free from the internet. If necessary, we will also cross-reference the satellite images with images captured by the project's drone during aerial photography. These images will also be verified for accuracy. We will involve various members of the community in the ground truth training to help them understand the relationship between the project interventions and landscape biodiversity.

11.2.2.3 Example of applying FRAGSTATS in a project pilot site



Map 6 Standing map from 2022 of an intensive protection zone in Truktsinasta.

We have processed this file as a raster file in FRAGSTATS. After entering this file, we chose to analyse it at the class and landscape levels. See Figures 23, 24, 25, and 26, which depict the subindices chosen to calculate the LBI.

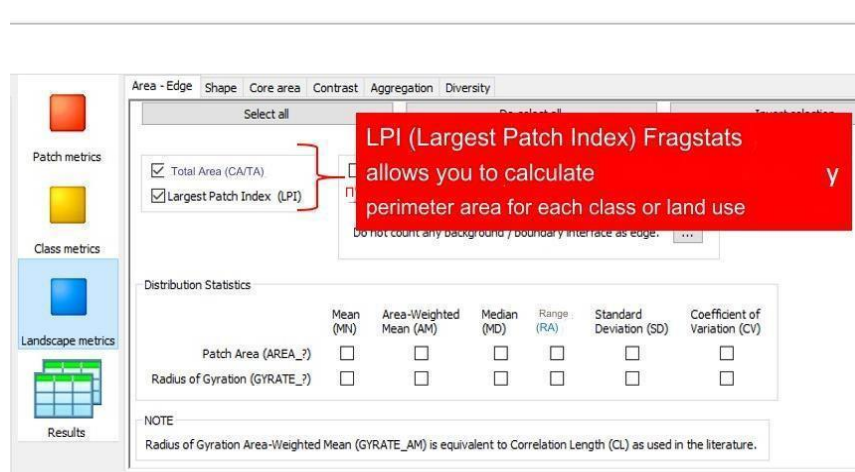


Figure 24 Calculation of LPI at the landscape level

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

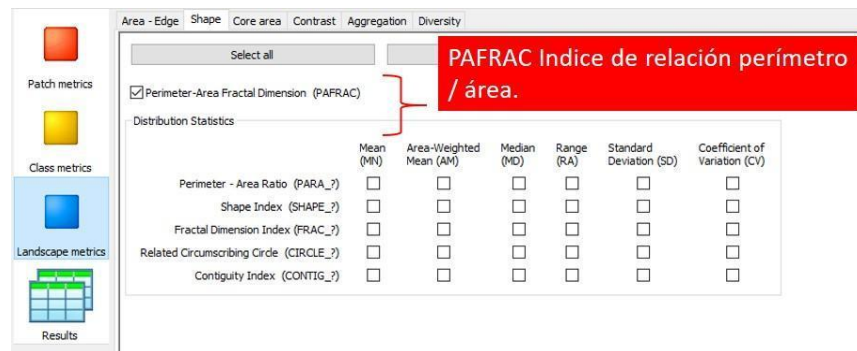


Figure 25 PAFRAC calculation at landscape level.



Figure 26 Calculation of NP and CONTAG at landscape level.

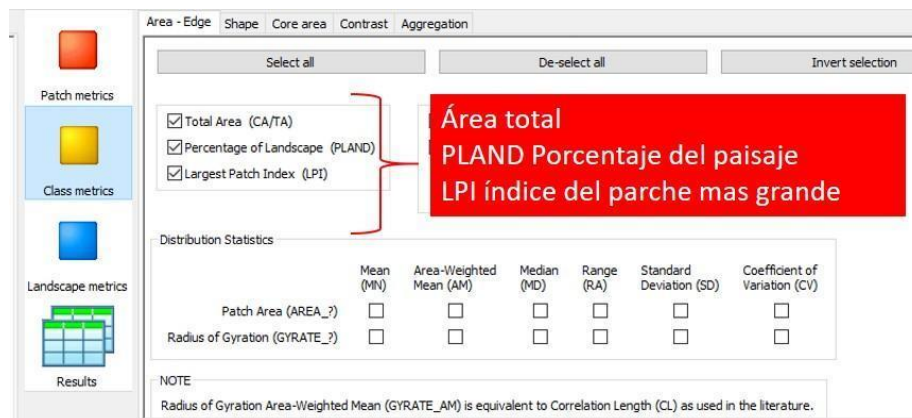


Figure 27 PLAND calculation at class level.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

In the Figures 27 and 28 you can see the results from the analysis in FRAGSTATS

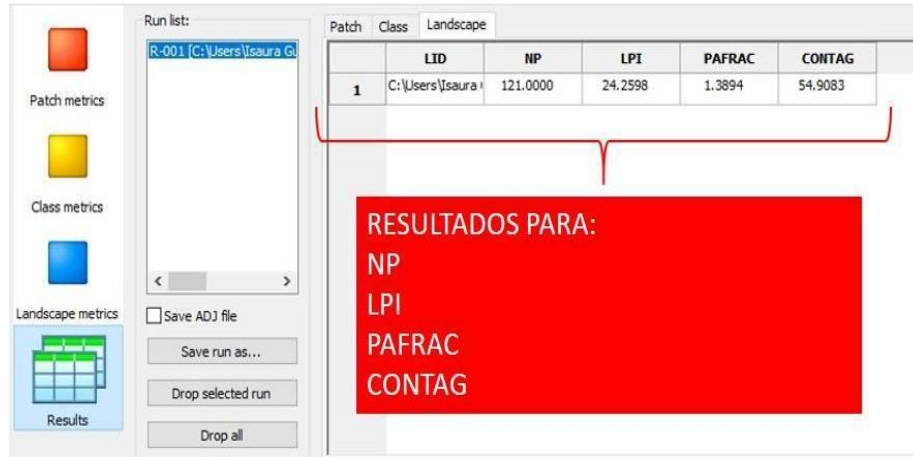


Figure 28 Results at Landscape Level

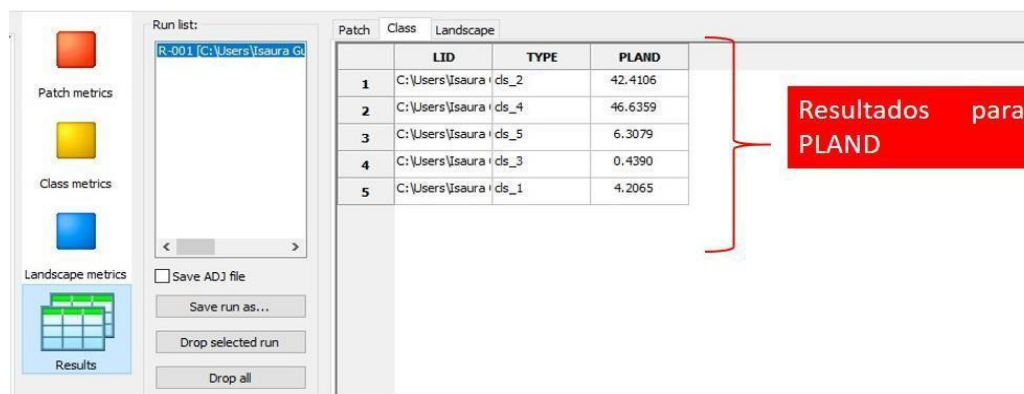


Figure 29 Results using classes.

11.2.2.4 Interpretation of the Results

The sub-indices are of varying ranges and must be analyzed. In the bibliographic references, a link to the document is attached where the conversion of each subindex into acceptable values for the calculation of the IBP is shown and explained (each subindex must have a value between 0 and 1) (PRISMA, 2018)

Once the five indices have been calculated and normalized, the PPI can be calculated by averaging the five values. See Table 25, which has converted the values of the Contagion index so they can be included in the calculation of the overall LBI.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Table 25 Example of how convert values of the contagion index (CONTAG) to a value between 0 and 1

Calculation methodology									
Through the CONTAG program, it considers all patch types present in an image, including any present at the edge of the landscape, if present, and considers similar adjacencies (i.e. cells of patch types adjacent to cells of the same type).									
Range: $0 < \text{COUNT} < 100$									
Normalization by ranges of the Contagion Index (CONTAG)									
Deficient		Regular		Well		Very good		Great	
CONTAG	Norm.	CONTAG	Norm.	CONTAG	Norm.	CONTAG	Norm.	CONTAG	Norm.
0.0 a 20	0 a 0.2	21 a 35	0.21 a 0.4	36 a 55	0.41 a 0.6	56 a 70	0.61 a 0.8	71 a 100	0.81 a 1.0
0.0 – 5	0.00 - 0.05	21 - 23	0.21 - 0.25	36 - 40	0.41 - 0.45	56 - 58	0.61 - 0.65	71 - 75	0.81 - 0.85
6 – 10	0.06 - 0.1	24 - 26	0.26 - 0.30	41 - 45	0.46 - 0.50	59 - 62	0.66 - 0.70	76 - 85	0.86 - 0.9
11 – 15	0.11 - 0.15	27 - 30	0.31 - 0.35	46 - 50	0.51 - 0.55	63 - 66	0.71 - 0.75	86 - 90	0.91 - 0.95
16 – 20	0.16 - 0.2	31 - 35	0.36 - 0.40	51 - 55	0.56 - 0.60	67 - 70	0.76 - 0.8	91 - 100	0.96 - 1.00

Reporting from the monitoring of Landscape Biodiversity Index will occur at five-year intervals.

11.2.2.5 Data Reporting

[See Annex](#)

11.2.2.6 Monitoring frequency

- Presentation of reports every 4 years.

11.2.2.7 Follow-up duration

- 20 years

11.2.2.8 Required resources and capacity

- Forestry technician or other type of GIS specialist to map the study area.
- Computer, programs such as ArcMap, QGIS, Fragstats or others for the analysis of biodiversity in the study area.
- Financial resources used will be described in a budget. Said budget will be included in the reports that PASKAIA periodically provides to Plan Vivo. See the attached document.

11.2.2.9 How communities will participate in monitoring

- Socialization of information, See attached document

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

- Data processing and information validation: to involve the communities more, people will be trained so that they can understand and process the information and thus they can validate the process before the community.

11.2.2.10 How monitoring results will be shared and discussed with participants

- See attached document

11.3 Socio-economic Impacts

As exemplified in the imaginaries, communities view the project as a means to promote rural development, secure land titles, and reduce their vulnerability to socio-ecological shocks. Three indicators have been created to align project development with the community's vision of a favourable future for socio-economic growth. The socio-economic impact will be monitored and compared with the baseline in **Table 27**. The project will monitor socio-economic impact indicators annually throughout the project period.

11.3.1 Indicators

11.3.1.1 Indicator 1 Water Quality Index (WQI)

The Water Quality Index (WQI) is a measure used to determine the quality of surface water bodies. In the project site, the rivers will be evaluated based on their condition in relation to the development of aquatic biodiversity and fishery resources. These resources contribute significantly to the livelihoods of the people. Additionally, the assessment will determine the suitability of the river water for potable water and recreational activities such as swimming. The index uses a maximum value of 1 for optimal conditions and decreases as pollution in the water course being monitored increases (Cristales et al. 2020).

First derived from the Brown Index formula ([Brown et. al. 1971](#)), the WQI calculation uses 9 parameters.

$$WQI_s = \sum_{i=1}^9 (Sub_i * w_i)$$

Where:

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

- W_i refers to the relative weights assigned to each parameter (Sub_i), and weighted between 0 and 1, in such a way that the sum is equal to one.
- Sub_i : Subscript of parameter i .

The parameters used to measure WQI, including the sub-index weighting and unit of analysis can be found in Table 26.

Table 26 Parameters used to calculate the water quality index (WQI)

i	Sub_i	W_i	
1	Fecal coliforms	0.15	NMP/100 mL
2	pH	0.12	pH
3	Biodiversity Oxygen Demand	0.1	BOD5 in mg/L
4	Nitrates	0.1	NO3 in Mg/L
5	Phosphates	0.1	PO4 in mg/L
6	Temperature change	0.1	°C
7	Turbidity	0.08	FAU
8	Total dissolved solids	0.08	mg/L
9	Saturation of dissolved oxygen	0.17	mg/L

Each parameter of the water body will be measured, and these values will be converted to usable values for the index and then multiplied by its weighted percentage according to the previous table. In the bibliographies, a link to a website document is attached detailing how to convert each value ([Corrales L. Fung E., 2017](#))

11.3.1.2 Data Source

To calculate the Water Quality Index (WQI), it is essential to measure certain parameters in the field. In the savannah areas, we will sample the outlets of the micro-basins that are located within the protected area. Additionally, we will use the data from the Aguas de Honduras platform as a reference and compare it with the data collected from the local micro-basins.

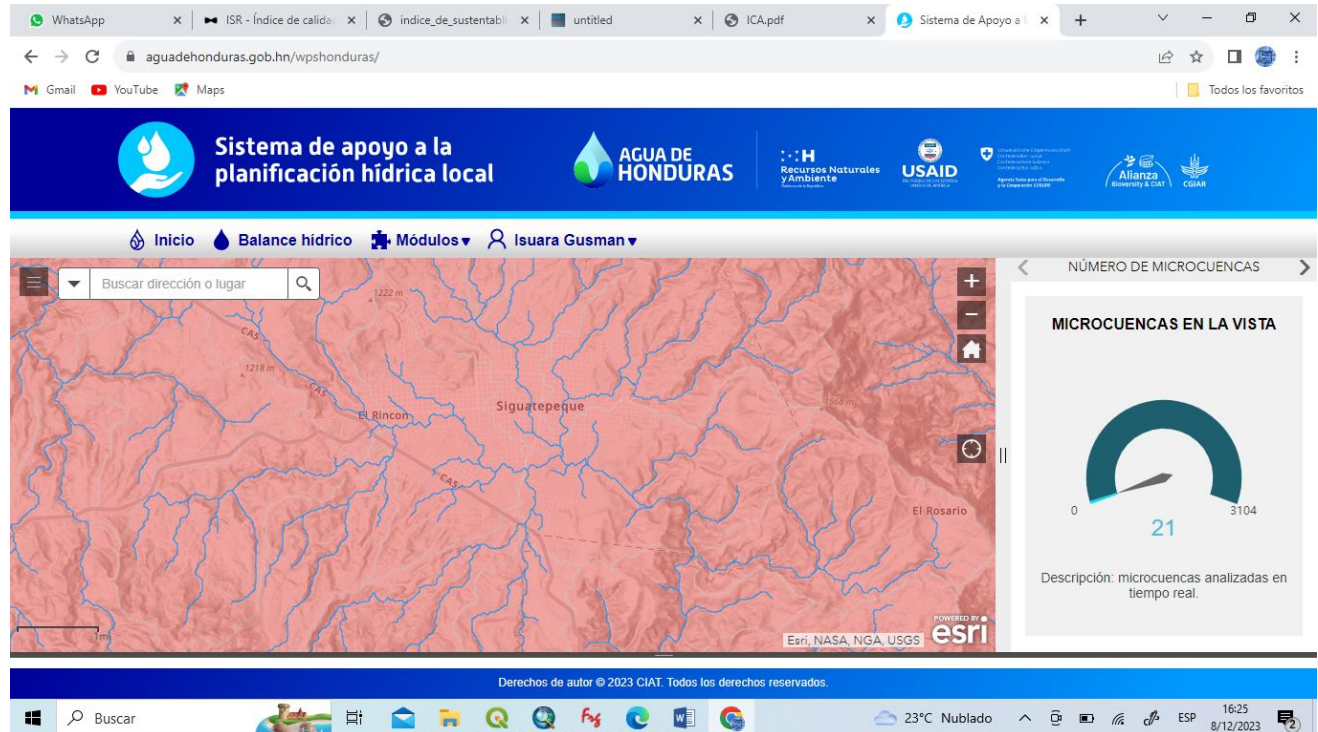


Figure 30 Interface of the Aguas de Honduras platform

The Aguas de Honduras platform is a tool that combines various types of information about the country including climate, soils, hydrometry, and land cover/use. It uses scientific methods to estimate the monthly water balance at a micro-basin level, which helps in determining the availability of water. Furthermore, the platform provides access to data on physical, chemical, and bacteriological parameters that are available on the micro-basins. You can learn more about the platform by visiting the Aguas de Honduras page: <https://aguadehonduras.gob.hn/>

Additionally, the bibliography includes a link to a document available on the same platform. This document explains the parameters that evaluate the quality of water in micro basins and provides the necessary information (Chavez et al.). A link is attached to an instructional manual for collecting water quality data, which is available on the Aguas de Honduras platform (Valencia et al, 2023).

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

Información Cuerpo de Agua

ID 0510099-07	Nombre Sistema barrio san juan	Temporalidad Permanente
Tipo Superficial	Clase Quebrada	Id Drenaje 105671

Información Fuente de Agua

ID 0510099-07-01	Nombre Obra toma pacayal	Sito de Toma de Agua Vertiente/Nacimiento
Latitud (GD) 14.2116	Longitud (GD) -87.919476	

Información de Análisis de Calidad de Agua

Fecha toma Muestra	pH	Conductividad (µs/cm)	Sólidos disueltos totales (mg/L)	Salinidad (ppt)	Color verdadero (mg/L)	Turbiedad (UNT - cm secchi)	Temperatura (°C)	Cloro libre residual (mg/L)	Oxígeno disuelto (mg/L)	DBO5 (mg/L)	DQO
2023-02-16	7.2	11	7.37	0.0055							

Derechos de autor © 2023 CIAT. Todos los derechos reservados.

Figure 31 Record of data on water quality in the micro-basins. Aguas de Honduras Platform

Información Cuerpo de Agua

ID 0510099-07	Nombre Sistema barrio san juan	Temporalidad Permanente
Tipo Superficial	Clase Quebrada	Id Drenaje 105671

Información Fuente de Agua

ID 0510099-07-01	Nombre Obra toma pacayal	Sito de Toma de Agua Vertiente/Nacimiento
Latitud (GD) 14.2116	Longitud (GD) -87.919476	

Información de Análisis de Calidad de Agua

Fecha toma Muestra	pH	Conductividad (µs/cm)	Sólidos disueltos totales (mg/L)	Salinidad (ppt)	Color verdadero (mg/L)	Turbiedad (UNT - cm secchi)	Temperatura (°C)	Cloro libre residual (mg/L)	Oxígeno disuelto (mg/L)	DBO5 (mg/L)	DQO
2023-02-16	7.2	11	7.37	0.0055							

Derechos de autor © 2023 CIAT. Todos los derechos reservados.

Figure 32 Example of measuring water quality parameters in a micro-basin of Siguatepeque, Comayagua. The availability of information will depend on the monitoring in the micro-basin under study

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

11.3.1.3 Communication

Quality	WQI	Interpretation
Excellent	0.91-1	The waters are capable of having a high diversity of aquatic life. In addition, water is also convenient for all forms of direct contact including potable drinking water.
Good	0.71-0.90	Waters are capable of facilitating aquatic diversity. In addition, water is also convenient for all forms of direct contact with it.
Regular	0.51-0.70	The waters generally have less diversity of aquatic organisms and have frequently increased algae growth.
Poor	0.26-0.50	The waters can only support a low diversity of aquatic life and are likely experiencing problems with pollution.
Bad	0-0.25	The waters can only support a limited number of aquatic life forms, present abundant problems and would not normally be considered acceptable for activities that involve direct contact with it, such as swimming.

Source ([MARN, 2018](#))

11.3.1.4 Monitoring frequency

- Quarterly field measurement
- Sending annual reports to Plan Vivo, including the 3 measurements made per year.

11.3.1.5 Follow-up duration

- 20 years

11.3.1.6 Required resources and capacity

- Kit with tools and materials for measuring water quality in the rivers found in the study area.
- Forestry technician and at least two assistants for collecting information in the field.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

- Computer, for generating reports.
- Economic resources that cover costs of mobilization, acquisition of tools or other necessary costs that will be described in a budget. Said budget will be included in the reports that PASKAIA periodically provides to Plan Vivo. See attached document.

11.3.1.7 How communities will participate in monitoring

- Socialization of information, See attached document
- Data processing and information validation: to involve the communities more, people will be trained so that they can understand and process the information and thus they can validate the process before the community.

11.3.1.8 How monitoring results will be shared and discussed with participants

- See attached document

11.3.2 Indicator 2 Number of additional wage days generated by the restoration project.

According to the socio-economic assessment, the vegetables and grains produced in households' home gardens usually comprise a significant part of their subsistence needs. In 2020, Eta and Iota destroyed these home gardens before the crops could be harvested and the seeds saved for future planting. As a result, most households are still struggling to recover from the hurricane because they lack seeds to grow new crops. However, the assessment also showed that households with a member working in the fire brigade are using their income to buy seeds. Based on this finding, we can conclude that the number of community members employed and earning income from the project is an important socio-economic indicator.

In relation to this indicator, we will once again refer to the Sustainability Index for Landscape Restoration. We will utilize the Additional Wage Index (AWI), which is a measure of the increase in income for the populations involved in restoration activities. AWI calculates the additional wages generated by the different restoration actions. ([MARN, 2018](#))

It is given:

$$AWI = \frac{(\text{Current additional days} - \text{Minimum value})}{(\text{Maximum value} - \text{Minimum value})}$$

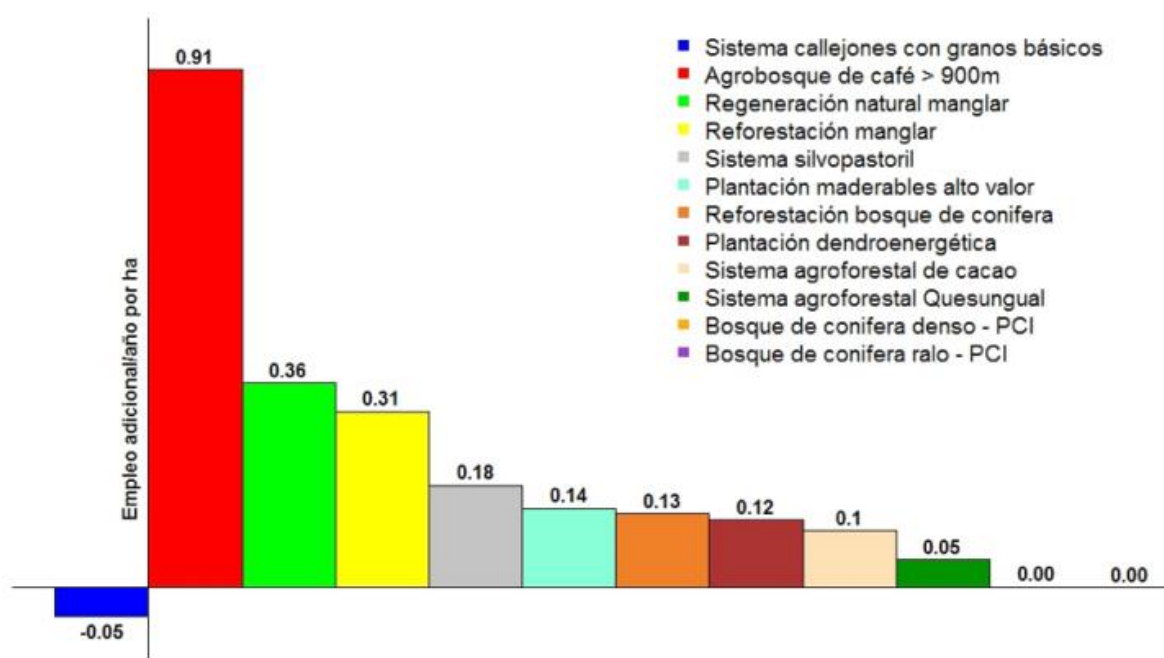
*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

- Current Additional Day: Number of additional days generated from the base year.
- Minimum value: Represents the number of days that would be generated if the restoration actions were not carried out; theoretically, it is 0.
- Maximum value: It is the maximum number of days that would be generated if the entire proposed area is restored.

11.3.2.1 Method and Communication

To calculate the number of extra days for a given period, you need to multiply the number of hectares reported for each restoration practice by its corresponding factor and then multiply this product by the number of years the practice has been carried out ([Nello et al., 2019](#)),

To calculate the days, we considered two analysis periods. The first year is related to the implementation of the restoration, while the second to twentieth year is for maintaining the restoration. [Nello et al. \(2019\)](#) expressed the values in full-time employment, assuming an average of five working days per week for 52 weeks in a year, as cited by the Secretary of Labor and Social Security in 2009.



Graph: Job creation in year 1 (implementation) for each restoration action per ha. Source: ([Nello et al, 2019](#))

Records will be collected by the project manager and included in the annual project reporting.

11.3.2.2 Monitoring frequency

- Presentation of annual reports to Plan Vivo

11.3.2.3 Follow-up duration

- 20 years

11.3.2.4 Required resources and capacity

- Computer for generating reports.
- Economic resources that cover costs of mobilization, acquisition of tools or other necessary costs that will be described in a budget. Said budget will be included in the reports that PASKAIA periodically provides to Plan Vivo. See attached document.

11.3.2.5 How communities will participate in monitoring

- Socialization of information, See attached document
- This index mainly involves communities, since it describes the increase or decrease in job creation.
- Participation in the generation of reports: to involve the communities more, people will be trained so that they can understand and process the information and thus they can validate the process before the community.

11.3.2.6 How monitoring results will be shared and discussed with participants

- See attached document

11.3.3 Indicator 3 The percentage of families using their land to sustain livelihoods.

Residents of a Concejo have the right to purchase land and obtain individual land titles that secure their ownership rights and allow them to utilise the land at their discretion. They can also request to borrow land from the Concejo for farming or planting trees. If the land is used productively, family members may inherit the right to continue using it and potentially even receive a land title. However, the lack of financial resources among Concejo residents has resulted in challenges in obtaining land titles and purchasing seeds for cultivating the borrowed land. Only 35% of families in the project site are using their owned or borrowed land for productive purposes. Therefore, we can conclude that an increase in the percentage of families using their land to support livelihoods can be used as a project indicator of impact.

In relation to this indicator, we have developed an equation so that it can be included in the Sustainability Index for Landscape Restoration. Here we will utilise the percentage of families using their land to support livelihoods (PFSL) as an indicator that the project is helping secure land tenure and food security in the area.

The index is calculated by:

$$\text{PFSL} = \frac{\text{Current No. of families} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}}$$

Communication

Classification	ITA Value Range
Excellent	0.75 - 1
Good	0.51 - 0.75
Regular	0.26 - 0.50
Poor	0.11 - 0.50
Bad	0 - 0.10

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaiia*

11.3.3.1 Data Recording

For the data recording sheets please [See Annex 1.4.1](#)

Table 27 Socio-Economic Indicators

Indicator	Baseline	Communication	Method
<i>Indicator 1: Water Quality in river in the project site</i>		Reporting and community consultation about the desirability of the interventions. Records including in annual reporting.	The use of the community fund to support community activities will be recorded.
Indicator 2 Number of additional wage days generated by the restoration project	0	Records obtained from the project manager and included in the annual project reporting	Define project area where restoration is taking place.
Indicator 3. The percentage families using their land to support livelihoods	35% of owned or borrowed land is used for Household livelihoods	Annual reporting to project clients	Remote sensing and annual data collection directly from households

11.3.3.2 Monitoring frequency

- Annual reports to Plan Vivo

11.3.3.3 Follow-up duration

- 20 years

11.3.3.4 Required resources and capacity

- Computer for generating reports.
- Economic resources that cover costs of mobilization, acquisition of tools or other necessary costs that will be described in a budget. Said budget will be included in the reports that PASKAIA periodically provides to Plan Vivo. See attached document.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

11.3.3.5 How communities will participate in monitoring

- Socialization of information, [See attached document](#)
- This index mainly involves communities, since it describes an increase or decrease in the number of families that take advantage of their land to sustain their livelihoods.
- Participation in the generation of reports: to involve the communities more, people will be trained so that they can understand and process the information and thus they can validate the process before the community.

11.3.3.6 How monitoring results will be shared and discussed with participants

- [See attached document](#)

11.4 How monitoring results will be shared and discussed with participants

The monitoring plan was co-designing with community representatives. The results will be shared and discussed at community meetings and directly with participants and their families. Since community members will be involved in the monitoring work, this will also provide a natural way to discuss and disseminate knowledge about the monitoring results.

In addition to community meetings and interaction periodic meetings will be held with leaders who will be informed of the executed and planned activities. The result of the monitoring plan will be presented cyclically, firefighting cycle, plantation cycle and via an annual report that will be shared in community meetings.

In addition, flipcharts or index cards with summarized information will be distributed. Currently, the company has implemented the use of logs that are delivered to foresters when the project technicians visit them. This will serve as evidence to demonstrate that the information on the monitoring plans is being shared with them.



Photo 15 First meeting in Puerto Lempira with MASTA leaders, and Lainasta and Truktsinasta territorial councils



Photo 16 First meeting where project staff with inhabitants Truktsinasta Council.

*L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*

12 References

- Alberto, DM, and JA Elvir. 2008. "Carbon accumulation and fixation in aerial biomass of *Pinus oocarpa* in natural forests in Honduras." *Forest Systems* 17 (1):67-78.
- Ampatzidou, Cristina. 2020. "Lessons About Learning from Serious Games: The Learning Potential of Co-creation and Gameplay in Participatory Urban Planning Processes." In *Strategies for Urban Network Learning*, 281-305. Palgrave Macmillan, Cham.
- Bank, The World. 2019. Improving the Livelihoods of Miskito indigenous peoples in la Moskitia: Project Information Document/ Identification/Concept Stage (PID). Washington, D.C.: The World Bank.
- Busch, Jonah, and Jens Engelmann. 2015. "The future of forests: emissions from tropical deforestation with and without a carbon price, 2016-2050." *Center for Global Development Working Paper* (411).
- C.a, Norverto. 2006. "La Fijación de CO₂ en Plantaciones Forestales y en Productos de Madera en Argentina."
- Ceccon, Eliane, Moisés Méndez-Toribio, and Cristina Martínez-Garza. 2020. "Social Participation in Forest Restoration Projects: Insights from a National Assessment in Mexico." *Human Ecology* 48 (5):609-617. doi: 10.1007/s10745-020-00178-w.
- Checkland, Peter, and John Poulter. 2006. *Learning for action: a short definitive account of soft systems methodology and its use, for practitioners, teachers and students*: John Wiley and Sons Ltd.
- Cochran Jr, David M, Carl A Reese, and Kam-biu Liu. 2009. "Tropical Storm Gamma and the Mosquitia of eastern Honduras: a little-known story from the 2005 hurricane season." *Area* 41 (4):425-434.
- Colvin, Rebecca M, G Bradd Witt, and Justine Lacey. 2016. "Approaches to identifying stakeholders in environmental management: Insights from practitioners to go beyond the 'usual suspects'." *Land use policy* 52:266-276.
- Confederation, Schweizerische Eidgenossenschaft. 2022. "Territorial Inclusive Economic Development in the Mosquitia region, department of Gracias a Dios." <https://www.eda.admin.ch/deza/en/home/themen/wasser.html/content/dezaprojects/SDC/en/2016/7F09527/phase2.html>.
- Cordova Arauz, Diana. 2020. "A Quiet Revolution: Land justice for Miskito Indigenous peoples in Honduras."
- Cristales, René Zamora, Doribel Herrador, Nelson Cuellar, Oscar Díaz, Susan Kandel, Jorge Quezada, Silvia de Larios, Giovanni Molina, Madelyn Rivera, and Wilfredo Moran Ramírez. 2020. "Sustainability Index for Landscape Restoration."

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia

- Elvir, Axander, and César Alvarado. 2007. "Evaluación financiera de una Plantación de Caoba establecida en 1979 en el Jardín Botánico Lancetilla Honduras. ." *TATASCAN Revista Técnica Científica*. 19 (1):61-78.
- Elvir, Alexander, César Alvarado, Tomás Mendoza, Zoila Ávila, Luís Zepeda, and Johnny Pérez. 2010. "Plantar caoba (*Swietenia macrophylla*): un negocio rentable." *TATASCAN Revista Técnica Científica*. 22 (1): 83-99.2010.
- Elvir, J Alexander. 2015. "Crecimiento de *Swietenia macrophylla* en plantaciones sin y con fertilización inicial." *TATASCAN Revista Técnica Científica*. 25 (2):3-12.
- Felt, Ulrike, Judith Igelsböck, Andrea Schikowitz, and Thomas Völker. 2016. "Transdisciplinary sustainability research in practice: between imaginaries of collective experimentation and entrenched academic value orders." *Science, Technology, & Human Values* 41 (4):732-761.
- Ferreira, O. W. "Análisis estadístico del factor de forma y elaboración de tablas de volumen para grupos de especies latifoliadas de igual factor de forma. (2).PDF." *Google Docs*.
- FERREIRA ROJAS, O. 1994. "Manual de inventarios forestales 2da." *Ed. Siguatepeque, Honduras. ESNACIFOR*.
- Forests, National Institute of. 2017. Caribbean pine (*Pinus caribaea* var. *hondurensis* (Sénécl.) W. H. Barrett & Golfari). In *Forest technology package*. Guatemala, INAB.
- Fund, Global Greengrants. 2015. "Climate Justice and Women's Rights: A Guide to Supporting Grassroots Women's Action."
- Herlihy, Peter H, and Taylor A Tappan. 2019. "Recognizing indigenous miskitu territory in Honduras." *Geographical Review* 109 (1):67-86.
- Herlihy, PH, and AP Leake. 1992. "Situación actual del frente de colonización/deforestación en la región. Propuesta para el Parque Nacional Patuca." *Tegucigalpa: Mosquitia Pawisa (MOPAWI). Manuscript*.
- Howland, Fanny, Mariola Acosta, Juliana Muriel, and Jean-Francois Le Coq. 2021. "Examining the barriers to gender integration in agriculture, climate change, food security, and nutrition policies: Guatemalan and Honduran perspectives." *Frontiers in Sustainable Food Systems* 5:122.
- Jasanoff, Sheila, and Sang-Hyun Kim. 2015. "Dreamscapes of modernity." *Sociotechnical imaginaries and the fabrication of power*. Chicago.
- Keely, J and Zedler P. 1998. "Evolution of Life History of *Pinus*." In *Ecology and Biogeography of Pinus*, edited by D Richardson. Cambridge: Cambridge University Press.
- Larsen, TH. 2019. "Evaluación biológica rápida en Ciudad del Jaguar, Ciudad Blanca, La Mosquitia, Honduras." *RAP Bulletin of Biological Assessment* 72.
- Lemckert, D. 1980. "Support to the implementation of forestry programmes priorities, Costa Rica. Tables on growth of *Pinus caribaea* var. *hondurensis* in Costa Rica (preliminary)."
- MacDicken, Kenneth G. 1997. "A guide to monitoring carbon storage in forestry and agroforestry projects."

- Martinez Franzoni, Juliana. 2013. "Social protection systems in Latin America and the Caribbean: Honduras."
- McSweeney, Kendra, and Zoe Pearson. 2013. "Prying native people from native lands: Narco business in Honduras." *NACLA Report on the Americas* 46 (4):7-12.
- Méndez, María José. 2020. "The Silent Violence of Climate Change in Honduras: In one of the most environmentally vulnerable regions in the world, indigenous and rural communities are fighting to stay in the face of climate-driven displacement. Still, the immediate exodus demands new international forms of protection for climate refugees." *NACLA Report on the Americas* 52 (4):436-441.
- Mollett, Sharlene. 2010. "Está listo (Are you ready)? Gender, race and land registration in the Río Plátano Biosphere Reserve." *Gender, Place & Culture* 17 (3):357-375.
- Mollett, Sharlene. 2011. "Racial narratives: Miskito and colono land struggles in the Honduran Mosquitia." *cultural geographies* 18 (1):43-62.
- Mollett, Sharlene. 2013. "Mapping deception: The politics of mapping Miskito and Garifuna space in Honduras." *Annals of the Association of American Geographers* 103 (5):1227-1241.
- Munro, Neil. 1966. "The fire ecology of Caribbean pine in Nicaragua." Proc. 5th Annu. Tall Timbers Fire Ecol. Conf., Seattle, Washington.
- Myers, Roland L. 2006. Fire management overview of the Caribbean Pine (*Pinus Caribaea*) savannas of the Mosquitia, Honduras. The Nature Conservancy.
- Norverto, Carlos A. 2006. "La fijación de CO₂ en plantaciones forestales y en productos de madera en Argentina." *Buenos Aires, Argentina. Editorial GRAM.*
- Núñez, Samuel Arturo. 2011. "Análisis de crecimiento en plantaciones certificadas de *Swietenia macrophylla* en el Departamento de Atlántida, Honduras, CA."
- Parsons, James J. 1955. "The Miskito pine savanna of Nicaragua and Honduras." *Annals of the Association of American Geographers* 45 (1):36-63.
- PDC. 2020. Honduras National Disaster Preparedness Assessment, Gracia Dios, Department Profile. Hawaii: Pacific Disaster Centre.
- Pellegrini, Adam F. A., Jennifer Harden, Katerina Georgiou, Kyle S. Hemes, Avni Malhotra, Connor J. Nolan, and Robert B. Jackson. 2022. "Fire effects on the persistence of soil organic matter and long-term carbon storage." *Nature Geoscience* 15 (1):5-13. doi: 10.1038/s41561-021-00867-1.
- Reytar, K, K Buckingham, F Stolle, J Brandt, R Zamora Cristales, F Landsberg, R Singh, C Streck, C Saint-Laurent, and CJ Tucker. 2020. "Measuring progress in forest and landscape restoration." *Unasylva* 71 (252):62-70.
- Richardson, David M. 2000. *Ecology and biogeography of Pinus*: Cambridge University Press.
- Ruiz, Eber Pérez, and Marta Bonilla Vichot. 2014. "La retención de carbono en plantaciones forestales.: Estudio de caso: Empresa Forestal Integral "Cienfuegos". " *Revista Cubana de Ciencias Forestales: CFORES* 2 (2):9.

- Sanches, A. J., and Dubon. 2011. "Estudio de especies forestales latifoliadas bajo la modalidad agroforestal multiestratos con cacao.pdf." *Google Docs*.
- Sánchez, Jesús, and Aroldo Dubón. 2007. "Estudio de especies forestales latifoliadas bajo la modalidad agroforestal multiestratos con cacao. CAC02-01." *Contenido Página:31*.
- Sanders, Arie, Denisse McLean, and Alexandra Manueles. 2015. "Land use and climate change impact on the coastal zones of Northern Honduras." In *Sustainability of Integrated Water Resources Management*, 505-530. Springer.
- Sanders, Elizabeth B-N, and Pieter Jan Stappers. 2008. "Co-creation and the new landscapes of design." *Co-design* 4 (1):5-18.
- Sauls, Laura Aileen. 2019. *Territorial Claims and Climate Change Governance in Mesoamerica*: Clark University.
- Schweizer, Daniella, Paula Meli, Pedro HS Brancalion, and Manuel R Guariguata. 2018. *Oportunidades y desafíos para la gobernanza de la restauración del paisaje forestal en América Latina*. Vol. 182: CIFOR.
- SilvaPlan. 2017. "Manual del Usuario SilvaPlan.pdf." *Google Docs*.
- Suarez Cerrato, Mario Alberto. 2012. Comparación estadística de la tabla de volumen INFONAC y ajustes de una ecuación de volumen local para bosques de *Pinus oocarpa* Shiede bajo sistema de raleo arse en los Municipios de El Porvenir y Cedros, Francisco Morazán, Honduras. Escuela Nacional de Ciencias Forestales (ESNACIFOR), Comayagua (Honduras).
- Taylor, BW. 1963. "An outline of the vegetation of Nicaragua." *The Journal of Ecology*:27-54.
- van Noordwijk, Meine, Vincent Gitz, Peter A. Minang, Sonya Dewi, Beria Leimona, Lalis Duguma, Nathanaël Pingault, and Alexandre Meybeck. 2020. "People-Centric Nature-Based Land Restoration through Agroforestry: A Typology." *Land* 9 (8):251.
- Welsh, Ian, and Brian Wynne. 2013. "Science, scientism and imaginaries of publics in the UK: Passive objects, incipient threats." *Science as Culture* 22 (4):540-566.
- AFE-COHDEFOR. (2006). *RESULTADOS DEL INVENTARIO DE BOSQUES Y ÁRBOLES 2005-2006*. Obtenido de <https://drive.google.com/file/d/13RjkGLpBF6kVq8EeLyQqVRxtDNjcxAu/view>
- Gaceta, L. (2018). *ACUERDO No. 022-2018 NORMATIVA TÉCNICA PARA LA CERTIFICACIÓN Y APROVECHAMIENTO DE ARBOLES Y PLANTACIONES FORESTALES*.,. Obtenido de AÑO CXL TEGUCIGALPA, M. D. C., HONDURAS, C. A. LUNES 4 DE JUNIO DEL 2018. NUM. 34,657: <https://drive.google.com/file/d/1QxPxMD953wyqiNLB0gNdVjOEWgR2a0ZR/view>
- ICF. (2015-2023). *Anuario Estadístico Forestal de Honduras*. Obtenido de Instituto de Conservación Forestal, Áreas Protegidas y Vida Silvestre (ICF): <https://icf.gob.hn/estadisticas-forestales/>
- ICF. (2017). *Resultados de la Evaluación Nacional Forestal de Honduras*. Obtenido de Tegucigalpa MDC, Honduras: Proyecto de Modernización del Sector Forestal de Honduras, EuroFor MOSEF.: <https://drive.usercontent.google.com/download?id=1jDxmoM9J9Y45XE5iusHXWWPYODRDHwP1&export=download&authuser=0>

La Gaceta. (2023). *LEY ESPECIAL DE LAS TRANSACCIONES DE CARBONO FORESTAL PARA LA JUSTICIA CLIMÁTICA*. Obtenido de La Gaceta, diario oficial de la República de Honduras: https://drive.google.com/file/d/1xqtf5lix0WW2l9fBXQ5PxCUw3w_QkP0k/view

LFAPVS. (2009). *LEY FORESTAL, ÁREAS PROTEGIDAS Y VIDA SILVESTRE*. Obtenido de Ley Forestal, Areas Protegidas y Vida Silvestre, Decreto 98-2007 en Honduras: <https://drive.google.com/file/d/1wSen1WqvSFAISSIpQ27S8qhpc7oWCjqD/view>

Zamora et al. (2020). *Hoja metodologica para el calculo de los indicadores en el Indice de Sustentabilidad para la restauración del paisaje*. Obtenido de <https://onewri.sharepoint.com/:f:/t/Projects/Restoration/Ej3y6-GT5jlAnEDS6yoec38BUOSpbjzmZUX3zudFXLFQ?e=5yG8pl>

Castañeda, F. (1985). Altura total, diámetro, altura de pecho y factor de forma para *Pinus oocarpa* Schi., en Siguatepeque, Honduras. P, 153.

Ferreira, O. W, (2004) índice de sitio y tablas de rendimiento como instrumentos analíticos para el manejo de *Pinus caribaea* MORELET en La Región de La Mosquitia. Revista. Vol. 16/ N° 2. P. 92. Citada página # 92.

Ferreira Rojas, O. (2005). Manual de inventarios forestales. Siguatepeque, Hond.: Escuela Nacional de Ciencias Forestales. P. 105.

NACIONAL DE BOSQUES. 2017. Pino caribe (*Pinus caribaea* var. *Hondurensis* (Sénécl.) W. H. Barrett & Golfari). Paquete tecnológico forestal. Guatemala, INAB. 30 p.

Prados, J. (2022, November). Relación Hipsométrica y Factor de Forma en una Plantación Raleada de *Pinus Caribaea* Var. *Caribaea* en Veracruz, México. In 9° Congresso Florestal Brasileiro (Vol. 1, No. 1, pp. 652-655).

Sanches, J., & Dubon, A. 2011. Estudio de especies latifoliadas bajo modalidad agroforestal multi estratos con Cacao. Revista Técnica Científica Tatascan. 23 (1): 40 -50 p. Página 48.

SilvaPlan (2017) Software Silva-Plan _ Guía del Silvicultor/ ICF – Honduras.

MARN. (2018). Índice de sustentabilidad para la restauración de paisajes (ISR). Obtenido de <https://srt.snet.gob.sv/isr/index.php>

Zamora et al. (2020). Índice de Sustentabilidad para la Restauración de Paisajes. Obtenido de https://www.prisma.org.sv/wp-content/uploads/2020/03/indice_de_sustentabilidad_para_la_restauracion_de_paisaje.pdf

Instituto Nacional de Conservación y Desarrollo Forestal, Áreas Protegidas y Vida Silvestre ICF, (2017). Resultados de la Evaluación Nacional Forestal de Honduras. Tegucigalpa MDC, Honduras: Proyecto Modernización del Sector Forestal de Honduras, EuroFor MOSEF. p. 60

Evaluación Nacional Forestal, (2006). RESULTADOS DEL INVENTARIO DE BOSQUES Y ÁRBOLES 2005-2006, PROYECTO APOYO AL INVENTARIO Y EVALUACIÓN NACIONAL DE BOSQUES Y ÁRBOLES TCP/HON/3001 (A), Honduras. p. 73

Pérez, N. Ferreira, O y Stiff, C. (1989). Ecuación de volumen para *Pinus oocarpa* Schiede en la región central de Honduras. Escuela Nacional de Ciencias Forestales. ESNACIFOR. Corporación Hondureña de Desarrollo Forestal. COHDEFOR.

Carrasco, J.C. y Caviedes, V. 2014. Diagnóstico de los Ecosistemas Marino - Costeros y de Agua Dulce de Honduras: Basado en Análisis de Viabilidad, Amenazas y Situación. ICF y USAID ProParque. 102 p.

13 ANEXXES



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



Collaboration agreement between La Empresa Paskaia Honduras SA and CTI Truktsinasta.

TOGETHER

Among the subscribers, on the one hand;

The company "**Paskaia Honduras SA**", legally constituted with **RTN: 0801 -9022 - 4015 - 42**, Residing in **West End . Roatan** City Department of **Islas de la Bahía**. Represented by: **Marvin Donaldo Rodriguez Lara, of Honduran** nationality , by profession **Forest Engineer**, with DNI: **1503 - 1987 - 00303**. From now on it will be called "**The Company**".

Of the other part,

Mr.: _____, nationality **honduran**, of profession or trade _____ with DNI: _____ - _____ - _____. With address at _____, **Puerto Lempira, Gracias a Dios** and as president and representative of the CTI Truktsinasta, legally elected by the Miskito people of the Territory and recognized in the **DIRRSAC**, they ensure that the Territorial Council is the owner of a land with an area of _____ mz (____hectares), legally titled and located in the municipality of Puerto Lempira, and that in this there is an extension of Savannah with pine of _____ hectares , a Site called " _____" which is free of conflicts over tenure, with other Territorial Councils. Hereinafter called "**The Forester**".

We agree to enter into this Collaboration Agreement to **jointly provide the CO₂ Sequestration Ecosystem Services or (PSA)**, which will be governed by the following clauses;

First – Objective of the agreement: implement a reforestation project in the forester's territory with the local species, *Pinus caribaea* . The main objective is the legal sale of Carbon Credits and other environmental services (PSA), which will benefit the Forester (Territorial Council), the Communities that comprise it, The Company and will allow Economic and Social Development in general. The financing of this project will be carried out through the sale of carbon credits in the international voluntary market.

Second. – Mutual and general responsibilities, The parties must ensure that **Honduran** forest and environmental protection legislation, **international agreements and treaties** to which the State is a signatory, prevail. Both parties agree to avoid any activity or action that goes against the objectives of the project, with due diligence. If this

L'ngsiktigt klimatarbete, Socialt hållbart
 Long-term, socially sustainable climate work
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia

1

Figure 1: Work Agreement CTI Truktsinasta - Paskaia SA.

*L'ngsiktigt klimatarbete, Socialt hållbart
 Trabajo climático a largo plazo, socialmente sostenible
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



responsibility is not fulfilled, the sanctions provided for in national laws and agreements and the internal regulations of the Company will be applied.

Third. – Forester's Commitments: The Forester undertakes to carry out forestry activities, which include:

- a. Reforestation of areas by fighting forest fires, reducing illegal logging of the forest and managing the natural regeneration of the Savannah.
- b. The implementation of protection plans against forest fires and felling of seed trees within the restoration areas.
- c. Replant or complete areas where natural regeneration cannot be adequately established or are lost due to natural or human factors.
- d. Carry out fertilization, pest and disease control programs in the forest.
- e. Carry out training pruning, sanitation thinning and density control.
- f. Maintain the density of plants in accordance with the projections established by The Company in the PDD in terms of the number of plants and CO₂.
- g. It is committed to ensuring the proper development of the project and its safety by reporting any problem or change in the forest.
- h. It undertakes to deliver the credits generated in the designated area to The Paskaia Company, so that they can be marketed.
- i. Be open to the resolution of conflicts, complaints or others that arise during the project period.
- j. The forester will authorize the inclusion of the modifications that are considered necessary (Addendum) to this work agreement, in order to guarantee the safety of the forester, the Company and the continuity of the project.
- k. You agree to comply with this Agreement.

Fourth. – Company Commitments: The Company undertakes to:

- a. Obtain funds for the establishment of the plantation or natural regeneration intended to produce the carbon credits.
- b. Cover the labor costs of protection, maintenance and management of the forest plantation or regeneration (Brigades, surveillance, construction of patrols and surveillance posts, chapia, comaleo, pruning and liberation thinning).
- c. Establish a monitoring plan to evaluate losses or damage to the plantation, in conjunction with the forester. The company will work to replace the damages or losses suffered during the establishment of the regeneration, which will mainly span from year one (1) to year five (5).
- d. Coverage of expenses for legal procedures such as certification of established plantation or regeneration, field inspections by the Institute of Forest Conservation, Protected Areas and Wildlife (ICF).

L'ngsiktigt klimatarbete, Socialt hållbart

Long-term, socially sustainable climate work

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia

2

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



- e. The coverage of administrative and technical expenses for forest monitoring during this agreement is in force.
- f. Market the credits generated by the established forest to finance the costs of protection, management and administration.
- g. Execute the equivalent of 61% of the income generated by the sale of carbon credits, through programmed disbursements, which cover the cost of the activities carried out by the forester within the established forest.
- h. Develop a mechanism that allows project participants to access information efficiently.
- i. The Company is obliged, together with the forester, to make the update or modifications that are considered necessary (Addendum) to this work agreement, in order to guarantee the benefits of the forester, the operation of the Company and the continuity of the project.
- j. Be open to the resolution of conflicts, complaints or others that arise during the validity period of the agreement.

Fifth – Location of plot and time of use. The reforestation will be carried out in the Savannah, of the Territory of the Territorial Council (the Forester), which will be destined for this project and may not be used for other purposes that may affect or compromise the protection of the established regeneration. Agroforestry activities, extraction of forest by-products, will be allowed to maintain the food security of the families and communities that make up the Territorial Council. A land use period of 20 years will be established for forest restoration and credit generation.

Sixth. - Worth. All activities related to the establishment, protection, maintenance and management of the plantation or regeneration (Forestry Activities) will be paid to the Forester, each one carried out and will be measured in unit of plant, tree and/or hectare, kilometer The value of each of them will be based on the average value in the area, or according to man-day performance of work by area and/or activity.

Seventh. - Way to pay. The forester will receive payment for each activity carried out, previously authorized. The payment will be credited after supervising the progress or completion of the work through a deposit in a bank account. If the progress or completion of the work is not made, the forester will be penalized with a defect, will not receive the full payment and the activity will be executed with external personnel in charge of the Company.

L'ngsiktigt klimatarbete, Socialt hållbart
 Long-term, socially sustainable climate work
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia

3

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



Eighth. – The benefits generated by carbon credits . The Paskaia Company will respect the distribution of benefits that the standard by which it was certified, established there, the distribution will be carried out in the following way;

- a. Paskaia will receive 39% of the profits and will be used to cover operational and administrative costs in the execution of the project.
- b. 61% of the benefits generated by the commercialization of carbon credits will be delivered to the forester, through programmed transfers, and will serve to cover the costs of maintenance, management and protection of the forest plantation or established natural regeneration.

Ninth. – Duration of the Agreement . This work agreement will have a duration of 20 years, starting from the date of its signing. At the end of the period, it may be extended every five years, a period that will allow the development and use of the established forest or subject it to another standard for PES.

Tenth. – Termination of the Agreement . This agreement may be terminated for the following reasons:

1. Due to expiration of the agreed time.
2. By mutual agreement between the parties. After having tried to reconcile differences between the parties.
3. Unilaterally by the **Forester** in the event that the **Company** fails to comply with the acquired obligations.

Accordingly, once the agreement has been read, both parties sign this document, in _____, Puerto Lempira, Gracias a Dios on the _____ days of the month of _____ of the year two thousand twenty and _____.

 Pte. CTI Truktsinasta
 Legal representative
 Vivo Plan Owner

 Ing. Marvin Rodriguez
 Director Paskaia

L'ngsiktigt klimatarbete, Socialt hållbart
 Long-term, socially sustainable climate work
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



Collaboration agreement between The Paskaia Honduras SA Company and the Forester.

TOGETHER

Among the subscribers, on the one hand;

The company **"Paskaia Honduras SA"**, legally constituted with **RTN: 0801 -9022 - 4015 - 42**, Residing in **West End**, **Roatan** City Department of **Islas de la Bahía**. Represented by: **Marvin Donaldo Rodriguez Lara, of Honduran** nationality, by profession **Forest Engineer** with DNI: **1503 - 1987 - 00303**. From now on it will be called **"The Company"**.

Of the other part,

Name: _____, nationality **honduran**, of profession or trade _____ with DNI: _____ - _____ - _____. With address at _____, **Puerto Lempira, Gracias a Dios** and in his own name and representation he claims to be the owner of a land with an area of _____ mz (____ha), located within the Territorial Council _____, in the community of _____, a site called "_____" which is free of possession conflicts. Hereinafter called **"The Forester"**.

We agree to enter into this Cooperation Agreement to provide the **CO₂ Sequestration Ecosystem Services or (PSA) jointly**, which will be governed by the following clauses;

First – Objective of the agreement: implement a reforestation project on the forester's land with local timber species of high commercial value. The main objective is the legal sale of Carbon Credits, which will benefit the Forester, the Community, the Company and will allow Economic and Social Development in general. The financing of this project will be carried out through the sale of carbon credits in the international voluntary market.

Second. – Mutual and general responsibilities, The parties must ensure that **Honduran** forest and environmental protection legislation, **international agreements and treaties** to which the State is a signatory, prevail. Both parties agree to avoid any activity or action that goes against the objectives of the project, with due diligence. If this responsibility is not fulfilled, the sanctions provided for in national laws and agreements and the internal regulations of the Company will be applied.

L'ngsiktigt klimatarbete, Socialt hållbart
 Long-term, socially sustainable climate work
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia

1

Figure 2: Forestry work Agreement - Paskaia SA.

*L'ngsiktigt klimatarbete, Socialt hållbart
 Trabajo climático a largo plazo, socialmente sostenible
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia*



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



Third. – Forester's Commitments: The Forester undertakes to carry out forestry activities, which include:

- a. Initial reforestation planting.
- b. Cleaning using chapeas and comaleo.
- c. Replace plants that fail to grow properly or are lost due to natural or other factors.
- d. Fertilization, pest and disease control.
- e. Training pruning and sanitation thinning of the forest plantation.
- f. Maintain plant density in accordance with the projections established by The Company in the PDD in terms of number of plants and CO2 capture.
- g. It is committed to ensuring the proper development of the project and its safety by reporting any problem or change to the plantation.
- h. He undertakes to deliver the credits generated on his plot to The Paskaia Company, so that they can be marketed.
- i. Be open to the resolution of conflicts, complaints or others that arise during the project period.
- j. The forester will authorize the inclusion of the modifications that are considered necessary (Addendum) to this work agreement, in order to guarantee the safety of the forester, the company and the continuity of the project.
- k. You agree to comply with this Agreement.

Fourth. – Company Commitments: The company undertakes to:

- a. Obtain funds for the establishment of forest plantations to produce carbon credits.
- b. Cover the labor costs of maintenance and management of the forest plantation (chapia, comaleo, pruning and sanitation thinning).
- c. Determine a percentage of losses or damage to the plantation. Together with the forester, the company will work to replace the damage or losses suffered during the planting of young trees, ranging from 0 years to 5 years.
- d. Coverage of expenses for legal procedures such as certification of the plantation and field inspections by the Institute of Forest Conservation, Protected Areas and Wildlife (ICF).
- e. The coverage of administrative and technical expenses for monitoring the forest plantation, while this agreement is in force.
- f. Market the credits generated by forest plantations to finance management and administrative costs.
- g. Execute the equivalent of 61% of the income generated by the sale of carbon credits, through programmed disbursements, which cover the cost of the activities carried out by the forester within the plantation.
- h. Develop a mechanism that allows project participants to access information efficiently.

L'ngsiktigt klimatarbete, Socialt hållbart

Long-term, socially sustainable climate work

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia

L'ngsiktigt klimatarbete, Socialt hållbart

Trabajo climático a largo plazo, socialmente sostenible

Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



- i. The Company is obliged, together with the forester, to make the update or modifications that are considered necessary (Addendum) to this work agreement, in order to guarantee the benefits of the forester, the operation of the Company and the continuity of the project.
- j. Be open to the resolution of conflicts, complaints or others that arise during the validity period of the agreement.

Fifth – Location of plot and time of use. The plantation will be carried out on the Forester's property, which will be used solely for this project and may not be used for other purposes that may affect or compromise the protection of the plantation. Agroforestry activities will be allowed so as not to endanger the food security of the forester's family. A land use period of 20 years will be established for the generation of credits in the plantation.

Sixth. - Worth. All activities related to the establishment, maintenance and management of the plantations (Forestry Activities) will be paid to the Forester, each one carried out and will be measured in plant, tree and/or hectare units, the value of each of them. They will be based on the average value in the area, or according to man-day performance of work by area and/or activity.

Seventh. - Way to pay. The forester will receive payment for each activity carried out, previously authorized. The payment will be credited after supervising the progress or completion of the work through a deposit in a bank account, if the progress or completion of the work is not made, the forester will be sanctioned with a fault, will not receive any payment and the activity will be executed by external personnel in charge of the Company.

Eighth. – The benefits generated by carbon credits . The Paskaia company will respect the distribution of benefits that the standard by which it was certified has established, the distribution will be carried out as follows;

- a. Paskaia will receive 39% of the profits and will be used to cover operational and administrative costs in the execution of the project.
- b. 61% of the benefits generated by the commercialization of carbon credits will be delivered to the forester, through programmed transfers, and will serve to cover the costs of maintenance, management and protection of the forest plantation

Ninth. – Duration of the Agreement . This work agreement will have a duration of 20 years, starting from the date of its signing. At the end of the period, it may be extended every five years, a period that will allow the development and use of forest plantations

L'ngsiktigt klimatarbete, Socialt hållbart
 Long-term, socially sustainable climate work
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia



www.paskaia.se
Paskaia Honduras SA
 Roatan, Islas de la Bahía, Honduras



established in pure plots or Agro-Forest systems, through the implementation of the Plan Vivo standard.

Tenth. – Termination of the Agreement . This agreement may be terminated for the following reasons:

1. Due to expiration of the agreed time.
2. By mutual agreement between the parties. After having tried to reconcile differences between the parties.
3. Unilaterally by the **Forester** in the event that the **Company** fails to comply with the acquired obligations.
4. For the loss of more than 50% of the plantation established by the forester, due to lack of attention or the accumulation of faults established in the company's internal regulations.

Accordingly, once the agreement has been read, both parties sign this document, in _____, Puerto Lempira, Gracias a Dios on the _____ days of the month of _____ of the year two thousand twenty and _____.

In case of absence, the forester names the following as heirs, in this order;

1. Full name: _____ M____ F____
 ID: _____/_____/_____/ Age _____
2. Full name: _____ M____ F____
 ID: _____/_____/_____/ Age _____

 Forester
 Vivo Plan Owner

 Ing. Marvin Rodriguez
 Director

L'ngsiktigt klimatarbete, Socialt hållbart
 Long-term, socially sustainable climate work
 Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma Mapara sip main kaiki briaia

L'ngsiktigt klimatarbete, Socialt hållbart
Trabajo climático a largo plazo, socialmente sostenible
Taim saura patka nani ba wark wal pain dauki piuwa Yari lahma mapara sip main kaiki briaia