

REDD PROJECT IN BRAZIL NUT CONCESSIONS IN MADRE DE DIOS



Project Name	REDD Project in Brazil Nut Concessions in Madre de Dios
Project Location	Madre de Dios Region, Peru
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Project Dates	Start date: 24/09/2009 GHG Accounting Period: from 01/01/2010 to 31/12/2040 Lifetime: up to 31/12/2040
CCB Status	Undergoing first validation (full validation)
Edition used	CCB Standards Second Edition
Expected Benefits	Climate: Reduction of GHG emissions caused by deforestation and degradation Community: Improvement of the quality of life of Brazil nut harvesters, strengthening of their individual and collective capacities for managing and controlling the brazil nut forest and increased revenues from sustainable use of it Biodiversity: Guarantee and maintain the integrity of biological diversity and ecological processes in the Brazil nut concessions
Gold Level	Exceptional Biodiversity Benefits (Vulnerability) by the presence of endangered species of flora and fauna
PDD Version	05
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INDEX

INDEX.....	2
GENERAL SECTION	3
G1. Original Conditions in the Project Area	3
G2. Base Line Projections.....	55
G3. Project Design and Goals.....	127
G4. Management Capacity and Best Practices.....	162
G5. Legal Status and Property Ownership.....	172
CLIMATE SECTION	183
CL1. Net Positive Climate Impacts	183
CL2. Offsite Climate Impacts (“Leakage”)	197
CL3. Climate Impact Monitoring.....	207
COMMUNITY SECTION	230
CM1. Net Positive Community Impacts.....	230
CM2. Impacts on Offsite Stakeholders.....	239
CM3. Community Impact Monitoring	240
BIODIVERSITY SECTION.....	254
B1. Impacts within the Project Area.....	254
B2. Offsite Biodiversity Impacts.....	259
B3. Biodiversity Impact Monitoring.....	260
GOLD LEVEL SECTION.....	262
GL1. Exceptional Climate Benefits	262
GL2. Exceptional Community Benefits.....	262
GL3. Exceptional Biodiversity Benefits.....	263
LIST OF ANNEX.....	265
Annex 1. Centroid Coordinates of Concessions in Project Area	265
Annex 2. Digital Process of Images in the ZEE.....	275
Annex 3. Crammer’s Test for the Baseline Scenario (N°2)	276
Annex 4. Significant Test for the Carbon Inventory Results of Native Community of Belgica.....	277

GENERAL SECTION

G1. Original Conditions in the Project Area

1. Location of the Project and Basic Physical Parameters

1.1 Project Location

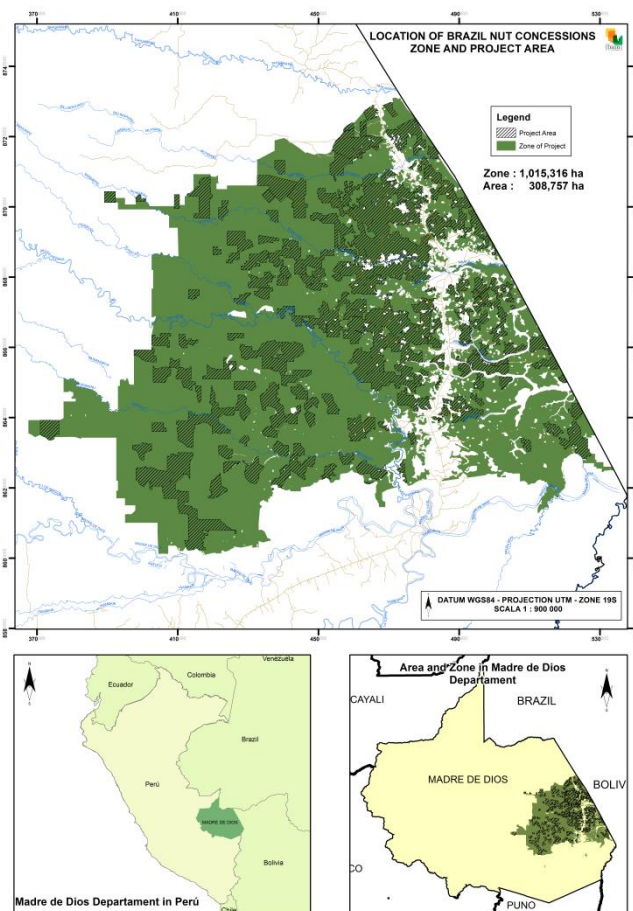
The Project is located in the eastern part of Madre de Dios, a Department in southeastern Peru, bordering Brazil, Bolivia and the Peruvian Departments of Puno, Cuzco and Ucayali. Within Madre de Dios, the Project is located in the Provinces of Tahuamanu (Iberia and Tahuamanu districts) and Tambopata (Las Piedras, Laberinto, Inambari and Tambopata districts).

The Project Area (PA) is comprised of a group of 405 concessions of Brazil nut covering 308 757.3 hectares. The centroid coordinates of each concession are shown in Annex 1.

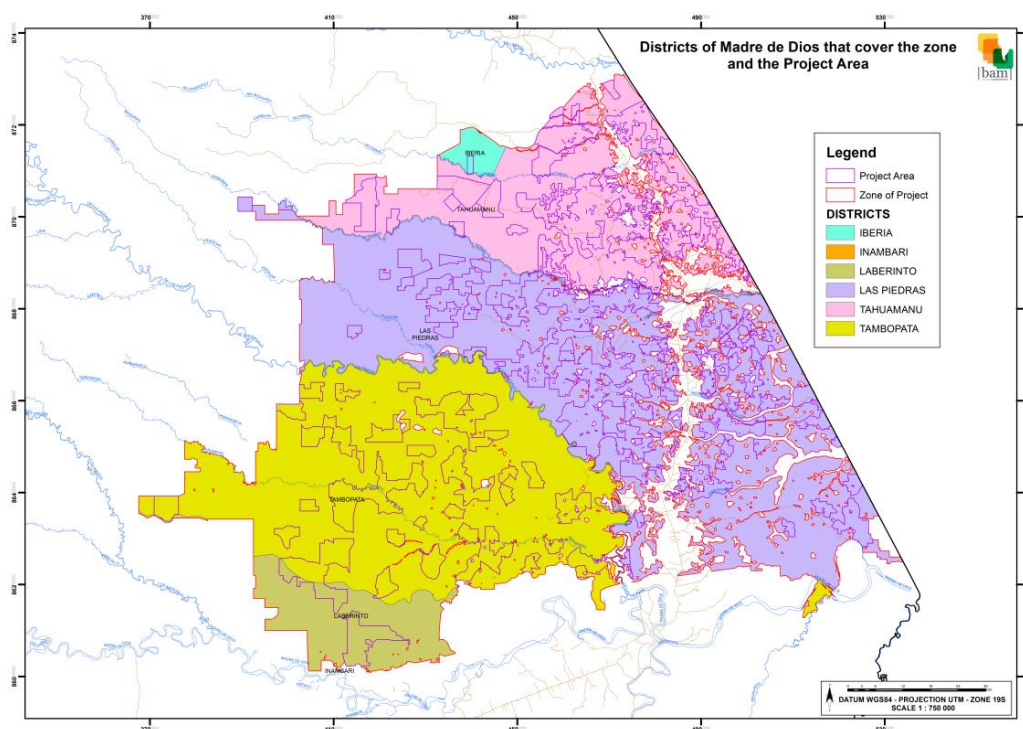
The Project Zone (PZ) is determined by the sum of the PA and its Leakage Belt (LB), which comprises non-project Brazil nut concessions and adjacent agricultural land, mining areas and other forestry concessions. The PZ covers a total area of 1 015 316.0 hectares.

Map 1 below shows the location of the project in Peru and in the department of Madre de Dios. Map 2 shows the districts in which the Project Zone and Project Area are located.

Map 1. Location of the Project Zone and Project Area



Map 2. Project Zone and Project Area by Regional Districts



1.2 Basic Physical Parameters

Weather

The weather in the low forest of Madre de Dios is hot and humid most part of the year. During the winter (June - August), the rains stop and sporadic cold winds from the south of the continent can lower the temperature considerably to 10° C (Barthem et al. 2003). Throughout the year, the average monthly temperature ranges from 21° to 26° C, with a maximum of 40° C and a minimum of 4.5° C. The average annual rainfall in the low forest of Madre de Dios varies between 1,500 and 3,000 mm.

The Project Area is characterized by two types of climate, *Sub-Humid and Hot* and *Humid and Hot*, according to the Climate Map included in the Economic-Ecological Zoning of Madre de Dios (IIAP, 2009) that shows climatic conditions prevailing in the Region.

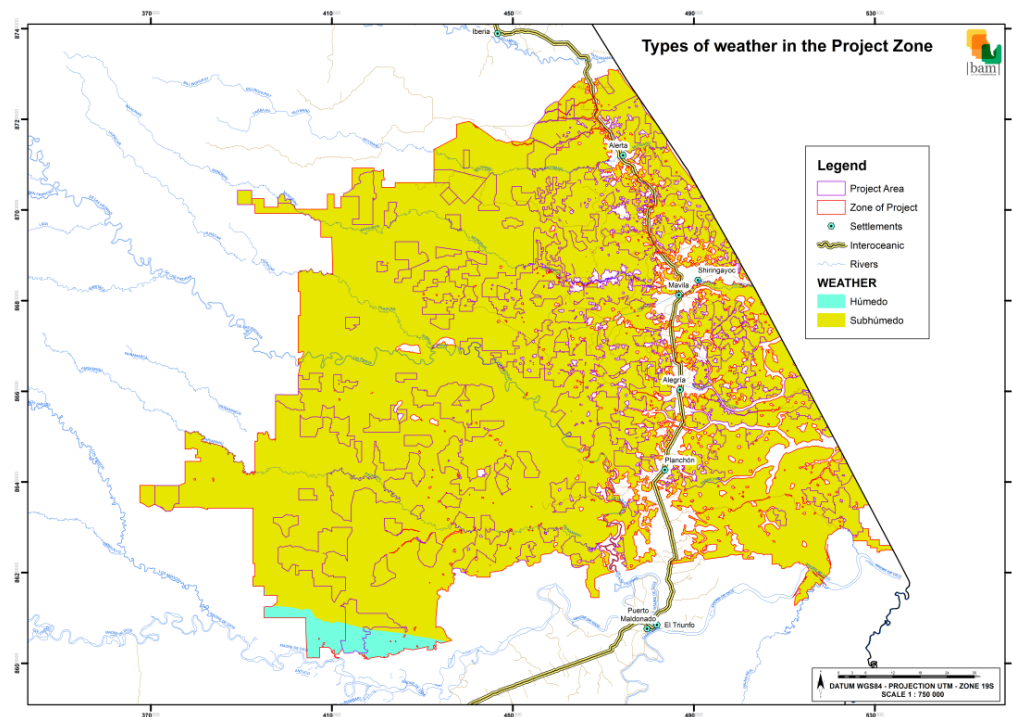
- Sub-Humid and Hot

It covers the northeastern part of the Department, including 98% of the Project Area. The average annual temperature is 25°C, and it is moderately rainy.

- Humid and Hot

It covers the south and southern western part of the Department, including 2% of the Project Area. The annual rainfall is 2000 mm and the average annual temperature is 25°C. This climate type is rainy, dry in winter and with a warm and humid season.

Map 3. Weather Types in the Project Zone



Physiography

Madre de Dios has a quite heterogeneous physiography, as a result of the interaction of various factors such as the tectonic, climatic and the hydro-erosive processes that have acted on them. The following three vast landscapes can be identified:

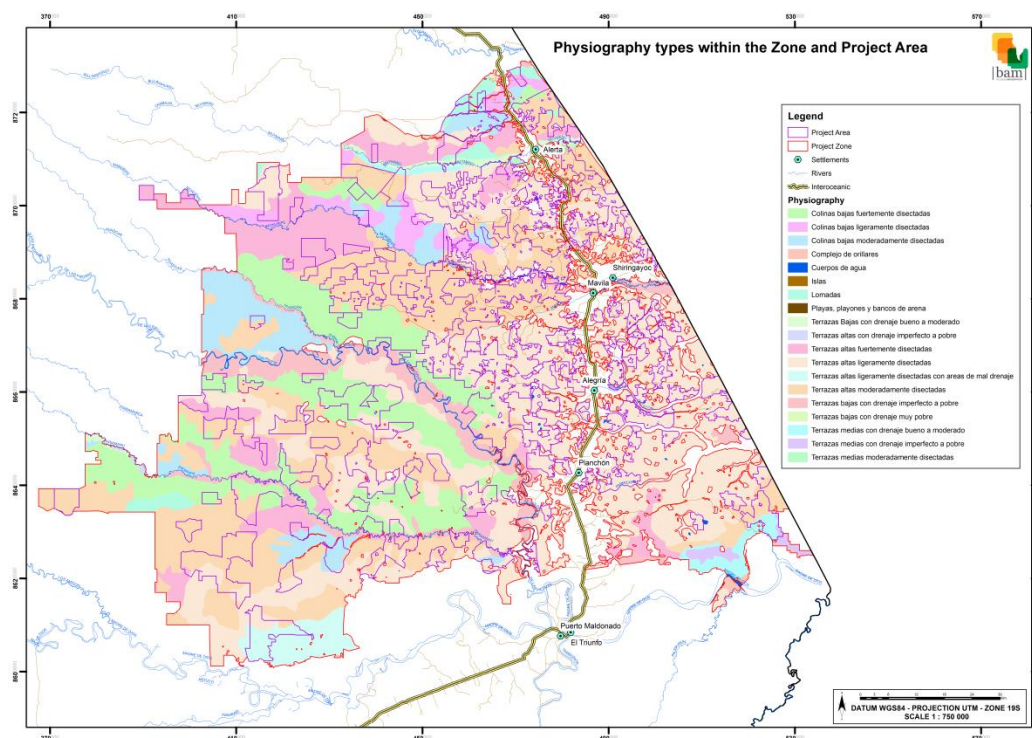
- Great vast alluvial plain
Composed by recent, growing sub and former sediments brought down by main rivers, are characterized for presenting relatively flat and slightly inclined topography (0%-8 %).
- Great hilly landscape
It is characterized for presenting a wavy shape and strongly dissected surface, originated by the compression effects or by the erosive process they have been submitted to.
- Great mountainous landscape
Its surface is characterized for presenting mountainous and rugged shapes of tectonic origins and steep to rugged slopes, with inclinations that vary from 25% to over 70%. Composed by folded structures, are unstable grounds in which landslides occur frequently.

In turn, this classification was subdivided into 5 landscapes and 13 sub-landscapes, with which the Project Area was described. As can be seen in Table 1, the *Slightly Dissected High Terraces* and the *Moderately Dissected High Terraces* are the most common physiography types in the Project Zone.

Table 1. Physiographic Units within the Project Zone

Physiographic units	Area (ha)	%
Slightly dissected High terraces	352 154.23	34.68
Moderately dissected High terraces	251 836.15	24.80
Highly dissected Low hills	134 394.83	13.24
Highly dissected High terraces	86 204.41	8.49
Low terraces with imperfect to poor drainage	54 063.75	5.32
Moderately dissected Low hills	51 922.47	5.11
Slightly dissected Low hills	22 312.16	2.20
High terraces slightly dissected with areas of poor drainage	18 674.39	1.84
Hills	11 667.01	1.15
Middle terraces with moderate or good drainage	10 219.45	1.01
Low terraces with moderate or good drainage	7 419.45	0.73
Water bodies	6 328.00	0.62
Middle terraces with bad to poor drainage	4 089.75	0.40
Middle terraces moderately dissected	2 176.54	0.21
Complex riverbank	1 218.28	0.12
High terraces with bad to poor drainage	552.04	0.05
Islands	41.22	0.00
Low terraces with very poor drainage	31.69	0.00
beaches river rock beaches and sandbanks	9.04	0.00
Total	1 015 314.8	100.00

Map 4. Physiography types within the Project Zone and Project Area



Soils

There are three groups of soil in Madre de Dios:

- Recent alluvial soil

Soil located near rivers and that continuously receive sediments. Generally, this soil is used for agriculture. However, poor drainage or hydromorphic and low fertility also characterize it.

- Sub-recent alluvial soil

Soils originated from former river sediments due to undermining channels or orogenic and epirogenic movements. In general they are deep soils, of a moderately refined texture, flat topography and slightly wavy, a drainage which may vary from good to imperfect to poor, of a natural very low fertility.

These middle and high terraces have been dissected and deepened slowly due to pluvial erosion up to the point of forming, in many cases, low hills.

- Residual soil

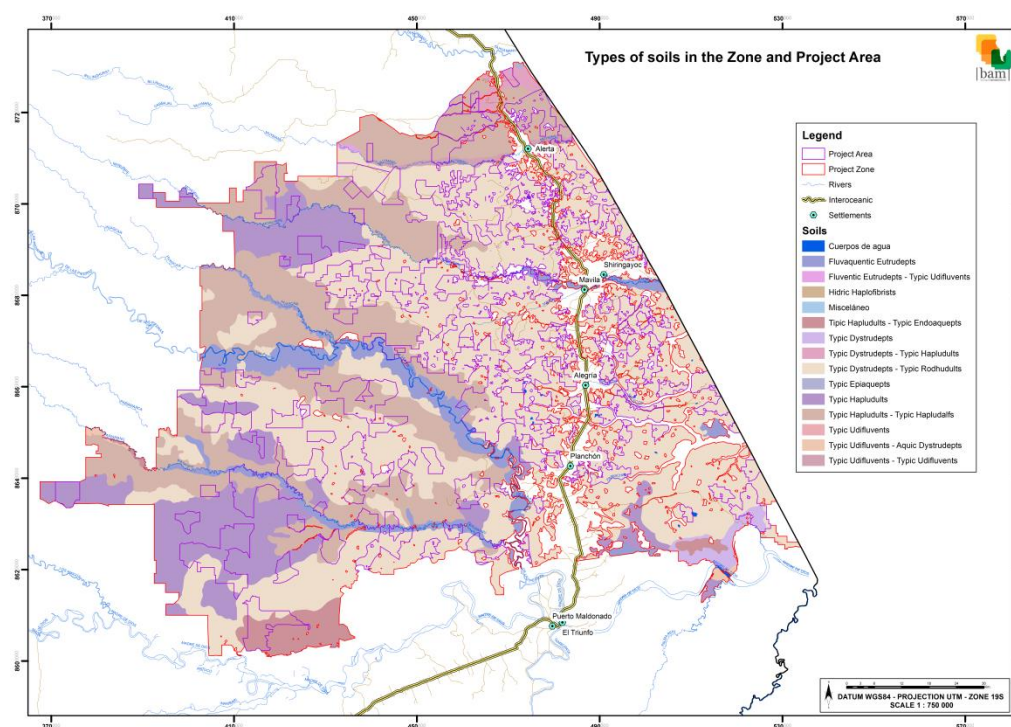
Soil that originated on site based on Tertiary and Quaternary sedimentary materials (shale, limonite, sandstones and gravels), forming high and low hills as a result of various phenomena and which is neighboring the highland mountainous system. The soils are generally moderately refined, deep to superficial and an abrupt topography, which gives it a moderate to high erosive potential.

Taxonomically, twelve types of soil were identified within the Project Zone, of which *Typic Dystrudepts* - *Typic Rodhudepts* and *Typic Hapludepts* - *Typic Haplualfs* are the predominant ones as they cover 53% and 24% of the Project Zone, respectively. All types of soil are listed in Table 2, and their distribution inside the Project Zone and Project Area is shown in Map 5.

Table 2. Types of soil in the Project Zone

Types of soil	Area	%
Typic Dystrudepts - Typic Rodhudepts	537 668.46	52.96
Typic Hapludepts - Typic Haplualfs	245 126.08	24.14
Typic Hapludepts	128 303.34	12.64
Fluvaquentic Eutrudepts	53 807.78	5.30
Typic Hapludepts - Typic Endoaqupts	21 697.53	2.14
Typic Dystrudepts	7 889.58	0.78
Water bodies	6 328.00	0.62
Typic Udifluvents - Typic Udifluvents	5 975.57	0.59
Typic Dystrudepts - Typic Hapludepts	5 518.47	0.54
Typic Udifluvents - Aquic Dystrudepts	2 111.87	0.21
Fluventic Eutrudepts - Typic Udifluvents	550.29	0.05
Typic Epiaqupts	255.93	0.03
Typic Udifluvents	41.22	0.00
Hidric Haplofibrists	31.69	0.00
Miscellaneous	9.04	0.00
Total	1 015 314.8	100.00

Map 5. Types of soils in the Project Zone and Project Area



Geology

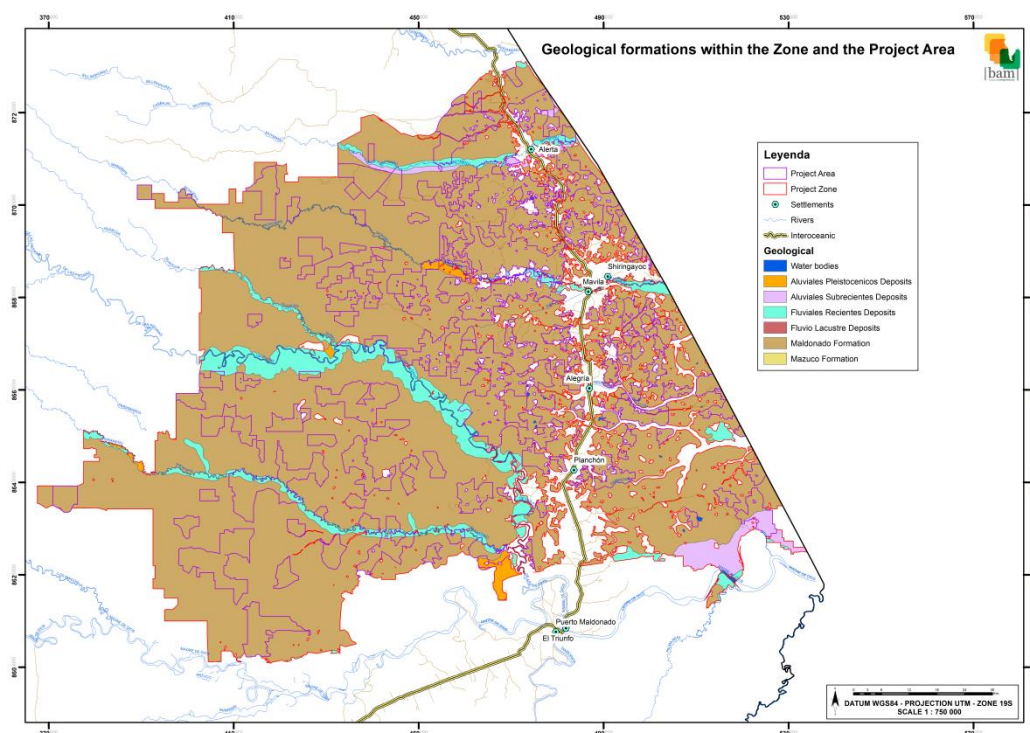
Madre de Dios is situated in the Madre de Dios-Beni depression at the foot of the Andes. Every year, rivers like the Alto Madre de Dios and the Inambari flow down from the Andes carrying millions of tons of newly eroded material to this depression. Due to this constant flow of new material, the superficial geology of the department is extremely young. All the terraces in the department that have been studied so far are less than 200,000 years old and some are only 30,000 years old. Below the surface lies a layer of the same alluvial material, 3-4 km thick, deposited during the last 20 million years.

The Maldonado geological formation predominates in the Project Zone, covering 91% of the total area. This formation is comprised of deposits of gravel, conglomerates and sandstone distributed along the plain land of Madre de Dios, lying in discordance with the Madre de Dios Formation. Table 3 shows the area of each type of geological formation located in the Project Zone and Map 6 shows these formations within the Project Zone and the Project Area.

Table 3. Types of geological formation in the Project Zone

Types of geological formation	Area	%
Maldonado formation	922 227.15	90.83
Recent fluvial deposits	63 845.11	6.29
On growing alluvial deposits	16 485.74	1.62
Pleistocene alluvial deposits	6 389.42	0.63
Water bodies	6 328.00	0.62
lacustrine fluvial deposits	31.69	0.00
Mazuco formation	7.74	0.00
Total	1 015 314.4	100

Map 6. Geological formations within the Project Zone and the Project Area



Hydrography

Madre de Dios presents 11 hydrographic units, which are grouped in three great basins: the basin of the Madre de Dios River, the basin of the Tambopata River and the Acre¹ River Basin.

The project is located in the Madre de Dios River Basin, which occupies 66% of the Department and whose hydrographic-network main rivers are the Madre de Dios River (27.38%), the Tambopata River (19.03%) and Las Piedras River (12.45%). The Heath and Inambari Rivers also compose this basin.

- Madre de Dios River

It has an approximate length of 655km and passes through Peru, Bolivia and Brazil. The Madre de Dios River originates in the Pucara snow-capped mountain southeast of Paucartambo in the department of Cusco. The most important tributaries are: the Colorado, Inambari, Tambopata and Heath Rivers to the right borderline and the Manu and Las Piedras Rivers to the left borderline.

- Tambopata River

It has an approximate length of 402 km. It originates in the Carabaya Mountains (Puno). Its main tributaries are the Azata, Shenahuaja, Shehetapiti, Távara, Elías Aguirre, Malinowski Rivers, etc. The first populations used the Tambopata River for their entry and they settled on the river's bank, which caused the discovery of gold.

- Las Piedras River

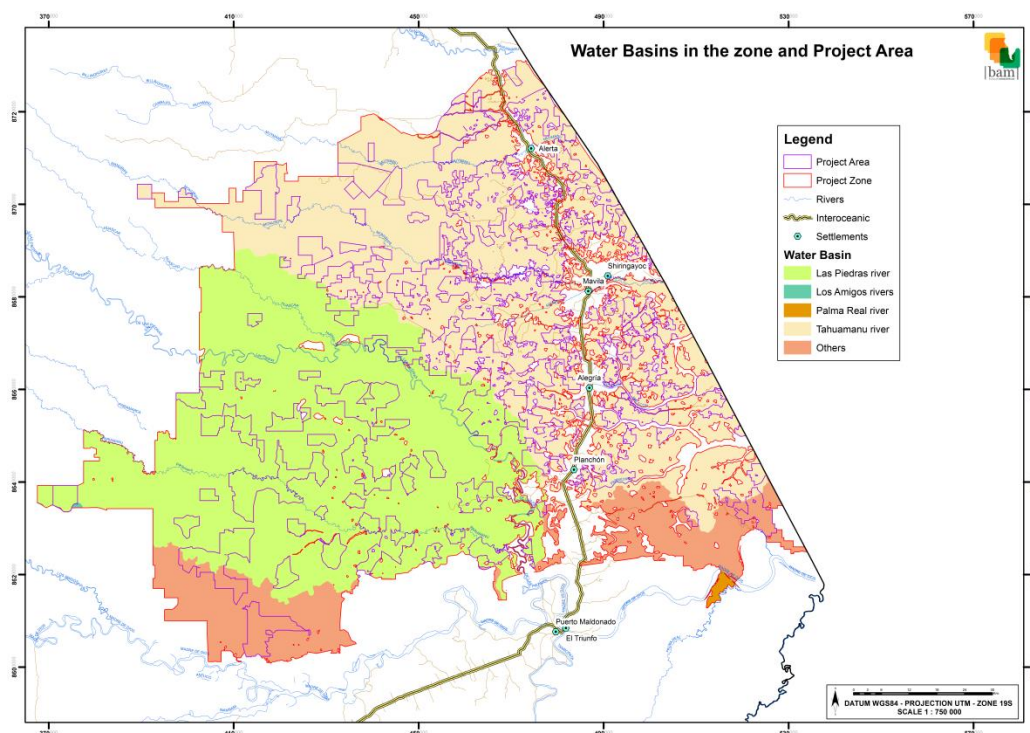
It is approximately 500 km long. Its main tributaries are the Ceticoyacu, Chanchamayo, San Francisco, Lidia, Cariyacu, Pariamanu y Upuri Capu Tuari Rivers on the right

¹ Environmental Baseline Study of the Basin of Madre de Dios River. 2010. Project Baseline of Rivers Basin. Ministry of Environment (MINAM)

borderline. The basin of the river of Las Piedras is sparsely populated and only some estates are isolated located in its banks.

In the Project Zone, there are four sub-basins: Las Piedras, Los Amigos, Palma Real and Tahuamanu. The Tahuamanu River runs over the north limit of the Project Area. To the south, from east to west, Muymanu and Manuripe Rivers run by the Mavila village. Further south Las Piedras River and its tributary, the Pariamanu River, run by. To the south and parallel to limits of the project runs the Madre de Dios River. (See map 7)

Map 7. Water Basins in the Project Zone and Project Area



2. Types and Conditions of the Vegetation in the Project Area

2.1 Types of Vegetation in the Department of Madre de Dios and in the Project Area

Natural forests cover an area of 8,102,917 hectares in Madre de Dios, which ranks as the third department in the country with the largest forest area after Ucayali and Loreto.²

The *Instituto de Investigaciones de la Amazonía Peruana* (IIAP), in coordination with the Regional Government of Madre de Dios (GOREMAD), did the Ecological Economic Zoning (ZEE) for the entire Madre de Dios Region in 2009. According to the ZEE's Thematic Vegetation Map, the Region presents 22 types of natural vegetation, containing at least 2,429 species of plants (angiosperms and gymnosperms), including 869 genera and 172 families.

The most widespread types of vegetation in the Project Zone are Semi-Deciduous Dense Forests in Plains (58.11%), Semi-Deciduous Dense Forests in Hills (14.16%), and Mixed Bamboo Communities or Mixed Pacales Associated with Scattered Trees in Plains (9.87%).

² CESVI, 2005. "Model of sustainable use of forest and the concessionaire companies" Progress and challenges in the province of Tahuamanu, Madre de Dios

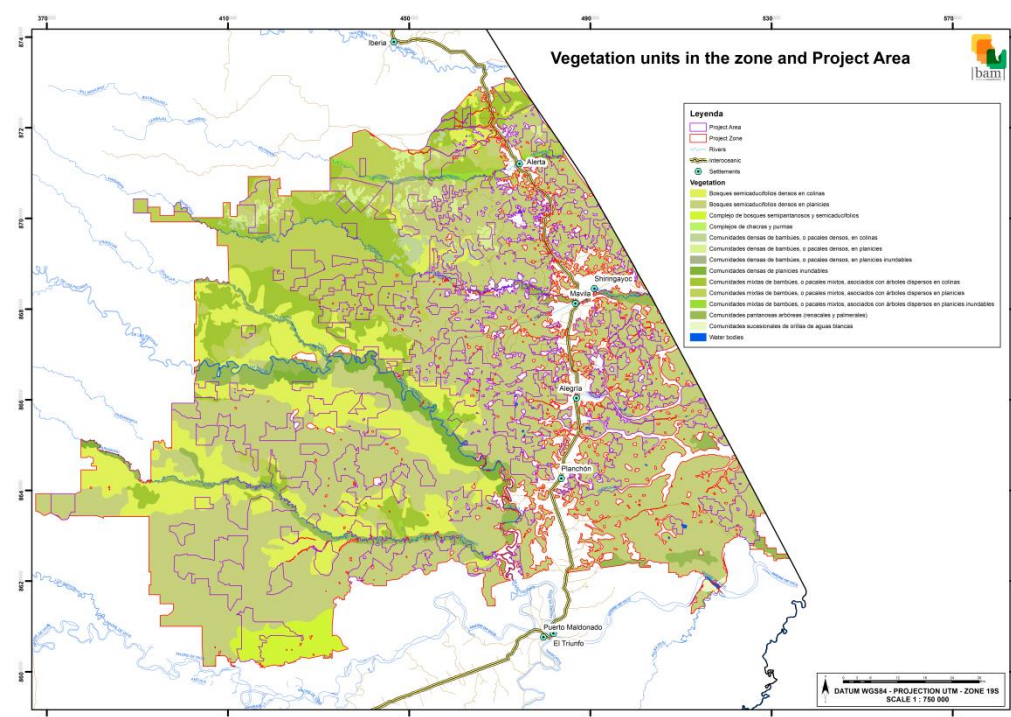
Similarly, these units are the most representative of the Project Area, occupying 69%, 11% and 10% respectively.

The vegetation units of the PZ and PA are shown in the following table and map:

Table 4. Vegetation units in the Project Zone and Project Area

Vegetation Units	Project Zone		Project Area	
	Ha	%	Ha	%
Dense semi deciduous forests in the plains	590 017.59	58.11	212 050.80	68.68
Dense semi deciduous forests in the hills	143 722.70	14.16	32 868.47	10.65
Mixed communities of bamboos or mixed pacaes associated with scattered trees in the plains	100 252.82	9.87	30 656.36	9.93
Mixed communities of bamboos or mixed pacaes associated with scattered trees in the hills	69 703.85	6.87	13 381.90	4.33
Dense communities of bamboos or dense pacaes in the plains	12 320.27	1.21	5 562.52	1.80
Arboreal swampy communities	44 240.25	4.36	4 808.63	1.56
Semi swampy and semi deciduous forests complex	18 674.43	1.84	4 604.90	1.49
Dense communities of bamboos or dense pacaes in the hills	6 870.01	0.68	1 694.93	0.55
Mixed communities of bamboos or mixed pacaes associated with scattered trees in flood plains	6 347.76	0.63	1 353.71	0.44
Dense communities of flood plains	14 973.47	1.47	864.70	0.28
Water bodies	6 328.00	0.62	849.40	0.28
Successional communities of White water shores	1 227.32	0.12	36.48	0.01
Dense communities of bamboos or dense pacaes in flood plains	636.09	0.06	24.23	0.01
Complex of deforested and agricultural lands	0.28	0.00	0.28	0.00
Total	1 015 314.8	100.0	308 757.31	100.0

Map 8. Vegetation units in the Project Zone and Project Area



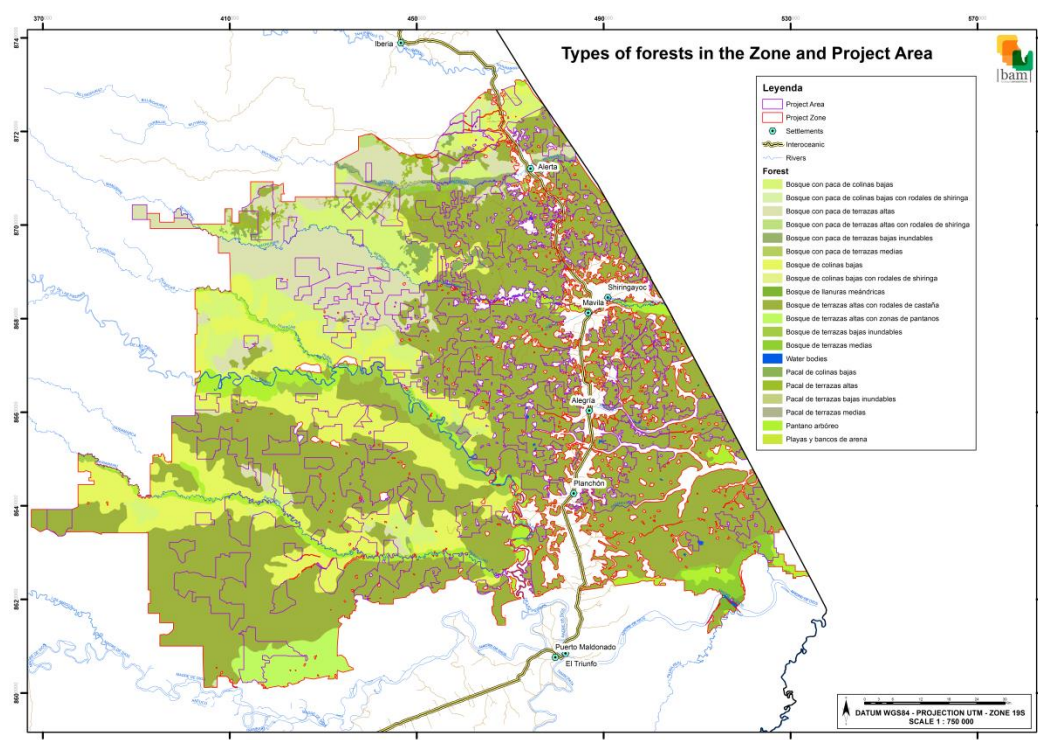
Types of Forests

By using the Thematic Forest Map of the ZEE, we have identified nineteen types of forests inside the Project Zone of which three are predominant: High Terrace Forests with Brazil Nut Stands (57%), Low Hill Forests (14%) and High Terrace Forests with Bamboo (9.6%). Similarly, there are seventeen types of forest inside the Project Area, where the most representative ones are the three types already mentioned covering 67.9%, 10.7% and 9.8%, respectively. All types of forest within the Project Area and Project Zone can be observed in Table 5 and Map 9.

Table 5. Types of forest in the Project Zone and Project Area

Forest Units	Project Zone		Project Area	
	Ha	%	Ha	%
High terrace forest with Brazil nut stands	579 765.55	57.1	209 784.76	67.94
Low hill forests	142 952.93	14.08	32 343.16	10.48
Terrace Forests with Bamboo	97 522.79	9.61	30 241.11	9.79
Low hills with bamboo (paca) forest	66 349.15	6.53	11 068.55	3.58
Swamp trees	44 240.53	4.36	4 808.90	1.56
High terrace forest with swamp areas	18 674.43	1.84	4 604.90	1.49
Low flood terrace forest	14 973.36	1.47	864.70	0.28
Bamboos of high terraces	11 840.93	1.06	5 377.87	1.74
Mid terrace forest	10 252.04	1.01	2 266.04	0.73
Low hills with bamboo (paca) forest and Hevea stands	3 354.70	0.33	2 313.35	0.75
High terrace with bamboo forest with Shiringa stands	1 065.43	0.10		-
Forests with Pacal of low floodable terraces	6 347.87	0.63	1 353.71	0.44
Forests with Pacal of middle terraces	1 664.60	0.16	415.26	0.13
Low hill forests with Hevea stands	769.77	0.08	525.31	0.17
Meandering plain forests	1 218.28	0.12	36.48	0.01
Water bodies	6 328.00	0.62	849.40	0.28
Bamboos of low hills	6 870.01	0.68	1 694.93	0.55
Bamboos of low flooded terraces	636.09	0.06	24.23	0.01
Bamboos of low flooded terraces	479.34	0.05	184.65	0.06
Beaches and sandbanks	9.04	0.00		-
Total	1 015 314.8	100.00	308 757.30	100.00

Map 9. Types of forests in the Zone and Project Area



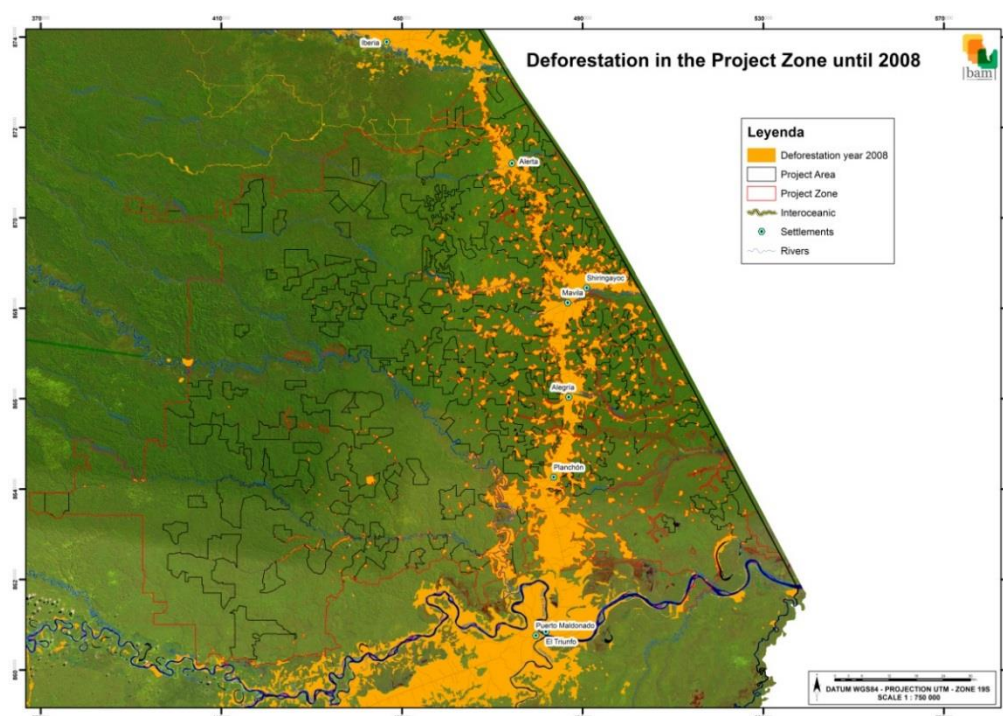
2.2 Condition of the Vegetation in the Project Area

The Project Area includes forests that have been subject to constant recollection of Brazil nuts; therefore, the integrity of these forests as an ecosystem has been maintained. Since year 2000, the Brazil nut concessionaires present their Forest Management General Plan and their Annual Operational Plan. For the sustainable use of timber resources, they also present Complementary Plans.

As seen in the Forest Types Map from ZEE, IIAP identified intervened-deforested areas. In Map 10 that shows the satellite image of year 2008 of the Project Zone, these poles of deforestation become evident especially in the nearby areas of the Interoceanic Highway, and sidings. It can be clearly observed how the opening and improvements of this highway increase the areas of deforestation.

According to the deforestation model, deforestation will increase significantly over the Project Area and Project Zone. The REDD Project is probably the only alternative for the conservation of these forests.

Map 10. Landsat-7 2008-year satellite image of the Project Area and Zone



3. Boundaries of the Project Area and Project Zone

The Project Area is formed by a set of non-timber concessions, specifically Brazil nut (BN) concessions that were granted by the Peruvian Government from year 2002, after the recognition and regulation of this activity by the Forestry and Wildlife Law of year 2000.

These concessions are dispersed in a well-defined zone, where the majority of BN concessions (nearly 1000) are located (both margins of Stretch 3 of the Inter-Oceanic Highway, most of them at the left side).

In the beginning, 377 concessions joined the Project, but the number increased during the first three years making 405 associates so far, being more expected in the future. Each concession consists of an irregular polygon of "n" vertices³. Annex 1 shows a table with the unique code for each concession (which is the contract's code), their areas and centroids coordinates.

The boundaries of the PA were defined based on the legal boundaries of each concession contract; nevertheless, some parts (especially the ones near the IOS and secondary roads) were excluded because they had been deforested.

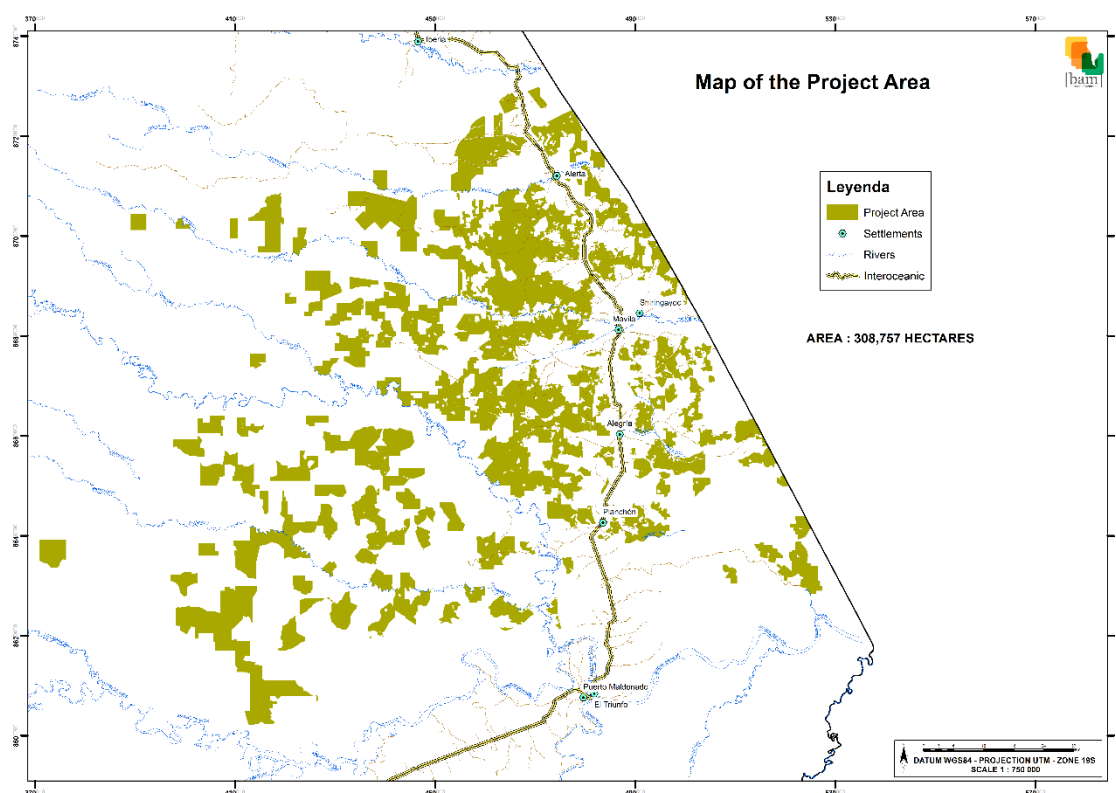
The overlap of areas among different concessions was an issue encountered to calculate the total Project Area. This made it unreliable to use the areas stated in the contracts⁴. In addition, there were some areas identified that could classify as peat soils according to the map of Forest and Soil of ZEE. Therefore, we have removed all areas that did not classify as

³ The coordinates of the vertices of each concession are not shown in this document due to practical issues, but are kept available in BAM's office

⁴ BAM is currently working with the concessionaires members of the Project to resolve this issue by re-dimensioning their boundaries

forest. Additionally, the overlaps were solved in ArcGIS by dissolving all the boundaries to get a net area. The resulting Project Area is 308 757.3 hectares of forestland.

Map 11. Map of the Project Area Boundaries



The Project Zone has been determined as the Project Area plus the Leakage Belt, which is comprised of other Brazil nut concessions and neighboring properties. The Project Zone covers a total area of 1 015 316 hectares. Its boundary is delineated in the previous maps and contains the entire BN region.

This boundary was considered sufficient to estimate the influence of activities of the project due to the following considerations:

- It is composed by holders of land of similar characteristics of those who occupy the Project Area. The Brazil nut concessionaires, as well as the agricultural properties, are rural families of scarce resources that live of these activities for their subsistence.
- It is located in an equidistant way from the principal access roads, terrestrial and fluvial. The only difference between the Brazil nut concessionaires who form part of the Project Area and the ones that form part of the Project Zone (in leakage belt) is its adhesion to the project REDD+ being this a circumstantial situation which can vary with the adhesion and/or withdrawal of each type of concessionaire.

4. Current carbon stocks in the Project Area

4.1 Stratification

The Project Area consists of forests located within the Brazil nut concessions that were part at the start of the project. Within this, the Project team identified 17 units of forests or

“strata”. As it was mentioned in Section G1-2.1, the forest strata were obtained from the Thematic Forest Map of the Economical Ecological Zoning (ZEE) of Madre de Dios.

Figure 1. Decision tree for choosing a stratification method

Source: GOFD-GOLD Sourcebook, COP 16 v1

- It has less than 5 years of development (the ZEE map was elaborated in 2009)
- Since it has been officially utilized to conduct the inventories and forest census in all the country, it has coefficients of variation known for each region
- The scale is acceptable (1:100,000)
- It considers areas of non-forest as deforestation and also water bodies and sandbanks.
- The studies developed will be comparable at a national level, because it is a coverage included in all the ecological-economic zoning, and a forest national map exists.
- Its model integrates various elements which can influence on the biomass (floristic, physiographic, physiognomic or structural and ecological)

⁵ Reátegui, F; Martínez, P. Zonificación Ecológica Económica del Departamento de Madre de Dios – Forestal. IIAP – GOREMAD. 2009.

In order to establish the carbon stock, the types of forests of the Project Area have been regrouped in new strata, which require less sampling plots while keeping a desired level of precision.

The existing types of vegetation and physiography were the criteria used for regrouping the forest units of the Forest Map, so that the new strata have natural continuity. The results of this simplification can be appreciated in the following table.

Table 6. Forest strata simplification y its respective extensions in the Project Area

Forest type in ZEE	Simplified strata	Code	Area
Low floodable terraces with bamboo (paca) forests	Flooded terraces forest	BTI	2 218.4
Low flood terrace forests			
Mid terrace forests	Terraces forests	BT	216 655.7
High terrace forests with Brazil nut stands			
Middle terrace forests with swamp areas			
Low hill forests	Low hills forests	BCb	32 868.47
Low hill forests with Hevea stands			
Mid terrace with bamboo (paca) forest	High and mid terrace with bamboo (paca) forests	BPT	30 656.36
High terrace with bamboo (paca) forest			
Paca forests of low hills	Low hill with bamboo (paca) forests	BPCb	13 381.9
Paca forests of low hills with Hevea stands			
Bamboos of low flooded terraces	Bamboos (Pacal)	P	7 281.68
Bamboos of mid terraces			
Bamboos of high terraces			
Bamboos of low hills			
Meandering plains forest	Swamp trees	PA	4 845.38
Swamp trees			
Water bodies	Others	NB	849.4

In-house elaboration

4.2 Carbon Inventory

Once the strata were defined, the Project team calculated the number of sample plots required for the carbon inventory and elaborated a manual of procedures for the fieldwork⁶. Subsequently, the inventory of the area was carried out. All in all, the inventory followed the below characteristics:

- It was taken place through a stratified sample, using 58 permanent plots within the Project Area
- Trees, palm trees and pacas (bamboos) inside the plots were all measured
- The parameters measured were the DBH, total height and number of individuals (in the case of the pacas)
- The biomass of trees and palm trees are estimated using allometric equations of renowned authors, such as J. Chavé and Delaney. In the case of the *pacas*, a fixed value

⁶ Standardized Operating Procedure for the carbon inventory in REDD *Project Concessions of Brazil nut of Madre de Dios*. Amazon Forests, 2011

of biomass per individual, obtained from bamboo forest studies in Colombia, was used.

- The final conversion, from biomass to content of carbon dioxide, was calculated by multiplying standardized factors such as: carbon fraction, relationship of the molecular weight between CO₂ and carbon and the *Root-to-shoot Ratio* for root biomass.

Number of plots

To reach an acceptable level of precision of $\pm 15\%$ of the mean with 95% confidence, the carbon inventory carried out for the REDD Project in Brazil nut concessions followed the guidelines described in the *Sourcebook for Land use, Land-use change and forestry Projects* (BioCF – Winrock International, 2005)⁷. The number of locations or “plots” was calculated using the Winrock Sampling Calculator tool, which includes a safety margin of 15% additional plots.

With the purpose of having a more adjusted value of the coefficient of variation of each stratum, necessary to estimate the number of plots, the Project team used the results of the following regional inventories: Native Belgium Community; Maderacre and Maderyja Forestry Concessions; and Bahuaja Sonene National Park. The three inventories were conducted between 2010 and 2011, in the surrounding areas of the PA, and using the same forest stratification as the Project. Therefore, the results of the inventories are comparable and can be used as a reference.

Given that some of the plots of the inventories mentioned above showed non-representative results, the project team applied a statistical Z-test to identify any atypical values (defined as values with a difference of more (less) than 2.5 times the standard deviation of the data). These values outliers were withdrawn from the calculation to avoid their influence on the results.

The summary of these calculations can be seen in the following tables:

Table 7. Required Error and Confidence Level

Plot Quantity - Aboveground Carbon		
e - Level of error (%)	15.0%	
Error level (decimal)	0.15	
Z(1-a) - Confidence level	95.0%	
Sample statistic Z(1-a)	1.96	
Total Project Area size	290,695.5	hectares

⁷ Pearson et al. Sourcebook for Land Use, Land-Use Change and Forestry Projects. 2005

Table 8. Size and variance of each Strata

Stratum	Stratum Name	Area (ha)	Mean C/ha (tones)	Standard Deviation (tones C/ha)	Plot size (ha)	Cost C _h If no cost, put C _h =1	Coefficient of Variation
1	Flooded Terraces Forests (BTI)	2,193.4	338.94	144.12	0.2	1	43%
2	Swamp Trees (PA)	5,276.4	438.24	176.94	0.2	1	40%
3	High and Mid Terrace with Bamboo (Paca) Forests (BPT)	28,939.8	50.96	171.89	0.2	1	49%
4	Terrace Forests (BT)	204,712.1	476.02	201.30	0.2	1	42%
5	Bamboos (P)	6,221.0	470.31	161.95	0.2	1	34%
6	Low Hill Forests (BCB)	31,085.4	507.96	216.32	0.2	1	43%
7	Low Hill with Bamboo (Paca) Forests (BPCB)	12,267.3	383.01	155.25	0.2	1	41%

Table 9. Aboveground Carbon - Number of Plots to be used

Stratum	Stratum Name	Sourcebook for LULUCF Projects	
		Plot Quantity	Rounded Plot Quantity
Total Sample Size		30.89	36
1	Flooded Terraces Forests (BTI)	0.17	1
2	Swamp Trees (PA)	0.95	1
3	High and Mid Terrace with Bamboo (Paca) Forests (BPT)	2.70	4
4	Terrace Forests (BT)	21.85	26
5	Bamboos (P)	0.55	1
6	Low Hill Forests (BCB)	3.65	5
7	Low Hill with Bamboo (Paca) Forests (BPCB)	1.03	2
Total Number of Plots			40

The excel file *Winrock Sampling Calculator - Castañeros.xls* spreadsheets: *Aboveground C-plots*, *Belgica's Inventory data* and *Outlier detection* shows the calculations in full. It should be stressed that the inventory work was done during the project's second year, when there were 377 associated concessions.

According to the results of the calculations, the required number of samples was 40 plots. However, in order to reduce the level of uncertainty, 58 plots were sampled. The sample plots per stratum are as follow:

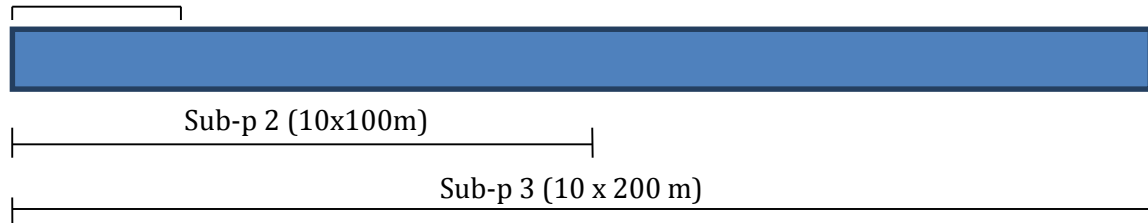
Table 10. Final Number of Permanent Plot per Stratum

Stratum	Plot Number
BPCB	3
BPT	4
BCB	7
BT	40
P	1
BTI	1
PA	2
Total	58

Shape and Size of Plots

Plots with rectangular shapes and measurements of 10m x 200m were established. Each of these plots was divided in 3 sub plots:

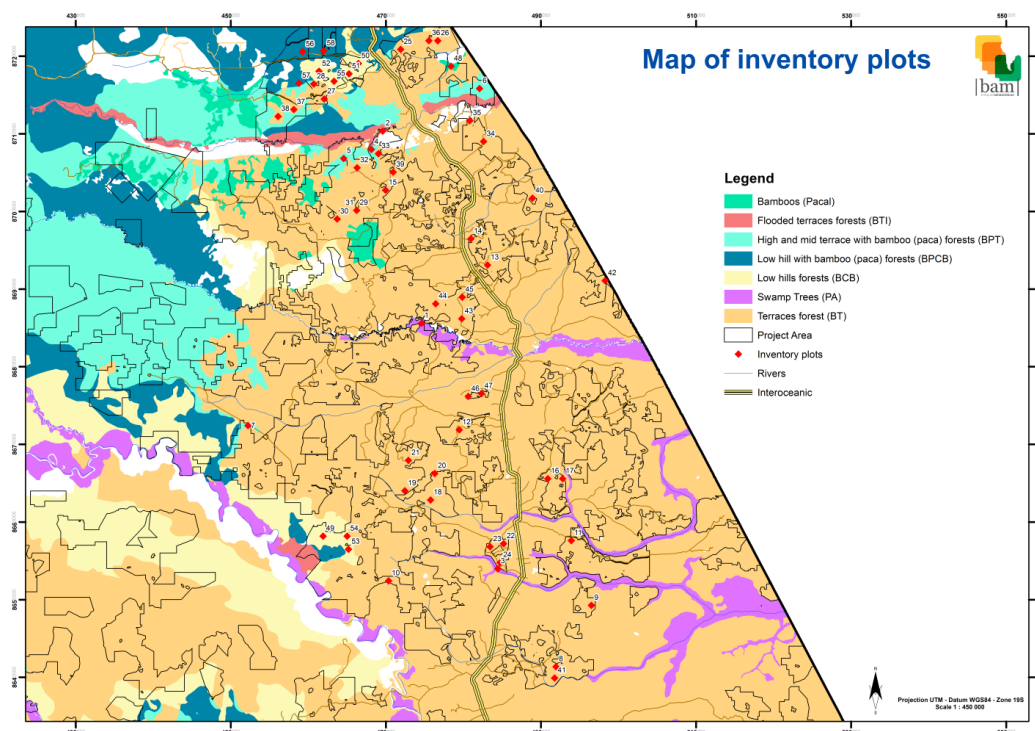
Sub-p 1 (10x20m)



In the sub plot 1, all the trees were measured with DBH higher or equal to 5cm. From the limit of sub plot 1 to the end of sub-plot 2, trees were measured with DBH higher or equal to 10cm. In a similar way, from the limit of sub plot 2 forward, all the tree were measured with DBH higher or equal to 30cm.

Palm trees and *pacales* were evaluated along the entire plot.

Map 12. Location of the Inventory Plots in Project Area



Measurements

The following measurements were registered during the inventory; however, some of them were not used in the calculations:

- Breast height Circumference: only in trees. This measurement is easily transformed to DBH and has the advantage of being less difficult to measure on field. The minimum and maximum DBH, according to the selected equation specifications, is 5cm and 156cm respectively, which are equal to the circumference of 15,7cm and 490cm.

- Total height (TH): for trees and palm trees. For the latter, the measure only considers the height up to the stem, and the maximum value allowed was 30 meters.
- Commercial heights: for the trees
- Health: for trees, palm trees and bamboos

In the case of bamboos, the only necessary parameter was the number of individuals, since the quantity of dry biomass per individual⁸ is already known.

Biomass equations

For trees

For the biomass calculation of trees, the allometric equations applied is the “biomass-diameter regression (model II)” proposed in Chave et al⁹ (2005) for humid¹⁰ forests. This equation was validated by the author based on data of prior studies done in many tropical countries.

$$B = \rho \cdot \exp (-1.499 + 2.148 \cdot \ln (\text{DBH}) + 0.207 \cdot (\ln (\text{DBH}))^2 - 0.0281 \cdot (\ln (\text{DBH}))^3) \text{ in Kg}_{(\text{dry})}$$

Where,

P = species density (gr/cm³)

DBH = chest height diameter, (cm)

For palm trees (pa)

There are few studies to elaborate allometric equations for palm trees, and in this specific case after reviewing literature, equations were found only for 4 out of 17 species present in the Project Area: *Euterpe precatoria* (Huasaí), *Attalea phalerata* (Shapaja), *Bactris gasipaes* (Pijuayo) y *Mauritia flexuosa* (Aguaje). The first one is the most common palm tree in the Project Area, while the last two are less abundant, having one individual of each in the 58 plots.

To choose the most suitable equation, a calculation test was done using the equations of Shapaja and Huasaí, obtaining more conservative results with the last. For this reason, and for having an additional advantage of a wider range of heights permitted (1-30m compared to 1-11m allowed in the Shapaja equation), it was considered better to use the allometric equation of Huasaí in all the palm tree species.

$$B = 6.666 + 12.826 \times H^{0.5} \times \ln (H) \text{ in Kg}_{(\text{dry})}$$

Where,

H = palm tree height (m)

This allometric equation was developed by Delaney et al. (1999) and quoted in the *Sourcebook for Land Use, Land-Use Change and Forestry Projects* (2005) and in Chapter 4 of *Good Practice Guidance for LULUCF* of IPCC.

⁸ Cruz Ríos Hormilson, Bambú - Guadua: *Guadua angustifolia* Kunth. Natural forests in Colombia y commercial plantations in México. Pereira, Risaralda, Colombia. 2009. 720 pages.

⁹ Chave, J; Andalo, C; et al. 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. *Oecologia* 145: 87-99

¹⁰ The forest in Madre de Dios can be considered as a *humid forest*, according to the authors forest classification.

For Pacales (p)

Due to the difficulty of inventorying areas with vast presence of pacas, the Project team decided to use the value of biomass per individual, taken from the studies done in natural pacales in the Colombian Amazonian, which is described in Cruz, H. (2009). The value is equal to:

$$B = 47.022 \text{ kg/individual (dry)}$$

Therefore, the only required parameter to obtain the biomass of pacales, is the number of individuals per plot.

4.3 Carbon stocks calculation

Aboveground Carbon Stocks

For the calculation of the dry biomass of each individual, the above equations were used, depending on the type of vegetation (tree, palm tree and paca). This result was multiplied by the carbon fraction (FC) to obtain the carbon content in tones (t C). The Project team used a FC of 0.49 tC / t m. s., as indicated in table 4.3, chapter 4 of AFOLU Guidelines (IPCC 2006), for the tropical and sub-tropical forests.

In order to extrapolate the carbon stocks from a per sub-plot basis to a per hectare basis, the total sum of the carbon stock in each sub-plot was divided by their respective size:

- a) 0.02 m² for sub plot 1 (5 – 10 cm DBH)
- b) 0.1 m² for sub plot 2 (10 – 30 cm DBH)
- c) 0.2 m² for sub plot 3 ($\geq$ 30 cm DBH, PA y P)

Subsequently these measurements were multiplied by 44/12 to calculate the carbon dioxide equivalent per hectare (t CO₂-e/ha). The following table shows the results:

Table 11: Carbon dioxide stock per plot

		Carbon Stock (t CO ₂ -e /ha)				
STRATUM	PLOT	PA y P	5-10	10-30	30	TOTAL
PA	1	11.64	4.85	104.28	628.90	749.68
BTI	2	14.47	22.56	70.60	206.75	314.39
PA	3	6.35	21.54	111.71	609.49	749.09
BPT	4	4.26	31.47	98.54	93.68	227.95
BPT	5	7.47	19.31	160.45	437.37	624.60
BPT	6	7.34	26.02	121.00	267.62	421.98
BPT	7	1.25	8.06	131.42	196.48	337.20
BT	8	1.05	8.75	139.06	327.44	476.30
BT	9	20.79	9.58	104.06	584.86	719.30
BT	10	2.77	29.76	103.93	227.15	363.62
BT	11	16.75	2.33	92.85	476.40	588.33
BT	12	3.00	9.02	76.22	1 854.26	1 942.50
BT	13	3.26	32.46	169.30	431.19	636.22
BT	14	11.18	19.73	181.39	712.66	924.96
BT	15	1.60	25.53	100.99	718.83	846.96
BT	16	1.80	6.30	124.56	484.10	616.76
BT	17	1.54	11.02	110.77	560.42	683.75
BT	18	3.82	2.02	165.08	331.57	502.49
BT	19	4.19	21.54	95.47	848.54	969.75
BT	20	3.46	4.31	116.18	513.10	637.05

BT	21	4.04	11.90	121.54	265.00	402.47
BT	22	15.06	27.64	173.05	557.85	773.60
BT	23	10.34	13.11	113.55	1 209.02	1 346.01
BT	24	2.69	18.13	155.50	503.79	680.11
BT	25	3.71	22.57	99.48	218.11	343.87
BT	26	4.16	32.59	168.46	820.39	1 025.59
BT	27	5.14	26.09	128.64	791.89	951.76
BT	28	3.25	25.41	163.99	505.31	697.96
BT	29	3.16	22.06	129.55	684.03	838.80
BT	30	13.37	18.64	156.84	620.46	809.30
BT	31	13.62	25.39	101.09	561.78	701.88
BT	32	5.43	19.23	183.53	272.45	480.64
BT	33	17.62	11.48	100.81	286.20	416.12
BT	34	12.61	10.39	100.76	560.76	684.52
BT	35	5.79	21.05	61.30	927.35	1 015.48
BT	36	9.63	29.14	150.89	485.31	674.97
BT	37	11.03	18.54	144.09	1 005.83	1 179.49
BT	38	1.28	17.60	168.04	539.55	726.46
BT	39	8.38	22.48	138.13	856.93	1 025.92
BT	40	16.76	9.24	43.73	352.48	422.20
BT	41	2.57	4.67	131.02	1 390.08	1 528.34
BT	42	5.45	28.77	75.75	586.28	696.25
BT	43	6.80	17.65	198.56	355.06	578.07
BT	44	14.77	14.05	123.31	449.83	601.96
BT	45	14.83	19.15	92.35	446.61	572.95
BT	46	9.12	21.00	116.77	806.91	953.80
BT	47	7.74	10.17	153.91	250.89	422.71
P	48	12.62	0.90	134.72	459.83	608.06
BCB	49	7.61	26.79	154.71	325.04	514.15
BCB	50	2.54	23.73	209.40	1 204.08	1 439.74
BCB	51	-	23.27	82.21	1 244.38	1 349.86
BCB	52	7.69	26.50	135.31	528.63	698.13
BCB	53	8.21	9.51	32.68	579.76	630.16
BCB	54	12.53	5.44	153.69	398.79	570.45
BCB	55	5.61	9.69	60.70	482.01	558.01
BPCB	56	5.44	32.69	191.89	188.29	418.30
BPCB	57	0.05	10.11	72.38	252.99	335.53
BPCB	58	20.34	11.15	48.91	263.32	343.72

Table 12. The average aboveground carbon stock per stratum

Stratum	Aboveground Carbon Stock (t CO₂-e/ha)
BPCB	365.85
BPT	402.93
BCB	822.93
BT	761.48
P	608.06
BTI	314.39
PA	749.38

Belowground Carbon

Root carbon has been measured as a ratio of the biomass previously calculated. This ratio, called root-to-shoot ratio, is equal to 0.24 and was taken from the Table 4.4 of the *AFOLU*

Guidelines (IPCC 2006), for humid deciduous tropical forests with an aboveground biomass (AGB) higher than 125 t/ha.

In other words, we multiplied the AGB measurement of each individual by 0.24 to obtain the belowground biomass. The measurements were aggregated per each sub plot. In turn, these sub plot totals were divided by the size of the respective sub plots, and multiplied by 44/12 to obtain the carbon dioxide equivalent per hectare (t CO₂-e/ha).

Table 13. Average belowground carbon stock per stratum

Stratum	Belowground Carbon Stock (t CO ₂ -e/ha)
BPCB	87.80
BPT	96.70
BCB	197.50
BT	182.76
P	145.93
BTI	75.45
PA	179.85

Total carbon stock per plot

In order to obtain the total carbon stock per stratum, the calculations of the carbon stock per carbon pool were added. It is important to stress that only tree biomass carbon stock was accounted for, without including the other carbon pools: non-tree biomass, dead wood, litter and soil organic carbon; because many of the estimates were not significant. This point will be detailed in section G2.

Table 14. Total carbon stock in the Project Area.

Stratum	Total Carbon Stock (t CO ₂ -e/ha)
BPCB	453.7
BPT	499.6
BCB	1 020.4
BT	944.2
P	753.9
BTI	389.8
PA	929.2

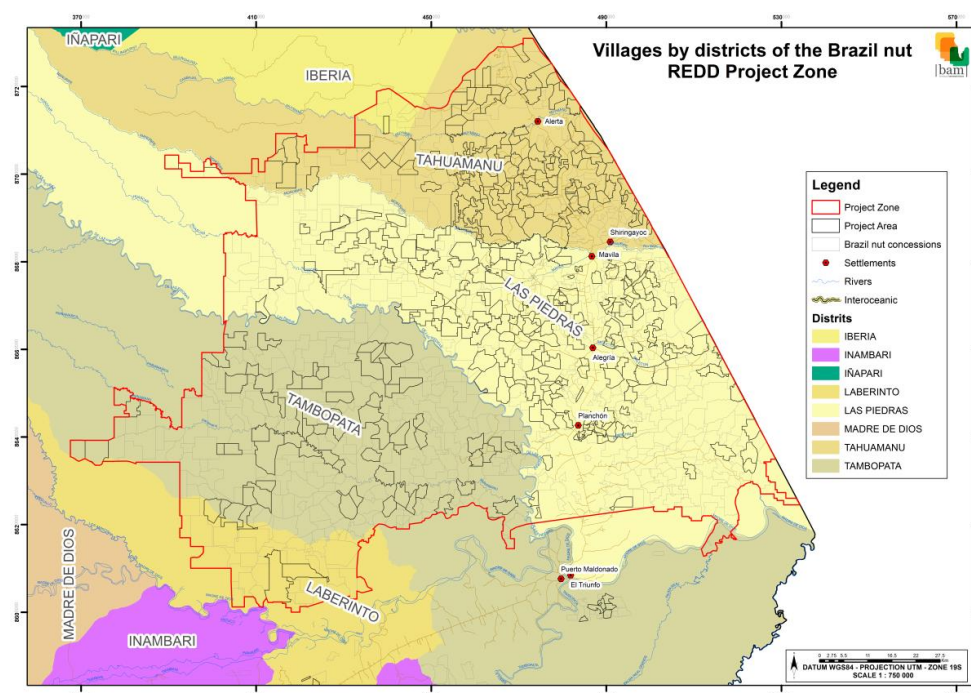
5. Communities in the Project Zone

Local populations in the Project Zone are mainly composed of people engaged in economic activities as Brazil nuts harvesting, timber extraction and alluvial mining, as well as agriculture, livestock, services and local employment. These communities are located in the main population centers, housing associations and other types of scattered settlements.

5.1 Villages and Population

The most important villages of the Project Zone are located along the South Interoceanic Highway - stretch 3, which is the sector between Puerto Maldonado and Iberia. These villages are politically circumscribed to the districts of Tahuamanu (Tahuamanu province) and Las Piedras (province of Tambopata), all of them in the Madre de Dios department.

Map 13. Villages by Districts within the Project Zone



Six villages¹¹ were identified within the Project Zone. The total population registered (Census of 2007)¹² in terms of villages and scattered population, accounts for 7 119 inhabitants, out of which 55.5% were males and 44.5% were females. It must be noted that, in the case of the scattered population, we consider the population registered for the entire district; therefore, it is a referential quantity.

Table 15. Villages and Population by gender in the Project Zone

Districts, Villages and Population (by Gender) Located in the Project Zone						
District	Populated centers	Population	Male	%	Female	%
Dist. Las Piedras	CCPP Urb. Las Piedras (Planchón)	844	463	54.9	381	45.1
Dist. Las Piedras	CCPP Urb. Mavila	978	521	53.3	457	46.7
Dist. Las Piedras	CCPP Urb. Alegria	708	348	49.2	360	50.9
Dist. Las Piedras	scattered population	2 113	1 212	57.4	901	42.6
Dist. Tahuamanu	CCPP Urb. Alerta	986	539	54.7	447	45.3
Dist. Tahuamanu	CCPP Rural La Novia	241	128	53.1	113	46.9
Dist. Tahuamanu	CCPP Rural Shiringayoc	281	147	52.3	134	47.7
Dist. Tahuamanu	scattered population	968	736	76.0	232	24.0
TOTAL		7 119	4 094	55.5	3 025	44.5

In-house elaboration. Source: Populated centers, Census 2007- INEI

¹¹ The category of villages (or population centers) and scattered population used by the Census 2007, has been ordered by the Law on Territorial Organization and Position No. 27795. With this norm, the Peruvian government has established those population groups with more than 150 inhabitants as Villages.

¹² For the department of Madre de Dios, the last census (Census 2007) recorded 109 555 inhabitants (0.4% of the total population of Peru), composed of 54.3% men and 45.7% women. Of this population, 73.3% are located in urban areas and 26.7% in rural areas.

The population by age group has a distribution that has high incidence of children and youth. In addition, the majority of the population by gender is male; however, an important presence of young females was identified. It should be stressed that the population younger than 15 years old represents 32.9% of the total population.

Table 16. Total population by large age groups in the Project Zone of the districts included in the Project Zone

District and Gender	Total	Large age groups					
		Less than 1 year	1 to 14 years	15 to 29 years	30 to 44 years	45 to 64 years	65 and more
Las Piedras	5 491	126	1871	1 467	1 092	722	213
Tahuamanu	2 739	48	665	806	710	410	100
Total	8 230	174	2 536	2 273	1 802	1 132	313
%	100.0	2.1	30.8	27.6	21.9	13.8	3.8

In-house elaboration. Source: INEI - national census 2007: XI of population VI of housing (population nominally registered)

5.2 Socio-economic profile

The main poverty indicators for the Project Zone are shown in Table 17. It is important to note that the districts included in the Project Zone (Las Piedras and Tahuamanu) present the following characteristics:

- The rural population is 54% of the total population
- 40% and 48% of population without water, respectively
- 56% and 57% of the population without electricity, respectively

Table 17. Main indicators of poverty in the Brazil nut REDD in the Project Zone

Madre de Dios Poverty Indicators - Foncodes District Poverty Map 2006, Updated with the 2007 Census										
Province and district	Population 2007	% Rural population	Quintile 1/	% Population without water	% Population without drainage /latrine	% Population without electricity	% Illiterate women	% Children 0-12 years old	Malnutrition rate children 6-9 years old	Human development index
Peru	27 428 169	24		23	17	24	11	26	22	0.5976
Madre De Dios	109 555	27	3	20	19	31	5	27	13	0.5997
Las Piedras	5 491	54	2	40	7	56	8	31	14	0.5753
Tahuamanu	2 739	54	2	48	8	57	7	22	12	0.5868

In-house elaboration. Source: FONCODES Poverty Map

In terms labor force in the project Zone, the Census of 2007 registered 45.1% and 61.1% of employed labor force and 1.5% and 0.8% of unemployed labor force, in the districts of Las Piedras y Tahuamanu, respectively. It must be noted that the Census also registered 53.5% and 38.1% of non-labor force in the same districts (where the “non-labor force” is the population at age to work but who during the adopted reference period, failed to engage in or pursue an economic activity).

The labor force is linked to diverse economic activities, mainly gold mining, mono-crop traditional agriculture, logging and Brazil nut extraction, livestock and breeding of small animals. The population of the rural areas is mainly formed by former inhabitants and migrants with more than 15 years in the area, who are dedicated to monoculture agriculture, hunting, fishery, Brazil nut recollection, wood extraction, and seasonal artisanal mining and little businesses (stores, restaurants, bars, inns, others) (Lourdes Fernández 2009).

For the population of the districts of Las Piedras and Tahuamanu, the two most important economic activities are mining (47.6% and 30.3% of the population) and agriculture, livestock, hunting and forestry (10.1% and 35.4% of the population).

Table 18. Main activities by group for the districts of the Project Zone

Activity according to grouping	Dist. Las Piedras		Dist. Tahuamanu	
	Cases	%	Cases	%
Exploitation of mines and quarries	1 002	47.6	453	30.3
Agriculture, livestock, hunting ,and forestry	212	10.1	529	35.4
Not specific economic activity	179	8.5	128	8.6
Manufacturing industry	32	1.5	80	5.4
Transportation, storage, and communication	130	6.2	47	3.1
Retail commerce	175	8.3	1	0.1
Other activities*	377	17.9	257	17.2
Total	2 107	100.0	1 495	100.0
NSA :	3 384		1 244	

In-house elaboration. Source: INEI – CPV 2007

*Agglomerates diverse activities like services, wholesome trade, financial intermediation, fishing, etc.

5.3 Brazil nut people

The main population groups in the Project Zone are made up of Brazil nut families (families dedicated to the brazil-nut activity). The “Castañeros” are the holders of the Brazil nut concessions, thus having, among their families, the access to these areas, especially in the harvesting season.

Within the Project Zone there are 1 037 Brazil nut concessionaires¹³, of which 405 are associated to the Project and make up the Project Area. In order to define the socio-economic profile of the BN population, Bosques Amazónicos conducted a diagnostic study¹⁴ of the BN Sector in which it was possible to define and collect information on socio-economic indicators of relevance to the project, described next:

5.3.1 Population, age, gender and housing

Gender: According to a random selection of 356 project members, 71.3% concessionaires are male and 28.7% are female.

Age: 30.5% of concessionaires are more than 60 years old (meaning that a third of them are seniors. The age factor defines many aspects of the BN activity, especially the availability of family workforce.

¹³ Up to July 2010, by the Regional Directorate of Forestry and Wild Fauna

¹⁴ Diagnóstico Socio-Económico del Concesionario Castaño de Madre de Dios. October 2010, Bosques Amazónicos. In the present document, we will refer to it as *Diagnóstico Castaño* for practical reasons. The methodology applied included interviews to 109 BN concessionaires, whom constitute the 10% of the total of BN concessionaires in Madre de Dios. Said interviews were implemented randomly, without distinction in gender or age, in the different sectors with greatest relevance defined by a high degree of BN population on them (Alerta, Mavila, Alegría, Planchón and Puerto Maldonado), It was a priority to have at least 25% of interviews directed to woman concessionaires.

Civil Status: From the interviews, it is possible to say that 48% of concessionaires have a couple, but are not married, while 12% are widowed or divorced. Additionally, 96% of them have children, in an average of 5 per family, which is a high family burden. Of these children, 4 out of 5 have more than 15 years, indicating the extent and antiquity of the Castañeros family network.

Housing: The concessionaires were inquired after how many people lived in their house and how many bedrooms it had, obtaining the following results:

Table 19. Overcrowding in Housing

Rooms per House	1	2	3	4	5	6	Total
Housing residents	18	31	27	17	11	5	109
Total residents per room	50	116	135	93	59	24	477
Average residents per room	2.8	3.7	5.0	5.5	5.4	4.8	4.4

In-house elaboration. Source: *Diagnóstico Castañero*, October 2010 - BAM

The 95% of concessionaires own their houses. The majority of houses (80%) were constructed with wood, as occurs in rural areas. Even so, it is important to mention that 12% were made with concrete.

The restrooms consist mainly on pit latrines made by the own concessionaires (81%). The water is supplied by the public system in many cases (61%); however, in some sectors as Pariamanu and Alegria, the water is obtained from rivers and streams.

5.3.2 Productive activities of the BN Sector

A research made by IIAP in 2006¹⁵ states that in Madre de Dios, the Brazil nut harvesting is an important income source for 6 500 families, in a direct or indirect way. An estimated 15 000 to 20 000 people are linked to the extraction of this resource, which represents 22% of total departmental population. The 57% of the BN concessions are located near highways and the 43% are accessed through rivers.

The Brazil nut activity has a long history, recording its exploitation since middle of last century. According to the survey, the oldest BN harvesters are those who have worked since the 1950s. Between years 1970-1999 were incorporated much of the BN harvesters (74%). Those who entered after year 2000 did so under the formalization process through forest concessions; they represent the youngest group in the region.

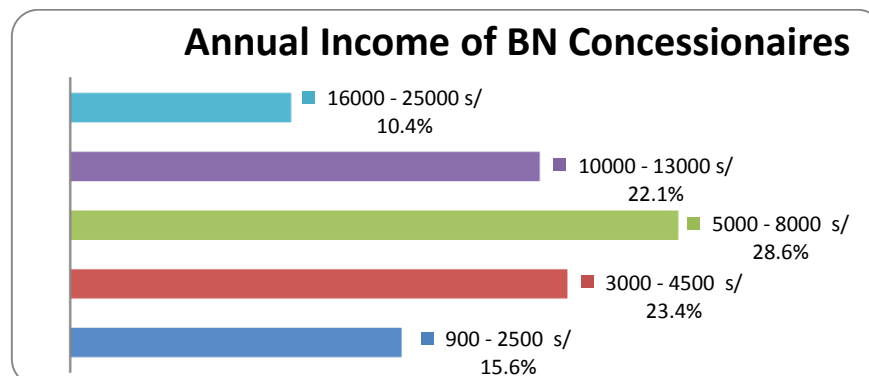
A study made by FAO in 2007¹⁶ states that this activity generates an average of 67% of the concessionaire's annual gross income, equivalent to 6410.0 dollars per year or 534.0 dollars per month. Revenues were estimated based on the volume of peeled nuts sold at the 2006-zarfra price (7.0 – 9.0 soles/kg). However, the study notes that the average family has 6 members, meaning that a monthly income per person is 89.0 dollars; much less than the country's minimum wage (260 dollars/month approximately).

¹⁵ Evaluación Económica de la Extracción de Castaña (*Bertholletia excelsa* H.B.K) – Departamento de Madre de Dios. (Working paper). Luis Álvarez Gómez and Sandra Ríos Torres. Programa de Ordenamiento Ambiental - IIAP. Iquitos Peru. 2006.

¹⁶ Perú: La Industria de la Nuez de Brasil en Madre de Dios. In: Las Microfinanzas y las Pequeñas Empresas Forestales. Estudio FAO: Montes 164. Roma. 2007.

The survey shows that the concessionaires' profits range from 900.0 to 25 000.0 soles/year (or 320.0 – 8 928.0 dollars approx.). This makes a simple average of 7 204.2 soles/year (or 2 573 dollars) and 600.4 soles/month (or 214 dollars). The 74% of concessionaires earn between 3 000 to 13 000 soles/year.

Figure 2. Annual income ranges of the Brazil nut concessionaires

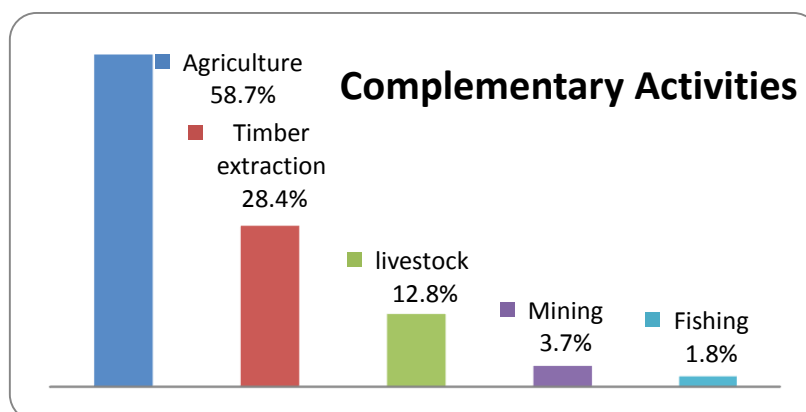


In-house elaboration. Source: *Diagnóstico Castaño*, October 2010 - BAM

The BN concessionaires, besides the activity of collecting and selling Brazil nuts, have other economic activities that complement (and in many cases are the main activity) their source of income.

In that sense, the activities related to forest resources and farming are considered as a way of diversifying their main activity. Figure 2 shows that agriculture is the second most common activity, followed by timber extraction, which is done legally by developing a complementary management plan¹⁷.

Figure 3. Complementary activities undertaken by the Brazil nut concessionaires



In-house elaboration. Source: *Diagnóstico Castaño*, October 2010 - BAM

Agriculture is mainly carried to produce staple food for self-consumption and/or sale in the local market. The production is focused in Corn, Plantain, Rice and Cassava. Additionally, the concessionaires grow other products, but in a much lesser volume, like Papaya, Chili, Mango, Avocado, Coffee, Sapote, Sugarcane, Pineapple, Sacha Inchi, Sweet Potato, etc.

¹⁷ Since year 2002, timber harvesting for commercial purposes inside a Brazil nut concession was allowed (Supreme Decree N°014-2006-AG), for which it must be presented an Annual Complementary Management Plan (PMCA). The *Intendencia Forestal de Fauna Silvestre* (the former forest authority) established the maximum permissible extraction volume be equal to 5.0 m³/ha.

5.3.3 Sociocultural Profile

Formal Education: A 52% of Castañeros have received elementary education while 32% of them have received secondary education. The 6.4% of Castañeros are without studies. These percentages are reflected in the level of reading and writing, where 89.9% of Castañeros affirmed they could read and write very well. Even so, note that if the percentages of Castañeros who do not read and those who read poorly are added, it makes up 8.3%.

Culture: The Castañeros can be described as of Andean-Amazon culture. The survey shows that 49.5% of the population was born in Madre de Dios, while 42.2% of Castañeros were born somewhere in the southern highlands of Peru (67.4% come from Cusco and 21.7% come from Puno). Half of the migrant Castañeros came to Madre de Dios more than 30 years ago and most of them (79%) at least before the 90s.

Of all Castañeros interviewed, the 75% said they identified themselves with the Amazonian culture and specifically, 66% said they were “Madrediosense” (regional identity that includes “Huarayos”, Castañeros and “Maldonadenses”). On the other hand, 19% claims an Andean identity.

The Quechua is the second language in importance, after Spanish. The 34.9 % of Castañeros speak it fluently and 13.8% understand it.

The Castañeros are religious people. A great majority is catholic (73.4%) and an important sector (16.6%) is evangelical. The term “Christian” includes everyone with a religious belief without referring to a specific religion.

5.3.4 Other people involved in the Brazil nut activity

The production of the Brazil nut has four components: the production, harvesting, processing (drying and soaking, peeling, peeled nut drying) and commercialization (FAO, 2007)¹⁸.

This activity involves various actors or agents, from collection to processing for getting the peeled and dry nut, which is the final product sold in local and international markets. Said agents are the concessionaires, “barriqueros”, intermediaries, processing people and exporting companies. Beside this group, the NGOs supporting concessionaires at various stages of the production chain as well as the Castañeros organization itself complete the social group of the Castaña activity (IIAP, 2006)¹⁹. They are described next:

- a. Brazil nut producer: Called Castañero or Castaña producer, he/she is the concession holder that among with his/her family, organizes the extracting activities and optionally, the processing ones.
- b. Barriquero: A person hired by the concessionaire in charge of collecting and transporting the nuts from the forest to the camp store. His salary depends on the volume of nuts he collects.
- c. Peelers: Women are preferred for this job, as the peeling step is critical for the quality of the product.

¹⁸ Perú: La Industria de la Nuez de Brasil en Madre de Dios. In: Las Microfinanzas y las Pequeñas Empresas Forestales. FAO Study: Montes 164. Food and Agriculture Organization of the United Nations. Rome. 2007.

¹⁹ Evaluación Económica de la Extracción de Castaña (*Bertholletia excelsa* H.B.K) – Departamento de Madre de Dios. (Working paper). Luis Alvarez Gomez and Sandra Rios Torres. Programa de Ordenamiento Ambiental - IIAP. Iquitos, Peru. 2006.

- d. Intermediates: Their job is to buy directly the first nuts out of the camps to supply the companies. They see the immediate sale, for why many of them are capitalized by companies. Their profit is obtained through the sales margins from the transactions.
- e. Processing and trading companies: In Madre de Dios there are several companies that buy, process and export the brazil nuts. Some of them are "El Bosque EIRL", "La Nuez SRL", "Candela Perú", "La Selva SA", "Agrícolas Forestales SAC", among others.
- f. NGOs: They promote the Castaña sector development and the conservation of the Brazil nut forest. These are "Asociación para la Conservación de la Cuenca Amazónica" (ACCA), "ProNaturaleza", "CAMDE Perú", "Sociedad Peruana de Derecho Ambiental" (SPDA), "Rain Forest Alliance", "World Wildlife Forest" (WWF), etc.

5.4 Farming Producers

The Agrarian Plan of Madre de Dios says agriculture is an *"Activity characterized by the dominance of the traditional migration system, adapted to the conditions of the region: the prevailing use and/or application of unimproved seed and poor agricultural practices: slash and burn, use of common seeds and hand harvesting, and by restricted and inadequate external inputs. This system is subject to weather conditions and availability of poor soils with high acidity (typical forest), which added to the above, results in low yields. The production goes to the livelihood of the rural population and a small surplus for the local market, which does not cover the regional demand."* OPA/DRA-GOREMAD.

In addition, the agricultural activity in Madre de Dios²⁰ is considered a livestock-dominated economic front associated with subsistence agriculture, covering 583526.0 hectares or 3.08% of Madre de Dios area. *"The agrarian activity is subsistence-driven with emphasis in livestock; there is predominance of grasses growing on agricultural lands, which is reflected in the statistical data of 2007, which shows that about 56.4% of the total area corresponds to growing pasture."* IIAP-GOREMAD, 2008.

Despite the livestock predominance is seen in all the grasslands present in much of the road axis, especially between Santa Rosa town - Puerto Maldonado City and El Triunfo Town - Iñapari City; IIAP notes that *"the large majority of grasslands don't contain the number of cattle they can sustain, or in many cases, there was no evidence of a head of cattle, which gives the impression that grasslands were made in order to consolidate and protect land possession from the likely invasion by other settlers."* IIAP-GOREMAD, 2008.

Concerning the profits of this activity, *"The average annual income of farmers in Madre de Dios, determined by the ratio between the gross value of farming production and the number of farmers, for the year 2007 was 5 951 soles, with a monthly average of 496 soles per month."* DIREAG/GOREMAD, 2007.

In the Project Zone, there are people who develop agricultural activities such as agriculturists, ranchers and others. These people are owners or possessors of agricultural lands along the Inter-Oceanic Highway, secondary roads and riverbanks of the Tahuamanu, Inambari and Madre de Dios Rivers. Most farmers have land titles, many of them provided by the former land titling program²¹ of the Ministry of Agriculture. Currently, the *Organismo de Formalización de la Propiedad Informal* (COFOPRI) grants these titles.

²⁰ Informe: Uso actual de las tierras. Juan Manuel Ramírez Barco. Zonificación Ecológica y Económica del Departamento de Madre de Dios. IIAP – GOREMAD.

²¹ Proyecto Especial de Titulación de Tierras y Catastro Rural – PETT

Table 20. Average Area of Farms in Las Piedras and Tahuamanu Districts

District	N° Farms	Area (Ha)	Area/Farm (ha)
Las Piedras	1 904	47 785	25.1
Tahuamanu	678	20 640	30.4

Source: Digital database - BAM

The cultivated area within the districts of the Project Zone, in year 2001, was equal to 5 452 hectares, composed by pastures, rice and yellow corn (the main crops of said year) in a proportion of 56.7%, 17.6% and 9.9%, respectively.

Table 21. Cultivated Area per District per Crop

Agrarian Agency of	Rice	Beans	Yellow Corn	Soy	Cassava	Plantain	Pastures	Papaya	Others	Total (ha)
Las Piedras	781	27	380	3	192	348	2171	15	100	4017
Tahuamanu	180	64	160	0	22	36	918	5	50	1435
Total (ha)	961	91	540	3	214	384	3,089	20	150	5452

Source: *Plan de Desarrollo Concertado de Madre de Dios 2002-2011*(various authors)

5.5 Organizations in the Project Zone

Organizations of the Brazil Nut Concessionaires

The BN concessionaires have had various and different organizations over the time. Some were created by public entities, projects, community organization, etc. Currently, they are grouped in a second level organization called *Federación Departamental de Productores Castañeros de Madre de Dios* – FEPROCAMD.

FEPROCAMD was founded on November 18, 2009, and registered in SUNARP²² on April 15, 2010 with a certificate registration number of 11016791. This organization represents 11 Brazil nut associations and constitutes the superior organization, which represents the majority of BN concessionaires of Madre de Dios.

Table 22. FEPROCAMD based associations, certificate of registration and legal representative

Departmental Federation Of Brazil Nut Producers Of Madre De Dios Based Associations		
Nº	Name	N° Of Certificate In Public Records
1	Asociación de Productores de Extractores de Castaña de Planchón	11016567
2	Asociación de Productores y Extractores de Castaña de Shiringayoc	11016632
3	Asociación Castañera Agroforstal de Carmen Rosa	11016658
4	Asociación de Productores y Extractores de Castaña de Mavila	11016615
5	Asociación Agroforestal Alegría, Alto Malecón San Carlos y Anexos	11015063
6	Asociación de Productores Castañeros y Agroforestales de Alerta	11016540
7	Asociación de Castañeros de Alegría	11000665
8	Asociación de Productores y Extractores de Castaña de Río Paríamanu y Afluentes	11016654
9	Asociación Castañera Agroforestal de Varsovia	11016652
10	Asociación de Productores y Extractores de Castaña de Loreto	11016672
11	Asociación de Extractores Productores Forestales y Agropecuario de La Novia	11006728

²² SUNARP is the National Office for Registration of Titles, Rights and Properties

Additionally, in the Project Zone there is the *Asociación de Recolectores de la Nuez Amazónica del Perú* - RONAP, founded in 2003. RONAP groups 58 Brazil nut producers of Madre de Dios and has its own Organic Certification and Fair Trade Certification programs.

Organizations of the Timber Forestry Concessionaires

Many of these companies are affiliated with the Forest Management Committee of the department. On the other hand, as entrepreneurs, they are affiliated to the Timber Federation of Madre de Dios.

Agrarian organizations

In the Project Zone no relevant agricultural associations have been identified, farmers are organized in function to the agrarian agencies distributed in each district. On a departmental level the farmer have the Agrarian Departmental Federation of Madre de Dios.

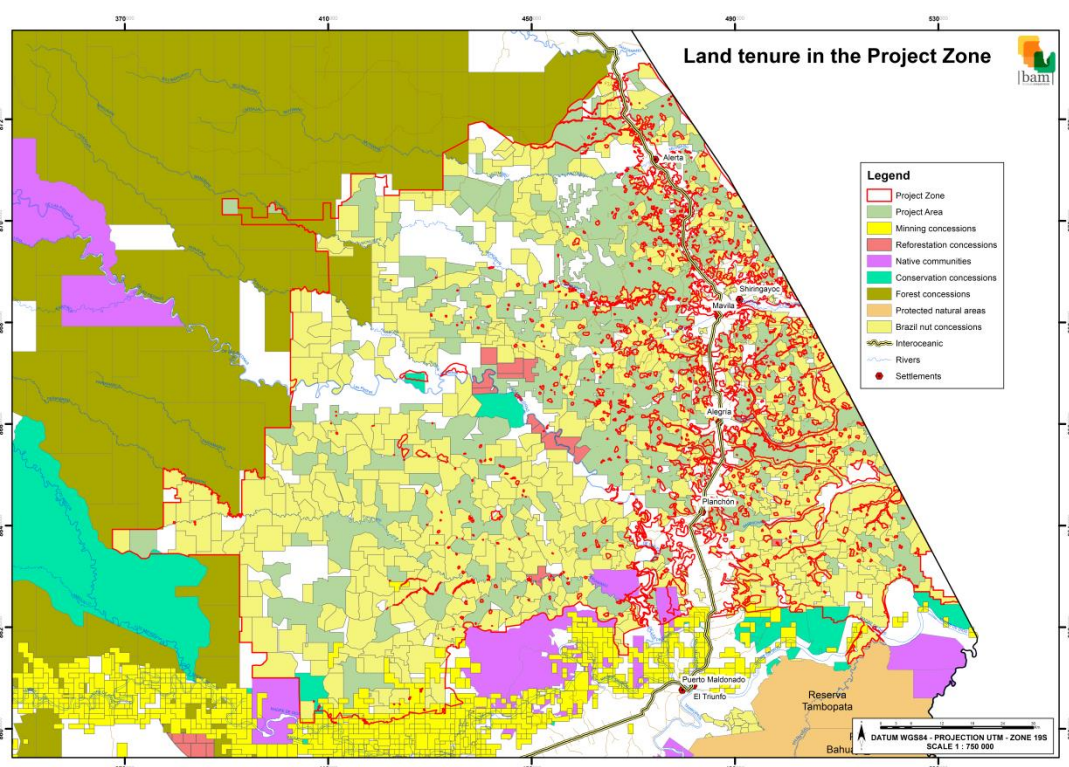
Mining organizations

The mining concessionaires are organized in associations per district, sectors or rivers. In the Project Zone, no relevant mining association has been identified. At a departmental level, all the miners and miner associations are affiliated to the Miners Federation of Madre de Dios – FEDEMIM, organization which brings together 24 miners associations in Madre de Dios. This organization is at the same time affiliated to the Artisanal Mining Federation of Peru (FENAMARPE), which brings together 198 associations of miners in 18 regions of the country.

6. Land use and Property Rights of the Community

In the Project Zone, the tenure rights of the land are distributed according to the following map: forestry concessions: timber, non-timber (Brazil nut) and ecotourism, populated centers, agricultural lands, native communities and mining concessions.

Map 14. Land Tenure inside the Zone and Project Area



6.1 Settlements

The Peruvian territory is sub-divided in regions, provinces, districts and villages (*centros poblados*) to organize the State and the government at a national, regional and local level.

According to the current legal system, Departments are constituencies, which have a regional government. Each government region has autonomy or the right to set standards, regulate and administer public matters of its jurisdiction. The autonomy can be political to adopt and coordinate policies. The administrative autonomy refers to the faculty of organizing in addition to legislate and determine the public services. Finally, the economic autonomy is the faculty to create, gather and administer its own incomes and revenues as well as approving its institutional budgets. This must be in accordance of the State Budget Management laws and the annual budget laws. Its practice implies to recognize the right to perceive the resources that the State assigns for the complement of its functions and jurisdiction.

Villages have been defined according to the Demarcation and Organization Territorial Law Regulations 27795 published in the official newspaper “El Peruano” on February 24 of 2003 and modified on February 15 of 2006 (the law was published in “El Peruano” on July 25 of 202). With this norm, the Peruvian government has defined villages as the population groups that have more than 150 inhabitants.

In the Project Zone, villages and scattered populations (less than 150 people) are located along the Interoceanic Highway, secondary roads and navigable rivers. The main villages where the most project-community and stakeholders live are Alerta, Shingarayoc, Mavila, Alegría, Planchón and the City of Puerto Maldonado, which is further away at the south of the PZ. These villages are crossing the Project Zone, although not included in it.

The legal property in settlements, whether they are villages, scattered settlements, informal urban centers, etc. were initially granted by the *Proyecto Especial de Titulación de Tierras y Catastro Rural (PETT)* through a formalization process. Nowadays, this process is carried by the *Organismo de Formalización de la Propiedad Informal (COFOPRI)*, a public decentralized institution of the Ministry of Housing Construction and Sanitation, in charge of formalizing the urban and rural property nationwide by providing property titles or certificates registered in the Public Registry.

There are no customary property rights over the settlements, as the residents, in most cases, are immigrants who came at different times to the region.

6.2 Native Communities

The Native Communities are governed by Decree Law N° 22175 – Law on Native Communities and for the Agricultural Development of the *Selva* and *Ceja de Selva* (05.10.78). This law defines the Native Communities as organizations that “originate from the tribal groups of the *Selva* and *Ceja de Selva* and are comprised by families connected by their language or dialect, cultural and social characteristics, common and permanent tenancy of the same territory, with a scattered or nucleated/clustered settlement”. (Article 8° of D.L. N° 22175).

This law is enforced under Supreme Decree N° 003-79-AA, the regulations of the Law of Native Communities and for the Agricultural Development of the *Selva* and *Ceja de Selva* Regions (01.25.79), and ILO Convention 169 approved by the Peru Government by Legislative Resolution N° 26253 (12.05.93).

Parts of three titled Native Communities have been registered in the Project Zone (IBC 2002): **Boca Pariamanu** of Pano linguistic family (Amahuaca ethnicity), **Tres Islas** of Pano linguistic family (Shipibo Conibo/ Ese Eja ethnicity) and Puerto Arturo of the Quechua language family.

These communities are organized community assemblies and directed by a board that is led by the Chief or President of the Community. The president of the community is the main authority and is the legal representative of the community.

The main land use in these native communities and therefore, the main economic activity is artisanal mining, followed by timber logging and brazil nut recollection, and thirdly, by agriculture of basic food-crops as rice, papaya and banana for marketing (CD Rown : Atlas of CCNN IBC 2002-2009).

Mining activity highlights in the native community Three Islands, located on the banks of the Madre de Dios River, which causes them problems of granting mining concessions inside their area and conflicts between farmers and miners, etc. (GOREMAD 2007).

6.3 Agricultural Lands

To complement the description made in Section 5.4, it should be added that the average area of farms is less than 100 hectares per owner. By year 2007, the Regional Government of Madre de Dios made its first effort of planning the agricultural sector²³. In this document, the following is reported: "... up to year 2005, 6092 rural properties were entitled, located mainly at the margins of the highways and riverbanks of the rivers. An 84,7% of the properties have more than 50 hectares, while the properties ranging between 10 to 29.9 hectares represent 14,8%...". Up to now, excepting slight variations, the proportion of area of the entitled properties is maintained.

6.4 Forestry Concessions

In Peru, the Organic Law for the Sustainable Use of Natural Resources of 1997 regulates the concessions of natural resources; but for the forest sector, the concept of concessions appears specifically in the Forestry and Wildlife Law of 2000 and its regulations of 2001. In 2002, the government awarded the first concessions of forest areas of permanent production (BPP) in the departments of Madre de Dios and Ucayali. The Ministry of Agriculture – MINAG, through the Forestry and Wildlife General Direction - DGFFS, is the regulator of the use and sustainable management of the forestry resources and wildlife.

The concessions are granted through a Concession Contract, which is the legal tool for using the State's natural wild flora and fauna resources. The Forestry Law sets that a Forestry Concession is granted to exclusivity, whereby the Forest Authority is unable to deliver other rights over the same area to third parties.

The types of Forestry Concessions present in the Project Zone are:

Concessions for Non-Timber Forest Products – Brazil Nut Concessions

This type of concession has only been granted in the department of Madre de Dios and covers most of the Project Zone. The government provides 40-year concessions to individuals with the exclusive rights to harvest the nuts found in a certain area. The concessionaire has the obligation to present a Forestry Management General Plan– PGMF and an Annual Operating Plan – POA.

²³ Plan Estratégico Regional del Sector Agrario de Madre de Dios 2008-2015. Oficina de Planificación Agraria, Dirección Regional de Agricultura, Gobierno Regional de Madre de Dios.

By year 2009, 1036 contracts were identified representing 936 863.0 hectares of forest under management, according to the digital database of the Forestry and Wildlife General Direction. It is necessary to mention that concessions can be cancelled by the authorities, be transferred, expire, which make difficult to know exactly the number of valid concessions. The majority of these contracts were granted since 2004. The authority is the DGFFS through the Forestry and of Wildlife Technical Administration offices (ATFFS) of Tambopata-Manu and Tahuamanu provinces.

It is worth noting that a Ministry Resolution of 1981 prohibits the slash and burn of Castaña trees. In the same way, in year 1997 a Directorial Resolution of the Sub-regional Agrarian Direction established a penalty for possessing, transporting and selling Castaña trees, and for granting property rights over forests with Castaña and Rubber trees. Both regulations remain in force.

Forest Concessions with Timber Purposes (Timber Concessions)

The timber concessions are granted within areas considered forests of permanent production. In the Project Zone (see Map 14) the Timber Concessions are located at the north-western and western side of the Project Zone.

According to a report from the *Sociedad Peruana de Derecho Ambiental* (SPDA), the situation of the timber concessions is not stable because many of the concessionaires have debts with the Tax Authority, SUNAT, and the Forestry Authorities.

Table 23. Forestry Concessions in the Project Zone

Id	Lot	Concessionaire	Contract	Area (ha)
1	105	Maderera Kalinowski E.I.R.L.	17-TAM/C-J-022-03	5 041.3
2	103	Corporación Forestal Tres Fronteras S.R.L.	17-TAH/C-J-048-02	4 089.4
3	89	Empresa Ecoforestal Camanejo's S.A.C.	17-TAH/C-J-021-03	3 362.3
4	102	Empresa Maderera Croacia S.Ac.	17-TAH/C-J-020-03	2 596.3
5	112	Emfor Portillo S.A.C.(Exp.A)	17-TAH/C-J-017-02	1 372.3
6	104	Empresa Maderera Lidia S.R.L.	17-TAM/C-J-002-03	1 064.9

Source: Area SIG – BAM

Concessions for Ecotourism

This type of concession was created to promote the use of the landscape resource, the conservation of nature and the cultural values associated. The Complementary Dispositions for the Granting of Ecotourism Concessions were approved through the Ministry Resolution N° 314-2002-AG. The first concession of this type was approved in Madre de Dios and nowadays there are 18 concessions, of which 5 are partially or entirely in the Project Zone:

Table 24. Ecotourism Concessions in the Project Zone

Concession	Total Area (ha)	Area in PZ (ha)
Tambopata Expeditions SA	4 460.2	4 460.2
Mader Sur Oriental	3 394.7	2 989.4
Jungle Odyssey Peru EIRL	1 062.1	555.5
Inkaterra	7 783.1	435.3
Ecoamazonia Lodge SRL	6 246.8	1 296.5

6.5 Mining Concessions

The Mining Concessions are granted by the Ministry of Energy and Mines, through the Geological Mining and Metallurgical Institute (INGEMMET), to third parties to do exploration and exploitation activities to extract minerals which are located in the subsoil of the national territory. In the case of small and artisanal mining producers, the request of concession is presented to the Regional Direction of Energy and Mines, of the region where the concession is located. Both entities are based on the National Mining Registry developed by INGEMMET.

In Madre de Dios, there are 2 800 concessionaires dedicated to gold extraction, of which 129 are inside The Project Zone making up approximately 39 000 hectares. In addition, there are 28 petitioners. Most miners are informal or illegal, that is they work without the environmental certifications requested, according to the Law of Formalization and Promotion of Small Mining and Artisanal Mining,

6.6 Land-Use Conflicts

Table 25. Conflict matrix in the zone of REDD Brazil nut project

Tenure Type Of The Area	Latent Or Potential Conflict	Expressly Conflicts	Advanced Stage Of Resolution
Villages and scattered groups	-With the increase of the migrations, the pressure over the potential areas for settlements and forestry and agriculture production and mining extraction is incentivized -These migrations generate camp, population cores and scattered populations, which require the State's attention	-Invasion of migrants from Ayacucho to private properties in the populated center of Alegría -Camps and human settlements in Laberinto (riverbanks of the river Madre de Dios) and at the riverbanks of the rivers Paríamanu y Paríamarca	none
Native Communities	Part of the indigenous lands are overlapped with mining concessionaires, creating conflicts between indigenous that work on mining and indigenous that don't work on mining, concessionaires and communities, etc. Some native communities do not have closed their boundaries	The mining and non-mining population of the CCNN Boca Paríamanu El Pilar y San Jacinto have continuous conflicts with foreign miners for the benefits of gold Adjacent disputes: indigenous villagers with concessionaires or others for the access to forest resources	-Process of negotiation and servitude -Urgency decree 012-2010. Order and exclusion mining areas -Ecologic and economic zoning -Regional territorial order plan
Agricultural Land	Many of agricultural plots are informal as they do not have their ownership certificate nor border establishments. Mining Concessions and petitions, which overlap some agricultural plots, located in the riverbank of the rivers Paríamanu y Tahuamanu.	Disputes between Farmers with adjacent concessionaires, miners and families	-Implementation of the rural property formalization plan - COFOPRI -private and servitude negotiations - Judicial process in progress, where the sentences are unfavorable to the agricultural plots
Forestry concessions for non-timber purposes– Brazil nut	- Non-authorized harvesting of forest resources by third parties (illegal loggers, other Brazil nut harvesters, etc.) - Some concessions with problems because of boundaries delimitation and ordering of the	-Furtive incursion of small illegal loggers in some Brazil nut concessionaires -Tension with neighboring concessionaires and with agricultural plots, and	-"Through the supreme decree 019-2004-AG, the government declared the multi-sectorial national strategy against illegal logging to be of national interest. The decree proposes diverse measures to fight the illegal

Tenure Type Of The Area	Latent Or Potential Conflict	Expressly Conflicts	Advanced Stage Of Resolution
	concession not concluded -Overlap of Brazil nut concessionaires (1)Brazil nut concessionaires which were granted over already entitled properties, (2) concessionaires which were granted over non entitled properties but with possession right -Concessionaires and miner petitioners overlap and invade the Brazil nut concessionaires	villagers, etc. -Invasion of agricultural migrants over to Brazil nut forestry concessions Conflict of some Brazil nut concessionaires with farmers and miners -Illegal mining incursions and encounters with non-timber forestry concessionaires owners of the district of Laberinto and timber of the Madre de Dios river	logging in Peru" - Some NGOs and private companies offer assistance for ordering and delimitation -The GOREMAD has started up the process of Ecological and Economical Zoning and the process of Territorial Order of the department -The GOREMAD has boosted the formalization and order process of the mining activity of the department -On February 18, 2010, the Urgent Decree N° 012-2010- is given MINAM: declare of national interest the mining ordering in the department of Madre de Dios, which seeks order (use and occupation of the territory) of gold mining

In-house elaboration

As evidenced in the conflict-type matrix, the main causes of conflict affecting Brazil nut forests are the high migration to exploit agricultural and artisanal mining resources (which are encouraged by the improvement of the Interoceanic highway) on one hand, and the deficient formalization of the Brazil nut concessions on the other. The enormous risk arising out from overlapping use permits, in addition to serious weaknesses in the execution of the laws and regulations of the forest and mining sectors, represent a serious threat to the sustainable management of the forest as well as an incentive for the increase of deforestation processes and degradation of the areas.

7. Current Biodiversity in the Project Zone

The Department of Madre de Dios, where the Project Area locates, is a space of great biological diversity and of well-known international importance. Its extension is equivalent to 6.6% of the national territory and it has a large diversity of species, ecosystems, genetic and cultural diversity (IIAP, CONAM, GOREMAD, 2006).

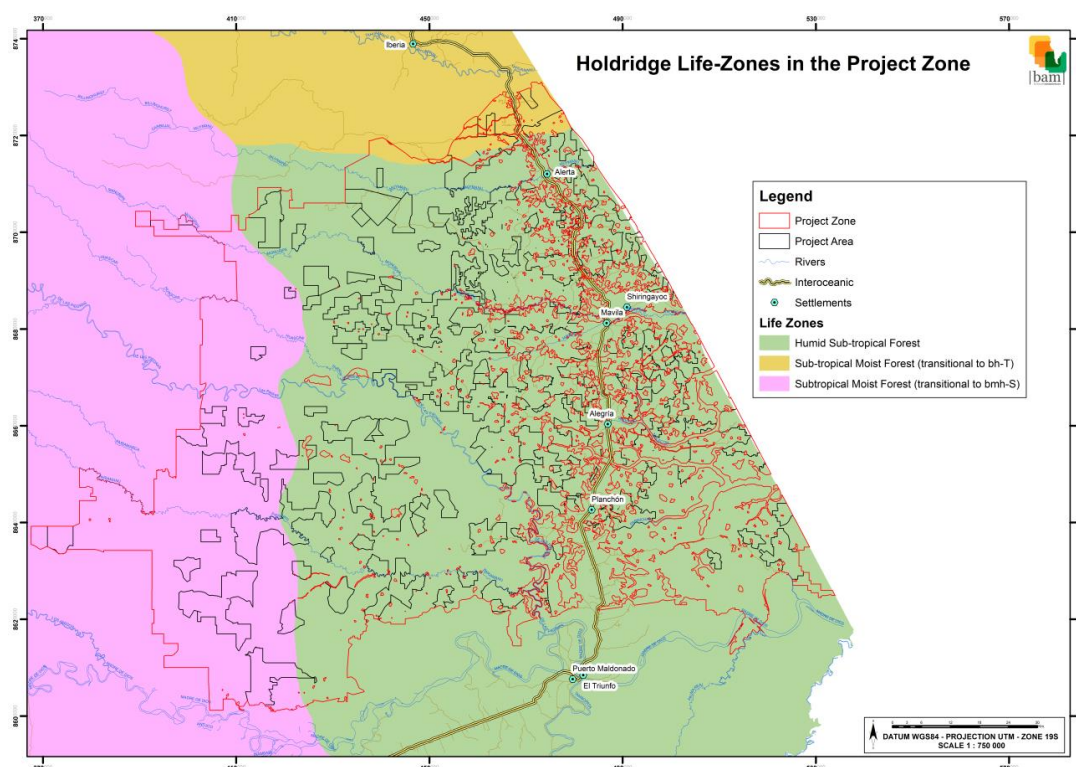
A great part of this biological diversity is present inside the Protected Natural Areas (ANP). Since 1973, with the Manu National Park creation up to the date, six ANPs have been created in Madre de Dios but some of them are shared with other regions. The following units are part of the ANP system: Manu National Park, Manu Reserved Zone, Bahuaja-Sonene National Park, Alto Purús National Park, Tambopata Candamo National Reserve, Amarakaeri Communal Reserve and Purús Communal Reserve. Together, they occupy 3 784 081 ha, which is the 44.6% of the department's territory. (IIAP, GOREMAD, 2009) ²⁴.

²⁴ Investigation Institute of the Peruvian Amazonia - IIAP; Regional Government of Madre de Dios - GOREMAD, 2009. Economic Ecologic Zoning

7.1 Life Zones

The Life Zone is a group of abiotic factors (soil, temperature, humidity, altitude, luminosity, etc.) that determine the types and variety of flora and fauna of the place (biotic factors). In the Project Zone, three Life Zones²⁵ can be found: Tropical Moist Forest, Sub-Tropical Moist Forest (transitory to Tropical Moist Forest) and Sub-Tropical Moist Forest (transitory to Sub-Tropical Wet Forest). These life zones can be seen in Map 15.

Map15. Life Zone in the Zone and Project Area



Tropical Moist Forest (bh-T)

It is distributed in an altitude range between 350 to 650 meters (above sea level); presents an annual average bio-temperature of maximum 25.7 °C and of minimum 23.2 °C. The total average rainfall is of maximum 3 419 mm and of minimum 1 916 mm. It presents vegetation characterized for being high, exuberant and dense, full of bromeliads, orchids, lianas and twisted vines. The trees are distributed in 4 strata, and those in the emerging stratum can reach 50 meters of height and 3 meters of wide.

Sub-tropical Moist Forest (transitional to bmh-S)

This zone is distributed between 150 and 259 meters (above sea level) in the lowland forest. The annual average bio-temperature ranges between 18.4 a 24.5 °C and the annual average rainfall between 1 200 a 1 959 mm. It presents a stratified structure of up to four arboreal strata and its underbrush is relatively scarce. In addition, the trees do not present root buttresses and a lower quantity of palm tree exists compared to more humid and warm zones.

²⁵ National office of Evaluation of natural Resources - ONERN, 1976. "Ecologic Map of Peru"-explanatory guide

Sub-tropical Wet Forest (bmh-S)

This zone is distributed between 600 and 2000 m (above sea level) in the highland forest and between 200 and 400 meters (above sea level) in the lowland forest. It presents an annual average bio-temperature which varies between 17 y 22.5 °C, and an annual total rainfall between 4 000 a 4 500 mm. The vegetation is dense and diverse with presence of epiphytes. The arboreal structure is differentiated by 4 strata, where the emerging trees surpass the 45 m of height.

7.2 Biological Diversity

Madre de Dios is a worldwide-recognized region for its high biological diversity (Voss & Emmons, 1996)²⁶, reason why the title *Biodiversity Capital of Peru* was given. It is estimated that in this department, one of the world's "Pleistocene shelters" is located and at a national level, 50% of the biodiversity and endemism is located (IIAP-GOREMAD, 2009)²⁷

Wild Fauna

The Brazil nut forests inside the Project Area are unique in Peru. Nonetheless, there are few studies of fauna. Kirkby (1999)²⁸ points out that medium and large size species such as Tapir (*Tapirus terrestris*), Black Capuchin Monkey (*Cebus apella*), Tamarin (*Saguinus fuscicollis*), Titi Monkey (*Callicebus brunneus*), and Tigrillo (*Leopardus pardalis*) are negatively impacted by the hunting pressure. On the other hand, other species are favored by the reduction of its natural predators such as Squirrel Monkey (*Saimiri boliviensis*), Kinkajou (*Potos flavus*), Deer (*Mazama americana*) and Red Squirrel (*Sciurus spadiceus*).

The "Estándar para la Certificación del Manejo Forestal con Fines de Producción de Castaña en Perú" ²⁹ book indicates that the Brazil nut fruits and seeds are frequently consumed by Macaws (*Ara ararauna*, *Ara macao*, *Ara chloropterus*), Agouti (*Dasyprocta variegata*), Picuro (*Cuniculus paca*), Southern Red Squirrel (*Sciurus spadiceus*), Bolivian Squirrel (*Sciurus ignitus*), Wild Pig (*Tayassu tajacu*), Wild Boars (*Tayassu pecari*), Black Capuchin (*Cebus apella*) and White Capuchin (*Cebus albifrons*). The seedlings are mostly consumed by Tapir (*Tapirus terrestris*), Red Deer (*Mazama americana*) and Ash Deer (*Mazama gouazoubira*). In addition, the Brazil nut tree is frequently used by the Harpy Eagle (*Harpia harpyja*) and the Crested Eagle (*Morphnus guianensis*) as nesting place.

It also establishes the indicator species of the Brazil nut forest, to which we added the respective degree of threat³⁰ according to IUCN (2012)³¹:

²⁶ Voss y Emmons, 1996. Mammalian Diversity in Neotropical Lowland Rainforests: A Preliminary Assessment. Bulletin American Museum Natural History, 230:1-115

²⁷ Investigation Institute of the Peruvian Amazonia - IIAP; regional Government of Madre de Dios - GOREMAD, 2009. Economic Ecologic Zoning

²⁸ Kirkby, C. 1999. The impact of of the Brazil nut activity in the wildlife of Madre de Dios, Perú.

²⁹ WWF Perú; Peruvian Council for Voluntary Forest Certification - CP-CFV. 2005. Standard for Forest Management Certification for production of Brazil nut (*Bertholletia excelsa*) in Peru

³⁰ LC: least concern; NT: near threatened; VU: vulnerable; DD: deficient data; (*) these species havent been evaluated for the Lista Roja of the IUCN 2012

³¹ International Union for Conservation of Nature and Natural Resources - IUCN. 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>

Table 26. Brazil Nut Forest Indicator Species and their Degree of Threat

Indicator Species and Vulnerability	
Amphibious	<i>Dendrophryniscus minutus</i> (LC)
	<i>Leptodactylus rhodomystax</i> (LC)
	<i>Physalaemus petersi</i> (LC)
Reptiles	<i>Tropidurus plica</i> (*)
	<i>Lachesis muta</i> (*)
	<i>Chelonoidis denticulata</i> (VU)
Birds	<i>Tinamus guttatus</i> (NT)
	<i>Crypturellus variegatus</i> (LC)
	<i>Mitu tuberosum</i> (LC)
	<i>Psophia leucoptera</i> (LC)
	<i>Phaethornis stuarti</i> (LC)
	<i>Dendrocincla fuliginosa</i> (LC)
	<i>Dendrocolaptes certhia</i> (LC)
	<i>Synallaxis rutilans</i> (LC)
	<i>Sclerurus caudacutus</i> (LC)
	<i>Thamnomanes ardesiacus</i> (LC)
	<i>Myrmotherula hauxwelli</i> (LC)
	<i>Myrmotherula menetriesii</i> (LC)
	<i>Myrmoborus myotherinus</i> (LC)
	<i>Rhegmatorhina melanosticta</i> (LC)
	<i>Chamaeza nobilis</i> (LC)
	<i>Conopophaga peruviana</i> (LC)
	<i>Corythopsis torquatus</i> (LC)
	<i>Pipra rubrocapilla</i> (LC)
	<i>Microcerculus marginatus</i> (LC)
	<i>Penelope jacquacu</i> (LC)
	<i>Lipaugus vociferans</i> (LC)
	<i>Crypturellus strigulosus</i> (LC)
	<i>Micrastur gilvicollis</i> (LC)
	<i>Odontophorus stellatus</i> (LC)
	<i>Phaethornis philippii</i> (LC)
	<i>Malacoptila semicincta</i> (LC)
	<i>Dendrocincla merula</i> (LC)
	<i>Xiphorhynchus spixii</i> (LC)
	<i>Automolus infuscatus</i> (LC)
	<i>Thamnophilus aethiops</i> (LC)
	<i>Myrmotherula haematonata</i>
	<i>Myrmotherula leucophthalma</i>
	<i>Dichrozona cincta</i> (LC)
	<i>Gymnopithys salvini</i> (LC)
	<i>Formicarius colma</i> (LC)

	<i>Myrmothera campanisona</i> (LC)
	<i>Liosceles thoracicus</i> (LC)
	<i>Platyrrhinus coronatus</i> (LC)
	<i>Chiroxiphia pareola</i> (LC)
	<i>Habia rubica</i> (LC)
	<i>Aburria pipile</i>
Mammals	<i>Dasyprocta variegata</i>
	<i>Mazama Americana</i> (DD)
	<i>Mazama gouazoubira</i> (LC)
	<i>Cebus apella</i> (LC)

The Brazil nut, seed of the Brazil nut tree, is the main non-timber forest product (NTFP) commercialized in the Project Zone. The Brazil nut activity carried out only inside concessions recognized by the State, during the harvesting period that lasts 3 to 4 months (December – March). The intensity of the collection varies depending on the trees productivity. The concessionaires left some proportion of seeds in the field; however, the recruiting of new seedlings depends mainly on the wild fauna.

The regeneration of the Brazil nut seedlings depend on the dispersion and predation of the seeds mainly by the Agoutis (*Dasyprocta spp.*), between which the Añuje (*Dasyprocta variegata*) is the main disperser. (Zuidema, P. & Boot, R. 2002)³²

The Brazil nut seed is found in a Pyxidium (woody and capsular fruit) which when mature falls to the ground for the gravity effect. The Agoutis take advantage and gnaw on the fruit to pull out the seed, dispersing them in a radius of 25 m and even up to 100 m from the tree (Nicole, J. 2007)³³. In some occasions, the concessionaires have reported seeing the Agoutis take the fruits and bury them in fallow areas or young secondary forest areas. This “waiting strategy” allows the fruits to be disintegrated and the seeds to be exposed after spending a long period buried. In this way, the Agoutis reserve energy and in many cases the buried seeds germinate due to the time it takes the Agouti to find them (Zuidema, P. & Boot, R. 2002).

In recent years, it has been identified that not only the Agoutis are capable of opening the Pyxidium. There are other species that can pull out the seeds such as the Macaw (*Ara chloropterus*) and Woodpeckers (*Campephilus rubricollis*), which open the fruit while it is still in the process of growing and before they fall from the tree. Once the fruit and/or seed is on the ground they are collected by the Agoutis and small rodents (*Proechimys spp.*); and after some time (4 months) by the Capuchin Monkeys (*Cebus apella*). (Solorzano-Filho, J. 2009)³⁴.

³² Zuidema, P. & Boot, R. 2002. Demography of the Brazil Nut Tree (*Bertholletia excelsa*) in the Bolivian Amazon: impact of seed extraction on recruitment and population dynamics. Tropical Ecology, 18: 1-31.

³³ Nicole, J. 2007. Shifting Cultivation Effects on Brazil Nut (*Bertholletia excelsa*) Regeneration. A Thesis presented to the graduate school of the University of Florida in partial fulfillment of the requirements for the degree of Master of Science. University of Florida, USA.

³⁴ Solorzano-Filho, J. 2009. On Small Mammal Sympatry in the Southeastern Amazon and Ecological Relationships with Brazil nut Dispersal and Harvesting. A Thesis submitted in conformity with the requirements for the Degree Doctor of Philosophy, Faculty of Forestry. University of Toronto, Canadá.

Flora

The Brazil nut forests coincide with the forests of greater diversity in the region of Madre de Dios and present a great diversity of vegetation communities, between which are: the Vegetation of the tropical forest, cropping area, secondary forest vegetation, fern forest, palm tree forest, swamp, floodable forest vegetation, paca, riverside mount, cochas, etc. There is also present forest species of great economic importance such as cedar (*Cedrela odorata*), mahogany (*Swietenia macrophylla*), Tornillo (*Cedrelinga cateniforme*), Brazil nut (*Bertholletia excelsa*) and Aguaje (*Mauritia flexuosa*). (Fernández, 2010)³⁵

In the Project Zone, as mentioned in point **G.1.2.1**, 17 types of forest have been identified according to the ZEE (2009)³⁶, predominating the high terrace forests with Brazil nut stands, low hill forests and forests with paca of high terraces which represent almost 81% of the surface. Due to the great diversity of forests, a **simplified stratification**³⁷ was done which consists in regrouping forest areas in homogenous groups using factors such as: type of forest/vegetation, type of soil/geology, management; the stratification can be seen in this sub-section 4.1 (on page 17).

The types of forest/ associations of the ZEE, present in the Project Zone and Project Area, have been regrouped in seven forest strata according to the analysis of the inventory done in 2011. For each new stratum, the most representative species have been identified through the Value Index of Importance (IVI)³⁸, which are detailed next.

- Flooded Terraces Forest

It is the smallest stratum of the Project area as it covers only 2193.4 ha. Between the most representative species, we can find Moena (*Aniba sp.*), Pashaco (*Schizolobium sp.*), Quillobordon (*Aspidosperma parvifolium*), Ajosacha (*Mansoa allinacea*), Anonilla (*Anona sp.*), Shimbillo (*Inga sp.*), Misa Blanca (*Eschweilera coriacea*) and Chemicua (*Pseudolmedia laevis*).

- Terraces Forest

This type of forest represents almost 70% of the Project Area as it occupies 204 712.1 ha. Some of the most representative species are of high economic interest, such as Moena (*Aniba sp.*), Mashonaste (*Clarisia racemosa*), Cumala (*Virola sebifera*), Quillobordon (*Aspidosperma parvifolium*) and Castaña (*Bertholletia excelsa*). There are also species like Isigo (*Tetragastris sp.*), Shimbillo (*Inga sp.*), Coloradillo (*Licania oblongifolia*), Chemicua (*Pseudolmedia laevis*), Palo Santo (*Tachigalia vasquezii*), Uvilla (*Pourouma cecropiaefolia*), Cético (*Cecropia sp.*), Caimito (*Pouteria neglecta*) and Espintana Negra (*Oxandra xylopioides*).

- Low Hill Forest

This stratum has high predominance of Brazil nut trees or Castaña (*Bertholletia excelsa*), which is a native endemic specie of the upland areas of this part of the Amazon Basin shared by Peru, Brazil, and Bolivia. In this type of forest we also find species like Shimbillo

³⁵ Fernández, L. 2010. Land development in Madre de Dios - Social and environmental impacts of the South Inter-Oceanic Highway. Wildlife Conservation Society (WCS). Lima-Perú

³⁶ Institute of Research of the Peruvian Amazon - IAP; regional government of Madre de Dios - GOREMAD, 2009. Ecological Economic Zoning of the región of Madre de Dios

³⁷ Stratification effected followed the same parameters proposed in Sourcebook of GOF-C-GOLD, which states among other things that the maximum number of layers is 10.

³⁸ The Importance Value Index or IVI (Curtis and McIntosh, 1950) was used to determine the dominance that each species occupies in the forest community in the Project Area. The species that represent the first 150% were analyzed to characterize the forest.

(*Inga sp*), Isigo (*Tetragastris sp*), Malecon (Jacaranda copaia), Palo Santo (*Tachigalia vasquezii*), Misa (*Couratari guianensis*), Moena (Aniba sp.), Cumala (*Virola sebifera*), Espintana Negra (*Oxandra xylopioides*), Cético (*Cecropia sp*), Chemicua (*Pseudolmedia laevis*), Coloradillo (*Licania oblongifolia*) y Misa Blanca (*Eschweilera coriacea*). The Cético species would indicate that these forests have suffered some type of disturbance since it is a pioneer species of rapid growth. The total area has about 31 085.4 ha.

- High and Mid Terraces with Paca Forest

This stratum covers 28 939.8 ha of the Project Area, and has with high dominance of Isigo (*Tetragastris sp*), Pashaco (*Schizolobium sp.*), Coloradillo (*Licania oblongifolia*), Shimbillo (*Inga sp*), Palo Santo (*Tachigalia vasquezii*), Shiringa (*Hevea brasiliensis*); and timber species such as Misa Blanca (*Eschweilera coriacea*), Moena (Aniba sp.), Mashonaste (*Clarisia racemosa*), Quillobordon (*Aspidosperma parvifolium*), Cumala (*Virola sebifera*) and Lupuna (*Chorisia integrifolia*). Hevea or natural rubber produces natural latex that has greater plasticity and resistance than synthetic latex, and that is used principally in the making of tires. Hevea is also a good source of income for the local communities.

- Low Hills with Paca Forest

It covers 12 267.3 ha of the Project Area and has a predominance of Shimbillo (*Inga sp*), Pashaco (*Schizolobium sp.*), Caucho (Castilla hulei), Uvilla (Pourouma cecropiaefolia), Misa (*Couratari guianensis*), Anonilla (Anona sp.), Chemicua (*Pseudolmedia laevis*), Isigo (*Tetragastris sp*), Coloradillo (*Licania oblongifolia*) y Quillobordon (*Aspidosperma parvifolium*). In this stratum, there are groups of pacales.

- Bamboos (Pacal)

This stratum is represented mainly by the groups of Pacales (Bamboos)³⁹ and few tree species (less species diversity), some of which include Misa (*Couratari guianensis*), Pashaco (*Schizolobium sp.*), Isigo (*Tetragastris sp*), Shimbillo (*Inga sp*), Blanquillo (*Casearia Jabitensis*) and Carahuasca (*Guateria sp*). It covers 6 221.0 ha of the Project Area.

- Swamp Trees

It covers 5 276.4 ha of the Project Area, and is characterized mainly by its arboreal species such as Palo Santo (*Tachigalia vasquezii*), Coloradillo (*Licania oblongifolia*), Chemicua (*Pseudolmedia laevis*), Misa (*Couratari guianensis*), Shimbillo (*Inga sp*), Castaña (*Bertholletia excelsa*), Renaco (*Ficus sp.*), Cumala (*Virola sebifera*), Azúcar Huayo (*Hymenaea sp*), Remo Caspi (*Aspidosperma excelsum*), Caimito (*Pouteria neglecta*) and Misa blanca (*Eschweilera coriacea*).

7.3 Threats

The Brazil nut forests have an approximate area of 2.6 million hectares, representing 30% of the department of Madre de Dios. From this total, a million hectares are under Brazil nut activity, which is the traditional use of the forest by the local families since several decades⁴⁰ (WWF & CP-CFV; 2005).

The Brazil nut activity generates pressure over the wildlife, particularly in the harvesting season, in which subsistence hunting is carried. This pressure has a negative impact on the mammal species and great birds such as the Tapir, Colorado Deer, Black Machin and the

³⁹ The pacales were evaluated as isolated groups due to the difficulty in data collection.

⁴⁰ WWF Perú; Peruvian Council for Voluntary Forest Certification - CP-CFV. 2005. Standard for Forest Management Certification for production of Brazil nut (*Bertholletia excelsa*) in Peru

Trompeteros (Kirkby, C. 1999; Espinoza, E. 2005⁴¹). However, researches of Brazil nut forests indicate that the level of biodiversity in these forests (without timber use) is the same to the forest without intervention, and that the Brazil nut collectors did not influence the mammal and tree density (Ortiz, E. 2002⁴² mentioned by Espinoza, E. 2005).

Regarding the pressure generated on the Brazil nut trees, Cornejo and Ortiz (2001)⁴³ state that the way this activity is performed (low to mid intervention) does not affect the existence of seedlings less than 1 m high. They also mention that currently there is insufficient evidence to affirm that the extraction of Brazil nut seeds affect the fauna (dispersing agents), and thus the sustainability of the Brazil nut populations. Similarly, Zuidema (2003)⁴⁴ also points out that the Brazil nut gathering has little impact on the natural regeneration of the specie and in its dynamic, since new seedlings can be found in harvesting areas, and population models suggest that the size of the harvested populations remains stable and that there would be continuous recruitment.

As mentioned, in the Forest and Wildlife Law (paragraph two of the Article N° 10) the Peruvian Government establishes the granting of Brazil nut concessions, to secure the sustainable management of these areas. Furthermore, the cut and burning of Brazil nut trees was declared for an indefinite period in closed season through the Ministerial Resolution N° 00729-81-AG-DGFF. With these above-mentioned evidences, it is demonstrated that in the Project Area, the low and medium Brazil nut activity does not cause a decrease of the biodiversity nor of the Brazil nut resource.

The real threat to the biodiversity is the fragmentation and loss of habitat due to the advance of the agricultural frontier, farming and mining activities among the principle.

The continuous and accelerated pressure over the areas on both sides of the southern Interoceanic Highway (IOS) causes the expansion of the agricultural frontier, mainly by Andean migrants. They replicate the traditional practices of slash and burn, deforesting areas to install annual crops or to do extensive grazing. It is estimated that the land use change⁴⁵ for agriculture purposes grows on an annual rate of 1.29% and 0.66% in detriment of the primary and secondary forest respectively. Furthermore, the implementation of pastures for livestock registers the highest rate of annual growth, reaching a 3.51% in reduction of secondary forests and grasslands⁴⁶.

In addition, the improvement and maintenance of the IOS brings along indirect impacts over the adjacent forests, which according to Dourojeanni (2006)⁴⁷ would be:

⁴¹ Espinoza, E. 2005. The Impact of Brazil nut Harvest on Wildlife in Brazil nut Forest in Madre de Dios, Peru. Thesis for the degree of Forest Engineer. Universidad Nacional de Madre de Dios, Peru

⁴² Ortiz, E. 2002. Brazil Nuts. In: A. Guillén, S.A. Laira, P. Sharley & A. R. Pierce (EDS). Tapping the Green market: Certification and management of non-timber forest products. Earthscan

⁴³ Cornejo, F.; Ortiz, E. 2001. Brazil nut (*Bertholletia excelsa*) Natural Regeneration and proposals for its management. Association for the Conservation of the Amazon Basin (ACCA). Madre de Dios, Peru

⁴⁴ Zuidema, P. A. 2003. Ecology and management of Brazil nut trees (*Bertholletia excelsa*). PROMAB. Science Series N° 6. Riberalta, Bolivia y Utrecht, Países Bajos. Page 129

⁴⁵ Land use processes not only in terms of its natural vocation, but also on the type of activity developed.

⁴⁶ Línea Base de los Impactos Indirectos del Ámbito de Influencia del Corredor Vial interoceánico Sur. Volume I. Available in:

http://www.minam.gob.pe/index.php?option=com_docman&task=doc_download&gid=3448&Itemid=69

⁴⁷ Dourojeanni, Marc J. 2006. "Study Case on the Inter-Oceanic Highway". BIC and others. First Edition, Lima, 2006.

- Deforestation for legal and illegal agriculture on lands without agricultural aptitude
- Degradation due to timber extraction without management and trees replacement. Cedar and Mahogany are the preferred species representing the 90% of the extracted volume, which is mainly illegal. Myers (1980)⁴⁸ estimates that for every m³/ha of harvested timber, farmers invade afterwards the areas destroying approximately 1/5 ha of forest.
- Increase of the risk of forest fires (natural cause or by induced fires due to slash and burn practice)
- Illegal hunting for trade of meat, leather and skin, and live animal trade
- Reduction of environmental services such as water cycle, CO₂ fixation, etc.
- Loss of biodiversity, extinction of species and invasions of protected areas; which will result in the reduction of landscape and touristic values

The informal mining registered, according to the historical analysis made for the deforestation model, an annual growth rate of 3.62%. This increase is driven by the international price of the gold and the lack of tax control mechanisms; which allows most mining activity to be informal and to become a great environmental and social threat, constantly expanding.

The mining in Madre de Dios is done with heavy machinery and dredgers at the rivers and forestlands, including the displacement of vehicles and heavy machinery, soil removals and the dumping of chemicals, oils, lubricants and fuel. These produces negative impacts such as the alteration of the quality of superficial waters, direct destruction of flora and fauna, biodiversity and habitat alteration.

8. High Values of Conservation

8.1 Significant Concentrations of Biodiversity Values

Protected Natural Areas (ANP)

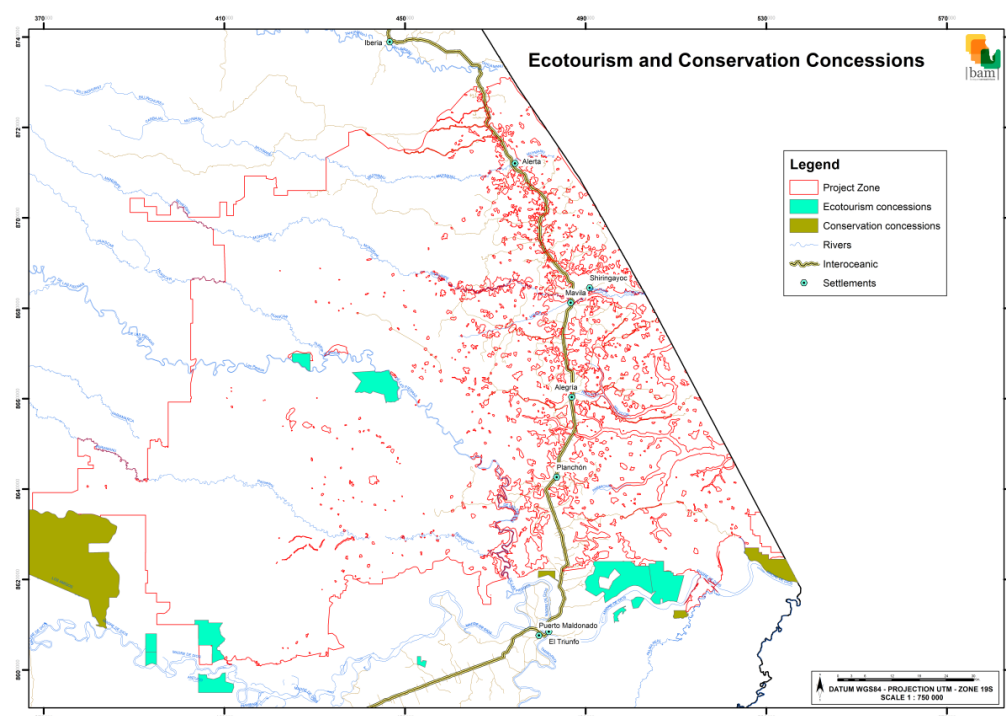
There are not protected natural areas within the Project Zone and the Project Area. However, there are ecotourism concessions. According to the article 113° of Supreme Decree 014-2001-AG: *"The ecotourism concessions are granted in forests that are not qualified as permanent production forests or protected areas; this type of concession grants its owner the faculty of taking advantage of the natural landscape as a resource."*

Ecotourism and activities that use Non-Timber Forest Resources, such as Brazil nut recollection, can be performed inside an ANP but they have to be addressed in its respective Management Plans. Map 16 shows the location of the Ecotourism Concessions within the Project Zone and the Conservation Concessions⁴⁹ adjacent to the Project Zone. These concessions are established by the State in forests and protection lands, and the assigned area will depend of the technic studies done by the Forest Authority, based on management criteria, type of forest ecosystem and requirements of the biological diversity (threaten species and fragile or threaten habitat), as well as the environmental service provision. For this reason, the project would act as a corridor for the protection of the values that are present in each concessionaire, allowing amongst other the free transit of species.

⁴⁸ Myers, N. 1980. Conversion of Tropical Moist Forests. National Research Council, Washington D.C. In: Lamprecht, Hans. 1990. Silviculture in the Tropics: forest ecosystems in tropical forests and its tree species Possibilities and methods for sustainable utilization. GTZ

⁴⁹ Article 119° of Supreme Decree 014-2001-AG. Regulation of the Forestry and Wildlife Law N° 27308

Map 16. Ecotourism Concessions and Conservation Concessions in the Project Zone



Endangered Species

International organizations have been working to give information over the priority areas for conservation. The International Union for Conservation of Nature⁵⁰ (IUCN) annually issues a list of endangered species called “Red List”. The list has several categories from the highest to lowest endangered species: EX (extinct), EW (extinct in natural state), CR (in critical danger), EN (in danger), VU (vulnerable), NT (almost threaten), LC (less worry).

Additionally, there are multilateral agreements between countries to reduce the pressure over flora and fauna species like the Convention on International Trade in Endangered Species of Wild Fauna and Flora⁵¹ (CITES) which divides in three groups and regulates the endangered species trade.

Appendix I includes all the species in danger of extinction whose trade is restricted under exceptional circumstances; Appendix II includes species which are not in danger of extinction but whose trade has to be controlled to avoid its incompatible utilization with its survival; and Appendix III includes protected species in at least one country party, which seeks the addition of this species to CITES to control its trade. At a national level, the endangered species are classified according to the Supreme Decree DS 034-2004-AG for wild fauna and DS 043-2006-AG for wild flora.

The evaluation and identification of endangered wild flora and fauna species present in the Project Zone was prepared as part of the elaboration of Baseline of Biodiversity (Loja, J., et al. 2013)⁵² and also by nearby biological monitoring of the Project Zone.

⁵⁰ IUCN. 2012. IUCN Red List of Threatened Species. Version 2012.2. <<http://www.iucnredlist.org>>. Downloaded on 18 February 2013.

⁵¹ Convention on International Trade in Endangered Species of Wild Fauna and Flora. Available on: <http://www.cites.org/eng/resources/species.html>

⁵² Loja, J., et al. 2013. Proposal for Baseline Survey of Flora and Fauna of Castañeros concessions in

The registered species in other studies are considered using the **Precaution Principle**⁵³, which states that whether the existence of a value were probable in a particular area, the management should assume that it does exist, and if an activity could be harmful for a value, the management should assume that it is harmful. For this reason, the species with a certain degree of threat registered near the Project Zone are also considered threats to our zone and Project Area. In addition, the species of which cannot be classified according to threat levels for deficiencies in its data (DD)⁵⁴.

The list of endangered fauna is shown in the Table 27. Each one of these species have been classified according to the UICN, the DS 034-2004 AG and CITES.

Table 27. Mammal Species in Conservation Categories

Scientific name	Local name	CITES category	IUCN category	DS-034-2004-AG
<i>Ateles chamek</i>	Maquisapa	II	EN	VU
<i>Priodontes maximus</i> *	Carachupa mama, Yungunturo	I	EN	VU
<i>Mazama americana</i>	Venado colorado		DD	
<i>Bradypus variegatus</i>	Pelejo de 3 dedos	II	LC	
<i>Saguinus fuscicollis</i> *	Frailecito	II	LC	
<i>Cebus paella</i>	Machín negro	II	LC	
<i>Aotus vociferans</i> *	Musmuqui	II	LC	
<i>Callicebus cupreus</i>	Tocón rojo	II	LC	
<i>Alouatta seniculus</i> *	Coto, mono coto	II	LC	NT
<i>Nasua nasua</i>	Coatí	III	LC	
<i>Panthera onca</i> *	Otorongo	I	NT	NT
<i>Puma concolor</i> *	Puma	II	LC	NT
<i>Leopardus pardalis</i> *	Tigrillo	I	LC	
<i>Pteronura brasiliensis</i>	Lobo de río	I	EN	EN
<i>Tapirus terrestris</i> *	Sachavaca	II	VU	VU
<i>Dinomys branickii</i>	Machetero, Picuro		VU	EN
<i>Pecari tajacu</i> *	Sajino	II	LC	
<i>Tayassu pecari</i> *	Huangana	II	NT	

Source: Loja, J., *et al.* 2013; PDD los Amigos⁵⁵ y Monitoreo biológico IRSA SUR⁵⁶

From the mammal species found in the evaluation of 2013^(*): 2 species were found to be as Near Threatened-NT (*Panthera onca* and *Tayassu pecari*) and 1 specie as Endangered (*Priodontes maximus*) in the list of IUCN; the *Tapirus terrestris* was classified as a Vulnerable-VU specie in the national and IUCN lists. Also, 10 species were included in Appendix I (*Priodontes maximus*, *Panthera onca* y *Leopardus pardalis*) and II (*Saguinus fuscicollis*, *Aotus vociferans*, *Alouatta seniculus*, *Puma concolor*, *Tapirus terrestres*, *Pecari tajacu* y *Tayassu pecari*) of CITES.

Madre de Dios.

⁵³ WWF, 2007. Forest with High Conservation Value: The Concept in Theory and Practice. Page 7

⁵⁴ There is inadequate information to assess its risk of extinction based on its distribution and / or condition of the population.

⁵⁵ PPD of the Conservation Concession Los Amigos. 2009

⁵⁶ Walsh Perú S.A, 2007. Social Environmental Impact Study "Interoceanic Highway South, Peru-Brazil: Stretch 3". Lima-Peru

Table 28. Bird Species in Conservation Categories

Scientific name	Local name	CITES category	IUCN category	DS-034-2004-AG
<i>Tinamus osgoodi</i>	Perdiz		VU	VU
<i>Pauxi unicornis</i>	Paujil unicornio		EN	
<i>Elanoides forficatus</i> *	Shihuango	II	LC	
<i>Buteo magnirostris</i> *	Shihuango	II	LC	
<i>Neochen jubata</i>	Ganso del Orinoco		NT	
<i>Daptrius ater</i> *	Halcón	II	LC	
<i>Ibycter americanus</i> *	Halcón	II	LC	
<i>Milvago chimachima</i> *	Halcón	II	LC	
<i>Primolius couloni</i>	Guacamayo de cabeza azul	I	VU	
<i>Harpia harpyja</i>	Águila harpía		NT	VU
<i>Pipile cumanensis</i> *	Pava campanilla		VU	NT
<i>Mitu tuberosum</i> *	Paujil		LC	NT
<i>Platalea ajaja</i>	Espátula rosada		LC	EN
<i>Coryphaspiza melanotis</i>	Pinzón enmascarado		VU	VU
<i>Ara macao</i> *	Guacamayo rojo		LC	VU
<i>Amazona festiva</i> *	Loro		VU	NT

Source: Loja, J., *et al.* 2013; PDD los Amigos y Monitoreo biológico IIRSA SUR

Of the bird species registered in the Baseline (*), 2 (*Amazona festiva* y *Pipile cumanensis*) are Vulnerable according to the IUCN list, 1 specie (*Mitu tuberosum*) is as Near Threatened by the Peruvian State. Also, 5 species (*Elanoides forficatus*, *Buteo magnirostris*, *Daptrius ater*, *Milvago chimachima*, *Ibycter americanus*) are in the Appendix II of CITES. The rest of the species with some threat level are of bibliographic revision.

Table 29. - Reptile and Amphibian Species in Conservation Categories

Scientific name	Local name	CITES category	IUCN category	DS-034-2004-AG
<i>Ameerega Trivitattus</i>	Rana venenosa	II	LC	
<i>Ameerega simulans</i>	Rana venenosa	II	LC	NT
<i>Ameerega macero</i>	Rana venenosa	II	LC	
<i>Chelonoidis denticulata</i> *	Motelo		VU	
<i>Epicrates cenchria</i>	Boa arco iris	II		
<i>Paleosuchus trigonatus</i> *	Dirindirín Lagarto enano		LC	NT
<i>Caiman crocodilus</i> *	Lagarto blanco	II	LC	
<i>Boa Constrictor</i> *	Mantona	I		
<i>Eunectes murinus</i> *	Anaconda	II		NT

Source: Loja, J., *et al.* 2013; PD Los Amigos and Biologic Monitoring IIRSA SUR

Of the registered species in the Baseline(*), *Chelonoidis denticulate* is at a Vulnerable state according to the IUCN list; *Paleosuchus trigonatus* y *Eunectes murinus* are Near Threatened in the national list. Similarly, *Boa constrictor* is included in the Appendix I of CITES. The other species have been registered near the Project Zone.

The list of the threaten flora is shown in Table 30. Each of those species have been classified according to the IUCN, the DS 043-2006-AG and CITES.

Table 30. Flora Species in the Conservation Categories

Scientific name	Local name	CITES category	UICN category	DS-043-2004-AG
<i>Dipteryx alata</i> *	Shihuahuaco		VU	
<i>Bertholletia excelsa</i> *	Castaña		VU	
<i>Clarisia racemosa</i> *	Mashonaste			NT
<i>Cedrela odorata</i> *	Cedro	III	VU	VU
<i>Swietenia macrophylla</i>	Caoba	II	VU	VU
<i>Tabebuia serratifolia</i>	Tahuarí			VU

Source: BAM⁵⁷; PD Los Amigos and Biologic Monitoring IIRSA SUR

From the records of the carbon inventory^(*) done in 2011, in the Project Zone 3 species in vulnerable state were found: *Dipteryx alata*, *Bertholletia excelsa* H.B.K and *Cedrela odorata* (IUCN, 2012). According to the Peruvian categorization, established by the Supreme Decree DS N° 043-2006-AG for the flora species, *Clarisia racemosa* was catalogued as Near Threatened (NT) and *Cedrela odorata* in vulnerable state (VU). This last one is a specie of great forest value and appears in the Appendix III of the CITES to regulate its utilization.

Endemic species

The inventories done in the field of the Manu National Park, Bahuaja-Sonene National Park, and the zone of Iberia-Iñapari, amongst others, have given as results bird, mammals, dragonflies, and endemic species in the register records, (Ministry of Agriculture of Peru, 2000 quoted by Fernández, 2010)⁵⁸. For example in the basin of the river Tambopata 91 species of mammal, 570 of birds, 127 of reptiles and amphibians, 94 of fish, amongst others can be found in hardly an area of 550 ha (Parkswatch, 2003)⁵⁹.

It should be said that in the study for the baseline of flora and fauna done in January 2013 in the Brazil nut concessions, registered endemic species were not found. Nonetheless, we mention them based on the monitoring done by Walsh Peru SAC (2007) in the IOS and consulted literature, determining the existence of 2 endemic mammal species whose distribution is registered at a regional level.

The “Añuje” (*Dasyprocta kalinowskii*) is distributed in the South Eastern Watershed. It is a rodent relatively frequent in the montane forests that could be found even in the pre-montane forests; it is distributed in the departments of Madre de Dios, Cusco and Puno, between 800 to 1,800 m above sea level (Cadle y Patton, 1988 quoted by Walsh, 2007).

The “Rata de Bambú” or Bamboo Rat (*Dactylomys peruanus*) is distributed along the entire South Eastern Watershed; it is a rodent that lives in the forests of high dominance of pacas and bamboos.

⁵⁷ BAM, 2011. Carbon Inventory in Brazil nut concessions in Madre de Dios, Peru.

⁵⁸ Fernández, L. 2010. Land development in Madre de Dios - Socio-Environmental Impacts of the South Inter-Oceanic Highway. Wildlife Conservation Society (WCS). Lima-Perú

⁵⁹ Parkswatch, 2002. Perú: Tambopata National Reserve and Bahuaja-Sonene National Park. Available in: <http://www.parkswatch.org/>. Last review on 20/12/2012

In the same way, consulted literature gives details of the “Rana Venenosa” or Poisonous Rat (*Ameerega simulans*⁶⁰), belonging to the Dendrobatidae family; it is restricted to the pre-montane and low jungle of Madre de Dios and Puno.

Regarding the endemic flora, no registry was obtained during the baseline fieldwork, but information from the “*Libro Rojo de las Plantas Endémicas del Perú*” was obtained:

Caraipa jaramilloi, of the clusiceae family, is an Amazonian tree of non-floodable forests present in various locations of the departments of Madre de Dios, Loreto and Pasco in areas of private conservation and in the Allpahuayo – Mishana National Reserve (Loreto).⁶¹ There is no current information of the specie but in the last evaluation (1998), it was assigned with the category of Near Threatened (NT).

Areas Holding Significant Concentrations of Species during any time of its Life Cycle

The Project Zone is included in the Endemic Bird Area⁶² (EBAs), as seen in Figure 4 shaded in gray. Inside the EBAs, the reproduction area and areas of restricted-range species overlap⁶³, thus the complete range is included within the limit of the EBA.

The Project Zone is in the EBA 068 called “South East Peruvian Lowlands” because it centers in the southeast part of the country, mainly in the department of Madre de Dios, but it also occupies parts of Bolivia and Brazil. The forests in this region are low-land humid forests , encompassing regular floodable plains, riparian forests and forests of firm, interfluvial ground. The bird species of restricted range of higher threat are: *Percnastola lophotes* (NT), *Formicarius rufifrons* (NT) y *Cacicus koepckeae* (EN) because they are confined to a specific locality where harmful activities that destroy and fragment their habitat are developed.

Moreover, around the Project Zone there are Important Bird Areas (IBAs) that provide an essential habitat for one or more species. These can be threatened birds, with restricted distribution range or especially numerous concentrations of birds in the places of reproduction, during their migration, or in their places of hibernation. The IBAs surrounding the project are: PE112 (MANU in the Manu National Park), PE113 (LOS AMIGOS in the Conservation Concession Río Los Amigos), PE114 (RESERVA AMAZONAS in the Ecotourism Concession Inkaterra), PE115 (TAMBOPATA NATIONAL RESERVE in the Tambopata National Reserve) y PE116 (BAHUAJA-SONENE in the Bahuaja-Sonene National Park), which can also be seen in Figure 4 in green.

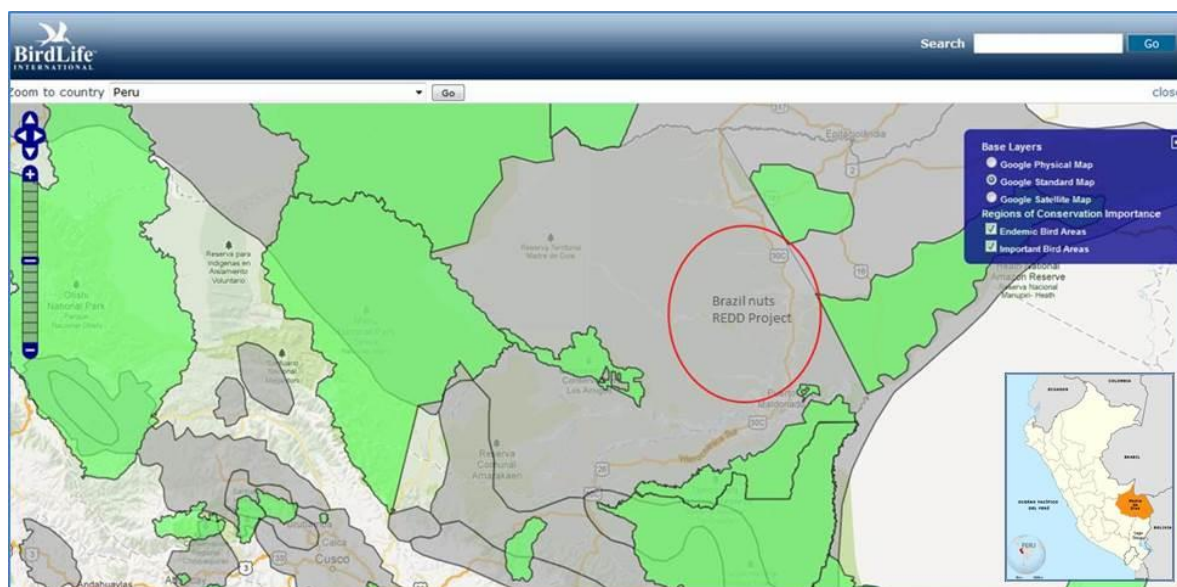
⁶⁰ Synonymy: *Epipedobates simulans*. Available in: <http://www.iucnredlist.org/details/55237/0>

⁶¹ Blanca León et al. 2006. The Red Book of Endemic Plants of Peru. Faculty of Biological Sciences UNMSM. Peruvian Magazine of Biology. Special number 13(2): 261s - 264s (December 2006)

⁶² Both the EBA's e IBA's are terms proposed by BirdLife International.

⁶³ All land birds along the times (since 1800), have a total worldwide reproduction range of less than 50000 km²

Figure 4. Distribution of Endemic Bird Areas (EBA) and Important Bird Areas (IBA) in the Project Zone



Source: <http://www.birdlife.org/datazone/geomap.php?r=i&c=166>

A Jaguar population (*Panthera onca*), which is considered the third largest feline in the world, lives in the Project Zone. Jaguars are spread out from the southern east of the United States to Argentina, particularly in dense forest areas with water reservoirs or rivers. However, the pressure of man over its natural environments has reduced the territory they occupied and their population. Currently, the Jaguar population in Madre de Dios is located in fragmented environments⁶⁴ as shown in Figure 2 in light green.

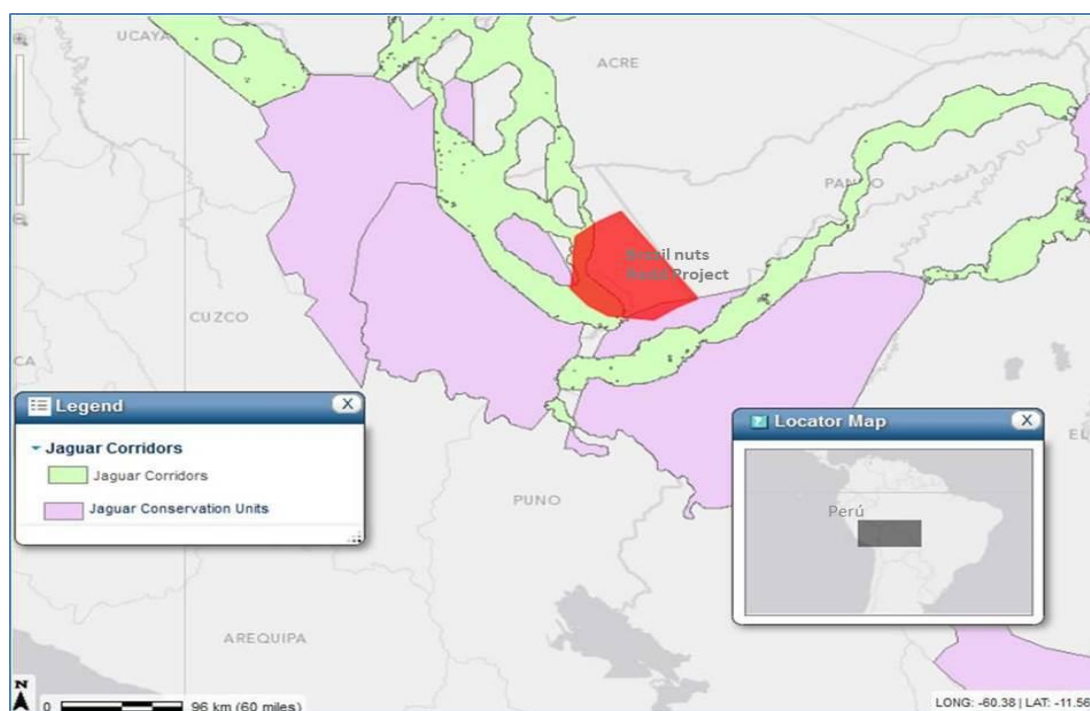
The continuous reduction of its areas of reproduction and feeding has caused the jaguars to transit through the areas occupied by man, mainly in search of food (cattle) causing the farmers to shoot them. Due to the decline of its population it is considered in the category NT by the IUCN and in Appendix I of the CITES for the growing tendency of its hunting for the trading of its skin for coats and wallets.

In Peru, the jaguar is protected by the Supreme Decree DS-034-2004-AG and with higher rigor in the natural protected areas where its hunting is prohibited. In Figure 5 the conservation units of the jaguars⁶⁵ are observed.

⁶⁴ Rabinowitz, A. & Zeller, K.A. 2010. A range-wide model of landscape connectivity and conservation for the Jaguar, *Panthera onca*. Biological Conservation 143: 939-945. In: <http://databasin.org/datasets/6108670b08dd44d99f353fbf0b05f1da>

⁶⁵ Zeller, Kathy. 2007. Jaguars in the New Millennium Data Set Update: The State of the Jaguar in 2006. WCS Report. Wildlife Conservation Society, New York. 1-82. In: <http://databasin.org/datasets/b530e75d0b464cf59a04a5da69b59735>

Figure 5: Jaguar Corridors and Jaguar Conservation Units in the Project Zone



Source: <http://databasin.org/datasets/b530e75d0b464cf59a04a5da69b59735>;
<http://databasin.org/datasets/6108670b08dd44d99f353fbf0b05f1da>

8.2 Extensive Landscape Areas

The Project Zone is constituted by heterogeneous forests and is habitat of threatened species, according to the bibliographical reference found. Many of these species have also been identified and referenced to in the POAs of the concessionaires.

The Project Zone overlaps with the **Conservation Corridor Vilcabamba – Amboró (CCVA)**⁶⁶ in 125668.7 ha (Map 17). The CCVA, is one of the most diverse places on the planet, biologic ecologic and culturally.

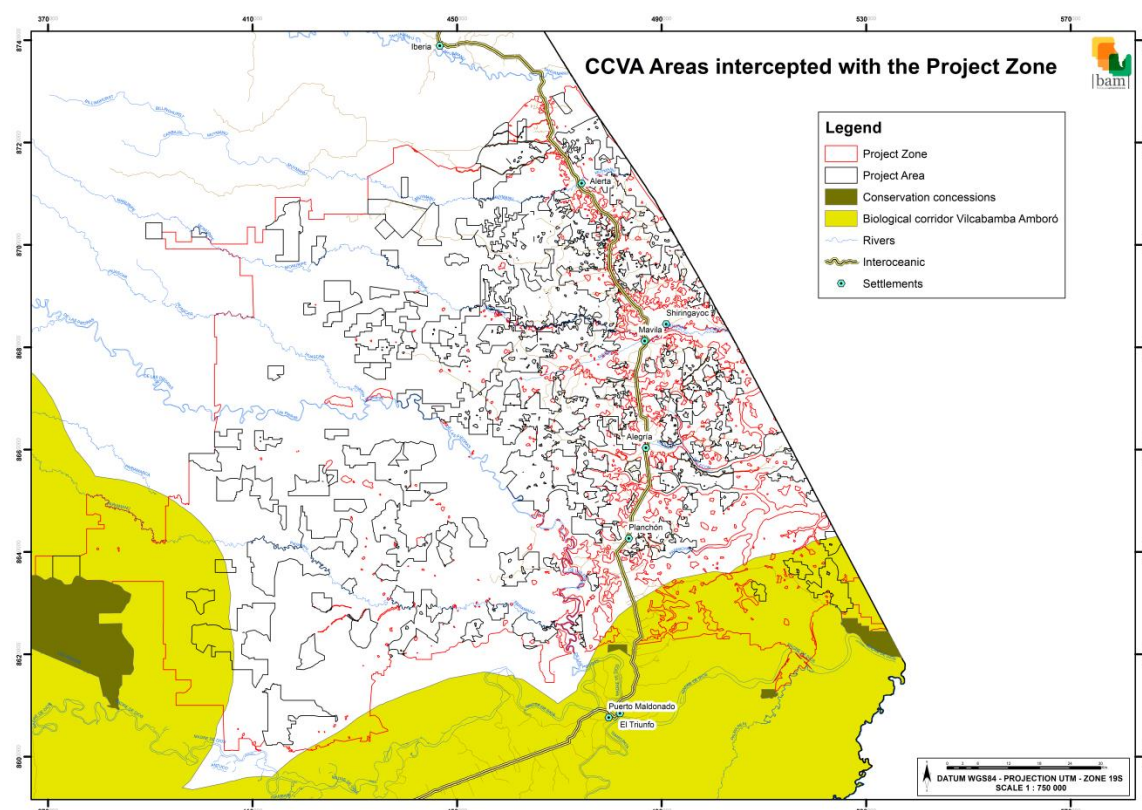
The CCVA is a bi-national area, since it extends from the mountain chain of Vilcabamba in Peru to the Amboró National Park in Bolivia, making up a total of 30 million hectares that include 19 protected areas. This contributes to the protection and ecological connectivity of mountainous forests and tropical plains best conserved in the world and to the subsistence of thousands of flora and fauna species.

The protected areas in this forest ecosystem form a corridor of biodiversity that maintains a notable biological and cultural diversity. Between these complexes are public and private lands, which are on intact lands or on very devastated lands due to the anthropic activities

The CCVA complies with a fundamental roll in the ecosystems regulation at a regional level since it includes areas of high-density rains, headwaters of the amazon basin, and other basins that regulate the temporary flooding. In addition, indigenous villages in voluntary isolation are found.

⁶⁶ Critical Ecosystem Partnership Fund (CEPF). 2001. Forest Ecosystem of Vilcabamba-Amboró of the Priority Area of Conservation of the Biodiversity in the Tropical Andes of Peru and Bolivia.

Map 17. CCVA Areas Overlapping the Project Zone



8.3 Threatened or Rare Ecosystems

Are not present in the Project Zone

8.4 Areas that Provide Critical Ecosystem Services

The Project Zone is formed by many basins, being the principal rivers: Las Piedras, Pariamanu y Madre de Dios. These rivers provide important hydro biological resources to the local populations. Currently these resources are being threatened by gold mining activity in the south part of the Project Zone, mainly in the rivers Pariamanu and Madre de Dios.

Studies done in the basin of the Madre de Dios River, regarding the flora and fauna contamination indicated that huge quantities of mercury used by mining are manipulated without any technical criteria or inspection. The continuous dumping of mercury has been evidenced in the fish and river otters evaluated in the Manu National Park and in feathers of raptor birds and in the interior of the forest's soil. In addition, studies in fish for human consumption show mercury level over the maximum recommended limits permitted by the World Health Organization. The study⁶⁷ also mentions that of a sample of 100 people of the city of Madre de Dios, 58% showed symptoms of mercury contamination.

The illegal mining activity in the Project Zone not only contaminates the area it occupies but the materials that are dumped in the rivers affect other zones in its entire course. Mercury is not the only contaminator; also, lubricants, oils and detergents are dumped. The removing of

⁶⁷ Línea base Ambiental de la Cuenca del Río Madre de Dios. 2010. Proyecto Línea Base de Cuenca de Ríos. Ministerio del Ambiente (MINAM)

soil generates the increase of suspended solids causing the death of flora and fauna for the diminution of oxygen and acidity in its waters.

The forests of the Project Zone comply with hydrologic and biologic services as any tropical forest and as part of the Vilcabamba – Amboró Conservation Corridor, comply with a fundamental roll to maintain and conserve the ecosystems.

8.5 Fundamental Areas for the Basic Needs of Local Communities

Local inhabitants use the water resources for self-consumption; thus, all the water system of the Project Zone must be conserved. As seen (Community Information G1), the main source of drinking water comes from the rivers, ditches, springs or similar with 39.2% and 44% in the districts of Las Piedras and Tahuamanu respectively.

The timber resource is used for the housing in the Project Zone, as the houses of the districts Las Piedras and Tahuamanu are mainly built (the walls) with wood in a 92.7% and 90.8%, respectively. Additionally, the use of firewood and charcoal for cooking represents a 74% for both districts compared other sources.

The local populations take advantage of the forests in an integral manner, mainly for its self-consumption, through the hunting, fishing and gathering of wild fruits activity.

8.6 Critical Areas for the Cultural Traditional Identities of the Community

The Brazil nut forest is a source of seasonal economical incomes for the families of the region; typically, it is a family activity in which 4500 families intervene representing 30% of the population of Madre de Dios. The Brazil nut activity provides direct and indirect jobs for 15 thousand to 20 thousand people; it is generator of 67% of the total income of the families, which would indicate a significant proportion of their involvement⁶⁸.

In turn, the deforestation of the Brazil nut forests is putting the ecosystem at risk and its capacity to generate resources for the families of Madre de Dios, since the Brazil nut extraction is done only in natural forests. For this reason the Brazil nut tree (*Bertholletia excels H.B.K*) is categorized with a vulnerable threat state according to the Supreme Decree N° 043-2004-AG, for which its good utilization and management is indispensable.

G2. Base Line Projections

For the elaboration of the Baseline of the project, the guidelines of the Modular Methodology VM007⁶⁹, which was approved in 2010 for the AFOLU sector, were followed; also, the indications of the requirements documents of VCS have been taken into consideration: *Tool for AFOLU Methodological Issues and Guidance for Agriculture, Forestry and Other Land Use Projects*.

Specifically, points 1 and 2 of this section were elaborated based on the VSC tool: *Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities v.1 (VT0001)*⁷⁰:

⁶⁸ The Value Chain of Peruvian amazonian Brazil nut.2006. Candela Perú, Multisectoral Technical Committee of the Brazil nut.

⁶⁹ <http://v-c-s.org/methodologies/VM0007>

⁷⁰ Version 3 is the latest. <http://v-c-s.org/methodologies/VT0001>

For point 3 of this section, where the complete calculation of the carbon stock changes in Baseline are explained as well as the modeling of deforestation in the Project Area, the steps of the module *Estimation of Carbon Stock Changes and Greenhouse Gas Emissions from Unplanned Deforestation* VMD007⁷¹ v2 (BL-UP) have been followed.

1. Most Probable Scenario of the Use of the Land in Absence of the Project

1.1. Definition of Potential Scenarios

First, two possible scenarios were identified. Both of them are realistic and credible, are based on historical land uses and economic trends, and would have occurred in the absence of the AFOLU project activity. They are described below:

Scenario 1: Continuation of Pre-Project land use

The main activity in the Project Area proposed, since more than 80 years ago⁷², is the harvesting of the fruits of the Brazil nut or Castaña tree (*Bertholletia excelsa* H.B.K). This activity has been legally organized since 2000⁷³, where the *Concessionaires for The Management and Utilization of the forest Products Other Than Timber* began to be granted.

The majority of concessionaires have been developing the Brazil nut activity for decades⁷⁴; however, they are still doing it in an artisanal manner, selling its products (with or without shell) at the local markets.

The value of the Brazil nut chain includes harvesting, transporting and post-harvest storing, artisanal and industrial processing, and the trade of the Brazil nut and/or of products of higher added value. The concessionaires are only the first link of this value chain, harvesting without applying better technics of recollection, and with a minimal investment, due to the lack of economic resources, little manpower and lack of technology to develop a sustainable harvest process, and other alternative land uses in a sustainable manner.

Also, the possibilities of improving their harvest and post-harvest technics, which affect directly the quality of the Brazil nut, are very low since the incomes of this activity are not enough and do not allow the capitalization and reinvestment in their areas. Also, not being eligible for credit, depend of each *Habilitos*⁷⁵ campaign provided by the different involved actors in the trading (intermediaries, exporters)

On the other hand, generally the sale prices are punished, either because the quality of their product does not meet the standards of buyers and/or because the agreements made before the campaign to obtain the *Habilitos*, sets a fixed piece that prevents the concessionaires from benefiting if the price increases during the campaign.

Given that Brazil nut harvesting is a periodic activity covering the months of November until March, the concessionaires are encouraged to see through other activities to have sources of income the rest of the year. In this sense, timber harvest has become in an additional necessary practice. In spite of being a low intensity activity, or counting with an *Annual*

⁷¹ Version 3 is the latest. <http://v-c-s.org/methodologies/VMD0007>

⁷² The commercial collection of Brazil nut goes from the early 30's. Multi-sectorial Technical Committee of the Brazil nut, 2006.

⁷³ Forestry and Wildlife Law. 2000.

⁷⁴ According to the document *Socio-Economic Diagnosis of the Brazil Nut Sector* almost 75% of the Brazil nut concessionaires started with this activity between years 1970 and 1999.

⁷⁵ It is a working capital prepayment given at the beginning of the harvesting campaign by private companies to the concessionaires in order to ensure the supply of Brazil nuts.

Complementary Management Plan (PMCA) and being regulated by a Regional Forest Direction, this extraction is done in an inadequate way, causing negative impacts in the forest as well as the loss of its value. Moreover, in the majority of the cases the concessionaires subcontract the extraction of their wood, thereby obtaining lower incomes from the harvested trees. Currently, less than the half⁷⁶ of the Brazil nut concessionaires report wood extraction, but it is expected that this proportion grow.

Other complementary activities, more important and practiced by the concessionaires are the agriculture of subsistence, the raising of small farm animals and the livestock. They are practiced at the borders of the concessionaires and are the supply of basic agricultural products for the concessionaires' families, who sell the surplus in the local markets. Those concessionaires nearby roads benefit most from this diversification of activities, due to the easy access to product transportation, while the concessionaires near rivers are less probable to reach the markets.

These activities (agriculture and wood extraction) help to complement the annual income that the concessionaires need, given that the Brazil nut recollection and sell only provides 2/3⁷⁷ of it.

In conclusion, this scenario proposes that the pre-project activities will be maintained, being the Brazil nut harvest the main source of income.

Scenario 2: Land use change for typical activities of the region

The activities that currently put pressure on the area are agriculture and livestock, especially in those parts near the IOS, secondary roads and riverbanks. These two activities usually take place at the same time, which is easily seen in the real use of the cultivated areas in the agricultural units (35% agricultural crops – grass 65%).

Agriculture and Livestock are characterized for being mainly of subsistence or small scale. According to III National Agriculture Census of 1994, the 61% of the agricultural units of the region counted with less than 100 hectares, a percentage which has remained the same up to the date (Agricultural Regional Direction –GOREMAD). On the other hand, according to the data of this census, only 3% of the units had its own machinery (tractor, sprayer, etc.). In turn, the average annual income of the agricultural producers of MDD in 2007 was equal to 5 952 soles⁷⁸, which represent 496 soles/monthly, while the minimum salary of the country is 675 soles/monthly⁷⁹.

In addition, a high degree of informality in the tenure of the agricultural units exist (29%⁸⁰ do not have property ownership certificate), which hinders the development of both activities because it limits the access to formal sources of credit.

⁷⁶ 23% of the Brazil nut concessionaires harvested timber from their concessions in the last year (Extraction Balance 2010, Forestry Directorate). It is worth noting that the whole concession area is divided in Annual Cutting Plots to avoid disorganized exploitation.

⁷⁷ According to the document "Micro-finance and Small Business Management" (FAO-2007), 67% of the gross annual income is covered by the Brazil nut activity.

⁷⁸ DIREAG/GOREMAD, 2007.

⁷⁹ Supreme Decree n° 011-2011-TR of the Ministry of Labor and Employment Promotion.

⁸⁰ Data from the PETT offices of Regional Enforcement (OPERs), shown in the record of the project "Cadaster, land titling and registration in 28 districts adjacent to the Interoceanic Highway, routes: i) Iñapari-Puente Inambari ii) Bridge Inambari, Carabaya, Azangaro, Lampa iii) Inambari Bridge –Urcos".

Despite the aforementioned, the pressure on new lands to develop agricultural activities is very high. It was estimated in 2005 that even though the effective demand of the land was 5,370 units (including the units with property titles and possession title); the potential demand reached the 10 091 units⁸¹.

The deforestation analysis between the years of 2000 and 2006 shows that the conversion of the land has taken place mainly along the IOS, at a rate of, 186.72 ha/year⁸². In the area of the Brazil nut concessionaires, the main reason of the usage change of the land has been, and continues to be, the installation of cropland and pastures.

Indeed, the paving of the Interoceanic Highway, recently finished, and the construction of secondary roads not only facilitate the access to the forest, but also by reducing the cost of transportation of the agricultural products to the big markets, improve the profitability of the alternative activities.

Another consequence on the culmination of the work in the IOS and in the Billingham bridge (over the Madre de Dios river) is that it facilitates the interaction between regional markets and markets of the south of Brazil; and since there are no tariffs between the trade between the 2 countries⁸³, many investors could explore the possibilities of installing highly rentable exportation cropland at MDD. It is worth to stress that the expected increase in the flux between both markets, can also facilitate the entering of deforestation agents of Brazil, like the great cattle or soy producers, present in the states of Acre y Rondonia.

As a result, the areas near the IOS are getting ready to meet the demand of the population of the southern Andes, Madre de Dios's own population (which is increasing) and the Brazilian population. Thus, it becomes necessary to install new areas of crops and pastures, in order to provide the increasing demand of food, since it surpasses the annual productive capacity. Therefore the deforestation will enter the proposed Project Area.

Not mentioned before, mining is another primary activity in Madre de Dios. However, despite its importance to the southern part of the region "... specifically in the middle and low part of the Madre de Dios river and the sub-basins of the Colorado, Inambari and Tambopata rivers⁸⁴," have little presence in the project areas. According to the studies done by the Geologic Mining and Metallurgy Institute (INGEMMET), the existence of commercial gold stocks are located in the alluvial formations of the Quaternary Holocene, which represents 4.8% of the Project Area and 5.3% of the total surface of the Brazil nut concessionaires.

This is the reason why mining is not considered as an alternative activity to the proposed Project Zone, under this scenario. However, its effects on the migration must be taken into consideration since the high mining profitability generates great attraction to the region, similar effect to the improvements road infrastructure (mentioned before).

The expected scenario for 2040 (completion of the project) shows an exacerbated deforestation due to the land use change for agricultural and livestock activities, practiced by migrants and even by many Brazil nut concessionaires that will change activities instead of losing all their areas.

⁸¹ Data from the PETT offices of Regional Enforcement (OPERs), shown in the record of the project "Cadaster, land titling and registration in 28 districts adjacent to the Interoceanic Highway, routes: i) Iñapari-bridge Inambari ii) Bridge Inambari, Carabaya, Azangaro, Lampa iii) Inambari Bridge -Urcos".

⁸² Analysis of deforestation areas using 5TM Landsat images of years 2000 and 2006.

⁸³ Peru for being a *Partner Country* of the Southern Common Market (MERCOSUR) has free commerce with member countries, including Brazil.

⁸⁴ Integral Study of Mining in Madre de Dios. Conservación Internacional – 2009.

Deforestation is given by its direct relationship with the increasing profitability of livestock and agriculture.

1.2. Consistency in the Scenarios

To propose the two previous scenarios various studies of the zone were reviewed. This data was divided by subjects to build up necessary evidence (which describe current characteristics and principle threats) to evaluate the consistency of the scenarios.

Evidence Based on Bibliographical Information

Despite its environmental and cultural wealth, the region of Madre de Dios has suffered due to the lack of institutional capacity and of public politics which insure adequate levels of governing, environmental conservation, integration and social local development (Dourojeanni, 2006; Fernández, 2009, GOREMAD & IIAP 2008).

On the other hand, the highway of Quincemil (Cuzco) to Puerto Maldonado, culminated at the beginnings of the 60s, led to the extractive and productive activities, and a strong migration from high lands of the Andean south. The occupation of disorganized lands has provoked a higher pressure over the natural resources, causing a great worry for the future of the conservation of the environment of the region (CSF y GRADE, 2009).

According to CSF and GRADE (2009), the Madre de Dios territory is currently occupied by: Natural Protected Areas (44,6%), Forest Timber Concessions (15,4%), Brazil Nut Concessions (9,45%), Mining Areas (5,2%), Conservation and Ecotourism Concessions (2,2%), Reforestation Concessions (1,3%), Indigenous Communities (9%), Private Lands (3,7%) and other uses (9,2%).

These different patterns of the use of the lands can be perceived according to the section of the IOS. A significant number of the mining activities take place between Mazuko and Puerto Maldonado, concentrating along the Inambari, Madre de Dios, Colorado, Puquiri, Huaypetuhe Caychihue rivers amongst others. The utilization of wood at a small scale takes place in the reforestation concessionaires, agricultural real estate and some forest concessionaires. Also the highway borders la zone damping the Tambopata National Reserve

The Puerto Maldonado-Iñapari section is less dynamic because the transportation of cargo and passengers is less intense. This section is more important, as for the wood and Brazil nut utilization. In a high or low degree, the agricultural and livestock activities take place next to the highway (CSF y GRADE, 2009).

The IOS forms part of the principal artery of the southern Amazonia (Peru-Brazil-Bolivia), and is one of the most important project of the South American Regional Integration Initiative (IIRSA) in the region and greatest road project in Peru. In the department of Madre de Dios, the project has consisted in the restoration, construction and paving of the principal road of terrestrial communication from Inambari to Iñapari rivers (frontier with Brazil), that goes back to the 1960. This highway is the principal road of terrestrial communication and the majority of the cities concentrate around it, including Puerto Maldonado where 50% of the population lives. (Fernández 2009).

On the other hand, Perz, et al. (2008) points out that while the projects of the official highways of the government attract a lot of attention, the informal changes constructed by groups of interest are expanding rapidly, especially where the official highways are being paved. The VIAS project, developed by ACCA in 2008, confirms the expansion of a network of

secondary and tertiary roads, built by general public, without any type of planning nor control from the State.

These roads were built by the users of the forest, which in that time had no control of the income of non-authorized people to the concessionaires or properties that the roads lead to, which increased the pressure over the natural resources, and resulted in deforestation.

Figure 6. Mazuko-Puerto Maldonado Section and Norte to Iñapari Section of the interoceanic highway



Source: George Powell

The picture to the left shows greater deforestation due to easy Access from the high lands of the neighbor departments. However, the image to the right has less deforestation because north side of Puerto Maldonado is separated by Madre de Dios River. The lack of a bridge over the river made the transportation prices be more expensive and limited the access to the forest lands. However its construction was held out in 2011, for which a rapid change of the landscape is expected

The paving of the IOS in Madre de Dios has facilitated the Access to flat land and to the natural resources for the new immigrants. Also has helped to reduce costs of transportation, a communication improvement, link the markets and promote the development in the department. However, for the same reasons non sustainable extractive activities have been easier to carry out (Fernández, 2009).

In the same way, the studies done by GRADE-CSF (2010) projects a potential profitability of different activities carried out along the Interoceanic Highway already paved. This data was obtained from production cost and transportation analysis, as well as the local productivity and costs of each product. The mentioned analysis does not contemplate potential side roads, which have a significant impact in the agriculture, since it improves its profitability. Therefore, it is assumed that the arrival agriculture and livestock farmers to the Project Zone will be greater to indicate by the results of the study of profitability.

Figure 6 shows the potential profitability for the three main activities of this zone in particular. As can be observed the maximum profitability obtained from the Brazil nut concessionaires is of 3 \$/ha/year, while with agriculture and livestock 60\$/ha/year and 140 \$/ha/year respectively can be reached, decreasing as father it goes away from the IOS. The low Brazil nut profitability would not be an impediment to convert these areas with other

ground uses. In addition, as mentioned before, even higher profitability could be gained in agriculture and livestock, if the future side roads were included in the analysis. This makes more feasible the conversion of the zones to the west of the IOS.

The last factor that encourages the deforestation of the department, and which should be documented with higher precision, is the incoherent policy of the Formalization of Informal Property Commission (COFOPRI), responsible for the concession of titles of properties of crop lands. Given that COFOPRI does not grant titles with forest resources which belong to the State, the possessors of these areas cut and burn the forest with the intention of expanding their lands.

Evidence Based on Demography and Historic Deforestation

Madre de Dios was the first region to start, in 2001, an Ecologic Economic Zoning process (ZEE), which was updated recently by the Regional Government of Madre de Dios and by the Peruvian Amazonian Investigation Institute (IIAP). In both processes, satellite LandSat images were analyzed to determine the historic deforestation, being the images of 2000 and 2006 of last ZEE.

Figure 7. Accumulated Historic Deforestation in the Department of Madre de Dios in 2000 and 2006

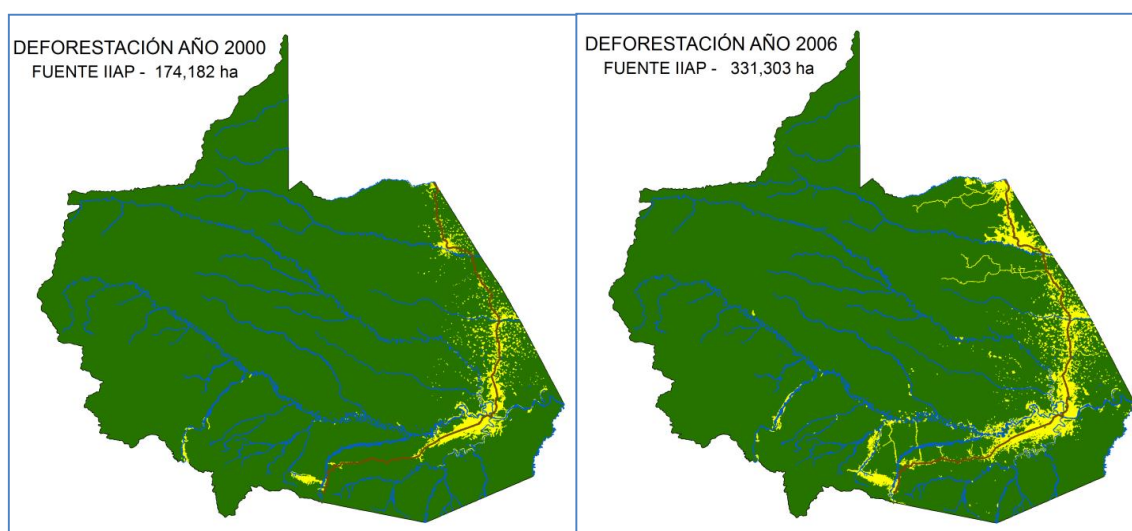
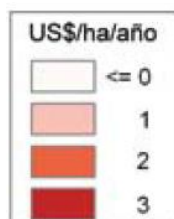
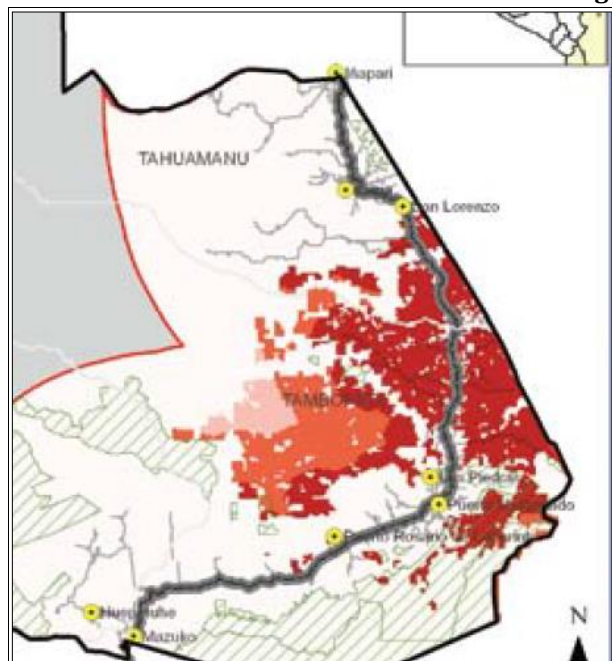
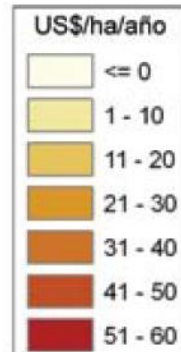
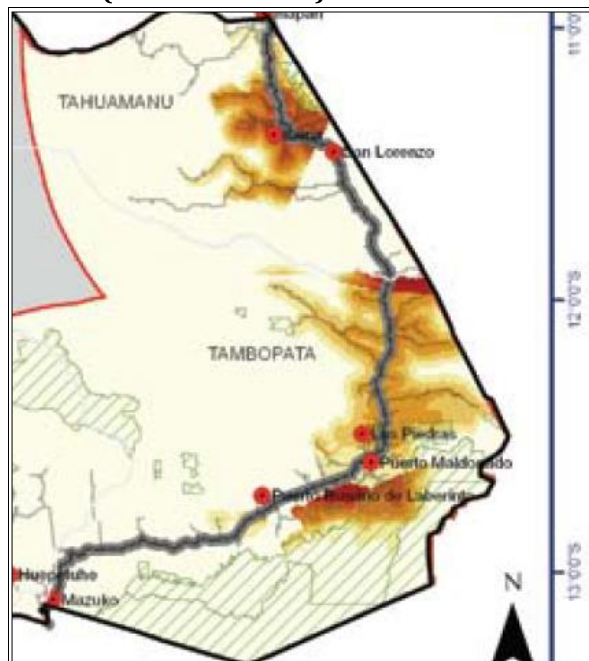


Figure 8: comparing of the profitability of the agriculture, livestock and Brazil nut gathering, in a buffer area of 100 km around the IOS

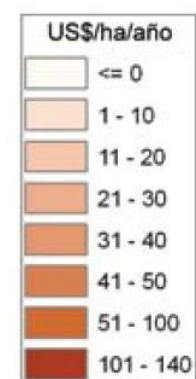
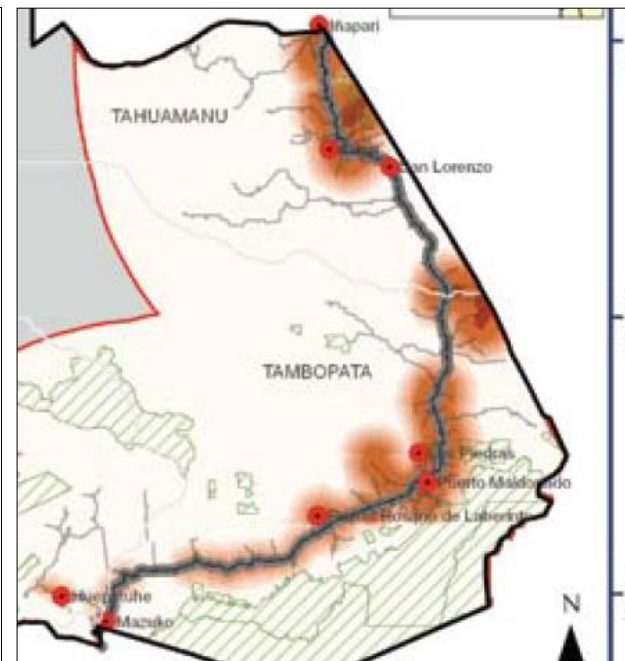
Brazil nut



Agriculture (Corn Production)



Livestock



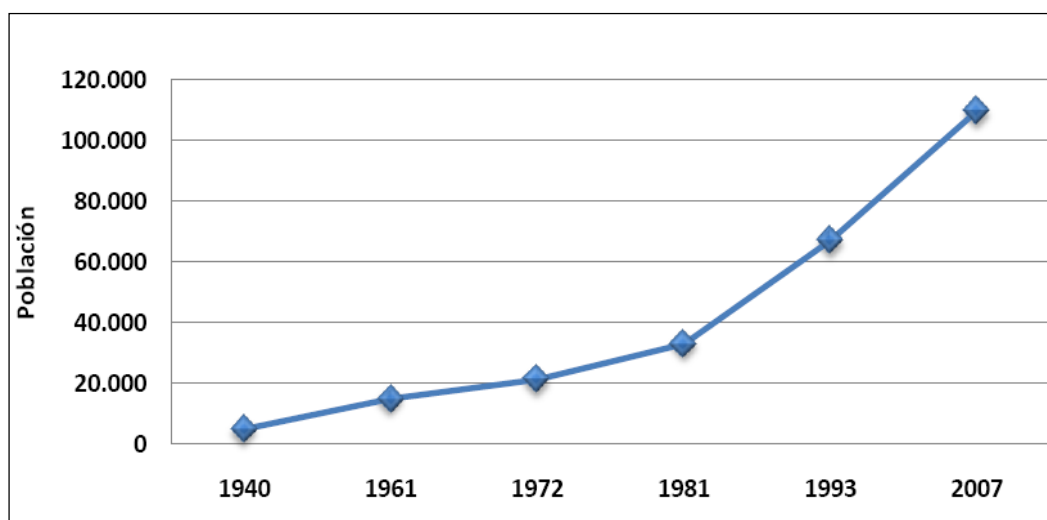
Fuente: CSF - GRADE, 2010.

The ZEE analysis indicated that in MDD 157,120 ha were deforested in 6 years, with an annual rate of 26,186.72 ha, 210% higher than the annual rate reported by PROCLIM (2001) which was of 12,461.1 ha/year between the years 1990 and 2000. This strong increase between both periods is an indicator, each time higher of deforestation agents in the region, due to the construction of the IOS and the following increase in the migration, mainly in the Andean zones of the departments of Cuzco, Puno and Arequipa.

However, this study did not include the period of 2007-2010, when the paving and signaling of the highway were culminated, which may have increased the flux of immigrants. It was reported that 300 people daily arrive to Puerto Maldonado from the zones priorly mentioned, settling on the side of the highway (according to a spokesman of the Regional Government of Madre de Dios) to carry through with the agricultural and mining activities, at expense of the forests.

This rapid population growth was analyzed by Aramburu (2008) that based on information from studies INEI sociodemographic and other demographic studies of the Amazon, predicted the population growth in the department of Madre de Dios from 2007 to 2037.

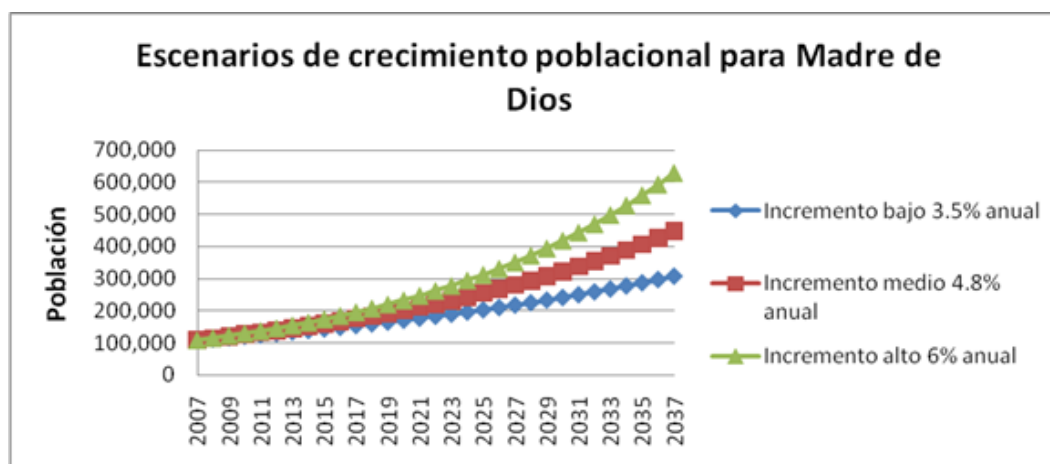
Figure 9. Population Growth History of Madre de Dios between 1940 and 2007



Source: INEI. Elaboración: CFS & GRADE 2009

The study identified a population of 109,555 people for the base year (2007), and developed three hypothetical scenarios: the "low scenario" that uses the annual rate of 3.5% observed between 1993 and 2007 and published by INEI in 2008, the "Middle scenario" which uses the annual rate of 4.8% observed between 1972 and 1981, and the "high scenario" that uses the annual rate of 6% observed between 1981 and 1993 by Aramburu and Bedoya (2003). Based on this information, the population of the Madre de Dios would double every 18.8, 13.8 or 11 years respectively. This can be seen in Figure 10.

Figure 10. Population Growth in MDD according to proposed scenarios



Source: Aramburú, 2009. Self-elaboration

Evidence based on interviews with stakeholders about the perceptions and threats the change of use of the lands and problems in the Brazil nut concessions

In order to construct the alternative scenarios that would occur without the proposed project, Bosques Amazonicos has prepared the document *Socio Economic Diagnosis of the Brazil Nut Concessionaire of Madre de Dios*, that contains the results of research conducted during June and July 2010. The information contained is sourced mostly from surveys and interviews to Brazil Nut Concessioners and field observations to the Brazil nut sector of Madre de Dios.

For the surveys, 109 concessionaires were interviewed representing 10% of the universe of Brazil nut concessionaires of Madre de Dios. These surveys were applied to the different population sectors designated as sample due to their high degree of Brazil nut population concentration. These points were located along the Inter-Oceanic Highway (Alerta, Mavila, Alegria and Planchon) the rivers (Pariamanu, Parimarca and Madre de Dios) and the capital city, Puerto Maldonado.

The surveys considered two questions: What problems do you face in your concession? and, what threats do you think Brazil nut concessions have? The first question sought to identify the current problem facing in particular the surveyed farmer's concession. The second question inquired about what type of threats or risks Brazil nut concessions or farmers in general have, in their opinion.

Results of Question #1

The survey distinguished five types of problems, of which 60.72% of the respondents claimed to have at least one (besides the economic problem):

- Documentary. Considers problems by difficulties and delays in doing paperwork and having documents as PGM, POAs, 5-year reports, reports of harvest, mobilization guides, leadership, concession transfer, etc.
- Adjoining. Consider problems with neighbors for lack of leadership, overlay, theft, concession transfer, logging, etc.

- Invaders. Consider problems with third and neighbors by Brazil nut and wood theft, invasion for mining, farm and housing, etc.
- Legal. Consider procedures and litigation with relatives, neighbors and others in cases of invasion, overlays and transfers
- Economic. Consider having money trouble for working capital, for the harvest, for paperwork, Brazil nut and other transport.

Table 31. Principal Reported Problems in Brazil nut Concessionaires by Sector

Brazil nut Concessionaire Problems (%)						
N	Sectors	Documentary	Adjoining	Invaders	Legal	Economic
1	Alerta	22.58	32.26	19.35	6.45	19.35
2	Mavila	28.95	5.26	26.32	13.2	26.32
3	Alegría	8	28	16	36	12
4	Pariamanu	15.15	30.3	24.24	9.09	21.21
5	Planchón	15.79	21.05	10.53	5.26	47.37
6	Puerto Maldonado	14.29	25	17.86	7.14	35.71
Total		29	37	32	20	41

Source: Bosques Amazónicos, 2010.

The Brazil nut harvesters that identified any of these problems in their concessionaire, said in first place economic problems, and in second place and third place problems with neighboring and invaders. In several cases, these two problems are as or more frequent than the economic problem, demonstrating its importance

Results of Question # 2

The 75.23% of respondents identified some kind of threats to the Brazil nut concessionaires. Of this percentage, the Brazil nut harvesters have identified four main types of threats: the highway, migrants, agriculture and mining.

Table 32. Main reported threat for the Brazil nut concessionaire in percentage per sector

Types of Threats in Brazil Nut Concessions (%)						
N	Sector	Highway	Migrants	Agriculture	Mining	Others
1	Alerta	18.42	26.32	44.74	10.53	0
2	Mavila	27.27	40.91	4.55	0	27.3
3	Alegría	66.67	16.67	16.67	0	0
4	Pariamanu	0	10.53	5.26	84.21	0
5	Planchón	20	50	20	0	10
6	Puerto Maldonado	17.39	17.39	8.7	30.43	26.1
Total		25	27	17	21	11

Source: Bosques Amazónicos, 2010

As seen in Table 32, 27.80% of the Brazil Nut Concessioners that identified threats consider that migration, now incentivized by the highway, generates invasions and dangers for their concessions. It is also relevant that agriculture is perceived as a threat, especially in Alerta and Planchón. It is worth noting that the first 3 threats are strongly connected as one result from the other, and together they account for almost 70%. In turn, the high percentage - 84.71% - shown by mining as a threat in the Pariamanu and Pariamarca sectors is quite particular (these sectors are located in the south of the proposed area, and has mining presence).

Under “Others”, reference is made to the application of forestry regulations from the Madre de Dios Forestry Office and the sanctions applied by the Forestry Resources and Wildlife Control Agency (OSINFOR) mentioned by several concessionaires.

We highlight some replies that show the degree of perception they have about these threats. Many of the answers are directly related to the highway with the arrival of migrants and invaders: *“Brazil Nut Concessioners will disappear in the future”* (concessionaire in PEM); *“People come from everywhere along the highway and invade us”* (concessionaire in Alerta); *“Migrants can take from us the Brazil nut areas because they claim that it is all abandoned”* (concessionaire in Mavila); *“Migrants steal and invade, mining is damaging river banks and ravines, interrupting free transit, they damage nature”* (concessionaire in Pariamanu).

1.3. Selection of the Baseline Scenario

Scenario 1 assumes that the Brazil nut concessions will remain in the same conditions from these last 80 years, as they have kept most of their areas despite the presence of IOS (built in the early 60's). However, analysis of all this evidence suggests that in the absence of the project, the alternative activities included in Scenario 2 are more feasible, and will occur in the Project Area, as has been the case in this part of the region.

The Inter-Oceanic Highway will transform the economic future of the region, and has made the Brazil nut concessions more accessible than ever for agents of deforestation. Moreover, with the expected increase in secondary and tertiary roads, which will start from the IOS to connect the most remote areas – but will be made without official planning by private people especially by forest concessionaires whose areas are located beyond the Brazil nut concessionaire, and miners in search of new areas - there will only be an increase in the risk of deforestation in reserved areas for forest uses, especially the Brazil nut areas.

According to the modules methodology, the main agents of deforestation should be small farmers/ranchers, immigrants or residents that expand the agricultural frontier. In the case of Scenario 2, this explains exactly the loss of forest areas. This is proven in the threats identified by the Brazil nut concessionaires themselves in their areas. Scenario 2 also meets the basic condition to include reforestation after deforestation activity.

2. Project Additionality

2.1 Alternative Scenarios Consistency with Laws and Regulations

To threats over the zone and Project Area described above, are added threats of legal and regulatory nature such as zoning process (ZEE) and the regional ordinance that approves it, the mining ordinance and urgency decree, the Biofuels Promotion law and the natural potential for these crops in MDD, amongst others who propose a scenario "without project" with real and quantifiable deforestation threats. The following describes the existing laws and regulations that support the Baseline scenario proposed:

Law of Forestry and Wildlife N° 27308

Despite the existence of a new forestry law, it is not yet in force because its rules have not been promulgated. Therefore, the continued application of Law No. 27308 whose Title 1 Article 7,

designates as national resources all forest resources and land whose main use would be the forest, either with or without forest cover. It states that the land cannot be used in activities affecting the vegetation, such as agriculture and livestock, unless permitted by law for specific cases (not described).

It also says that the only way to access forest resources (not to land per se) is through the award of a concession, according to its various modalities (forest, ecotourism, reforestation, etc.). The granted period can be 40 years and the concessionaire is asked to develop a sustainable management of given resources, justified by management plans. Otherwise, the concessionaire would be penalized or even lose the concession contract.

In the contract between the grantee and the State, a clause states the inheritance rights of the holder of the concession to his heirs if he dies first. Thus, the term of the concession is honored and the risk that the areas granted are returned to the state before its due course and without effective protection is limited in this way.

In addition, Title V, Article 27 prohibits burning the forest, which is the initial step for other activities.

Organization for the Formalization of Informal Property (COFOPRI)

Despite the existence of the Forest Law, COFOPRI, which is a government entity, legalizes land ownership in rural forested areas (which belong to the state) if simple possession can be evidenced⁸⁵:

- Having a direct, continuous, peaceful and public use of the area for over 5 years, in the case of private property, and for more than one year if it is state property
- The property must be exploited economically (agriculture) as many years as the period of possession.

There is nothing specified over intangible land; leaving open the possibility for any individual to take possession of forest areas, productive or protected with a high biological value, only to carry out "economic exploitation".

In fact, this system is very old and is the result of prior government policies that promoted the "colonization" of the Peruvian Amazon, since it is considered (and still is considered by many) as an "empty space" and "unproductive", favoring thus the change of land use.

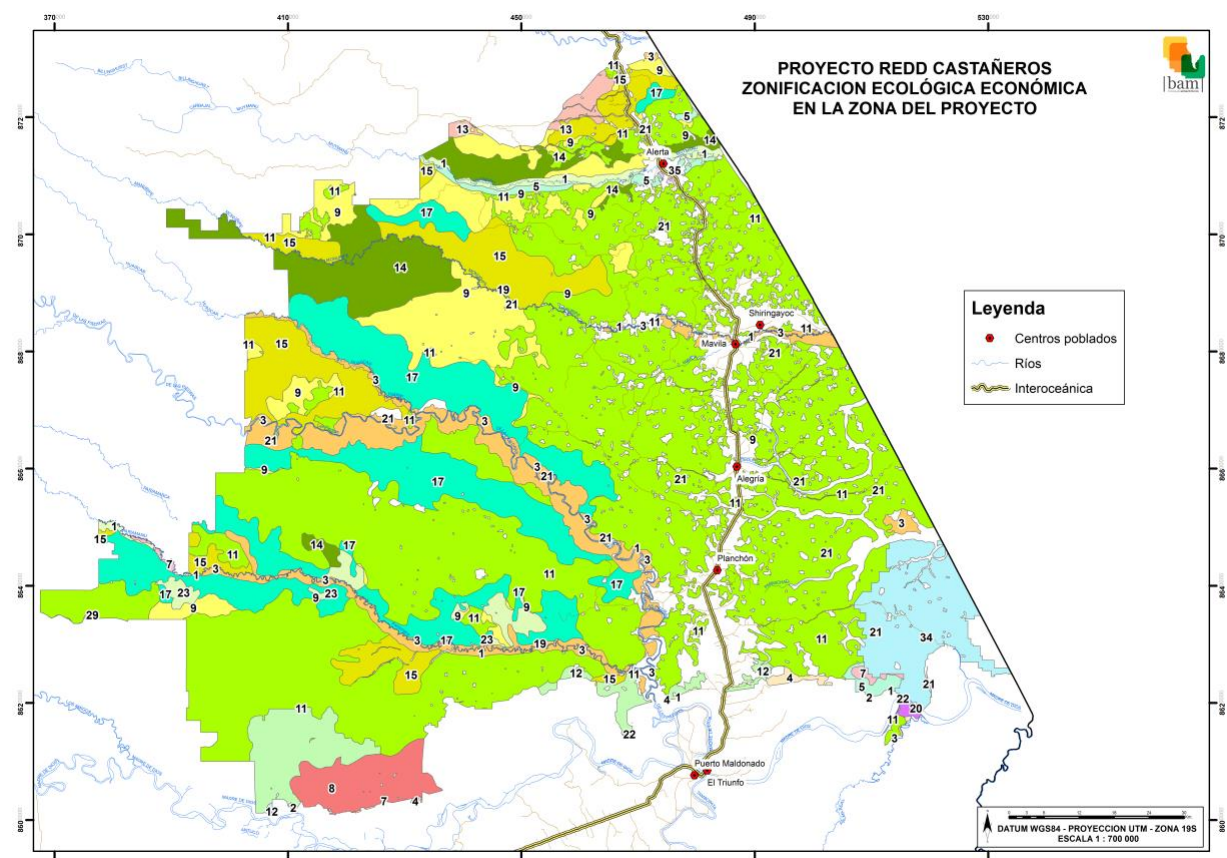
Ecological Economic Zoning: Regional Ordinance N° 032-2009-GRMDD-CR

Many classes of ZEE grouped together with forestry, agricultural crops and pastures with or without usage limitations, and even denote mining potential. An example of this is the class for *permanent crop areas, pastures, forest production with very high potential to medium of wood and stands of Brazil nut, and fish high potential*, which occupies 51% of the zone. Although it is true the contemplated activities are not necessarily opposite, when performed under agroforestry techniques, agrosilvopasturas, etc., do involve forest clearing in different degrees. By containing

⁸⁵ Taken from the Distribution Document of COFOPRI: Formalization of Rural Lands. Available in [:www.cofopri.gob.pe](http://www.cofopri.gob.pe)

activities with different land use, the arrangement opens the possibility deforestation. The following map illustrates the uses proposed by the ZEE proposals in the Project Area.

Map 18. Ecological Economic Zone in the Project Area



Leyenda

- 1 - Zonas para cultivo en limpio con calidad agrológica media, limitaciones por suelo, inundación y drenaje, asociados con protección
- 2 - Zonas para cultivo en limpio con calidad agrológica media, limitaciones por suelo, inundación y drenaje, asociados con protección y potencial minero aurífero
- 3 - Zonas para cultivo en limpio con calidad agrológica baja, asociados con pasto y protección por suelo y drenaje
- 4 - Zonas para cultivo en limpio con calidad agrológica baja, asociados con pasto y protección por suelo y drenaje, con potencial minero aurífero
- 5 - Zonas para cultivo permanente, asociado con pasto y protección, con limitaciones por suelo
- 7 - Zonas para cultivo permanente y pasto, asociados con producción forestal y protección, con limitaciones por pendiente y suelo
- 8 - Zonas para cultivo permanente y pasto, asociados con producción forestal y protección, con limitaciones por pendiente y suelo, asociado con potencial minero aurífero
- 9 - Zonas para cultivo permanente, pasto, producción forestal y potencial piscícola alto
- 10 - Zonas para cultivo permanente, pasto, producción forestal, con potencial muy alto a medio de madera y potencial piscícola alto, asociado con potencial minero aurífero
- 11 - Zonas para cultivo permanente, pasto, producción forestal con potencial muy alto a medio de madera y rodales de castaña y potencial piscícola alto
- 12 - Zonas para cultivo permanente, pasto, producción forestal con potencial muy alto a medio de madera y rodales de castaña y potencial piscícola alto, asociados con potencial minero aurífero
- 13 - Zonas para cultivo permanente, pasto, producción forestal con potencial muy alto a medio de madera y rodales de shiringa y potencial piscícola alto
- 14 - Zonas para pastos y producción forestal, asociados con cultivo permanente con limitaciones por pendiente y suelo
- 15 - Zonas para producción forestal muy alto a medio de madera y rodales de castaña y potencial piscícola alto
- 17 - Zonas para producción forestal y protección con limitaciones por pendiente y suelo
- 19 - Zonas para pesca de subsistencia
- 20 - Zonas para pesca comercial y de subsistencia
- 21 - Zonas de protección de cochas
- 22 - Zonas de protección por suelo, drenaje o inundación
- 23 - Zonas de protección de muy alto valor bioecológico
- 29 - Zonas de conservación privada
- 34 - Zona de interes regional para la conservación del Lago Valencia
- 35 - Zona para expansión urbano industrial

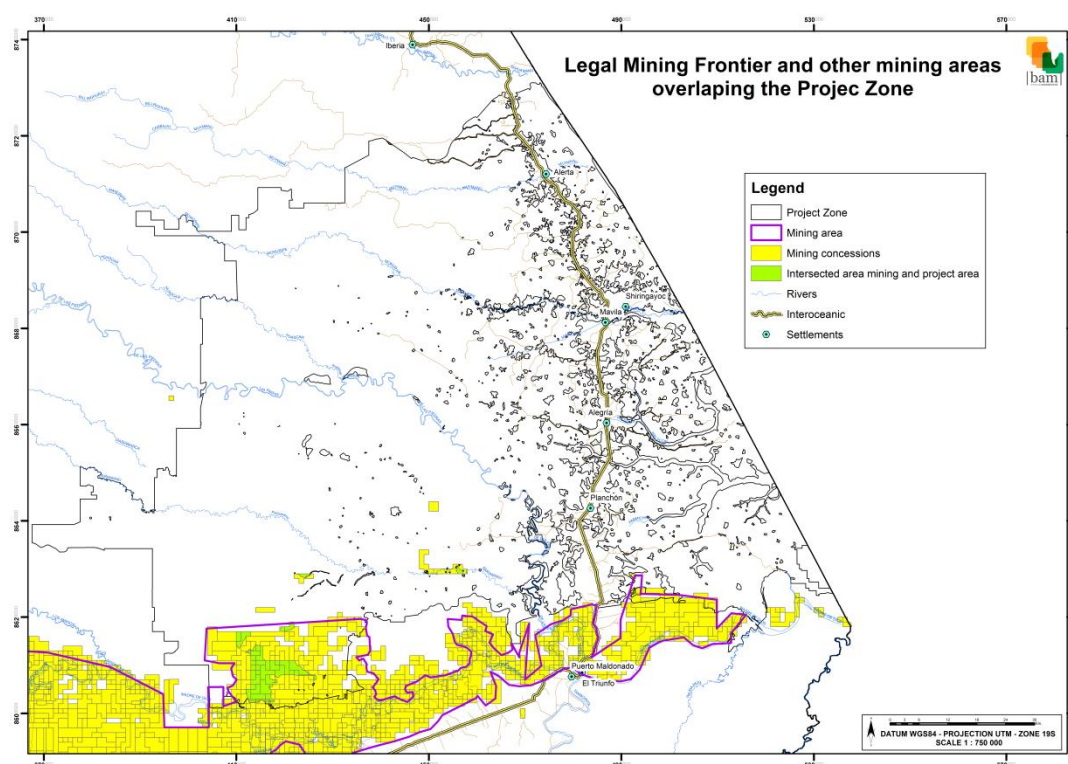
Source: IIAP, 2009.

Mining Planning: Emergency Decree N° 012-2010 MINAM

In the southern part of the Project Zone, and therefore the Project Area, there is an overlap with the proposed mining area by the Ministry of Environment in its Emergency Decree No. 012-2010 MINAM. This overlap ascends to 225 475 hectares and represents 172 460 ha of mining concessions in the zone and 22 160 ha within the Project Area.

Map 19 shows the location of the mining concessionaires and petitions within and outside the mining area of SD N° MINAM 012-2010 that overlap Brazil nut concessions, which is incompatible and shows a deficiency state to grant rights over natural resources in a way that does not create conflict (SPDA, 2009). In absence of the project, mining would prevail over the lands of Brazil nut concessionaires in the southern Project Zone.

Map 19. Current mining concessions within the mining area of that overlap the PA and PZ

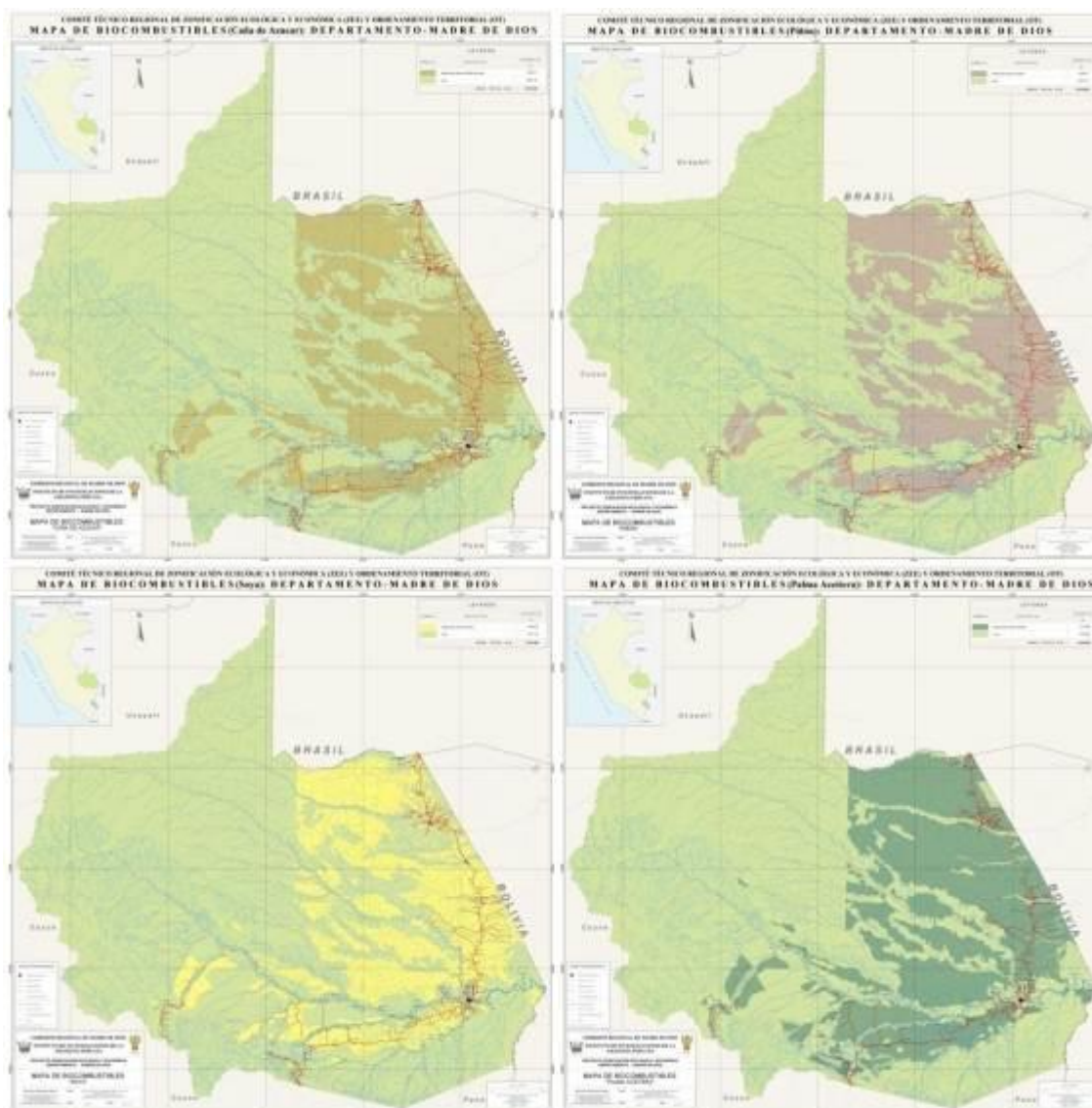


Biofuels: Supreme Decree N°013-2005-EM

According to the ZEE, the area with potential for biofuel crops includes Project Areas, which crops are a major threat to the continuation of the project and forests of the region (Figure 9). A project of GOREMAD by 22 million soles for the "Training and technical assistance for cultivation and industrialization of Oil Palm (*Elaeis guineensis*) in the districts of Tambopata, Laberinto and Inambari in Madre de Dios" according to the Report N°. 09-A-2008-GOREMAD/GRDE/SGDP of GOREMAD. However, the installation is considered as a possibility in the not near future, because it requires high level of investment, technology, and there is still no installed capacity nor marketing centers for the specific product⁸⁶.

⁸⁶ These requirements belong to soybean crop, which is the most common biofuel crop in the neighbor

Figure 11. Natural potential for growing biofuels in the Department of Madre de Dios (Sugarcane, Soya, Palm Oil and Pinion)



2.2 Common Practice Analysis in the Brazil nut Region

Although in Madre de Dios, the Brazil nut activity dates back to the mid-twentieth century, only recently in the 90's that the Brazil nut activity begins to increase, massify and initiate a process of regional consolidation as one of the main economic activities (the first companies that process and export Brazil nut are installed and consolidated).

Thus in 1999, the public sector, together with some NGOs (which the newly founded Association for the Conservation of the Amazon Basin – ACCA is most notable) and the company Candela

region of Acre, Brazil. Conservation strategies along the Interoceanic Highway in Madre de Dios, Peru. A spatial economic analysis. Conservation Strategy Found - GRADE, 2010.

Peru, seeing the growing importance of this activity, developed a diagnosis and Strategic Plan for the Brazil nut sector. That document did not spread

Given the enactment of the Forest and Wildlife Fauna Law in 2000, the Brazil nut activity in Madre de Dios began a process of organization, formalization, and promotion, in which various public institutions, private companies and civil society organizations participated.

Specifically, the **Projects of Formalization of The Brazil nut Activity** began, led by NGOs who realized the importance of adapting the activity to these regulations (reorganization of the areas, preparation of management documents, harvesting techniques, forest management, etc.). The first step was given by Pro Naturaleza with the legal organization in the Tambopata Natural Reserve (RNT) between the years 1998-2000; supplemented and updated by ACCA in 2003; other NGOs have implemented projects from that year to date (mainly ACCA, International Conservation – CI Peru, WWF, CESVI and in recent years, CAMDE Peru).

ACCA, through its program "Preserving Brazil Nut Forests" since 2003, has had the greatest impact on the whole Brazil nut sector. The projects that have been developed to date are:

Table 33. Existing Projects in the Brazil Nut Region

N	Period	Projects	Cooperating	Results
1	2003-2004 y 2005-2007	"Formalization of the access to forest resources and Implementation of a Sustainable management of Brazil nut in Madre de Dios"	Critical Ecosystem Partnership Fund (CEPF) – USA	Project which had two stages, a total of 320 Brazil nut concessions were formalized, in a total of 211 843.5 ha. This project succeeded formalizing, giving guidelines and technical criteria to the forest authority (ex INRENA). Planning and / or mapping Brazil nut concessions. Preparation of General Forest Management Plans (PGMF) and Annual Operating Plans (POAs). Training inventory techniques and Brazil nut ordering. Forestry regulations. Support for the institutional strengthening of the Office of Non Timber Products INRENA.
2	2004-2006	Sustainable management of Brazil nut forest (<i>Bertholletia excelsa</i>) through legal physical sanitation of concessions and improvement cropping systems in Madre de Dios	America's funds FONDAM. US \$ 95 812.0	40 concessions and Alerta and Alegria attended with Brazil nut regulation and general plan elaboration in forest management Mapping and formulation of 40 PGMFs. Estrada's Redesign and manual highway implementation Construction of 4 warehouses, 4 nuts dryers and 4 latrines. Training of 40 concessionaires in mapping techniques, forest inventory, and basket weaving technique. Transmission of radial micro program.
3	2007-2008	Sustainable Use of Brazilian Nut <i>Bertholletia excelsa</i> – management Forest Improving for forest conservation in the national reserve of Tambopata and Bahuaja Sonene National Park of Madre de Dios, Peru	ACCA/ Flamengo fund 60 775.0 Euros	32 Brazil nut harvesters that have organic and forestry certification. The project seeks to work in 30 117 hectares of natural Brazil nut forests RNT. The aim is to train the Brazil nut harvesters in the RNT almost 100% attention was accomplished

4	2007-2008	Sustainable management of the natural Brazil nut forests (<i>Bertholletia excelsa</i>) in the Amazonia od Madre de Dios, Peru.	ACCA/ European union 494 825.6 Euros	210 families, about 150 000 ha. Tambopata and Tahuamanu. Project which served to give support and technical advice to the Brazil nut harvesters, had relatively regular results didn't reach the designed success. Because technical management of the harvest and post-harvest was improved, but no progress was made in exchange income and products value added
5	2007-2011	Strengthening local groups for the Conservation of Biodiversity and Sustainable Land Management in the Conservation Complex Madidi-Manu. Bolivia and Peru.	Initiative for Conservation in the Andean Amazon ICAA - USAID. 1251 418.0 U.S. dollars	Project which intended to continue the Brazil nut arrangement and infrastructure construction of harvest in the Brazil nut sectors of Madre de Dios. Did not reach the expected success
6	Jul 2008-Ago 2010	PAT Project: Improving economic incomes around Brazil nut Activity Agroforestry of the Producers and located in the La Novia stretch - Alerta, Tahuamanu – Madre de Dios		Agroforestry system development that allow to conserve the Amazonian soil, diversifying their use and making it more profitable for the farmer without the loss of biodiversity.

In-house elaboration

While the work done since ACCA achieved great results, practically leading the Brazil nut projects, other organizations also joined this process, among the most important projects are the following:

1. *Strengthening Sustainable Forest Management in Amazonian Territories of Indigenous Peoples in Peru* - Forin (2006-2008). Executed by WWF, CESVI, IBIS, Welthungerhilfe and AIDSESP. European Union. 2 000 000.00 euros. (\$ 449 000.00 dollars for Madre de Dios).

CESVI applied the project in Madre de Dios⁸⁷, in the CCNN: Arturo Port, Boca Pariamanu, Three Islands, Palma Real and Belgica. The implemented activities were community development plans, land management, sustainable forest management, and organic certification of the Brazil nut, strengthening of the local indigenous governance and development multi-communal enterprise, forestry and trade chains for forest products.

Results:

- Illegal logging in native communities has been reduced through indigenous surveillance, promotion of new regional alliances and advocacy
- The boundaries of the five native communities are legally recognized and / or sanitized.
- Three native communities have integral plans of territorial ordering, General Forest Management Plans (PGMF) and Annual Operating Plans (POAs)
- Two native communities have met the Gradual System Approach to Management and Organic Certification of the Brazil nut process and have certified Brazil nut in community forests according to the standards of organic certification EU and NOP-USDA
- Indigenous organization has been formed AFIMAD, responsible for promoting the business chain based on the Brazil nut
- Two indigenous communities of Madre de Dios have developed business forest plans

⁸⁷ The Project was implemented in: Madre de Dios, Loreto, Junín, Ucayali. Its objective was promote land use planning, management and the sustainable management of forest resources of 36 indigenous communities in the Peruvian Amazon.

2. *Improving the competitiveness of the producers of the sector Alegria for the processing and marketing of the Brazil nut* (2008-2009). Executed by CAMDE Peru and financed by FONDEBOSQUE. Project Value 262 463.00 dollars. Beneficiaries, 25 CASAL SAC partners.

Results:

This project began the implementation of a processing plant in Alegria sector. This processing plant is being managed by CASAL SAC. Infrastructure and equipment has been given by another cooperation fund (FONDAM). To the date has begun the collection of data activities, storing and peeling of Brazil nuts. Industrial processing has not yet started, the production of processed products no the export of such.

3. *The Brazil nut Concessions Planchón – Manuripe sector have strengthened the competitiveness of Post-Harvest Management Processes and Market Relation* (2009-2010). Executor: Environmental Conservation and Development in Peru (CAMDE). FONDAM: U.S. \$ 124 985.31 (co-financed with CEPF).

Results:

- Construction of a basic module for the post-harvest and primary processing of Brazil nut managing: expanding raw material warehouse, building drying area, tank Brazil nuts, dressers and SSHH for staff
- Equipment and implementation of the basic module for the management of post-harvest and primary processing of Brazil nut
- Adaptation to the mixed certification system of forest management (FSC) and organic
- Development of a Strategic Plan for CASAL and a Business Plan for certified Brazil nut.
- Training of 25 families in business management, Brazil nut forest management and conservation awareness and protection of their Brazil nut
- Technical assistance to 25 families for proper crop, post-harvest and primary processing of Brazil nut management

As the projects implemented in Brazil nut concessions since ten years ago (2000) are discussed and compared with the REDD activities proposed by Bosques Amazonicos - BAM, it appears that the projects implemented **FAILED IN COMPARISON with REDD activities**, according to the following indicators of relevance:

- **There is no experience in REDD in the proposed area.** None of the analyzed projects considered to reduce CO₂ emissions by controlling deforestation and degradation, likewise, none of the projects considered to control the direct threats to the Brazil nut forests. The Castañeros REDD Project is proposed as the first project for avoiding unplanned deforestation and degradation practiced in the project area; and it bases its activity in monitoring and safeguarding the concession areas as well as in generating added-value to the products, among others.
- **Coverage.** The projects analyzed only have coverage (in areas and beneficiaries) of an average of 50 families reaching (in the case of the ACCA projects) to a maximum of 200 Brazil nut concessionaires (summation of several processes), to which they have received technical assistance, have ordered their concessions and have developed plans to manage their concessions (a situation which is required every year). These projects helped to formalize the legal ownership of the concession.

Another fact to be considered is that proposed projects to date have had a lifetime of no more than 4 years, while the Castañeros REDD Project is intended to last until 2040.

- **Economic valuation.** The projects analyzed do not have a proposal to generate their own businesses that can add value to the product. They have focused on generating processes of formalization and management, activity that today, still continues as a pending task. The only successful experience of economic improvement is the project executed by CASAL SAC., but it only benefits 25 Brazil nut producers.
- **Articulation and association for development.** The experiences gained with Brazil nut producers are oriented to groups of interest focused on sectors, which have made impact on certain issues and groups of Brazil nut families. The association for the Brazil nut development was not promoted, which constitutes a significant difference from the activities proposed by BAM, an association aimed not only to defend their areas, but also to promote the management of forests with the increased value by the environmental services.

2.3 Comparative Analysis of Investment

To complement the analysis of additionality of the project, a comparison of the financial attractiveness of the economic activities of Scenarios 1 and 2 (baseline) and of the project has been made, excluding the expected revenues of carbon in order to verify that the project (without carbon revenues) is less attractive. The financial indicators used were IRR⁸⁸, Payback Period and Average Investment. These include costs and revenues relevant to each activity.

The investment analysis below is presented in a transparent manner, and provides relevant assumptions and clear comparison between the proposed project and other scenarios of land use. For more detail on the calculations, please refer to the Excel document “*Scenarios Calculations*”.

Relevant Assumptions of Each Scenario

The activities are evaluated in a 10-year horizon, and use a discount rate of 15%. Furthermore, the analysis considers the capacity and production volume of each activity, according to the standards of the Madre de Dios region.

Artisanal Brazil Nut Activity with Low Added Value (Scenario 1)

Revenues in this scenario are generated from the use of Brazil nut⁸⁹ with low added value⁹⁰ and timber harvesting in small scale.

The farmers harvest an average of 136 Brazil nut barrels per year. To ensure the supply of nuts, private companies apply the common practice of giving *Habilitos* to the concessionaires

⁸⁸ This IRR ratio refers to the Project IRR calculated a return based on project cash outflows and cash inflows only, irrespective the source of financing.

⁸⁹ Information obtained from “La cadena de valor de la castaña amazónica”, Corporate Author: Comité Técnico Multisectorial de la Castaña - 2006.

⁹⁰ The low value added of Brazil nuts activity refers to the lack of harvesting techniques and international certifications that allow better prices in the market.

who invest this capital work in the collection activity. Through this practice, the concessionaires have cost-effectiveness in terms of TIR, due to limited self-investment (although sometimes profit in nominal terms remains of subsistence). The average net income estimated is S/.10 339 a year.

The small-scale logging activity within Brazil nut concession is usually performed by an agreement between the concessionaire and a logger, corresponding to 50% of the concessionaires' profit. The scenario assumes an annual average of 206m³ of wood (determined of the extraction balances), with average revenue and cost of S/.357 and S/.230 per cubic meter (m³) respectively.

Alternative Land Use Activities (Scenario 2 or Baseline):

Revenues in this scenario are generated by livestock and agriculture activities⁹¹, and additionally, in the remaining areas of the forest, Brazil nut collection and timber harvest at small scale (keeping both the cases described above).

Agricultural activity corresponds to Corn production, carried out by small farmers through slash-and-burn of the forest. The average productivity of the corn is estimated at 1.014 kg per hectare, low performance compared to the national average (3.962⁹² kg / ha). For livestock, the maximum productivity of meat considered is 45 kg per hectare of pasture. The profitability of livestock, especially near Puerto Maldonado and Las Piedras (very close to the proposed Project Zone), reaches a top value of \$ 140/ha/year, and decreases the farther away from the city center or Interoceanic highway. This scenario considers an average profitability of the two activities, agricultural livestock operations, S/.192.5 per hectare.

This analysis works with an average of 800 hectares⁹³ per concessionaire, and an annual historical deforestation rate of 1.04%.

REDD Project in Brazil Nut Concessionaires (Excluding Carbon Revenues):

The Project income will be generated by the processing and marketing of high value-added Brazil nut. The analysis shows the financial attractiveness of the proposed project⁹⁴.

The estimated production is based on storage capacity, operational processes and technology acquisition of the future plant. The supply of raw material will be gradual, reaching a production level of about 3000 tons of Brazil nuts in shell. The final products will be marketed primarily in international markets.

The project includes a monitoring and surveillance system in all Brazil nut concessions, since so far this activity has been developed inefficiently by the own Brazil nut harvesters due to lack of funds. Also, the organic certification of the Brazil nut concessions will be sought, thus achieving better revenues.

⁹¹ Information obtained from "Strategies for Conservation along the Interoceanic Highway in Madre de Dios, Peru: A spatial economic analysis" prepared by GRADE, March 2010.

⁹² Ministry of Agriculture - DGIA, 2008

⁹³ Real evidence of Brazil nuts concessionaires' database from Bosques Amazónicos SAC

⁹⁴ In fact BAM will support 100% of the costs of the Project in turn of a percentage of the sales in carbon credits and from the Brazil nut processing plant. Investments include: 1) implementation of the Brazil Nuts processing plant, 2) work capital for the harvesting activities of Brazil Nuts concessionaires' partners of the project, 3) formalization of the documentation of each Brazil Nuts concession in order to meet the terms of the contracts, 4) implementation expenses of the project.

Comparison of Financial Indicators

The activities proposed in the REDD Project in Brazil Nuts Concessions (peeled, process and transformation of Brazil nuts, monitoring and surveillance), without the GHG credit revenues, shows lower rate of return 18.7% compared to other scenarios analyzed. The proposed project estimates a total investment of approximately US\$1.6 million for machinery and equipment to implement the Brazil nuts processing plant.

Artisanal Brazil nuts activity (low value-added) has a return rate of 53.1% over the next 10 years; the concessionaire's investment is very small, less than US\$0.01 million. In this scenario, the main problem that generates the latent deforestation of the area is the reduction of productivity due to loss of standing Brazil nuts forest. This would have an impact on the economy and cost-effectiveness of the concessionaires in the long term.

Alternative land use activities (Agriculture and Livestock, along with Artisanal Brazil nuts activity in remaining forest), even if these activities require more efficient management techniques and investment to be sustainable, this scenario has higher rate of return in the absence of the project, IRR 56.1%. This is explained because the artisanal Brazil nut activity profitability will be reduced over the years due to the deforestation grows in the area. It is estimated that in ten years, approximately 10% of the hectares of Brazil nut concessions turn into alternative land use activities such as livestock and agriculture. The scenario estimates a total investment of approximately US\$0.01 million.

Table 34. Summary of Financial Indicators

	TIR	Period of Return	investment (millions US\$)
Proposed Project (without carbon credits)	18.7%	<7 years	1.6
artisanal Brazil nut Activity (without added value)	53.1%	<3 years	0.01
Alternative activities (agriculture and livestock)	56.1%	<3 years	0.01

Self-elaboration

Brazil nut concessionaires of Madre de Dios are not attractive to the financial system and, consequently, it is difficult for them to start a project to implement high value without private initiative. Comparing the results, we see that the highest average investment is of project, which in turn has the longest recovery period (seven years); making this scenario the less attractive (the other two scenarios would recover their investment in less than 3 years).

It is possible that in the long term, the dealers can organize, implement the organic certification of their concessions and improve the collection activity; however, the high costs of these activities will have a negative impact on their profits. Consequently, the scenario will not be sustainable and deforestation process would increase because of the risk of expansion of the agricultural frontier and informal mining.

There is also a high trend of international markets to become rigorous with the organic certification, therefore, the collection methods should be better to those traditional, artisanal methods currently used, in order to improve the quality of the Brazil nuts.

Since the project is close to a couple of Protected Natural Areas: Tambopata National Reserve

and Bahuaja Sonene national park, it is very beneficial to develop conservation activities to preserve the biodiversity and prevent the progressive deforestation of the area.

The investment comparison analysis has determined that the other scenarios of land use have better financial indicators (TIR, and Payback Period and Average investment) than the proposed project. Consequently, the proposed project is not financially the most attractive alternative.

Sensitivity Analysis

Finally, we did a sensitivity analysis to show whether the financial attractiveness is robust to reasonable variations in costs.

The following table shows the sensitivity of the IRR to changes on cost parameters of each scenario. To develop this analysis, we made the stress test of -5% and 5% on the cost parameters of each activity, since it is a key variable to quantify the impact on IRR. This analysis shows that the proposed project revenues without carbon components is less profitable than other scenarios of land use, even if reducing their costs is considered.

Table 35: Sensitivity Analysis

Scenario	Δ Costs	TIR
REDD project in Brazil nut Concessions (excluding carbon revenues):	-5%	22.7%
	0%	18.7%
	5%	14.5%
artisanal Brazil nut activity with low added value	-5%	56.3%
	0%	53.1%
	5%	49.9%
land use Alternative Activities	-5%	59.6%
	0%	56.1%
	5%	52.6%

Self-elaboration

These results conclude that the proposed project activity is not financially attractive compared to other activities

Finally, we can ensure that the project is additional, and that the proposed activities will not happen unless it is implemented.

3. Carbon Stock Change in the Baseline

3.1 Model of Deforestation

Madre de Dios is one of two Amazonian regions of Peru where REDD initiatives are emerging at an increasing rate. There are about 10 REDD projects are being designed in the region, and local organizations that are promoting these early actions have been grouped in a Technical Consortium to develop a single baseline, in a consensual way, for the whole region. The GOREMAD is part of this consortium, and MINAM is in constant communication with the group, in order to integrate these efforts into the National Baseline. For this reason, BAM, with support from other institutions, has designed and shared with the Madre de Dios REDD Consortium, the Deforestation Model, to be used as input to the Regional Baseline.

In the case of this project, the regional model, not yet completed, was adapted to meet the requirements of the Modular Methodology, specifically the VCS VMD0007 Module “*Estimation of Baseline Carbon Stock Changes and Greenhouse Gas Emissions from Unplanned Deforestation*”⁹⁵ (BL-UP).

The approach used is based on historical deforestation trends, called *Annual Average Historic Deforestation or Simple historic*, being farmers, ranchers and miners the main deforestation drivers, as mentioned in the description of the baseline. For the selection of the Reference Region, from which deforestation rates are taken, it has taken into account the specific particularities existent of the area in question.

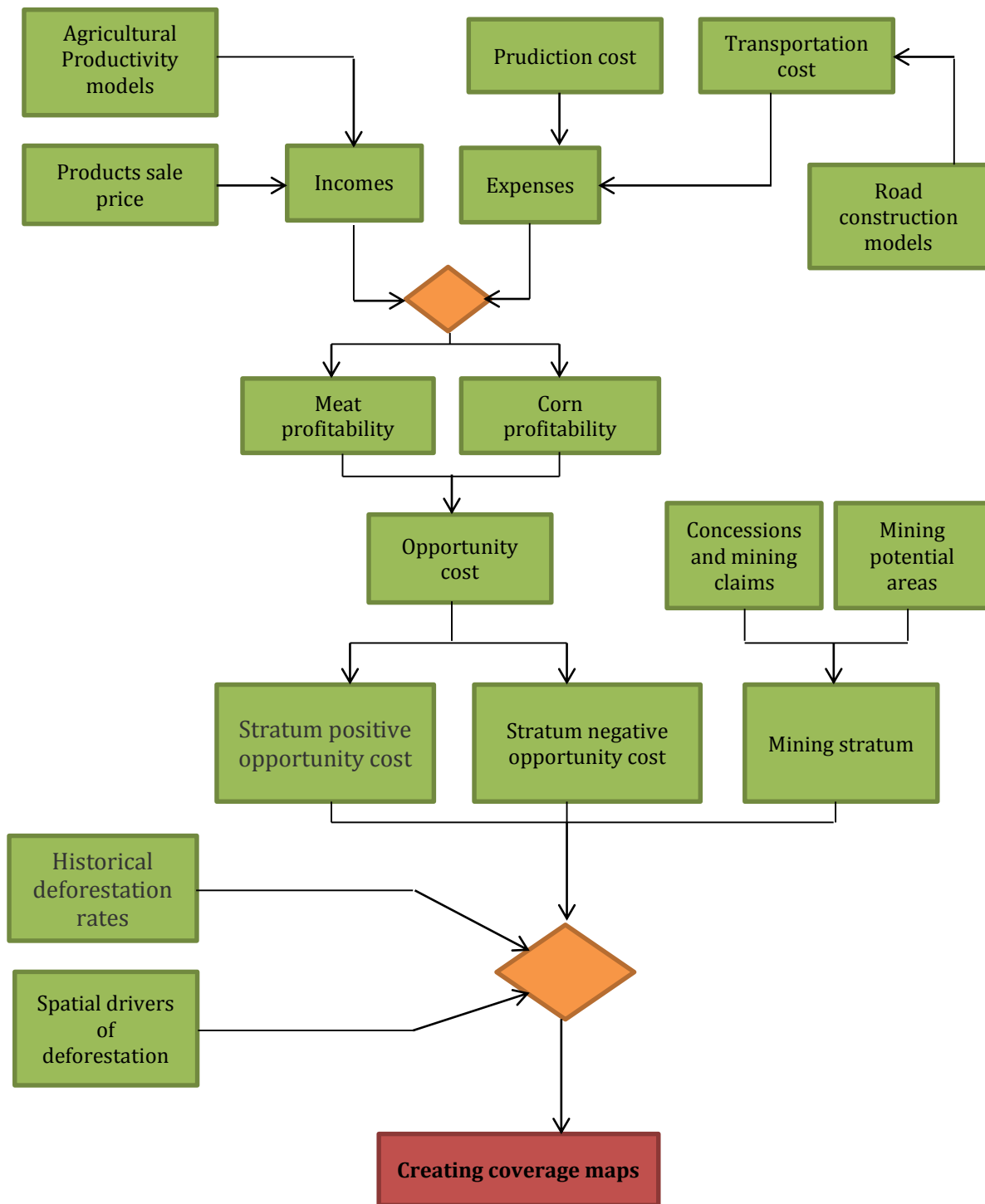
The deforestation model considers that land use change is related to the Opportunity Cost (CO), defined here as the economic benefits that could be obtained by farming or ranching, but that someone would have to resign for not deforesting. For the specific case of mining, the model assumes that there is no other activity more profitable than it, and therefore is the only expected use in areas with gold potential.

The CO is obtained as a result of the comparison of the meat and corn profitability, calculated with local cost and revenue information involved in local agricultural production. Among them, the transportation cost is very sensitive to change in the future by improving the road network, both for paving of the IOS, as for the creation of more secondary roads. These improvements include a reduction in the cost of transporting products to the markets, and therefore, reduced expenditures and increased profitability. To incorporate the expected changes in the cost of transportation, the model contains a module responsible for the construction of new roads.

The following diagram summarizes the operation of the model, and the details presented below.

⁹⁵ <http://v-c-s.org/sites/v-c-s.org/files/VMD0007%20BL-UP%20v3.1.pdf>

Figure 12. Model Framework Deforestation



Source: Carbon Decisions International. Modified by author

Reference Region (RR)

It is defined as the spatial delineation of the analytical domain, from which information of deforestation rates spatial patterns of deforestation are extracted, projected into the future and monitored. Therefore, this area should be representative of the general patterns of unplanned deforestation that influences the Project Area.

According to the Modular Methodology, for the elaboration of a Baseline for unplanned deforestation, two types of reference regions are needed: The Region of Reference for Projecting the Rate of Deforestation or RRD, and The Reference Region for Projecting Location of Deforestation or RRL.

Key features that differentiate each Reference Region:

RRD	100% Forest at the beginning of the historical period of reference Cannot contain the AP Can be formed by more than one plot, not necessarily continuous with each
RRL	≥ 50% at the start of the project Forest Must contain the AP Must be a single plot

For the selection of both areas, basic criteria such as landscape factors, agents of deforestation, regulatory framework, among others, must be similar to those seen in the Project Area.

As already mentioned, at first a baseline for the entire region of Madre de Dios was sought. To this end, we reviewed studies in forested areas with similar road infrastructure, such as Laurence et al. (2002) who argue that the primary roads are the main predictors of deforestation, and impact over the roads by allowing more efficient access to the forest at any time of year. Furthermore, Dourojeanni (2006b) and Delgado (2008) noted that the effects of logging could be seen up to 50 km from the main roads. This finding was supported by Brindao et al., who found that deforestation in the State of Amazonas - Brazil, was concentrated in a 50 km buffer area around well-developed road networks.

Therefore, it was determined that a 50-kilometer buffer around the existing road network, would be the most suitable reference region for MDD. Within this buffer, the two Reference Regions for the proposed project have been selected.

a) Region of Reference for Projecting Rate of Deforestation (RRD)

As the RRD cannot contain the Project Area, a nearby area that met the criteria of similarity was sought, especially the criterion of having the same drivers of deforestation. The southern part of the department was chosen since it is under pressure by both agricultural activities as mining activity, not present in the north part. In addition, and as required by the methodology, all deforested areas to 2000 were excluded as well as areas where soils can be classified as peats.

Regarding the regulation and policy, Peru has been developing a policy of decentralization, for which powers of the central government to the regional governments are being transferred. One of them is the management of forest resources, including review and approval of management plans for forests. The land ordering is also the responsibility of the Regional Government.

Therefore, by being within the same jurisdiction, both the AP and the RRD (and RRL) are governed by the same regulatory framework.

The Land Use Capacity⁹⁶ of Project Area and RRD have been compared, dividing both areas in two large strata, mining and agricultural, according to the drivers of deforestation expected.

As shown in Table 36, the proportions between the classes of Land Use Capacity are similar in both areas. In any case, the difference is higher than 20% as forbidden by the methodology.

Table 36. Land suitable for conversion in AP and RRD

Land Use Capacity	Mining Stratum		Agricultural Stratum	
	RRD	PA	RRD	PA
Land suitable for annual crops	54.6%	67.7%	0.00%	-
Land suitable for permanent crops	34.2%	32.3%	71.2%	77.7%
Land suitable for pastures	0.4%	-	0.6%	-
Land suitable for forest production	4.3%	-	16.7%	21.9%
Land suitable for protection	3.6%	-	8.7%	-
Urban Areas	-	-	0.0%	-
Bodies of Water	3.0%	-	2.9%	0.3%
Total	100.0%	100.0%	100.0%	100.0%

A similar result is seen in the comparison of forest strata (Table 37). Even more, the Project Area as the RRD have more than 95% of their area between the altitudinal range of 0-500 m (above sea level) and slopes lower than 15%.

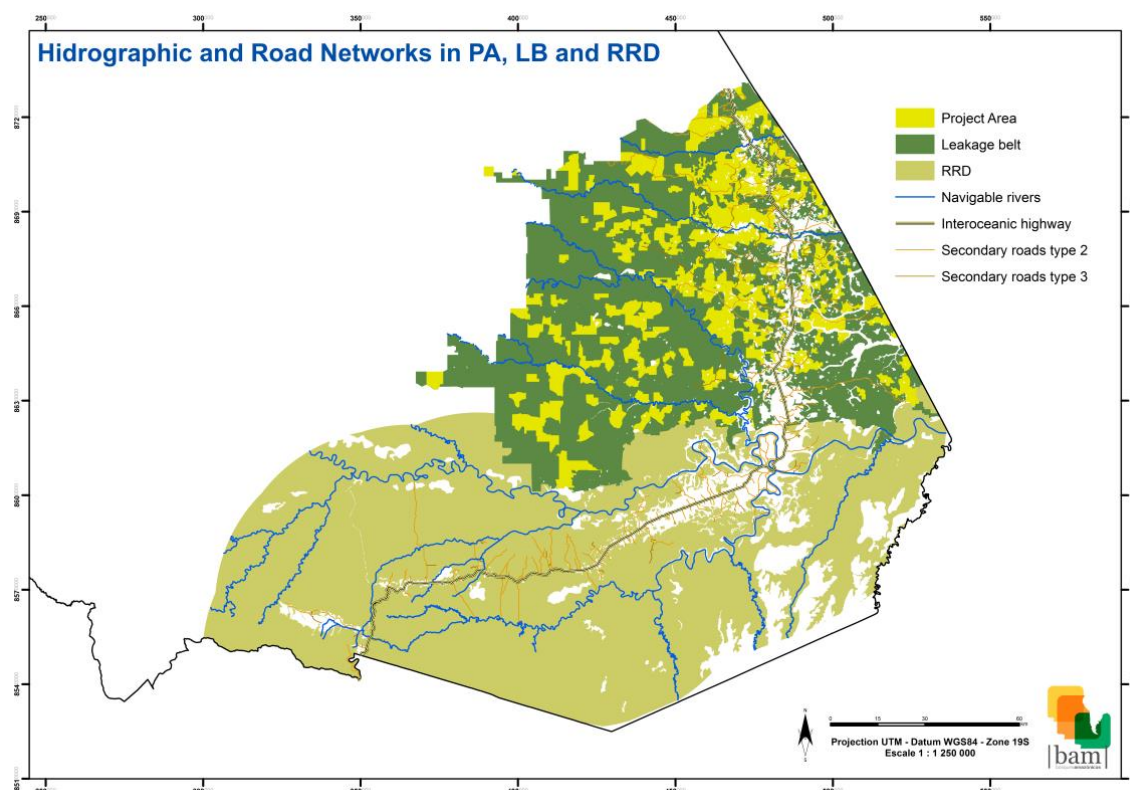
Table 37. Forest Strata in AP and RRD

Forest Strata	Code	Mining Stratum		Agrarian Stratum	
		RRD	PA	RRD	PA
Low hills with bamboo (paca) forest	BPCb	2.3%	-	2.6%	4.4%
High and mid terrace with bamboo (paca) forest	BPT	4.6%	3.9%	2.8%	10.2%
Low hills forest	BCb	0.8%	-	7.0%	11.1%
Terraces forest	BT	8.2%	23.2%	53.6%	72.0%
Flooded terraces forest	BTI	25.6%	20.8%	-	-
Bamboos (Pacal)	P	1.4%	2.0%	0.8%	2.1%
Swamp trees	PA	43.9%	50.1%	16.3%	-
High hills and mountain forest	BCaM	0.6%	-	9.5%	-
High hills and mountain with bamboo (paca) forest	BPCaM	0.5%	-	1.7%	-
Intervened Areas	AI	7.9%	-	2.9%	-
Others (Without Carbon)	NB	4.2%	-	2.8%	0.3%
TOTAL		100.0%	100.0%	100.0%	100.0%

⁹⁶ Ecological Economic Zoning Department of Madre de Dios. Technical document of soils and capacity of mayor use of the land. IIAP- GOREMAD. 2009

The Project area and the RRD (as the RRL) are longitudinal traversed by the IOS, which is the main access road of the region. Along the IOS and perpendicular to it, many secondary and tertiary roads have been built, making the forestlands more reachable. Moreover, the network of navigable rivers is widely distributed. The density of the transportation and river networks is quite similar between the AP and the reference regions as can be seen in Map 20.

Map 20. Hydrographic and Road Network in AP and RRD



As showed in REDD-MF document, in MDD there are not large-scale productive activities. Agriculture, cattle ranching and even mining, which are the main causes of deforestation in the region are carried out in a self-consumption / artisanal /small -scale way. The few existing regional plans for the Agricultural sector have not identified spaces where these activities could expand themselves in the future. In the other hand, mining is always considered as an unplanned deforestation activity because it is performed usually illegally.

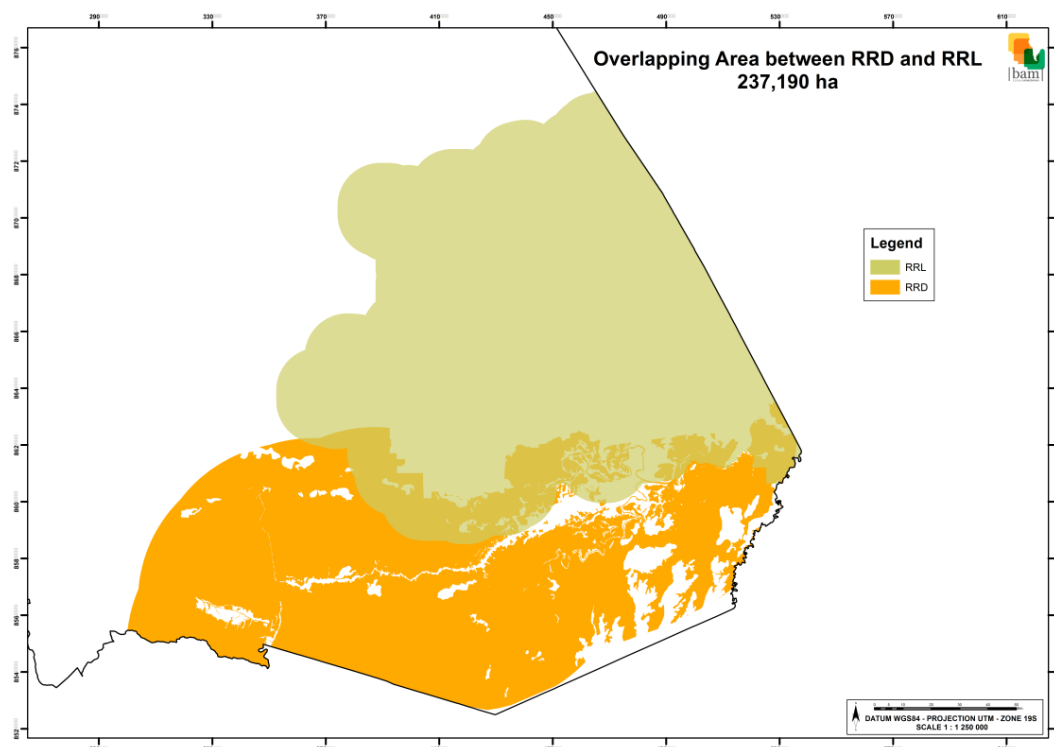
There are also no regional plans to guide urban and infrastructure growth. The Economic Ecological Zoning (IIAP-GOREMAD, 2009) has analyzed the urban-industrial vocation within Madre de Dios (Map 20, EEZ), and for RRD, only areas with very low or low vocation were observed. The areas with highest vocation, located along the IOS, were already excluded by removing non-forest areas.

b) Reference Region for Projecting Location of Deforestation (RRL)

The RRL is a continuous parcel of 1 804 906.5 ha, composed by forest areas (88.9%) and non-forest areas (11.09%). As required by the methodology, this boundary includes the Project Area

and its Leakage Belt⁹⁷, and overlaps the RRD in its southern part. Map 21 shows both reference regions and the Intersection between them.

Map 21. Overlapping Area between RRD and RRL



As RRD, the RRL must meet the similarity criterion ($\pm 30\%$) for the factors tested to demonstrate that it has the same proportion of forest suitable for conversion as the Project Area. Given that RRL covers the whole Brazil Nut Region, its resemblance with the concessions forming the PA is great as shown in the following comparison results:

Table 38. Land Suitable for Conversion in RRL and Project Area

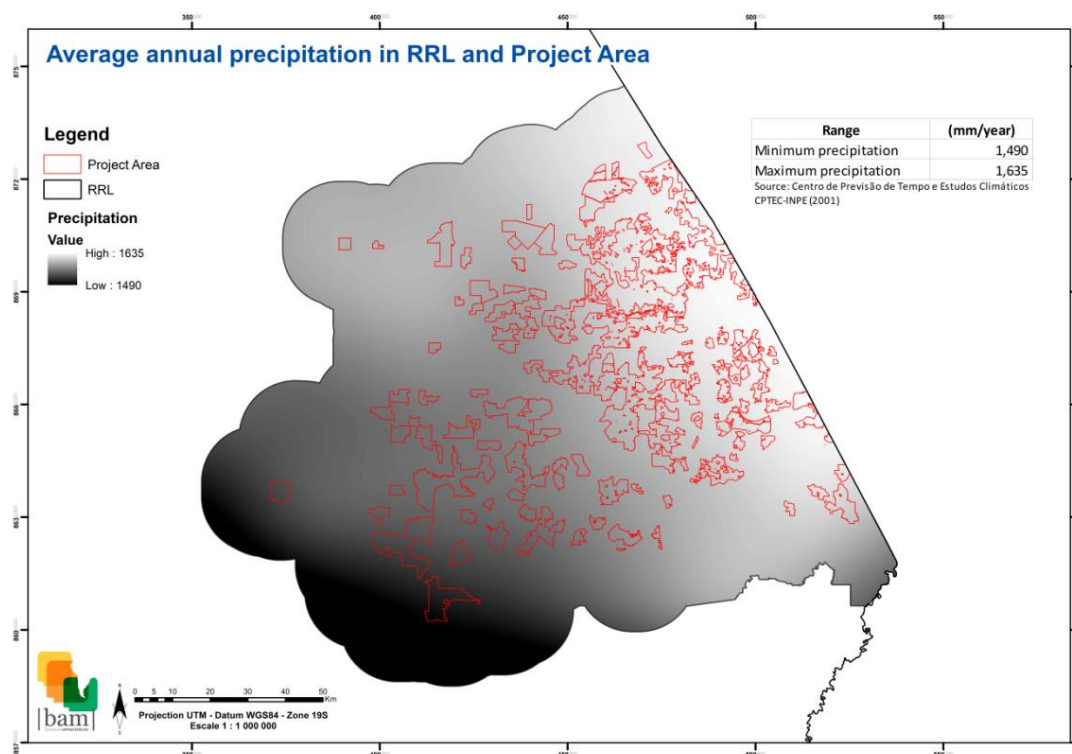
Soil Use Capacity	RRL (%)	PA (%)
Land suitable for annual crops	11.66	2.44
Land suitable for permanent crops	57.41	76.08
Land suitable for pastures	-	-
Land suitable for forestry production	27.39	21.18
Land suitable for protection	2.04	-
Settlements	0.06	-
Water Bodies	1.43	0.3
Total	100	100

⁹⁷ According to the VCS Modular Methodology (modules BL-UP and LK-ASU), the Leakage Belt is a forested area surrounding the Project Area defined by the project proponent. The leakage emissions caused by the project activities are assessed in this boundary. For this Project, the Leakage Belt is equal to the Project Zone minus the Project Area.

Like in RRD, the Soil Use Capacity Map from ZEE has been used to represent the suitability of current forested areas for conversion. All the values are inside the permitted limit. Likewise, both areas are located in the Madre de Dios Plain⁹⁸, which is below 500 AMSL; therefore 100% of their boundaries are in the same elevation class.

Moreover, the graphic information (spatialized precipitation values) obtained for the period 1991-2001 by CPTEC-INPE (2001), shows that RRL and PA have the same precipitation regime:

Map 22. Average Annual Precipitation Map for the Period 1996-2001

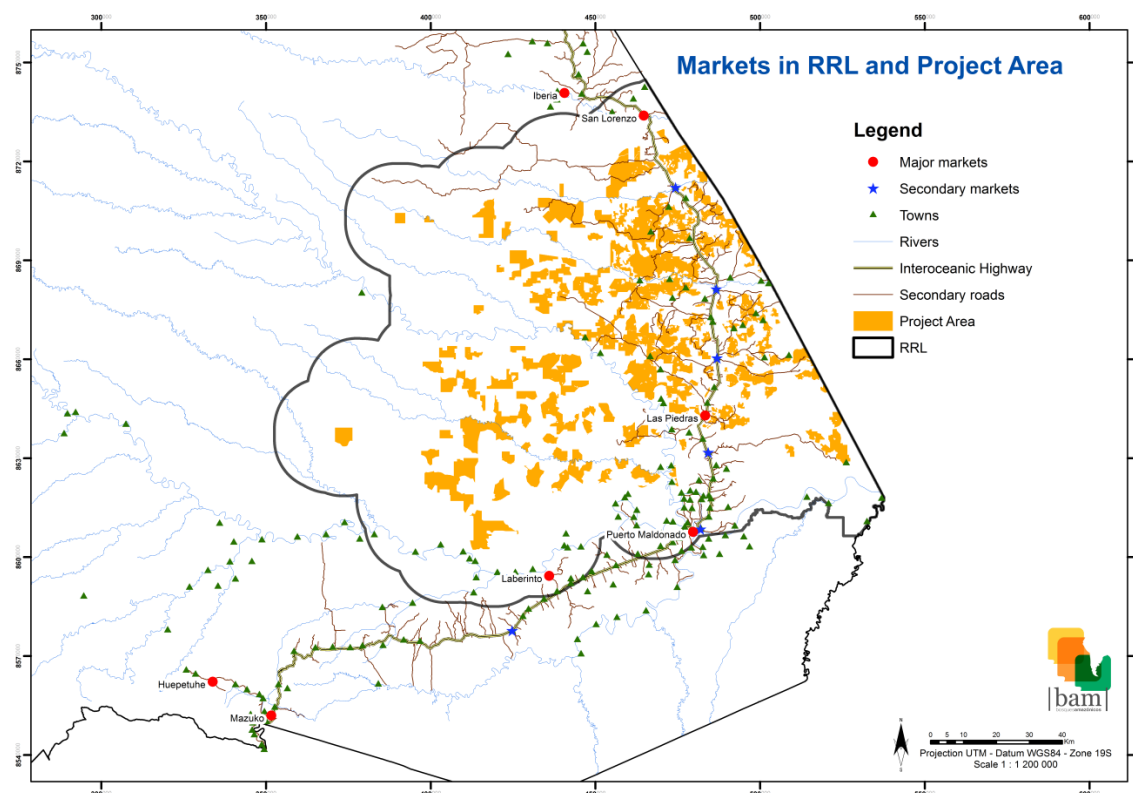


Finally, Access to Markets is the factor that has the greatest impact on agrarian profitability, ergo, in rate and location of deforestation. In Madre de Dios, markets for agrarian products are mainly located along the IOS. The principal ones reachable from RRL and PA are the cities of Puerto Maldonado, Iberia, Laberinto, Las Piedras and San Lorenzo. In the first 3 cities are located the only slaughterhouses of the region, needed for the commercialization of meat. Agricultural products as corn can be traded in all markets.

Smaller towns, around the OIH as well, have been named as Secondary markets in Map 23 (in blue). They link principal markets with the smaller towns (in green) farther away. As PA is evenly distributed inside RRL, they both have the same access to markets.

⁹⁸ In the ZEE final document, the Madre de Dios Region is divided in 3 major biophysical units defined by many factors as geology, physiography, vegetation and others. The broader unit is the Madre de Dios Plain.

Map 23. Location of Markets in and around RRL and Project Area



Strata Definition and Opportunity Cost Calculation

Considering the coexistence of distinct agents of deforestation (farmers/ranchers – miners) it cannot be expected that the deforestation trend would be uniform in the project's boundaries. Therefore, different strata were established to reflect as much real as possible the existing patterns. The criteria used for this purpose were: the economic attraction for alternative activities, and the historical deforestation rates.

In that sense, all project boundaries, starting with RRD were divided into:

- Positive Opportunity Cost Stratum (CO+). Consisting in the areas where the development of farming and/or livestock activities is profitable, due to its proximity to roads, markets, etc.
- Negative Opportunity Cost Stratum (CO-). Consisting in the areas where, under current conditions, it is not profitable to carry out agriculture or livestock activities, nor there is a mining potential.
- Mining Stratum. Consisting in the areas where illegal mining is carried out or could be carried out due to its geological characteristics.

Positive (CO+) and Negative (CO-) Opportunity Cost Strata

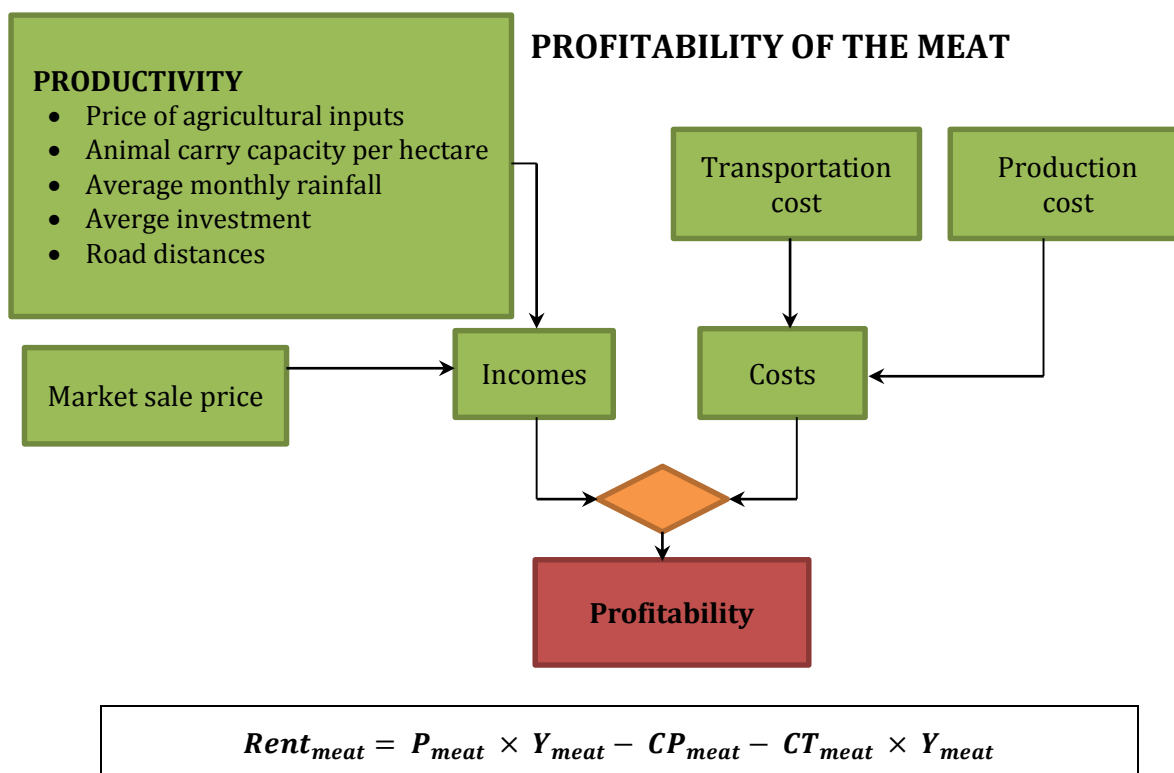
The CO calculation was based on the work done by Fleck et al. (2010), who have calculated and compared the profitability both forestry and agricultural activities. In the case of the lasts, in order to find their profitability, and collect information of costs and revenues, the authors had to develop spatial econometric models-productivity. For this reason, and given that the proposed

deforestation model works with spatialized information only agricultural activities were taken into account.

The profitability Surface is given by the subtraction of the surface incomes minus expenses surface. This is possible because each variable is in raster format. Revenues are obtained by multiplying the productivity by the unit price in the local market. The costs are the sum of the cost of transportation to bring the product to local markets and the cost of production.

These processes are explained below in diagrams and equations used to calculate the profitability of meat and corn:

Figure 13. Meat Profitability Model

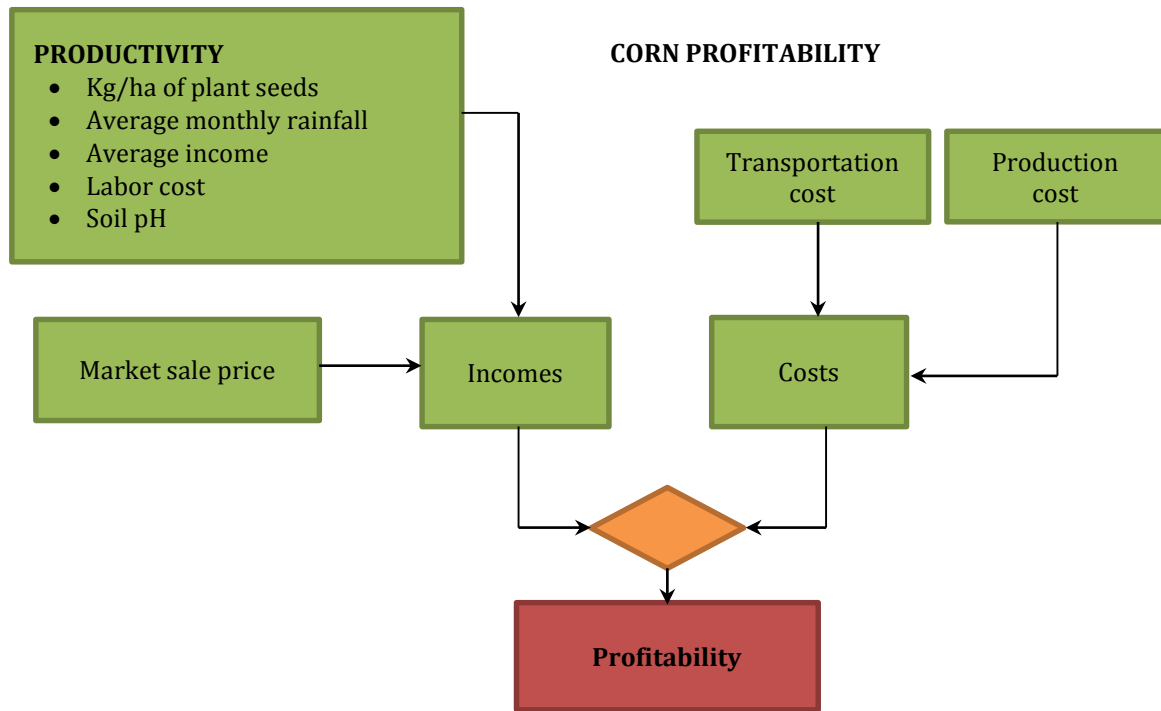


Where,

Table 39: Data used to calculate Meat Profitability

Variable	Description	Value	Source
P_{meat}	Sale price	4473 US\$/ton	Aguilar (2007)
Y_{meat}	Meat productivity	Ton/ha/year	Fleck et al (2010)
CP_{meat}	Production cost	61 US\$/ha	Field work CSF (2010)
CT_{meat}	Meat transportation cost to the markets	US\$/ton	Variable dinámica estimada por el modelo

Figure 14. Corn Profitability model



$$Rent_{corn} = P_{corn} \times Y_{corn} - CP_{corn} - CT_{corn} \times Y_{corn}$$

Where,

Table 40: Data used in the calculation of the Corn profitability

Variable	Description	Value	Source
P_{corn}	Sale price	166 US\$/ton	MINAG (2008)
Y_{corn}	Corn productivity	Ton/ha/year	Fleck et al (2010)
CP_{corn}	Production cost	US\$/ha (average value per district)	Field work CSF (2008)
CT_{corn}	Corn transportation cost to the markets	US\$/ton	Dynamic variable estimated by the model

As seen in previous equations, we need to know the yield of both products. For the construction of the models and Corn Beef Productivity, Fleck et al (2010) field interviews to corn farmers and ranchers in the region were applied, and raised a wide range of variables, including economic factors such as productivity, production area, sales, purchases, income, labor, investment and credit; climatic factors such as rainfall, soil, topography, and spatial factors such as distance to roads, distance to rivers, distance to towns and transportation costs.

With these variables, different multiple regressions were built, and the most determinant of productivity in each case (meat and corn) was chosen. Below are both with their respective variables:

Meat productivity equation:

$$\ln Y_{meat} = \beta_0 + \beta_1(\lg input_{meat}) + \beta_2(density_{meat}) + \beta_3(precip_{meat}) + \beta_4(\lg invest_{meat}) + \beta_5(dist_{viasAfirm_i}) + \mu_i$$

Where,

Table 41: Data for Calculating Meat Productivity

Variable	Description	Data type	Source
<i>Igninput_meat</i>	Logarithm of the average price of agricultural inputs (soles / ha)	Average value 4.07	Field labor CSF (2008)
<i>Density_meat</i>	Average value of stocking rate (head / ha)	Average value 1.456	Field labor CSF(2008)
<i>Precip_meat</i>	monthly average rainfall 1996-2001 (mm)	Spatial layer	CPTEC-INPE (2001)
<i>Iginvest_meat</i>	Logarithm of the average of the investment (soles / ha)	Average value 6.20	Field labor CSF (2008)
<i>Dist. Packed roads</i>	Road distance (Km)	Spatial layer	ZEE GOREMAD (2008)

Corn productivity equation:

$$Y_{corn} = \beta_0 + \beta_1(seed_{corn}) + \beta_2(precip_{corn}) + \beta_3(income_{corn}) + \beta_4(labor_{corn}) + \beta_5(pH_{corn}) + \mu_i$$

Where,

Table 42: Data for Calculating Corn Productivity

Variable	Description	Data Type	Source
<i>Seed_corn</i>	Average value of seeds planted at the district (kg/ha)	Raster	Field labor CSF (2008)
<i>precip_corn</i>	Average monthly rainfall 1996-2001 (mm)	Raster	CPTEC-INPE (2001)
<i>income_corn</i>	Average value of income at the district (soles)	Raster	Field labor CSF (2008)
<i>Labor_corn</i>	Average value of labor at the district (soles/ha)	Raster	Field labor CSF (2008)
<i>pH_corn</i>	pH values	Raster	ISRIC (1998)

Like Productivity, the Transportation Cost is another variable in terms of Profitability that needs to be calculated indirectly. The transportation cost depends on the condition of the road network, and any improvements, either for maintenance or for construction of new stretches. It has an impact on the products profitability. The continued increase of roads, to a historical rate of 142 km/year⁹⁹, was incorporated into the model, in order to reflect the impacts related to the changes in transportation costs that would be evidenced in the deforestation projections.

⁹⁹ Estimated for the RRD, between years 1999 and 2004

Once the two Profitability Surfaces were prepared, a pixel-level comparison was made between both, and the highest profitability value was selected, thus resulting in the Opportunity Cost Surface. The following equation represents the described action carried out in Dynamic Ego.

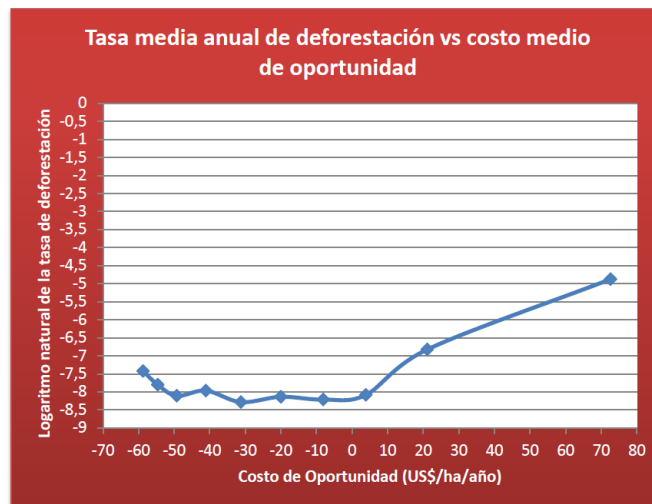
$$CO = Rent_{max}\{Meat, Corn\}$$

Where,

CO	Opportunity Cost
$Rent_{max}$	Maximum Profitability
$Meat$	Meat, referred to meat profitability
$Corn$	Corn, referred to corn profitability

Finally, by obtaining positive and negative values in the Opportunity Cost Map, the area was divided in the Positive Opportunity Cost (CO+) and the Negative Opportunity Cost (CO-) strata. Deforestation in the first one responds to alternative activities, while in the second stratum there are other impelling factors, as shown in the following graphic:

Figure 15. Annual Average Deforestation Rate related with Opportunity Cost



This graphic corresponds to the analysis of the logarithmic values of deforestation as a function of the opportunity cost, and indicates that, when there is a deforestation increase despite the very negative values of CO, it can be assumed that there are other factors affecting the deforestation rate. This was established as one of the main reasons for stratification.

As last, it should be mentioned that the opportunity cost strata are dynamic. Because of the growth of new roads at a historical annual rate, the transportation cost changes and therefore the profitability of agricultural products. Therefore, the stratum area with CO+ increases in each model iteration, in detriment of the area with CO-.

Mining Stratum

The South area of Madre de Dios is affected by illegal mining, which due to its high profitability, does not depend on the opportunity cost, but on the international gold price. According to several studies on mining in the region, it is clear that no other activity can compete with the

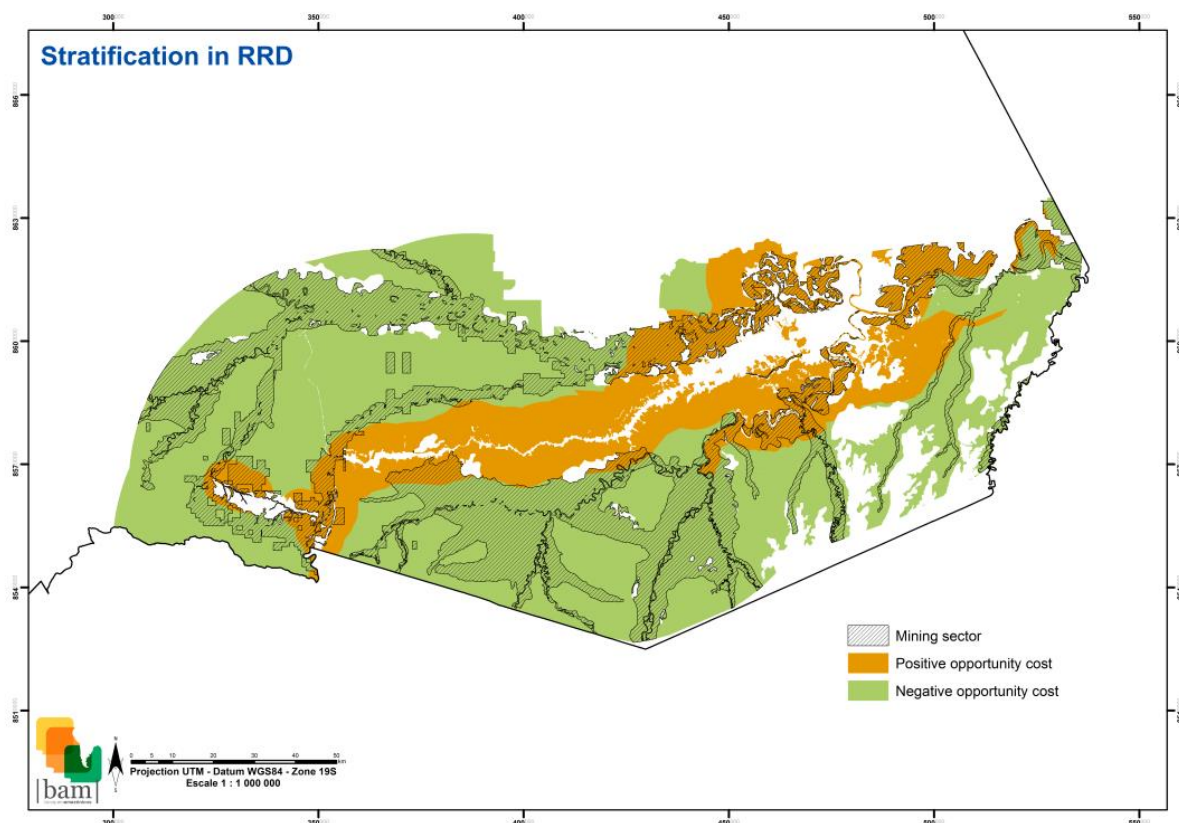
profitability of gold mining in these days, especially if the gold price continues to increase steadily.

However, mining is carried out in specific areas of the region. The Instituto Geológico, Minero y Metalúrgico del Perú (INGEMMET) made an estimate of the gold stock in Madre de Dios (INGEMMET, 1995), and found that this metal can be found in commercial quantities only along the Quaternary Holocene geological formation.

Therefore, the mining sector includes the current area of mining concessions and mining claims, and areas with mining potential (Quaternary Holocene). The area defined by Decree No. 012-2010, which could legally hold mining concessions is also included.

The mining sector is static so its area will not increase over time. The deforestation rate of the stratum has been found with the historic deforestation of the area during the reference period (2000-2008). In the following map, the stratification made in RRD is detailed, which is where the deforestation rates were taken from:

Map 24. Strata in RRD



Analysis of Historic Deforestation

For the historical deforestation analysis, made within the RRD, Landsat TM satellite images were used of years 2000, 2005 and 2008. These images have a spatial resolution of 30x30m, less than 10% of cloud cover and were obtained from the image database of the National Institute for Space Research (INPE) of Brazil, and the USGS Global Visualization Viewer.

The following table shows the selected images. More scenes than required were chosen, but in future monitoring only the first four in the table will be used. For 3-68 and 3-69 scenes of 2005, two different dates are listed as it was necessary to make a mosaic within the images, due to the presence of clouds at specific points.

Table 43. Landsat Scenes Used in the Deforestation Analysis

Path-Row	2000	2005	2008
2-68	24/11/2000 (7TM)	10/08/2005 (5TM)	18/08/2008 (5TM)
2-69	27/07/2000 (5TM)	13/10/2005 (5TM)	14/05/2008 (5TM)
3-68	17/08/1999 (5TM)	18/09/2005 (5TM) 17/08/2005 (5TM)	05/05/2008 (5TM)
3-69	23/05/2000 (5TM)	16/07/2005 (5TM) 17/08/2005 (5TM)	25/08/2008 (5TM)
4-67	29/08/2001 (5TM)	23/07/2005 (5TM)	01/09/2008 (5TM)
4-68	07/07/1999 (5TM)	05/08/2004 (5TM)	01/09/2008 (5TM)

All deforestation mapping of the three years was carried out by the IIAP, following the methodology proposed by them and used in the regional ZEE. This procedure is summarized in the following steps:

1) Selection and acquisition of satellite images.

Quicklooks were compared of the catalog images of the INPE and USGS, and the ones with lower cloud coverage (in the desired quadrants) and better visual appearance were chosen. These images were detailed in Table 43.

2) Image Processing

The recommendations of the Sourcebook for REDD (GOFC-GOLD, 2009) were followed as well as the manual for the preparation of mosaics developed by the IIAP¹⁰⁰. The processing involves the following sub-steps:

- Image Conditioning

Images were acquired in *.TIFF format, were decompressed and exported to the ERDAS IMAGINE program under *.img format where the spectral bands were joined.

- Georeferencing

For the 2000 image it was used as reference the vectorial data (1:100 000) of the National Chart of the National Geographic Institute (IGN). For images 2005 and 2008, the "frame by frame" technique was used, which consists in comparing a georeferenced image with a non-georeferenced image. In this case the already georeferenced image 2000 and the National Chart were used. The RMS was minimal in both images complying in this manner with the parameters of the ERDAS guide.

- Detection and removal of clouds and shadows

The images chosen had less than 10% of cloud cover (CC%) in the desired quadrants:

¹⁰⁰ IIAP, BIODAMAZ Peru - Finland. 2004. Manual for the elaboration of mosaics of Landsat TM satellite imagery for the Peruvian forest lowlands. Technical Document Nr. 03. Iquitos – Peru.

Table 44. Cloud Cover in the Selected Landsat Images

Scene Path-Row	Image 2000 CC%	Image 2005 CC%	Image 2008 CC%
p002r068	2.5%	0%	0%
p002r069	2.5%	7.5%	5%
p003r068	0%	0%* 2.5%**	0%
p003r069	2.5%	5%	0%
p004r067	2.5%	0%	0%
p004r068	0%	5%	7.5%

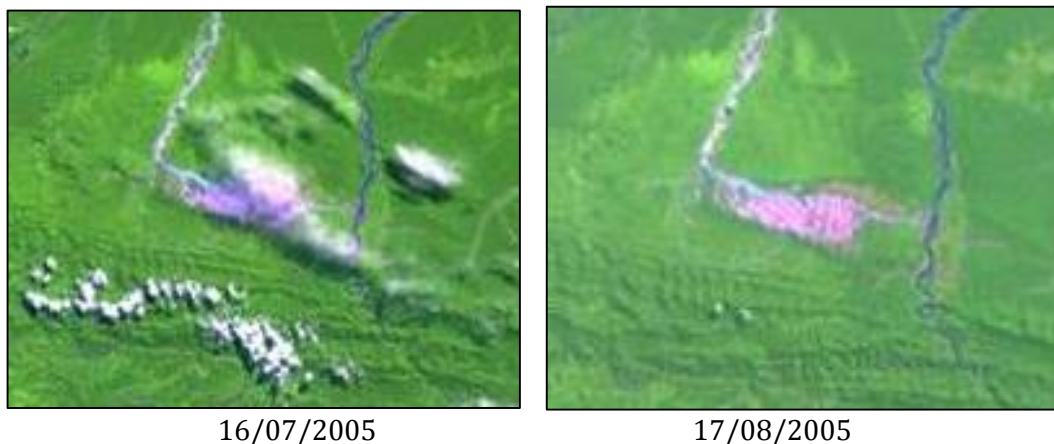
* CC% combined for **quadrants A and C** (image 17/08/2005)

** CC% combined **quadrants B and D** (image 18/09/2005)

However, in the scenes 3-68 and 3-69 there were small spots with clouds within the area of analysis, which were corrected by composing a mosaic using two images of the same scene. To do this, it was necessary that the second image was of the same year, and the section to be replaced from the first one, was free of clouds.

As an example, below is the section replaced in scene 3-69. The image 16/07/2005, which is almost completely cloud-free, had to be overlapped in some portions by image 17/08/2005. In this case, it was better to make a mosaic, since the second image has a greater CC% than the first one, with the exception of the section showed.

Figure 16. Comparison of the replaced Section of scene 3-69, year 2005



- Radiometric enhancement

This step was performed with the ERDAS' tool *Matching Histogram*, in order to improve the image's visual appearance.

- Mosaic construction

All the scenes were put together, making a larger image. During the splicing, consideration was given to the date of each image, to have the most recent at the top of the overlapped area, provided that they had less CC%.

3) Generation of vector data by visual interpretation of patterns of deforestation

This step consisted of visual interpretation, digitizing, editing and encoding of deforestation. According to Sourcebook on REDD (GOFC-GOLD, 2009), visual interpretation is a simple and robust method but time consuming, and requires an experienced interpreter. There was no such problem in our case, given that IIAP's technicians have large experience in the matter (e.g. Madre de Dios ZEE).

4) Map Accuracy Assessment

An accuracy assessment of the most recent map (2008) was carried out by AIDER, an independent NGO, in order to produce credible results of the historical deforestation rate. For both classes (forest and non-forest) the minimum accuracy had to be 90%.

The assessment was done by ground truthing over 55 sample plots in transition zones, distributed evenly among classes.

A Confusion Matrix was built with the field results. In this matrix, the diagonal represents the number of assessment points where both sources (map and field) agree, while the sides are errors of classification. As recommended by GOFC-GOLD Sourcebook, user accuracy formulae were used to determine the Map's confidence level of each class. In both cases, the percentage obtained was over the minimum requested by the methodology (90%).

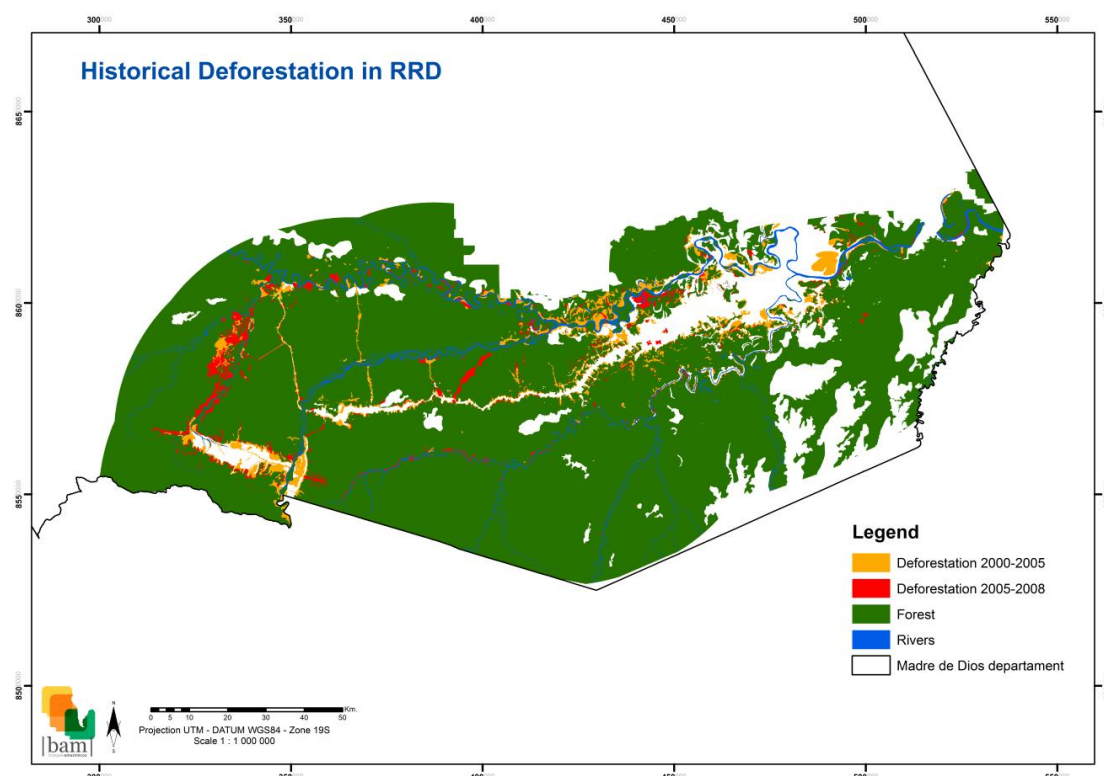
Table 45. Confusion Matrix for Accuracy Assessment

Predicted (Map) Classes	Actual (Field) Classes		Σ	Commission Errors %
	1	2		
1	25	2	27	7.41
2	1	27	28	3.70
Σ	26	29	55	
Omission Errors %	3.85	6.90		

Forest Accuracy	96.43	%
Deforestation Accuracy	92.59	%
Global Accuracy	94.55	%

The outcome of the whole analysis is the map showing the historical deforestation in RRD for the time periods 2000-2005 and 2005-2008, which can be seen in the following map.

Map 25. Historic Deforestation in RRD in Reference Period



The information was also classified by stratum to be able to calculate a deforestation rate for each one:

Table 46. Remaining Forest and Deforested Areas in the Opportunity Cost Strata in RRD, in the Historic Reference Period

RRD Strata	CO - (ha)		CO + (ha)	
	Deforested	Remaining Forest	Deforested	Remaining Forest
2000	-	956 219.28	-	356 307.58
2005	13 050.12	943 169.16	39 905.6	316 401.98
2008	15 801.79	927 367.36	13 921.06	302 480.92

Table 47. Remaining Forest and Deforested Areas in Mining Stratum in RRD, in the Historic Reference Period

RRD Strata	Mining Stratum (ha)	
	Deforested	Remaining Forest
2000	-	124 369.27
2005	16 906.26	107 463.01
2008	8 620.74	98 842.28

In the Mining Stratum, only the area formed by the mining concessions was used to get the deforestation rate, even though this stratum is also made up by the Quaternary Holocene geological layer. The main reason for this exclusion is that, to this date, almost all deforestation

due to mining activities has been concentrated in the concessions or petitioners. However it is expected that the rate observed in those areas is the same for the Holocene layer because it has equal mining potential.

Deforestation Rates per Stratum used in the Deforestation Model

To calculate historical rates for each RRD strata, the previous areas were used in the following equation:

$$ABSL,RRD,unplanned,t = ARRD,unplanned,hrp / Thrp \quad (\text{Eq. N° 3 BL-UP Module, VCS Modular Methodology})$$

Where,

$ABSL,RRD,unplanned,t$	Projected area of unplanned baseline deforestation in the RRD in year t ; ha
$ARRD,unplanned,hrp$	Total area deforested during the historical reference period in the RRD; ha
$Thrp$	Duration of the historical reference period in years; yr
t	1,2,3,... t^* year elapsed since the projected start of the REDD project activity

Table 48. Historical annual rate of deforestation in RRD

Strata	$ARRD,unplanned,hrp$ (ha)	$Thrp$ (yr)	$ABSL,RRD,unplanned,t$ (ha/yr)
Mining	25 527.0	8	3 190.87
Positive Opportunity Cost	53 826.66	8	6 728.33
Negative Opportunity Cost	28 851.92	8	3 606.49

These mean rates are used for each year of the baseline period in RRD. Given that RRD and RRL are different areas, it is necessary to estimate the mean rate for RRL from $ABSL,RRD,unplanned,t$. To this end, the following formula has to be used:

$$ABSL, RRL, unplanned, t = ABSL, RRD, unplanned, t * P_{RRL} \quad (\text{Eq. N° 4 BL-UP Module, VCS Modular Methodology VCS})$$

Where,

$ABSL, RRL, unplanned, t$	Projected area of unplanned baseline deforestation in the reference region for location RRL in year t ; ha
$ABSL, RRD, unplanned, t$	Projected area of unplanned baseline deforestation in RRD in year t ; ha
P_{RRL}	Ratio of forest area in RRL at the start of the baseline period to the total area of the RRD , dimensionless

Table 49. Ratio of forest area in RRL to the total area of RRD

Stratum	RRD (ha)	Forest in RRL at 2008 (ha)	P_{RRL}
Mining	124 369.27	40 097.3	0.32
Positive Opportunity Cost	356 307.58	551 324.9	1.55
Negative Opportunity Cost	956 219.28	1 053 295.57	1.10

Table 50. Projected Areas of unplanned baseline Deforestation in RRL

Stratum	$A_{BSL, RRL, unplanned}$ (ha)	P_{RRL}	$A_{BSL, RRL, unplanned, t}$	
			(Ha)	%
Mining	3 190.87	0.32	1 028.75	2.566
Positive Opportunity Cost	6 728.33	1.55	10 410.94	1.89
Negative Opportunity Cost	3 606.49	1.10	3 972.62	0.38

Since the deforestation model works with rates in percentages rather than in areas, each stratum rate was transformed using a simple equation:

$$A_{BSL, RRL, unplanned, t} (\%) = \frac{A_{BSL, RRL, unplanned, t} \text{ (ha)} \times 100}{\text{Forest in RRL at 2008 (from Table 48)}}$$

In this way, the projected deforestation advances at a historical constant rate in each stratum (different between them as can be seen in Table 50).

Location and Quantification of unplanned baseline deforestation in RRL

This sub-section explains in more detail the functioning of the model and the source and types of the inputs it uses. The software chosen is DINAMICA EGO¹⁰¹, and its main task is to determine the location of future deforestation.

DINAMICA EGO was developed by the Center of Remote Sensing from the Universidad Federal de Minas Gerais, led by internationally acknowledge scientist Britaldo Silveira Soares-Filho. The first version was used to model different scenarios of deforestation trend throughout the whole Amazon Basin¹⁰², and has been used lately for many other studies in the same region¹⁰³, and in the development of regional baselines by recognized institutions like Carbon Decisions International (CDI). In that sense, it can be considered that the software has been largely peer-reviewed by recognized scientists and REDD experts worldwide. As can be read in the program guidelines, information of local experts can be introduced in substitution of pure statistical parameters, if considered.

Also, detailed explanations of how the software works are available in many guidelines and YouTube videos¹⁰⁴, and several trainings have been given to Peruvian (public and private) organizations to ensure that it is adequately understood. For the project's case, the model created to project the deforestation, can be visualized as a diagram at the interface of the program. Thus every operation performed is known as well as its respective sub-result. For these reasons, it meets the methodology's transparency criterion.

Regarding the inclusion of spatial datasets, the model developed in DINAMICA has included many geographic layers in raster format, as distance to roads/rivers/deforested areas/settlements/markets and land tenure types (concessions for different resources, etc.)

¹⁰¹ www.csr.ufmg.br/dinamica/

¹⁰² Nature magazine, Vol. 440|23 March 2006|doi:10.1038/nature04389

¹⁰³ Soares-Filho, B. et al (2002); Mas, J.F. & Flamenco, A. (2011); Nunes, F. et al. (2011); among others

¹⁰⁴ www.youtube.com/watch?v=D8L_CtFgDKA; www.youtube.com/watch?v=9JS_zDyIB2o and www.youtube.com/watch?v=fQwsRlloPzQ

among others. All of them have different impacts over deforestation depending on their nature (e.g. Forestry Concessions repel deforestation while IOS attracts it), and for that, shape the future deforestation. It is worth noting that the correlation between all this spatial datasets were also calculated, removing those highly correlated.

Software has been specifically designed to predict, based on historical and new circumstances, future cover category maps (forest / non-forest, in our case). In that sense, we consider that DINAMICA EGO software meets all requirements of the Modular Methodology.

Preparation of Spatial Datasets

Existing digital layers that are officially used in the MDD Region were collected from different institutions, trying to get at least 1 factor for each of the four classes presented in the BL-UP Module.

Table 51. Spatial Datasets Collected for the Project

Spatial Datasets	Source	Year
Reforestation Concessions	Forestry and Wildlife General Direction (DGFFS)	2010
Forestry Concessions	Forestry and Wildlife General Direction (DGFFS)	2010
Brazil Nut Concessions	Forestry and Wildlife General Direction (DGFFS)	2010
Mining Concessions	Geological Mining and Metallurgical Institute (INGEMMET)	2011
Land Use Capacity	Peruvian Amazon Research Institute (IIAP) - Regional Government of Madre de Dios (GOREMAD)	2009
Protected Natural Areas	National System for Protected Natural Areas (SERNANP)	2009
Native Communities	Instituto del Bien Común (IBC)	2009
Quaternary Holocene	Peruvian Amazon Research Institute (IIAP) - Regional Government of Madre de Dios (GOREMAD)	2009
Agricultural Parcels (PETT)	Regional Government of Madre de Dios (GOREMAD)	2009
Geology	Peruvian Amazon Research Institute (IIAP) - Regional Government of Madre de Dios (GOREMAD)	2009
Productive Aptitude	Peruvian Amazon Research Institute (IIAP) - Regional Government of Madre de Dios (GOREMAD)	2009
Vegetation	Peruvian Amazon Research Institute (IIAP) - Regional Government of Madre de Dios (GOREMAD)	2009
Interoceanic Highway (IOS)	Regional Government of Madre de Dios (GOREMAD)	2009
Secondary Roads until 1999	Regional Government of Madre de Dios (GOREMAD)	2009
Secondary Roads until 2007	Asociación para la Conservación de la Cuenca Amazónica (ACCA)	2009
Hydrographic System	Peruvian Amazon Research Institute (IIAP) - Regional Government of Madre de Dios (GOREMAD)	2009
Settlements	Regional Government of Madre de Dios (GOREMAD)	2009

The column Year of the above chart refers to the year in which the data was obtained from the official sources, also listed. All of these sets were received in shape (vector) files and were adequate, in ArcGIS 10.0 with the tool ArcToolbox – Analysis tools – Extract – Clip, to match only

areas located within the RRL. The data sets created through field work, by its respective institution, are:

- Reforestation Concessions
- Native Communities
- Brazil Nut Concessions
- Forestry Concessions
- Secondary Roads until 2007
- Mining Concessions
- Agricultural Parcels (PETT)
- Interoceanic Highway (IOS)
- Secondary Roads until 1999
- Settlements

Many of these datasets are in constant actualization (PETT and concessions) because new concessions are granted or reshaped (through process of re-measurement or re-delimitation given that there are some problems of overlap), therefore we obtained from each source the most actual ones.

The maps coming from the Ecologic Economic Zoning, developed by IIAP-GOREMAD in 2009, are based in multiple datasets that were processed following IIAPs methodology¹⁰⁵, which can be seen in a diagram in Annex 2. The same processing techniques used in Landsat images for ZEE were applied in the analysis of the historic deforestation of the RRD.

It should be emphasized that all the above mentioned files are constituted by polygons and/or points, whose areas and boundaries are officially used by the National and Regional Government when signing new concession contracts, planning infrastructure projects, doing zoning work, etc. Some of these files can be easily viewed in nationwide scale maps, in the websites of public institutions¹⁰⁶.

On the other hand, the Forest/Non-Forest Maps for RRL (years 2000, 2005, 2008) were made from the same mapped images used for RRD, given that we analyzed a broader area than both regions. The procedures for elaborating theses maps were already explained. They are also in raster files.

All Spatial Datasets collected, except Natural Protected Areas (as there are no ANP within the RRL), were used to create the variables, called Factor Maps, for the modeling as shown below:

¹⁰⁵ Fachín, L. Zonificación Ecológica Económica del Departamento de Madre de Dios. Procesamiento Digital de Imágenes Satelitales y Modelamiento SIG. IIAP-GOREMAD, 2009.

¹⁰⁶ <http://www.sernanp.gob.pe/sernanp/bmapas.jsp>
http://dgffs.minag.gob.pe/pdf/mapas_tematicos/Concesiones%20Maderables%20y%20No%20Maderables.pdf

Table 52. Spatial variables per class used in the modeling process

Classes	Factors
Landscape	Soil Use (1)
Landscape	Holocene Quaternary (2)
Landscape	Geology (3)
Landscape	Productive Aptitude (4)
Landscape	Vegetation (5)
Accessibility	Distance to Secondary Roads (6)
Accessibility	Distance To Rivers (7)
Accessibility	Distance to Interoceanic Highway - IOS (8)
Anthropogenic	Distance to Settlements (9)
Anthropogenic	Distance to Deforested Areas (10)
Land Tenure	Reforestation Concessions (11)
Land Tenure	Forestry Concessions (12)
Land Tenure	Brazil Nut Concessions (13)
Land Tenure	Mining Concessions (14)
Land Tenure	Native Communities (15)
Land Tenure	Agricultural Parcels – PETT (16)

These spatial variables were grouped in two categories:

- Categorical variables: landscape and land tenure factors.
- Continuous variables: accessibility and anthropogenic factors.

All variables were converted to raster files matching the raster matrix defined by the model, based on the total area of RRL. The matrix has 2251 rows and 2606 columns, and each pixel has a resolution of 71 x 71 meters.

Table 53. Spatial properties for raster files

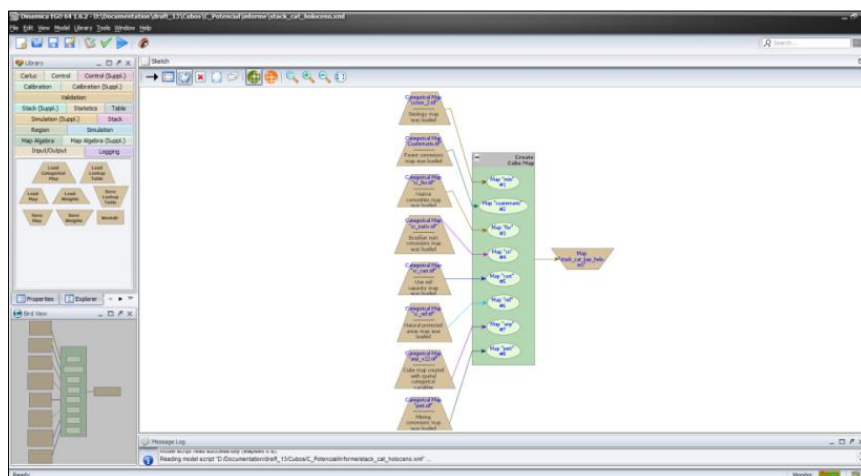
Columns	Rows	Spatial Reference	Extension			
			Upper	Left	Right	Lower
2606	2251	WGS 1984 UTM Zone 19S	8744821	352557	537583	8585000

After the conversion of all the spatial variables to raster files, they were grouped in *Cubes* to create a processing unit. The cubes are multilayer maps that organize the spatial data to be entered in the modeling process. The two cubes created are:

- Cube for Categorical Variables.
- Cube for Continuous Variables (excepting the variables *Distance to Secondary Road* and *Distance to Deforested Areas* which will be mentioned later).

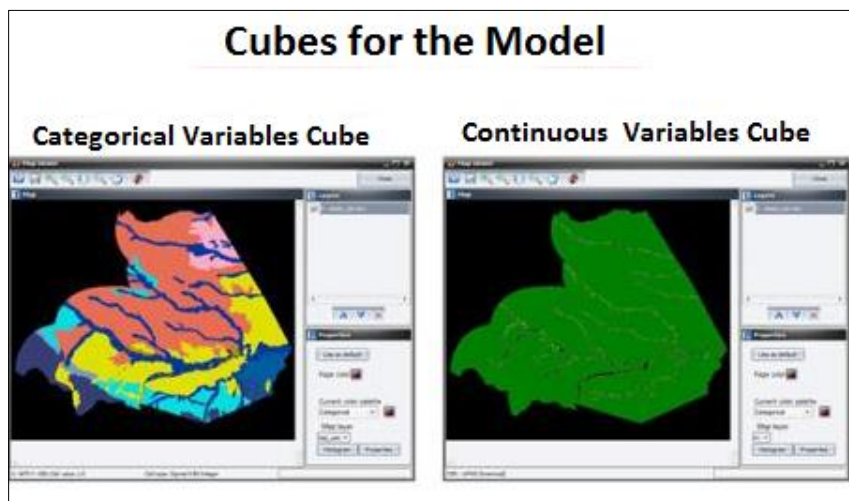
The process of cubes creation in DINAMICA EGO is graphed in the following example:

Figure 17. Cubes Creation Process



After this procedure, both cubes were ready to be inputs for the analysis in the deforestation modeling.

Figure 18. Cubes for the Model



Preparation of Deforestation Risk Maps

The process of elaborating Risk Maps consisted in two major steps: Calibrating the model and Modeling with the outputs from the calibration.

1. Model Calibration

Its main objective is to determine the incidence that each of the gathered variables have over the deforestation process. The Calibration consisted in 2 sub-steps called **Calculation of Correlation** that could exist between variables and **Calculation of Weights of Evidence**. To this

end, we have worked with the Deforestation Maps of RRL for years 2000 and 2005 that gave us a calibration period of 5 years.

a) Calculation of Correlation

The modeling is based on the statistical method “Weights of Evidence”, whose condition is that no correlation exists between the factor maps. Given that some of them represent similar factors (e.g. Geology's Map and Holocene Quaternary's Map) a correlation analysis between all the factors (from Table 52) was done in DINAMICA EGO, using Cramer's Test and Joint Information Uncertainty's Test. The maximum acceptable values were 0.5 for each¹⁰⁷.

The results show that the following factors are correlated (surpassed the maximum limit of 0.5 for both methods) and should not be used at the same time:

Table 54. Pairs of factors correlated

Distance to Deforested Areas	PETT
Distance to Deforested Areas	Forest Concessions
Productive Aptitude	Geology
Productive Aptitude	Soil Use
Productive Aptitude	Vegetation
PETT	Distance to IOS
PETT	Vegetation
Soil Use	Geology
Soil Use	Vegetation
Holocene Quaternary	Geology
Holocene Quaternary	Soil Use
Holocene Quaternary	Productive Aptitude
Holocene Quaternary	Vegetation
Holocene Quaternary	Distance to Rivers
Distance to IOS	Forest Concessions
Distance to second roads	Forest Concessions

With this information we created 10 scenarios (simulations) that combined differently the factors mentioned above, without mixing those correlated. For safety, the same correlation analysis was remade for each scenario, to check the inexistence of any correlation.

¹⁰⁷ Soares-Filho *et al.* empirically established thresholds of 0.45 for Cramer Test and of 0.35 for Joint Information Uncertainty's Test, nevertheless Bonham-Carter (1994) mentioned by Almeida (2004) states that inferior values than 0.5 for both methods represent less association between variables than otherwise.

Table 55. Mix of factors for each scenario tested

Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10
1	1	5	4	1	3	2	4	3	2
6	6	6	6	6	5	6	6	6	6
7	7	7	7	7	6	8	7	7	9
8	9	8	8	9	7	10	9	9	11
10	10	10	10	11	8	11	11	11	13
11	11	11	11	13	10	13	13	13	14
13	13	13	13	14	11	14	14	14	16
14	14	14	14	15	13	15	15	15	16
15	15	15	15	16	14		16	16	
					15				

* The numbers in the table correspond to the given value to each factor in Table 52

The correlation analysis confirmed that the drivers are not correlated, though there are Cramer values in some scenarios that are near the limit. It was also seen that all JIU values were less than 0.5 by far. For these reasons, we did develop a Risk Map for all the scenarios. The results of Scenario 3 can be seen in Annex 3.

Table 56. Highest Cramer Values per scenario

Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10
1-14 (0.47)	1-14 (0.47)	5-13 (0.46)	4-13 (0.479)	9-16 (0.48)	3-5 (0.47)	-	9-16 (0.48)	9-16 (0.48)	9-16 (0.48)
			4-14 (0.478)	1-14 (0.475)	5-13 (0.46)		4-13 (0.479)	6-16 (0.467)	6-16 (0.467)
				6-16 (0.467)			4-14 (0.478)		
							4-16 (0.472)		
							6-16 (0.467)		

* In each cell, the upper pairs of numbers correspond to the combination of factors with the highest Cramer's value for their respective scenario.

** The numbers in parenthesis are the Cramer's values obtained for their respective pair of factors.

b) Calculation of weights of evidence

The Weights of Evidence approach is the basis for the projection of deforestation in the model. This technique allows mixing different patterns simultaneously in a unique equation, for the calculation of the probability of occurrence of transitions (Forest to Non-Forest), in the presence or under the simultaneous influence of the different factors.

For the Calculation of the Weights of Evidence, the Deforestation Maps in RRL of years 2000 and 2005 were used. As mentioned before, these maps are already in raster files and equal the model raster matrix.

The layers of Rivers, IOS, Secondary Roads and Bridge (Billinghurst Bridge over the Madre de Dios River) were overlaid on each of the deforestation maps mentioned. The resulting maps are called Land Cover Maps, and the pixel values of the layers mentioned are:

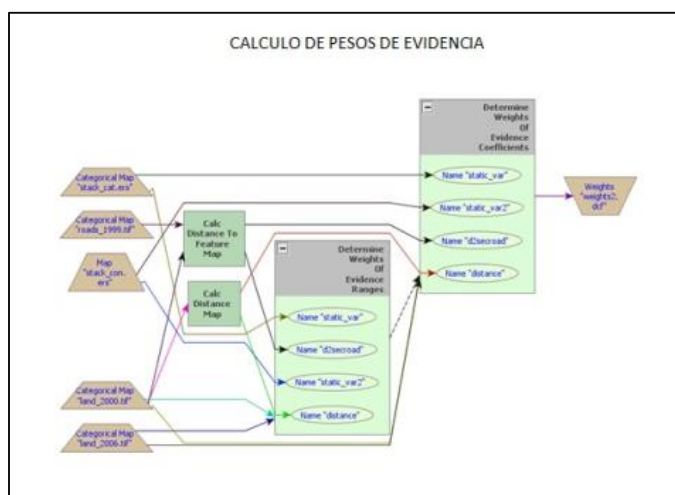
Table 57. Pixel Values for the Land Coverage Maps

Land Cover	Pixel Value
Forest	2
Deforestation	1
Secondary Roads	3
Interoceanic Highway	4
Rivers	5
Bridge	6

A model in DINAMICA EGO was elaborated to create the weights of evidence. This model considers a final classification of the factors:

- Static Variables, represented by the factors inside the *Categorical Variable Cube* and *Continuous Variable Cube*.
- Dynamic Variables, represented by the *Distance to Deforested Areas* and the *Distance to Secondary Roads* (which were not included in the cubes).

Figure 19. Weights of Evidence calculation in DINAMICA EGO



An example of the results obtained from this process is shown in Figure #. The guidelines of the software set that the project developer should use the values automatically generated by the model. Nonetheless, they can be changed if peer review data exists or if experts' opinion is collected for a given value. In the project case, no weight of evidence value was changed.

Figure 20. Graphic with results of Weights of Evidence for Natural Protected Areas

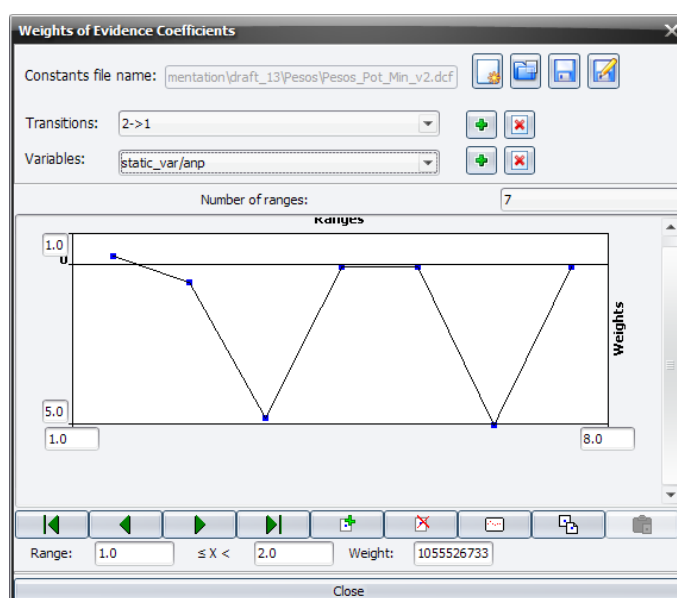


Table 58. Interpretation of the Values of Weights of Evidence

Value	Interpretation
Negative value (-)	Range of the driver that rejects the transition (Forest to Non-forest)
Neutral value (0)	Range of the driver that is neutral
Positive value (+)	Range of the driver that attracts the transition (Forest to Non-forest)

The process for calculating the weights of evidence was done for each one of the scenarios (simulations), as they combine differently the factors used.

It is worth noting that the Weights of Evidence Method is a peer review procedure, used in the studies made on the Amazon Basing already mentioned.

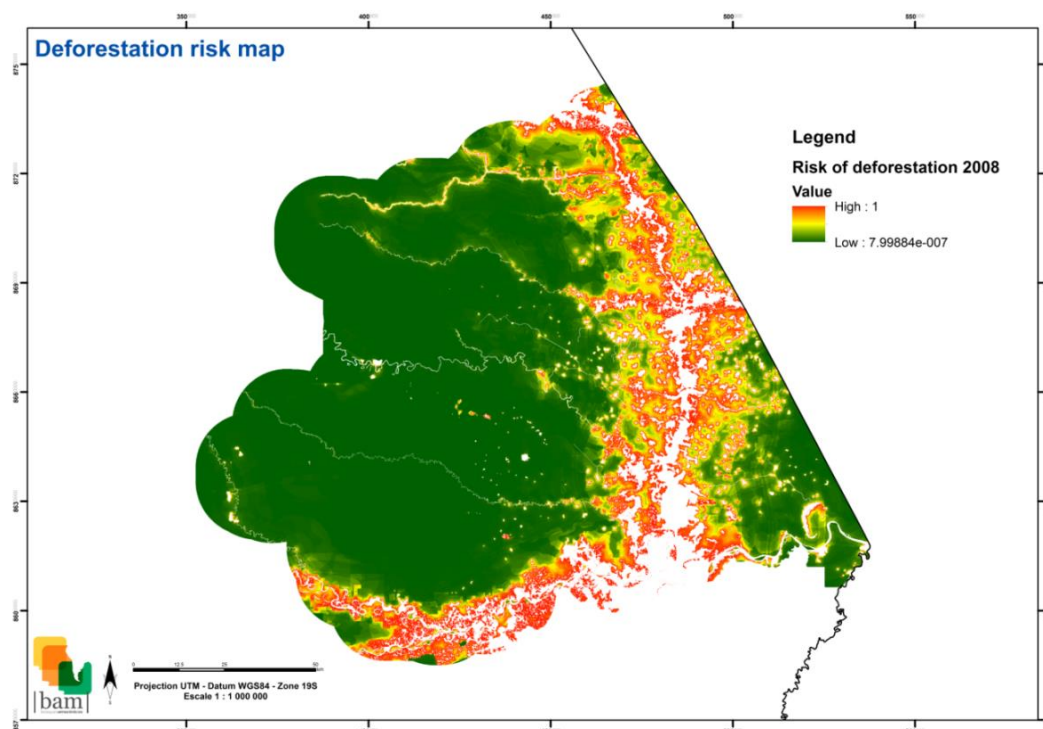
2. Modeling

In order to generate the Risk Maps, the following data was entered into the Model of Deforestation:

- The results of the calibration process (weights of evidence for each scenario, defined by the mix of variables selected based on the correlation results)
- The Historical Deforestation Rates of the 3 Strata
- The *Categorical Variables Cube* and the *Continuous Variables Cube* (Static Variables)
- Dynamic Variables
- Deforestation Map in RRL of year 2005

The model was run and a Risk Map for each scenario (simulation) under test was obtained. The Risk Maps were prepared to indicate the risk of deforestation, for each pixel location, in a numeric scale. In this case, the pixels take values from 0 (minimum risk) to 1 (maximum risk).

Map 26. Risk Map of Scenario 3



Selection of the Most Accurate Deforestation Risk Map

This selection was achieved through the confirmation (validation) of the models of deforestation created, and by the subsequent comparison of those results.

From the Risks Maps created of each scenario, we elaborated Predictions Maps for the confirmation period (2005-2008). These Prediction Maps were overlapped with the map showing real deforestation in the confirmation period. This map is represented by the Deforestation Map of 2008 in RRL that was created following the same criteria used for the other Coverage Maps of year 2000 and 2005, with the only difference that the secondary roads map of year 2007 was used given that is the current one.

To compare the predicted areas of each map versus the real deforestation seen in the Deforestation Map of 2008, the Figure of Merit (FOM) was calculated according to the following equation:

$$\text{FOM} = \frac{\text{CORRECT}}{\text{CORRECT} + \text{Err}_A + \text{Err}_B} \quad (\text{Eq. N}^\circ 15 \text{ BL-UP Module, VCS Modular Methodology})$$

Where,

CORRECT

Err_A

Err_B

Area correct due to observed change predicted as change; ha

Area of error due to observed change predicted as persistence; ha

Area of error due to observed persistence predicted as changed; ha

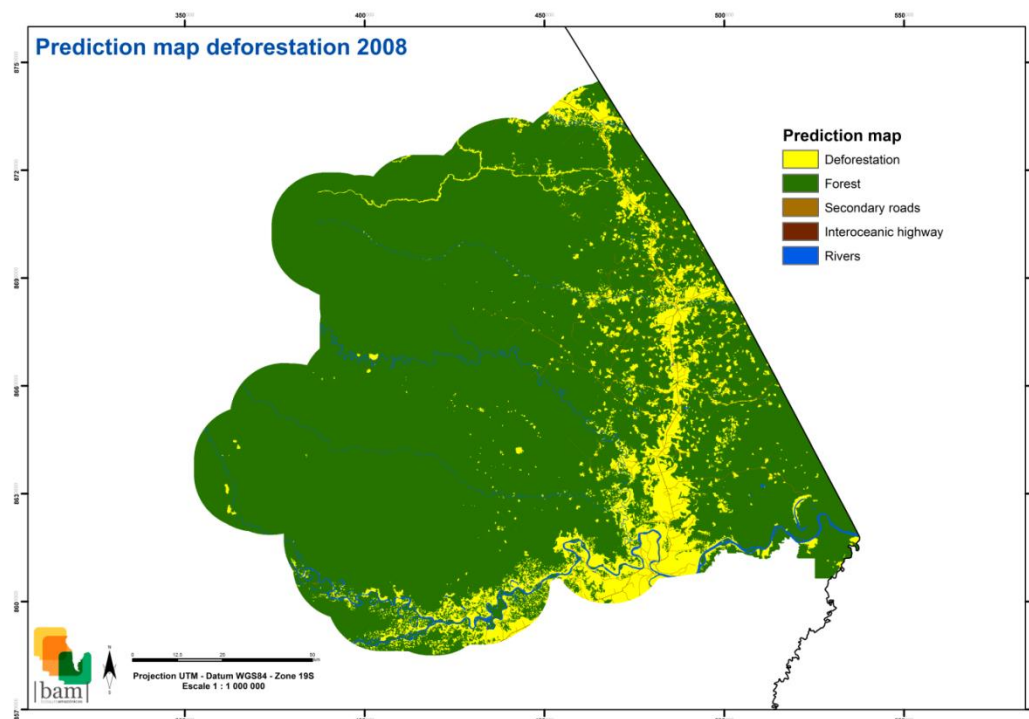
The results in Table 59 show that all the Prediction Maps have FOM values over 60%, which complies with the minimum limit of 40% for frontier deforestation. All Prediction Maps as well as the real Deforestation Map of 2008 in raster files are at disposition by request for further revision. The FOM calculations can be seen in the excel file *Castañeros REDD Project Calculations v5.xlsx*, spreadsheet *FOM*.

Table 59. FOM values for each simulation

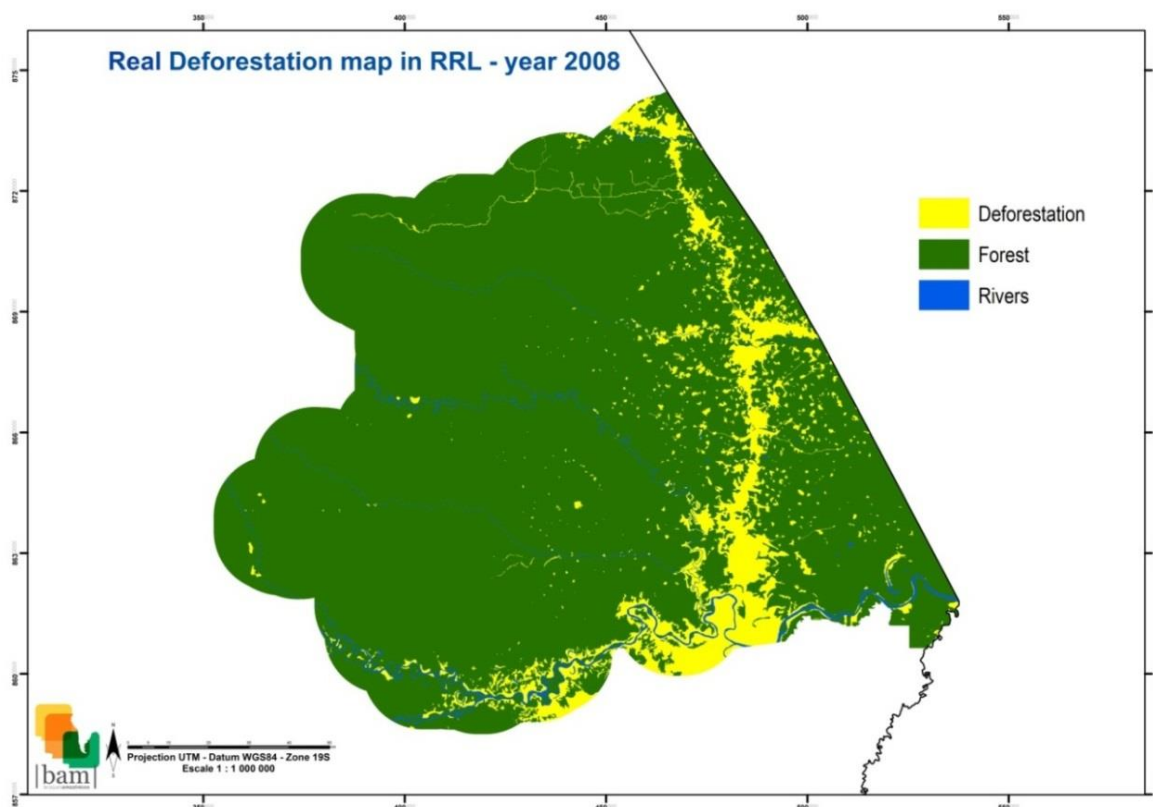
	Prediction Maps									
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8	Scenario 9	Scenario 10
Correct (ha)	147 575.3	147 265.8	149 309.4	149 402.6	146 559.5	149 611.3	147 254.2	148 169.6	146 421.4	146 210.7
Err_A (ha)	18 284.2	18 578.1	16 502.7	16 427.1	19 166.4	16 177.1	18 614.9	17 681.3	19 421.5	19 606.0
Err_B (ha)	46 091.9	46 363.6	44 222.7	44 067.4	47 060.8	43 833.0	46 250.7	45 505.6	47 316.8	47 513.4
FOM	0.696	0.694	0.711	0.712	0.689	0.714	0.694	0.701	0.687	0.685

The scenarios with the highest FOM values are S3, S4 and S6. However, the later uses ten factor maps while the first two use only nine. By comparing the correlation test results, it is evident that the factor *Productive Aptitude* (used in S4) tends to correlate with more factors, having therefore two correlation values near the maximum limit. On the other hand, S3 has only one (0.46 between Brazil nut concessions and vegetation) which is lower than the two before mentioned. For these reasons, we have chosen the Prediction Map from Scenario 3.

Map 27. Prediction Map of Scenario 3 of projected deforestation until year 2008



Map 28. Real Deforestation Map in RRL until year 2008

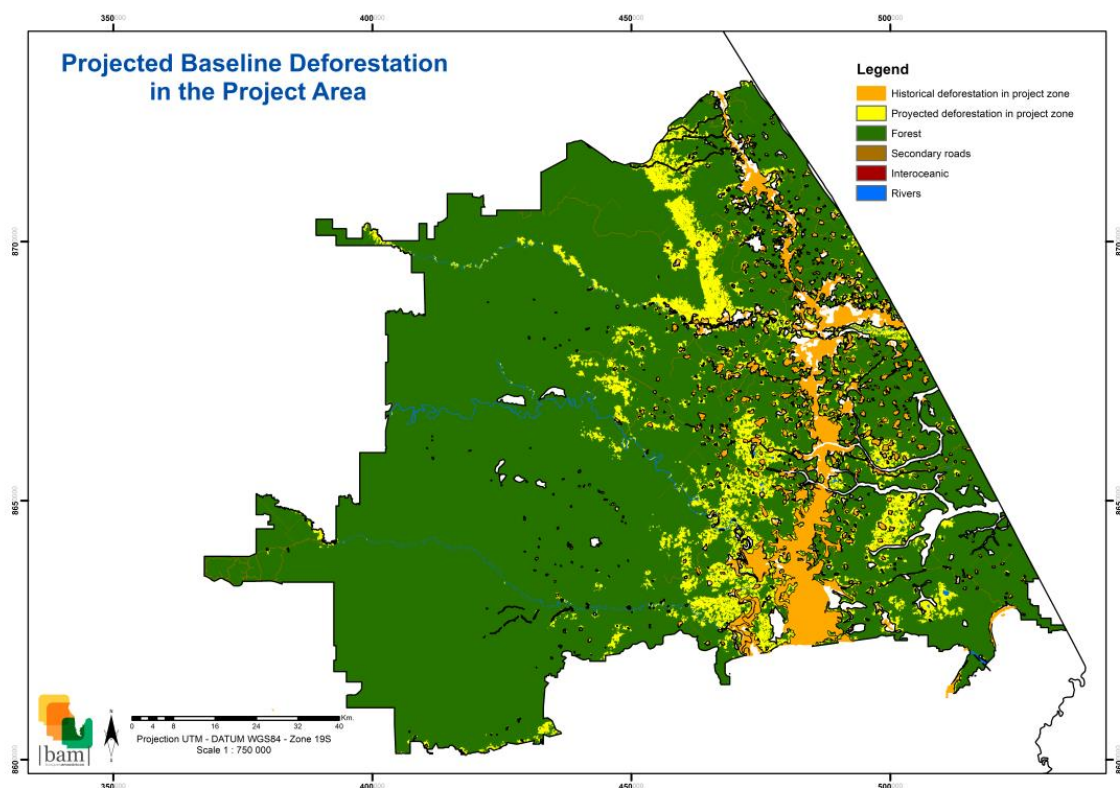


Projected Deforestation in Project Area

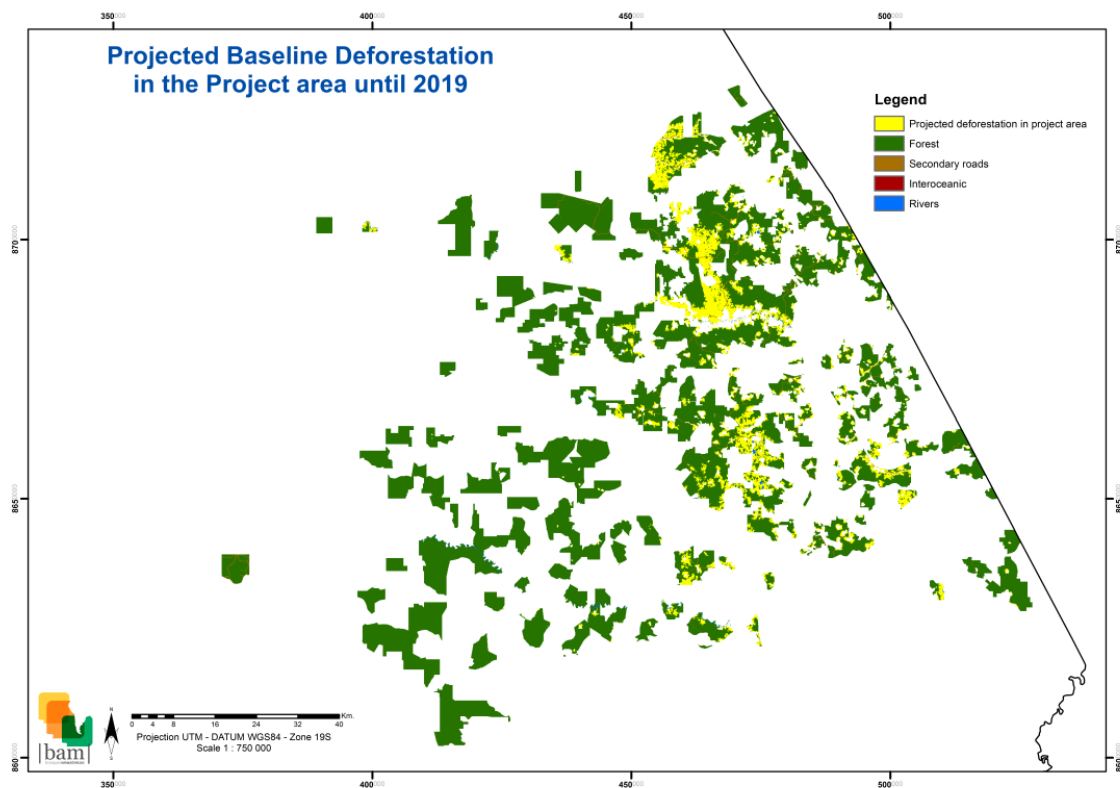
Once the fittest scenario was selected, we were able to project the baseline deforestation. The model allocates land use change, from forest to non-forest, in as many pixels (with the highest deforestation risk values) as needed to cover the amount of hectares to be deforested each year; which is based on the deforestation rates of each stratum. In this way, the software generates a map of baseline deforestation for year 1 in raster file for the whole Reference Region.

The process of creating Risk Maps, allocating deforestation and creating baseline deforestation maps was repeated for every year of the crediting period. However, the following maps and tables show the results of the first baseline period (first 10 years since the start of the project).

Map 29. Projected Deforestation in the Project Zone in Baseline Period



Map 30. Projected Deforestation in Project Area in Baseline Period



The resulting areas to be deforested in PA can be seen in the following table:

Table 60. Projected Deforestation in the Project Area per Strata

Annual areas deforested in each forest class within the <u>Project Area</u>									
<i>Strata i</i>		BTI	PA	BPT	BT	P	BCB	BPCB	SUM
T	Year	ha	ha	ha	ha	ha	ha	ha	Cumulative
1	2010	56.5	53.9	40.3	2 982.8	18.1	19.7	260.6	3 431.9
2	2011	100.3	84.7	180.5	5 938.3	52.4	41.8	514.7	6 912.7
3	2012	126.0	116.4	313.6	8 832.8	78.1	85.2	773.8	10 326.0
4	2013	166.9	159.8	469.3	12 029.8	110.9	143.7	1 082.8	14 163.2
5	2014	190.5	188.0	567.1	15 159.3	139.6	213.2	1 305.6	17 763.5
6	2015	246.5	229.4	676.0	18 274.1	182.5	312.5	1 617.7	21 538.7
7	2016	275.7	255.1	783.4	21 163.6	258.1	400.8	1 947.8	25 084.5
8	2017	303.0	315.6	896.3	23 927.1	350.3	457.7	2 242.2	28 492.2
9	2018	344.3	368.0	953.8	26 861.0	466.8	509.6	2 486.2	31 989.7
10	2019	382.1	435.0	1 035.9	29 542.3	564.1	556.5	2 712.1	35 228.0
11	2020	414.9	480.4	1 121.6	32 208.5	642.2	594.3	2 919.7	38 381.7
12	2021	450.7	527.8	1 208.8	34 860.0	723.4	658.4	3 105.3	41 534.3
13	2022	500.1	583.7	1 277.4	37 689.0	802.5	714.8	3 289.8	44 857.3
14	2023	565.1	659.9	1 373.2	40 284.1	885.7	804.5	3 487.9	48 060.4
15	2024	616.0	714.8	1 463.4	43 077.4	957.3	916.5	3 651.2	51 396.5
16	2025	653.3	802.0	1 538.5	45 865.5	1 027.9	1 032.4	3 788.3	54 708.0
17	2026	715.8	878.6	1 632.3	48 541.8	1 086.8	1 215.9	3 965.8	58 037.0
18	2027	746.6	953.8	1 733.1	51 276.5	1 124.1	1 364.1	4 186.0	61 384.3
19	2028	792.4	1 053.6	1 817.3	54 015.3	1 177.1	1 504.2	4 390.2	64 750.1
20	2029	834.3	1 112.5	1 882.8	56 623.5	1 257.7	1 653.4	4 565.1	67 929.5
21	2030	890.2	1 215.9	1 985.1	59 238.8	1 343.9	1 834.4	4 805.1	71 313.5
22	2031	949.7	1 331.3	2 055.7	61 983.1	1 397.4	1 984.1	5 015.8	74 717.2
23	2032	1 014.8	1 458.9	2 177.2	64 676.5	1 455.8	2 156.0	5 161.5	78 100.7
24	2033	1 050.5	1 553.6	2 303.7	67 336.7	1 529.4	2 373.3	5 345.0	81 492.3
25	2034	1 107.0	1 624.7	2 416.7	69 976.1	1 583.9	2 549.2	5 538.0	84 795.7
26	2035	1 137.2	1 742.7	2 530.6	72 812.2	1 606.1	2 808.3	5 748.8	88 385.9
27	2036	1 179.6	1 824.8	2 709.0	75 251.0	1 636.8	3 048.3	5 965.0	91 614.6
28	2037	1 236.1	1 902.0	2 863.3	77 805.8	1 672.6	3 292.3	6 145.5	94 917.5
29	2038	1 285.0	2 003.3	2 968.1	80 235.1	1 705.9	3 544.8	6 356.2	98 098.4
30	2039	1 329.3	2 118.7	3 137.5	82 679.5	1 755.3	3 768.1	6 540.7	101 329.1
31	2040	1 369.1	2 183.8	3 287.7	84 976.6	1 789.6	4 100.3	6 680.8	104 388.0

The first 3 years correspond to the deforestation in the original 377 concessions that made the Project Area. From year 2013 onwards, the projected deforestation for the 28 additional concessions is included. At the end of crediting period, we would have 104 388.0 hectares deforested in Project Area, in baseline scenario.

3.2 Carbon Pools and Sources Included in the Project

The Module Methodology VCS requires accounting for any significant reduction of the carbon stock in the project scenario, and any significant increase of the same in the baseline, of the following reservoirs:

Table 61: Carbon Pools Included and Excluded from the Project

Carbon Reservoirs	Included/ Excluded	Justification
Above-ground biomass (AGB)	Included	The ABG of trees and palm trees was estimated using a carbon inventory conducted in the AP. The AGB of non-arboreal vegetation is non-significant, therefore has been conservatively omitted. The AGB of vegetation in post-deforestation uses was taken from literature review.]
Below ground biomass (BGB)	Included	Included as being significant in tropical forests
Dead wood	Excluded	Is non-significant, therefore it has been conservatively omitted
Wood products	Excluded	The volume of harvested timber is similar at baseline as in the case of the project, since it has always been done under regulations. Furthermore, wood products are also the same in both cases (lumber); therefore, this reservoir has been conservatively omitted.
Leaf litter	Excluded	Is non-significant, therefore it has been conservatively omitted
Soil organic carbon (SOC)	Excluded	REDD-MF Module mentions that the exclusion of soil carbon is always a conservative measurement, has therefore been omitted

As seen in the table, we have included only the reservoirs that provide vegetation for trees, being required by methodology and more importantly, because they contain more than 95% of the total stock of the plot (not including soil carbon). Other reservoirs have been excluded because the results using carbon inventory in the Native Community of Belgium, and the significance tool of CDM-Executive Board, found that their contribution to the sum total of the stock is non-significant. This is explained in more detail in Annex 4.

In the case of the carbon of the soil, it has also been omitted because its presence is optional, and in this way simplifies the cost, time and complexity of field measurements.

The GHGs emission sources covered by the methodology and rationale for inclusion or exclusion in the project are:

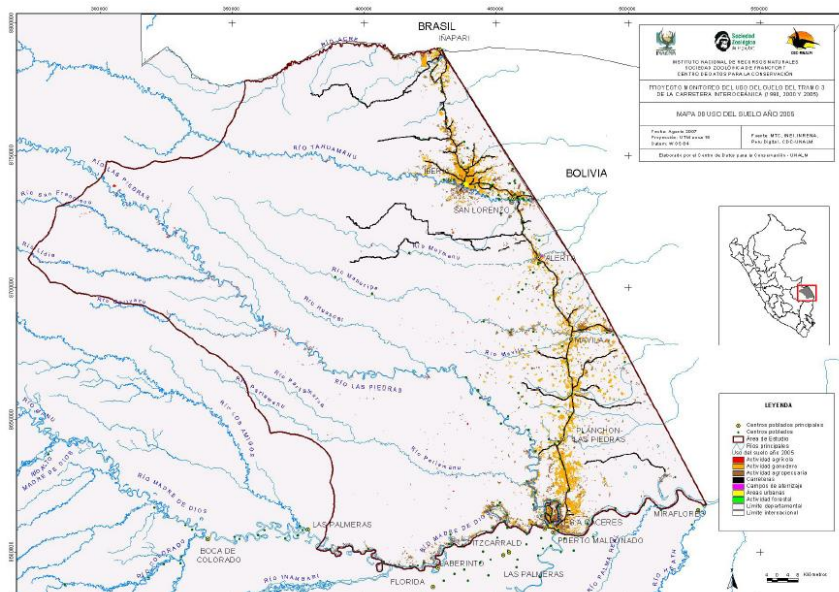
Table 62: GHGs Sources Included and Excluded from the Project

Sources	Gas	Included/ Excluded	Rationale
Biomass burning	CO ₂	Excluded	Already accounted in the carbon stock change
	CH ₄	Included	Biomass burning in forest strata, as part of the process of deforestation and burning of crop residues in agricultural areas
	N ₂ O	Included	Not included in the calculation ex-ante of the project, because there are no activities that include biomass burning. However will be monitored if they happen to be ex-post
Fossil Fuels *	CO ₂	Excluded	Not Included in Baseline as "insignificant" according to methodology Included in ex-ante estimations in the with-project case
Fertilizer Use	N ₂ O	Excluded	Excluded for there being no leakage prevention activity involving fertilization

3.3 Carbon Stock in Post-deforestation Land Uses

To determine the land use after deforestation, the study of the land use changes along the Stretch 3 of the IOS (CDC-SZF-INRENA, 2007)¹⁰⁸ was analyzed. This study was conducted using the methodology developed by the same authors to track Protected Natural Areas, and covers an area of 2 660 654 hectares, including the provinces of Tahuamanu and Tambopata. The analyzed period was 1990-2000-2005 with Landsat images (1990, 2000 and 2005) and additional CBERS images for 2005.

Map 31. Land use in the area of study along the Stretch 3 IOS, year 2005



Source: CDC-UNALM, SZF, INRENA. 2007

¹⁰⁸ CDC-UNALM, SZF, INRENA, 2007. Monitoring land use between Puerto Maldonado e Iñapari, corresponding to section 3 of the oceanic highway for years 1990,2000 y 2005. Lima, 45p. bailable on <http://www.ibcperu.org/doc/isis/11992.pdf>

The following table shows the monitoring results of degree of change in use in each year (1990, 2000 and 2005). It should be mentioned that agriculture is concentrated in areas near roads and river banks. "Farming" activity was established by study as the class that combines farming and livestock activities, because they either failed to discriminate between the two, or in many cases, because both were present in the area.

Table 63. Monitoring Results of post-deforestation land uses Stretch 3 of the IOS

Class	1990	2000	2005	Var. %
Forest	2 516 202	2 470 645	2 452 195	
Deforestation	56 795	102 197	120 783	
- Agriculture	949	3 587	4 074	3.37
- Pastures (livestock)	15 493	50 814	64 897	53.73
- agricultural	39 477	45 965	48 886	40.47
- Infrastructure	876	1 831	2 926	2.42

Source: CDC-SZF-INRENA, 2007. Self-elaboration

The trend of land use change in the post-deforestation scenario, assessed by the study mentioned in an area that includes and surrounds our Project Area, let us infer that the overall agricultural activity, is also the main cause of the deforestation in our PZ and that is constantly increasing.

Data from 1990 shows that Farming was the most common activity, followed by livestock and agriculture. In 2000, the three activities grew a lot (more than three times in the case of agriculture and livestock), and for 2005, both activities kept the expansion of their areas, but at a lower rate compared to the previous period. However, it is now evident that livestock is the most representative activity of deforested areas, being the only to grow at a positive rate, and has doubled its participation in deforestation from 27% in 1990 to 54% in 2005, while agriculture has reduced its stake from 70% to only 40% in the same period.

Pastures current representativeness can be confirmed by seeing the production areas of major crops in 2007, from the provinces of Tambopata and Tahuamanu (Table 64). These data helped validate the percentages of the study presented above.

Table 64. Production areas of major crops of Madre de Dios (2007)

Crop	Area	%
Pastures	15 673.0	60.8
paddy	4 278.2	16.6
Yellow corn	4 149.0	16.1
Dry bean grain	544.5	2.1
vegetables	88.5	0.3
Yucca	889.3	3.5
Other (Sweet potato, watermelon, soy and uncucha)	138.3	0.5
Total	25 760.7	100.0

Source: Agencia y Sede Agraria de MDD

The percentages in Table 63 will be used as the proportion that each post-deforestation land use identified occupy of the total future deforestation in the Project Zone:

- Agriculture	:	3.37%	} 100% of the Opportunity Cost Strata (CO+ and CO-)
- pastures (livestock)	:	53.73%	
- Farming	:	40.47%	
- Infrastructure (*)	:	2.42%	
(*) increase of urban areas, roads			

The above list does not include illegal mining, since the study did not cover the mining areas of the region. However, the 3.62% of AP has mining potential which will not be replaced by another use, therefore, the above percentages have been multiplied by the remaining 96.38% **(which do have agricultural potential)**, with the following final percentages:

- Agriculture	:	3.25%	} 100% of the total area
- pastures (livestock)	:	51.79%	
- Agriculture & grazing	:	39.01%	
- Infrastructure	:	2.32%	
And			
- Mining	:	3.62%	

Furthermore, for the calculation of carbon stock for post-deforestation uses, "Simple Approach" has been followed (Option 1) of BL-UP Module of the VCS Modular Methodology. To do this, we first reviewed the information of the National Agricultural Census of 2007, and found that the main crops in the region, based on the cultivated area of each (Table 64), are rice and corn, as agricultural products, and *Brachiaria decumbens*, as pasture. Then, we reviewed and compared studies¹⁰⁹ in the Amazon, on the carbon stock of such crops, and found the following:

Table 65. Carbon Stocks in Post-Deforestation Uses

Code	Post-Deforestation Land Use	$C_{post,i}$ t CO ₂ -e ha ⁻¹
DP	Deforestation for pastures (livestock)	18.63
DF	Deforestation for Farming	31.75
DI	Deforestation for Infrastructure	0.0
DA	Deforestation for Agriculture (corn)	31.75
DM	Deforestation for illegal mining	0.0

Corn was elected over Rice as the typical crop of the DA use, because its carbon stock is higher, something recommended by the methodology for being conservative in the estimates. In the same way, from being unable to calculate the stock of DF use because it is a combination of DA and DP, we preferred to match it to corn's carbon stock, instead of estimating a weighted average (between DA and DP), since it is a higher and more conservative value.

It should be stressed that for estimating post-deforestation stocks, it was not taken into account the reservoirs excluded from Baseline (soil carbon, litter and dead wood).

¹⁰⁹ Alegre, J. Arevalo, L. Ricse, A. Carbon stocks according to the use of the land at two sites in the Peruvian Amazon. Agroforestry for Animal Production in Latin America - II - Memoirs of the Second Electronic Conference (august of 2000-March of 2001) FAO.

Following are all the calculations made to estimate the total emissions in Baseline for unplanned deforestation. The period in which they are reported are the first ten years of the project, which constitute the first Baseline. After this period, the VCS Modular Methodology requires its revision and adjustment to the new conditions, if necessary. Full calculations can be revised in detail in the Excel document *Castaños REDD Project Calculations v5.xlsx*.

3.4 Calculation of Carbon Stock Change in Baseline

Based on the projected change of forest strata to post-deforestation uses, and considering the respective carbon stocks, the change in carbon stocks for Baseline in the Project Area was estimated. Within this calculation the carbon stock of timber products has not been included, because there is no commercial logging within the process of deforestation.

The equations used for the purposes thereof are:

$$\Delta C_{TOT} = C_{BSL} - C_{post} - C_{wp} \quad (\text{Eq. N° 18 BL-UP Module, Modular VCS Methodology})$$

$$C_{BSL} = \sum \sum ((C_{BSL,i}) * A_{unplanned,i,t}) \quad (\text{Eq. N° 19 BL-UP Module, VCS Modular Methodology})$$

$$C_{post} = \sum \sum ((C_{post,i}) * A_{unplanned,i,t}) \quad (\text{Eq. N° 20 BL-UP Module, VCS Modular Methodology})$$

Where,

ΔC_{TOT}	Sum of carbon stock changes in baseline, in all pools in year t^* ; t CO ₂ -e
C_{BSL}	Total forest carbon stock in deforested areas; t CO ₂ -e
C_{post}	Total post-deforestation carbon stock in deforested areas; t CO ₂ -e
C_{wp}	Total carbon stock in harvested wood products; t CO ₂ -e
$C_{BSL,i}$	Carbon stock of all pools in forest stratum i ; t CO ₂ -e
$A_{unplanned,i,t}$	Unplanned deforestation area in forest stratum i at time t ; ha
$C_{post,i}$	Carbon stock of all pools in post-deforestation stratum i ; t CO ₂ -e
$A_{unplanned,i,t}$	Area of unplanned deforestation in post-deforestation stratum i at time t ; ha
t	1,2,3,... t years as of the beginning of the REDD project
i	1,2,3, ... M strata

The cumulative results in the Project Area are 30 376 668 t CO₂ and 90 600 081 t CO₂, in the first 10 years and at the end of the accreditation period, respectively.

Table 66. Total Carbon Stock in Forest Strata in Project Area

Carbon stock changes in initial (pre-deforestation) forest classes in <u>Project Area</u>																Total C stock change in initial forests	
Strata <i>i</i>		BTI		PA		BPT		BT		P		BCB		BPCB		Cumulative	Annual
T	Year	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	t CO ₂ -e	t CO ₂ -e
1	2010	56	22 010	54	50 122	40	20 149	2 983	2 816 427	18	13 683	20	20 062	261	118 231	3 060 684	3 060 684
2	2011	100	39 108	85	78 695	180	90 168	5 938	5 607 150	52	39 529	42	42 695	515	233 489	6 130 835	3 070 151
3	2012	126	49 130	116	108 206	314	156 660	8 833	8 340 279	78	58 914	85	86 934	774	351 035	9 151 157	3 020 322
4	2013	167	65 048	160	148 491	469	234 486	12 030	11 359 001	111	83 619	144	146 604	1 083	491 220	12 528 469	3 377 312
5	2014	191	74 285	188	174 723	567	283 348	15 159	14 313 940	140	105 285	213	217 591	1 306	592 299	15 761 471	3 233 002
6	2015	247	96 098	229	213 134	676	337 751	18 274	17 255 076	182	137 592	313	318 928	1 618	733 857	19 092 436	3 330 965
7	2016	276	107 497	255	237 023	783	391 398	21 164	19 983 445	258	194 605	401	408 948	1 948	883 646	22 206 563	3 114 127
8	2017	303	118 109	316	293 234	896	447 816	23 927	22 592 816	350	264 162	458	467 076	2 242	1 017 200	25 200 412	2 993 849
9	2018	344	134 223	368	341 951	954	476 529	26 861	25 363 072	467	351 962	510	520 059	2 486	1 127 884	28 315 680	3 115 267
10	2019	382	148 962	435	404 251	1 036	517 583	29 542	27 894 857	564	425 319	557	567 898	2 712	1 230 336	31 189 207	2 873 527
11	2020	415	161 736	480	446 409	1 122	560 400	32 208	30 412 363	642	484 233	594	606 478	2 920	1 324 555	33 996 174	2 806 968
12	2021	451	175 689	528	490 441	1 209	603 973	34 860	32 916 065	723	545 427	658	671 807	3 105	1 408 712	36 812 114	2 815 939
13	2022	500	194 948	584	542 437	1 277	638 226	37 689	35 587 315	803	605 101	715	729 420	3 290	1 492 411	39 789 858	2 977 744
14	2023	565	220 299	660	613 169	1 373	686 081	40 284	38 037 706	886	667 816	805	820 983	3 488	1 582 285	42 628 338	2 838 481
15	2024	616	240 148	715	664 227	1 463	731 164	43 077	40 675 161	957	721 788	916	935 180	3 651	1 656 380	45 624 048	2 995 710
16	2025	653	254 690	802	745 265	1 539	768 692	45 866	43 307 856	1 028	775 001	1 032	1 053 492	3 788	1 718 583	48 623 578	2 999 530
17	2026	716	279 059	879	816 466	1 632	815 539	48 542	45 834 881	1 087	819 471	1 216	1 240 734	3 966	1 799 080	51 605 230	2 981 651
18	2027	747	291 046	954	886 261	1 733	865 912	51 277	48 417 121	1 124	847 598	1 364	1 391 967	4 186	1 899 017	54 598 923	2 993 693
19	2028	792	308 930	1 054	979 009	1 817	907 974	54 015	51 003 170	1 177	887 507	1 504	1 534 971	4 390	1 991 635	57 613 195	3 014 272
20	2029	834	325 241	1 113	1 033 815	1 883	940 716	56 624	53 465 936	1 258	948 321	1 653	1 687 233	4 565	2 070 989	60 472 252	2 859 057
21	2030	890	347 055	1 216	1 129 842	1 985	991 845	59 239	55 935 367	1 344	1 013 316	1 834	1 871 903	4 805	2 179 844	63 469 172	2 996 920
22	2031	950	370 244	1 331	1 237 112	2 056	1 027 106	61 983	58 526 651	1 397	1 053 606	1 984	2 024 680	5 016	2 275 435	66 514 833	3 045 661
23	2032	1 015	395 595	1 459	1 355 623	2 177	1 087 805	64 677	61 069 860	1 456	1 097 696	2 156	2 200 090	5 161	2 341 526	69 548 196	3 033 363
24	2033	1 051	409 548	1 554	1 443 687	2 304	1 151 023	67 337	63 581 654	1 529	1 153 189	2 373	2 421 797	5 345	2 424 768	72 585 666	3 037 470
25	2034	1 107	431 558	1 625	1 509 735	2 417	1 207 441	69 976	66 073 932	1 584	1 194 238	2 549	2 601 323	5 538	2 512 355	75 530 583	2 944 917
26	2035	1 137	443 349	1 743	1 619 347	2 531	1 264 363	72 812	68 751 846	1 606	1 210 962	2 808	2 865 724	5 749	2 607 946	78 763 538	3 232 955
27	2036	1 180	459 857	1 825	1 695 700	2 709	1 353 523	75 251	71 054 681	1 637	1 234 148	3 048	3 110 579	5 965	2 706 053	81 614 541	2 851 003
28	2037	1 236	481 867	1 902	1 767 369	2 863	1 430 594	77 806	73 466 993	1 673	1 261 134	3 292	3 359 549	6 145	2 787 923	84 555 429	2 940 888
29	2038	1 285	500 930	2 003	1 861 523	2 968	1 482 982	80 235	75 760 784	1 706	1 286 220	3 545	3 617 263	6 356	2 883 514	87 393 215	2 837 786
30	2039	1 329	518 224	2 119	1 968 792	3 138	1 567 608	82 679	78 068 854	1 755	1 323 468	3 768	3 845 143	6 541	2 967 214	90 259 303	2 866 088
31	2040	1 369	533 749	2 184	2 029 219	3 288	1 642 664	84 977	80 237 936	1 790	1 349 314	4 100	4 184 133	6 681	3 030 789	93 007 803	2 748 500

Table 67. Total Post-Deforestation Carbon Stock in Deforested Areas in Project Area

Carbon stock changes in final (post-deforestation) non forest classes in <u>Project Area</u>												Total C stock change in final post-deforestation classes	
Strata f		Deforestation for Pastures		Deforestation for Farming*		Deforestation for Agriculture (Corn)		Deforestation for Infrastructure		Deforestation for Illegal Mining		Cumulative	Annual
t	Year	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	ha	t CO ₂ -e	t CO ₂ -e	t CO ₂ -e
1	2010	1 777	33 110	1 339	42 506	112	3 542	80	-	124	-	79 157	79 157
2	2011	3 580	66 691	2 697	85 617	225	7 135	161	-	250	-	159 443	80 285
3	2012	5 347	99 621	4 028	127 891	336	10 658	240	-	374	-	238 170	78 727
4	2013	7 334	136 641	5 525	175 417	460	14 619	329	-	513	-	326 676	88 506
5	2014	9 199	171 375	6 929	220 007	577	18 335	412	-	643	-	409 717	83 041
6	2015	11 154	207 796	8 402	266 765	700	22 231	500	-	780	-	496 792	87 076
7	2016	12 990	242 005	9 785	310 681	815	25 891	582	-	908	-	578 578	81 785
8	2017	14 755	274 881	11 115	352 887	926	29 408	662	-	1 031	-	657 177	78 599
9	2018	16 566	308 623	12 479	396 204	1 040	33 018	743	-	1 158	-	737 846	80 669
10	2019	18 243	339 865	13 742	436 312	1 145	36 361	818	-	1 275	-	812 539	74 693
11	2020	19 876	370 290	14 972	475 372	1 248	39 616	891	-	1 389	-	885 278	72 739
12	2021	21 509	400 706	16 202	514 418	1 350	42 870	964	-	1 504	-	957 994	72 716
13	2022	23 229	432 765	17 498	555 575	1 458	46 300	1 042	-	1 624	-	1 034 640	76 646
14	2023	24 888	463 667	18 748	595 246	1 562	49 606	1 116	-	1 740	-	1 108 519	73 879
15	2024	26 616	495 852	20 049	636 565	1 671	53 049	1 193	-	1 861	-	1 185 467	76 948
16	2025	28 331	527 800	21 341	677 579	1 778	56 467	1 270	-	1 980	-	1 261 846	76 379
17	2026	30 055	559 917	22 640	718 811	1 887	59 903	1 348	-	2 101	-	1 338 631	76 786
18	2027	31 788	592 210	23 945	760 267	1 996	63 358	1 425	-	2 222	-	1 415 835	77 204
19	2028	33 531	624 682	25 258	801 955	2 105	66 832	1 504	-	2 344	-	1 493 470	77 634
20	2029	35 177	655 355	26 499	841 333	2 208	70 114	1 577	-	2 459	-	1 566 802	73 332
21	2030	36 930	688 003	27 819	883 245	2 318	73 607	1 656	-	2 582	-	1 644 855	78 053
22	2031	38 692	720 840	29 146	925 401	2 429	77 120	1 735	-	2 705	-	1 723 361	78 506
23	2032	40 445	753 483	30 466	967 307	2 539	80 612	1 814	-	2 827	-	1 801 403	78 041
24	2033	42 201	786 204	31 789	1 009 313	2 649	84 113	1 892	-	2 950	-	1 879 630	78 227
25	2034	43 912	818 073	33 078	1 050 227	2 757	87 522	1 969	-	3 070	-	1 955 822	76 193
26	2035	45 771	852 710	34 479	1 094 693	2 873	91 228	2 052	-	3 200	-	2 038 631	82 808
27	2036	47 443	883 860	35 738	1 134 682	2 978	94 561	2 127	-	3 316	-	2 113 103	74 472
28	2037	49 153	915 725	37 026	1 175 589	3 086	97 970	2 204	-	3 436	-	2 189 284	76 181
29	2038	50 800	946 412	38 267	1 214 986	3 189	101 253	2 278	-	3 551	-	2 262 651	73 367
30	2039	52 474	977 581	39 528	1 255 000	3 294	104 588	2 353	-	3 668	-	2 337 169	74 518
31	2040	54 058	1 007 092	40 721	1 292 885	3 394	107 745	2 424	-	3 779	-	2 407 722	70 553

Table 68. Sum of Baseline Carbon Stock Change in all Pools in Project Area

Classes		Total C stock change in initial forests		Total C stock change in final post-deforestation classes		Total baseline carbon stock change in <u>Project Area</u>	
		cumulative	annual	cumulative	annual	annual	cumulative
t	Year	t CO ₂ -e	t CO ₂ -e	t CO ₂ -e	t CO ₂ -e	tCO ₂ -e	tCO ₂ -e
1	2010	3 060 684	3 060 684	79 157	79 157	2 981 526	2 981 526
2	2011	6 130 835	3 070 151	159 443	80 285	2 989 866	5 971 392
3	2012	9 151 157	3 020 322	238 170	78 727	2 941 595	8 912 987
4	2013	12 528 469	3 377 312	326 676	88 506	3 288 807	12 201 794
5	2014	15 761 471	3 233 002	409 717	83 041	3 149 961	15 351 754
6	2015	19 092 436	3 330 965	496 792	87 076	3 243 889	18 595 644
7	2016	22 206 563	3 114 127	578 578	81 785	3 032 342	21 627 985
8	2017	25 200 412	2 993 849	657 177	78 599	2 915 250	24 543 235
9	2018	28 315 680	3 115 267	737 846	80 669	3 034 598	27 577 834
10	2019	31 189 207	2 873 527	812 539	74 693	2 798 834	30 376 668
11	2020	33 996 174	2 806 968	885 278	72 739	2 734 228	33 110 896
12	2021	36 812 114	2 815 939	957 994	72 716	2 743 223	35 854 120
13	2022	39 789 858	2 977 744	1 034 640	76 646	2 901 098	38 755 218
14	2023	42 628 338	2 838 481	1 108 519	73 879	2 764 602	41 519 820
15	2024	45 624 048	2 995 710	1 185 467	76 948	2 918 761	44 438 581
16	2025	48 623 578	2 999 530	1 261 846	76 379	2 923 152	47 361 733
17	2026	51 605 230	2 981 651	1 338 631	76 786	2 904 866	50 266 599
18	2027	54 598 923	2 993 693	1 415 835	77 204	2 916 489	53 183 087
19	2028	57 613 195	3 014 272	1 493 470	77 634	2 936 638	56 119 725
20	2029	60 472 252	2 859 057	1 566 802	73 332	2 785 725	58 905 450
21	2030	63 469 172	2 996 920	1 644 855	78 053	2 918 867	61 824 317
22	2031	66 514 833	3 045 661	1 723 361	78 506	2 967 155	64 791 472
23	2032	69 548 196	3 033 363	1 801 403	78 041	2 955 321	67 746 793
24	2033	72 585 666	3 037 470	1 879 630	78 227	2 959 243	70 706 037
25	2034	75 530 583	2 944 917	1 955 822	76 193	2 868 724	73 574 761
26	2035	78 763 538	3 232 955	2 038 631	82 808	3 150 147	76 724 907
27	2036	81 614 541	2 851 003	2 113 103	74 472	2 776 531	79 501 438
28	2037	84 555 429	2 940 888	2 189 284	76 181	2 864 707	82 366 145
29	2038	87 393 215	2 837 786	2 262 651	73 367	2 764 419	85 130 564
30	2039	90 259 303	2 866 088	2 337 169	74 518	2 791 570	87 922 134
31	2040	93 007 803	2 748 500	2 407 722	70 553	2 677 947	90 600 081

3.5 Non- CO₂ Gas Emissions in Baseline

The GHG emissions as a consequence of deforestation in Project Area are given by the sum of CO₂ emissions from fossil fuels combustion, GHG emissions from biomass burning and N₂O from nitrogen application.

$$GHG_{BSL,E} = \sum \sum (E_{FC,i,t} + E_{BiomassBurn,i,t} + N_2O_{direct-N,i,t}) \text{ (Eq. N° 22 BL-UP Module, VCS Modular Methodology)}$$

Where,

$GHG_{BSL,E}$	GHG emissions as a result of deforestation activities in PA in Baseline; t CO ₂ -e
$E_{FC,i,t}$	CO ₂ emission from fossil fuel combustion in stratum i in year t ; t CO ₂ -e
$E_{BiomassBurn,i,t}$	Non-CO ₂ emissions due to biomass burning as part of deforestation activities in stratum i in year t ; t CO ₂ -e
$N_2O_{direct-N,i,t}$	Direct N ₂ O emissions as a result of nitrogen application on the alternative land use within the project boundary in stratum i in year t , t CO ₂ -e

CO₂ Emissions from fossil fuel combustion

This calculation, according to the E-FFC Module is optional, unless the project emissions are higher than those of the Baseline are.

There is no information on the number of machines, equipment, trucks, among others, which may be incorporated annually because of farming and/or livestock activities during Baseline (after deforestation) in the Project Area. In addition, these activities usually are carried out in a small-scale or in self-consumption way for which much less machinery is used. Moreover, according to the E-FFC Module this source is optional. For the reasons detailed herein, it will not be included in the Baseline estimations.

N₂O Emissions by Nitrogen application

It is not expected the application of fertilizers in the agricultural and livestock areas because of their traditional management. Therefore, this source has not been included in the calculations.

Other GHG emissions from biomass burning

It has been considered the emissions of Methane (CH₄) and Nitrous Oxide (N₂O), resulting from biomass burning as part of deforestation and agricultural activities. The CO₂ emissions also generated in this process are not considered since they are already included in the previous calculation of carbon stock change.

The general formula for calculating GHG emissions from biomass burning is:

$$E_{BiomassBurn,i,t} = \sum_{g=1}^G \left(\left(A_{burn,i,t} * B_{i,t} * COMF_i * G_{g,i} \right) * 10^{-3} \right) * GWP_g$$

Eq. n°1 E-BB Module, VCS Modular Methodology

Where,

$E_{BiomassBurn,t}$	GHG emissions due to biomass burning as part of deforestation activities in stratum i in year t , t CO ₂ -e for each gas (CH ₄ , N ₂ O)
$A_{burn,i,t}$	Area burnt in stratum i in year t , has
$B_{i,t}$	Average biomass before burning in stratum i , year t , T m. s. ha-1
$COMF_i$	Combustion Factor, values from Table 2.6 of IPCC, 2006; dimensionless
$G_{g,i}$	Emission Factor, values from Table 2.5 of the IPCC, 2006; kg T-1 m. s. burned
GWP_g	Default values for CH ₄ and N ₂ O as IPCC SAR t CO ₂ -e / t gas g
g	1,2,3..... G greenhouse gases
i	1, 2, 3 ... M strata

t 1, 2, 3, ... t^* Years since the beginning of the project

The index values of the equation are presented below:

Table 69. Factors used for estimating CH₄ and N₂O emissions from biomass burning

Factors Type of vegetation	COMF dimensionless	For CH ₄		For N ₂ O	
		G Kg/t dry matter burnt	GWP t CO ₂ -e/t	G kg/t dry matter burnt	GWP t CO ₂ -e/t
Forest	0.5 Tropical Rain Forest Primary	6.8 Tropical forest	21	0.2 Tropical forest	310
Agriculture waste	0.8 corn	2.7		0.07	

Average aboveground biomass before burning is found with the following equation:

$$B_{i,t} = (C_{AB_tree,i,t} + C_{DWi,t} + C_{LL,i,t}) * 12/44 * (1/CF)$$

(Eq. N°2 E-BB Module, VCS Modular Methodology)

Where,

$B_{i,t}$	Average aboveground biomass before burning in stratum i in year t , t m. s. ha-1
$C_{AB_tree,i,t}$	Average carbon stock of the aboveground biomass of woody vegetation in stratum i in year t , t CO ₂ -e ha-1 (found by using CP-AB Module, Modular Methodology VCS)
$C_{DWi,t}$	Carbon stock of dead wood in stratum i , year t , t CO ₂ -e ha-1
$C_{LL,i,t}$	Carbon stock in litter in stratum i , year t , t CO ₂ -e ha-1
12/44	Inverted ratio of Molecular Weight of Carbon Dioxide to Carbon; t CO ₂ -e t C-1
CF	Carbon fraction of biomass t C t-1 m. s.
i	1, 2, 3 ... M strata
t	1, 2, 3, ... t^* years since the beginning of the project

Since pools of deadwood or litter in the project have not been considered, they were not considered in the equation.

The Carbon fraction for tree biomass in tropical forests is 0.49 t C / t m. s., and agricultural residues is 0.47 t C / t m. s, according to Table 4.3 of the IPCC, 2006.

The Biomass burning in the baseline occurs at two different times: during the process of deforestation, with the forest burning, and after settling post-deforestation activities, as annual burning of agricultural residues. Each is computed as follows:

a) Emissions from biomass burning in forest strata

It is estimated that in the Amazon, 55%¹¹⁰ of forest biomass is burned as part of the process of deforestation. This value is conservative when compared with that seen in practice, and

¹¹⁰ Map of Deforestation in the Peruvian Amazon, 2000. MINAM.

therefore it was considered that the same proportion would be burned in the areas to be deforested of the AP.

For this, first the carbon stock of each stratum (t CO₂-e/ha) was converted to in aboveground biomass (t dry matter/ha) using Equation No. 2 above written, and then multiplied by the factor of 0.55, thus obtaining the Average Biomass Over ground before burning. This result in turn, was multiplied by stratum deforested areas, and added to obtain over ground burned biomass per year throughout the AP. The results of this first step can be seen in Table 70.

Table 70: Biomass burning accumulated in baseline AP

Strata <i>i</i>		Biomass Burnt per Forest Strata = Area (ha) x 0.55 x AG biomass (t/ha)							Total
AG Biomass t/ha		BTI	PA	BPT	BT	P	BCB	BPCB	
T		Year							Cumulative
		t	t	t	t	t	t	t	
1	2010	5 434	12 374	4 974	695 300	3 378	4 953	29 188	755 600
2	2011	9 655	19 428	22 260	1 384 254	9 759	10 540	57 642	1 513 537
3	2012	12 129	26 713	38 675	2 058 989	14 544	21 462	86 661	2 259 173
4	2013	16 059	36 658	57 888	2 804 230	20 643	36 193	121 269	3 092 940
5	2014	18 339	43 134	69 951	3 533 725	25 992	53 717	146 223	3 891 081
6	2015	23 724	52 617	83 382	4 259 811	33 968	78 735	181 169	4 713 406
7	2016	26 538	58 515	96 626	4 933 372	48 043	100 958	218 148	5 482 200
8	2017	29 158	72 392	110 554	5 577 555	65 214	115 308	251 119	6 221 300
9	2018	33 136	84 418	117 642	6 261 456	86 890	128 388	278 444	6 990 375
10	2019	36 775	99 799	127 777	6 886 485	105 000	140 199	303 737	7 699 771
11	2020	39 928	110 206	138 348	7 507 990	119 544	149 723	326 997	8 392 736
12	2021	43 373	121 077	149 104	8 126 086	134 651	165 851	347 773	9 087 915
13	2022	48 127	133 913	157 561	8 785 545	149 383	180 074	368 436	9 823 039
14	2023	54 386	151 375	169 375	9 390 480	164 866	202 678	390 623	10 523 783
15	2024	59 286	163 980	180 505	10 041 597	178 190	230 871	408 915	11 263 343
16	2025	62 876	183 986	189 769	10 691 538	191 327	260 079	424 272	12 003 846
17	2026	68 892	201 563	201 335	11 315 392	202 305	306 304	444 144	12 739 935
18	2027	71 851	218 794	213 770	11 952 877	209 249	343 639	468 816	13 478 997
19	2028	76 266	241 691	224 154	12 591 303	219 101	378 943	491 681	14 223 139
20	2029	80 293	255 221	232 237	13 199 293	234 115	416 532	511 271	14 928 963
21	2030	85 678	278 927	244 860	13 808 929	250 160	462 122	538 145	15 668 821
22	2031	91 403	305 409	253 565	14 448 647	260 107	499 839	561 743	16 420 713
23	2032	97 662	334 667	268 550	15 076 496	270 991	543 143	578 059	17 169 568
24	2033	101 106	356 407	284 157	15 696 590	284 691	597 876	598 610	17 919 437
25	2034	106 540	372 713	298 085	16 311 866	294 825	642 196	620 233	18 646 457
26	2035	109 451	399 773	312 137	16 972 971	298 954	707 470	643 831	19 444 586
27	2036	113 526	418 622	334 148	17 541 478	304 678	767 918	668 051	20 148 422
28	2037	118 960	436 316	353 175	18 137 013	311 340	829 382	688 263	20 874 448
29	2038	123 666	459 560	366 108	18 703 288	317 533	893 004	711 862	21 575 020
30	2039	127 935	486 042	387 000	19 273 088	326 729	949 262	732 525	22 282 580
31	2040	131 768	500 959	405 529	19 808 575	333 109	1 032 949	748 220	22 961 110

Finally, the total amount of biomass burned is multiplied by the respective factors of Equation No. 1, to obtain CH₄ and N₂O emissions:

Table 71. GHGs Emissions from Biomass Burning in Forest Strata in Project Area

Strata <i>i</i>		Total GHG Emissions			
AG Biomass t/ha		CH ₄		N ₂ O	
T	Year	Cumulative t CO ₂ -e	Annual t CO ₂ -e	Cumulative t CO ₂ -e	Annual t CO ₂ -e
1	2010	53 950	53 950	23 424	23 424
2	2011	108 067	54 117	46 919	23 496
3	2012	161 305	53 238	70 034	23 115
4	2013	220 836	59 531	95 881	25 847
5	2014	277 823	56 987	120 624	24 742
6	2015	336 537	58 714	146 116	25 492
7	2016	391 429	54 892	169 948	23 833
8	2017	444 201	52 772	192 860	22 912
9	2018	499 113	54 912	216 702	23 841
10	2019	549 764	50 651	238 693	21 991
11	2020	599 241	49 478	260 175	21 482
12	2021	648 877	49 636	281 725	21 551
13	2022	701 365	52 488	304 514	22 789
14	2023	751 398	50 033	326 237	21 723
15	2024	804 203	52 805	349 164	22 926
16	2025	857 075	52 872	372 119	22 956
17	2026	909 631	52 557	394 938	22 819
18	2027	962 400	52 769	417 849	22 911
19	2028	1 015 532	53 132	440 917	23 068
20	2029	1 065 928	50 396	462 798	21 881
21	2030	1 118 754	52 826	485 733	22 936
22	2031	1 172 439	53 685	509 042	23 309
23	2032	1 225 907	53 468	532 257	23 215
24	2033	1 279 448	53 541	555 503	23 246
25	2034	1 331 357	51 909	578 040	22 538
26	2035	1 388 343	56 986	602 782	24 742
27	2036	1 438 597	50 254	624 601	21 819
28	2037	1 490 436	51 838	647 108	22 507
29	2038	1 540 456	50 021	668 826	21 718
30	2039	1 590 976	50 520	690 760	21 934
31	2040	1 639 423	48 447	711 794	21 034

b) Emissions from periodic burning of agricultural land

From the Analysis of land use post-deforestation, it is known that almost 100% of the deforested forest becomes agricultural areas, either as pasture and / or agriculture, and a small percentage becomes urban or infrastructure areas in general. Therefore, first the total area of projected deforestation by the module has been allocated in post-deforestation uses, according to the field ratio already explained above. This is evidenced in the following table.

Table 72: Post-Deforestation Land-Use Areas set out in the Project Area

Area of post-deforestation classes established on deforested areas within the Project Area							
Strata f		Deforestation for Pastures	Deforestation for Farming	Deforestation for Agriculture (Corn)	Deforestation for Infrastructure	Deforestation for Illegal Mining	Total
% historic		51.79%	39.01%	3.25%	2.32%	3.62%	Cumulative
T	Year	ha	ha	ha	ha	ha	ha
1	2010	1 777.2	1 338.8	111.6	79.7	124.2	3 431.9
2	2011	3 579.8	2 696.6	224.7	160.5	250.2	6 912.7
3	2012	5 347.3	4 028.1	335.7	239.8	373.8	10 326.0
4	2013	7 334.4	5 524.9	460.4	328.9	512.7	14 163.2
5	2014	9 198.9	6 929.4	577.5	412.5	643.0	17 763.5
6	2015	11 153.9	8 402.0	700.2	500.1	779.7	21 538.7
7	2016	12 990.1	9 785.2	815.5	582.5	908.1	25 084.5
8	2017	14 754.8	11 114.6	926.3	661.6	1 031.4	28 492.2
9	2018	16 565.9	12 478.9	1 039.9	742.8	1 158.0	31 989.7
10	2019	18 242.9	13 742.1	1 145.2	818.0	1 275.3	35 228.0
11	2020	19 876.0	14 972.3	1 247.7	891.2	1 389.4	38 381.7
12	2021	21 508.6	16 202.1	1 350.2	964.5	1 503.5	41 534.3
13	2022	23 229.5	17 498.4	1 458.3	1 041.6	1 623.8	44 857.3
14	2023	24 888.2	18 747.9	1 562.4	1 116.0	1 739.8	48 060.4
15	2024	26 615.8	20 049.3	1 670.8	1 193.5	1 860.6	51 396.5
16	2025	28 330.6	21 341.1	1 778.5	1 270.4	1 980.4	54 708.0
17	2026	30 054.6	22 639.7	1 886.7	1 347.7	2 100.9	58 037.0
18	2027	31 788.0	23 945.4	1 995.5	1 425.4	2 222.1	61 384.3
19	2028	33 531.0	25 258.4	2 105.0	1 503.5	2 344.0	64 750.1
20	2029	35 177.4	26 498.7	2 208.3	1 577.4	2 459.0	67 929.5
21	2030	36 929.9	27 818.7	2 318.3	1 655.9	2 581.5	71 313.5
22	2031	38 692.5	29 146.5	2 429.0	1 735.0	2 704.8	74 717.2
23	2032	40 444.6	30 466.4	2 539.0	1 813.5	2 827.2	78 100.7
24	2033	42 201.0	31 789.4	2 649.2	1 892.3	2 950.0	81 492.3
25	2034	43 911.6	33 078.0	2 756.6	1 969.0	3 069.6	84 795.7
26	2035	45 770.8	34 478.5	2 873.3	2 052.4	3 199.6	88 385.9
27	2036	47 442.8	35 738.0	2 978.3	2 127.3	3 316.4	91 614.6
28	2037	49 153.2	37 026.4	3 085.7	2 204.0	3 436.0	94 917.5
29	2038	50 800.4	38 267.3	3 189.1	2 277.9	3 551.2	98 098.4
30	2039	52 473.5	39 527.6	3 294.1	2 352.9	3 668.1	101 329.1
31	2040	54 057.6	40 720.8	3 393.5	2 424.0	3 778.8	104 388.0

From all of the uses presented, only the annual burning on Agricultural Land (DA) has been considered, although it can also be observed field burnings in pastures; thus obtaining conservative estimations. Consequently, the post-deforestation Burned Area equals the Agriculture Deforestation area.

The DA carbon stock corresponds to Corn, the most representative agricultural crop, and according to Alegre et al. (2000), is equal to 31.75 t CO₂/ha, of which 28.82 t CO₂/ha correspond

to the aboveground biomass. This value was converted into biomass values, using Equation N°2 and the Carbon Fraction for agricultural waste, resulting in 16.7 t dry matter/ha.

Finally, the aboveground biomass was multiplied by the factors in Equation N°1 obtaining the N₂O and CH₄ emissions.

Table 73. GHG Emissions from Biomass burning in Post-Deforestation Uses in Project Area

GHGs Emissions from Biomass Burning (from Agricultural wastes) in Project Area						
T	Year	Burnt Areas ha	CH ₄		N ₂ O	
			Cumulative t CO ₂ -e	Annual t CO ₂ -e	Cumulative t CO ₂ -e	Annual t CO ₂ -e
1	2010	111.6	84.63	84.63	32.39	32.39
2	2011	224.7	170.47	85.84	65.24	32.85
3	2012	335.7	254.64	84.17	97.46	32.21
4	2013	577.2	349.27	94.63	133.67	36.22
5	2014	694.3	438.05	88.78	167.65	33.98
6	2015	817.0	531.15	93.10	203.28	35.63
7	2016	932.3	618.59	87.44	236.75	33.47
8	2017	1 043.0	702.63	84.04	268.91	32.16
9	2018	1 156.7	788.88	86.25	301.92	33.01
10	2019	1 262.0	868.74	79.86	332.48	30.56
11	2020	1 364.5	946.51	77.77	362.24	29.76
12	2021	1 467.0	1 024.25	77.75	392.00	29.75
13	2022	1 575.1	1 106.20	81.95	423.36	31.36
14	2023	1 679.2	1 185.19	78.99	453.59	30.23
15	2024	1 787.6	1 267.46	82.27	485.08	31.49
16	2025	1 895.3	1 349.12	81.66	516.33	31.25
17	2026	2 003.5	1 431.22	82.10	547.75	31.42
18	2027	2 112.3	1 513.76	82.54	579.34	31.59
19	2028	2 221.8	1 596.76	83.00	611.11	31.77
20	2029	2 325.1	1 675.17	78.40	641.11	30.01
21	2030	2 435.1	1 758.62	83.45	673.05	31.94
22	2031	2 545.8	1 842.55	83.94	705.18	32.12
23	2032	2 655.8	1 925.99	83.44	737.11	31.93
24	2033	2 766.0	2 009.63	83.64	769.12	32.01
25	2034	2 873.4	2 091.09	81.46	800.30	31.18
26	2035	2 990.1	2 179.63	88.54	834.18	33.88
27	2036	3 095.1	2 259.25	79.62	864.65	30.47
28	2037	3 202.5	2 340.70	81.45	895.82	31.17
29	2038	3 305.9	2 419.14	78.44	925.85	30.02
30	2039	3 410.9	2 498.82	79.67	956.34	30.49
31	2040	3 510.3	2 574.25	75.43	985.21	28.87

The total GHG Emissions from biomass burning in the Project Area in Baseline are:

Table 74. Accumulated GHGs emitted in the AP in Baseline

<i>t</i>	year	Accumulated Greenhouse Gas Emissions in the Project Area in baseline (t CO ₂ -e) <i>GHG_{BSL,E}</i>
1	2010	77 490.46
2	2011	155 221.92
3	2012	231 691.42
4	2013	317 200.01
5	2014	399 052.37
6	2015	483 387.19
7	2016	562 232.57
8	2017	638 032.65
9	2018	716 905.21
10	2019	789 657.79
11	2020	860 724.87
12	2021	932 018.73
13	2022	1 007 408.78
14	2023	1 079 274.19
15	2024	1 155 118.86
16	2025	1 231 059.27
17	2026	1 306 548.30
18	2027	1 382 342.36
19	2028	1 458 657.29
20	2029	1 531 042.07
21	2030	1 606 918.97
22	2031	1 684 028.71
23	2032	1 760 826.85
24	2033	1 837 729.10
25	2034	1 912 288.62
26	2035	1 994 139.46
27	2036	2 066 322.30
28	2037	2 140 779.95
29	2038	2 212 627.06
30	2039	2 285 191.32
31	2040	2 354 777.13

3.6 Calculation of Net Emissions in Baseline

Previous results were aggregated with the following equations:

$$\Delta C_{BSL, unplanned} = \Delta C_{BSL, PA, unplanned} + GHG_{BSL, E} \quad (\text{Eq. N}^\circ 23 \text{ BL-UP Module, Modular VCS Methodology})$$

$$\Delta C_{BSL, PA, unplanned} = \Delta C_{TOT, PA} \quad (\text{Eq. N}^\circ 24 \text{ BL-UP Module, Modular VCS Methodology})$$

Where,

$\Delta C_{BSL, unplanned}$ Net GHG emissions in Baseline for unplanned deforestation; t CO₂-e

$\Delta C_{BSL, PA, unplanned}$ Net CO₂ emissions in Baseline for unplanned deforestation in the Project Area; t CO₂-e

$GHG_{BSL,E}$	GHG emissions resulting from deforestation activities within the Project Area in Baseline; t CO ₂ -e
$\Delta C_{TOT,PA}$	Sum of carbon stock changes in all reservoirs, at year t^* in PA, t CO ₂ -e

The total net GHG emissions in the Project Area in Baseline are 31 166 325.8 t CO₂-e in the first 10 years and 92 954 858.06 t CO₂-e during the entire accreditation period. The yearly cumulative emissions are presented in the following table:

Table 75. Net GHGs emissions in the Project Area for Unplanned Deforestation

T	Year	Cumulative Carbon Stock Change in Baseline (t CO ₂) $\Delta C_{BSL,PA,unplanned}$	Cumulative GHG Emissions in the Project Area in Baseline (t CO ₂ -e) $GHG_{BSL,E}$	Net GHG Emissions in Baseline from Unplanned Deforestation Cumulative (t CO ₂ -e) $\Delta C_{BSL,unplanned}$
1	2010	2 981 526.18	77 490.46	3 059 016.64
2	2011	5 971 391.74	155 221.92	6 126 613.66
3	2012	8 912 986.86	231 691.42	9 144 678.28
4	2013	12 201 793.53	317 200.01	12 518 993.54
5	2014	15 351 754.12	399 052.37	15 750 806.49
6	2015	18 595 643.50	483 387.19	19 079 030.69
7	2016	21 627 985.49	562 232.57	22 190 218.06
8	2017	24 543 235.18	638 032.65	25 181 267.82
9	2018	27 577 833.66	716 905.21	28 294 738.86
10	2019	30 376 667.99	789 657.79	31 166 325.78
11	2020	33 110 896.27	860 724.87	33 971 621.15
12	2021	35 854 119.67	932 018.73	36 786 138.40
13	2022	38 755 217.75	1 007 408.78	39 762 626.53
14	2023	41 519 819.74	1 079 274.19	42 599 093.94
15	2024	44 438 581.07	1 155 118.86	45 593 699.93
16	2025	47 361 732.77	1 231 059.27	48 592 792.04
17	2026	50 266 598.62	1 306 548.30	51 573 146.92
18	2027	53 183 087.24	1 382 342.36	54 565 429.60
19	2028	56 119 724.82	1 458 657.29	57 578 382.12
20	2029	58 905 449.91	1 531 042.07	60 436 491.98
21	2030	61 824 317.20	1 606 918.97	63 431 236.17
22	2031	64 791 472.13	1 684 028.71	66 475 500.84
23	2032	67 746 793.46	1 760 826.85	69 507 620.30
24	2033	70 706 036.51	1 837 729.10	72 543 765.62
25	2034	73 574 760.60	1 912 288.62	75 487 049.22
26	2035	76 724 907.23	1 994 139.46	78 719 046.69
27	2036	79 501 438.07	2 066 322.30	81 567 760.37
28	2037	82 366 145.28	2 140 779.95	84 506 925.24
29	2038	85 130 564.43	2 212 627.06	87 343 191.48
30	2039	87 922 134.01	2 285 191.32	90 207 325.33
31	2040	90 600 080.93	2 354 777.13	92 954 858.06

These Baseline emissions will be compared with the results of each monitoring period in order to find real reductions attributable to the project. It is also necessary to remember that Baseline estimates will be adjusted every 10 years.

4. Land Use Scenario “Without Project” and Communities

As seen in Map 29, the area located at the edges of the road are the ones that will be deforested in the near future, presenting the strongest intensity to the southern area of the Project Area. The first areas impacted by deforestation are those located near Puerto Maldonado.

This sequence of deforestation affects mainly to communities who depend of forest resources. It is known that more than 30% of the population living in the Project Zone, especially the districts of Laberinto, will affect negatively the food safety and the means of subsistence of the communities in the Project Zone, mainly because the quality and quantity of natural stock mainly provided by Brazil nut forests will decrease dramatically. This is evidenced by the high demand and use of water from rivers and streams and underground sources for their daily life in the districts of Las Piedras and Tahuamanu. The pressure on the timber resource is even more dramatic in the homes of the Project Zone, the type of energy used to cook food indicates a high consumption of firewood and charcoal: 7.12, and 23.77% for Tambopata, 48.93 and 25.79% in Las Piedras, 33.07 and 26.90% in Laberinto and 49.35% in 24.95% in Tahuamanu. Also, the construction of houses in the Project Zone primarily includes wood from forest: 49.56% in Tambopata, 92.68% Las Piedras, 86.79% in Laberinto, 90.79% in Tahuamanu.

In the southern part of the Project Zone, where the native communities Tres Islas and San Jacinto are located, would be the first affected by deforestation. There are also conservation concessions near the town of El Triunfo that will be affected and those located near the community of Shiringayoc.

Poverty will increase since deforested areas lead to poverty of the resident given that migratory agriculture or mining activities are not sustainable in the long term. Other sustainable activities such as ecotourism would not be possible.

5. Land Use Scenario “Without Project” and Biodiversity

According to the deforestation model, a projection of 107,980.7 hectares would be lost by year 2040, which represents 34.9% of total area of the Project. This expected loss caused by uncontrolled traditional activities (agriculture, cattle ranching, illegal mining, etc.) would affect the biological processes of flora and fauna species, causing degradation of the ecosystems.

The permanent loss and the fragmentation of the habitat would cause the isolation of flora and fauna species cutting the connectivity. This would increase the endogamy (reducing the genetic diversity), the infertile or unfeasible population (reducing the total population), the amount of species under threat and their degree of threat (by uncontrolled hunting or exploitation); and feeding and nesting sites would be damaged. All these impacts would be negative for biodiversity of the project area.

The loss of Brazil nut forests and the less production of Brazil nut trees would affect negatively the local economy, as it is source of employment of more than 30% of total population of Madre de Dios. This would increase the risk that Brazil nut harvesters change to other economic

activities as illegal logging, illegal mining, etc. The loss of these forests would damage the river basins, hydric regulation and climatic regulation, biological control, climate change, etc.

G3. Project Design and Goals

1. Project Objectives in the Areas of Climate, Community and Biodiversity

1.1 General Objective

The project aims to significantly reduce the deforestation in the forests of the Brazil nuts concessions in Madre de Dios and protect the existing biodiversity in the Project Zone while contributing to the sustainable development of local people.

Currently, the concessionaires only undertake subsistence Brazil nuts collection and, in very few cases, subsistence forestry within the project area. The project will reduce deforestation through activities directed at increasing the concessionaires' sustainable income and adding value to their forest. This, in turn, will allow the concessionaires to mitigate and oppose the main deforestation threats present in the area.

1.2 Climate Objectives

- Significantly reduce GHG emissions caused by deforestation and degradation in Brazil nut concessions of Madre de Dios.
- Decrease the trend of deforestation in the Project Zone.

1.3 Objectives vis-à-vis Community

- Strengthen the organization and capabilities of Brazil nut concessionaires for sustainable management and monitoring of their concessions.
- Improve the income of Brazil nut harvesters and of the communities of the Project Zone by increasing the value-added of their products.
- Contribute to maintaining and improving the quality of life of the communities in the Project Zone.
- To provide work opportunities for the families of the Brazil nut concessionaires during the 8 months of the year when Brazil nut harvesting is not performed.

1.4 Objectives for the Biodiversity

- Guarantee and maintain the integrity of biological diversity and ecological processes in the Brazil nut concessions and the wider Project Zone.

2. Project Results and Activities

2.1 Climate Component

Result 1. Significantly reduced GHG emissions caused by deforestation (according to the deforestation model) in the Brazil nut forests of Madre de Dios.

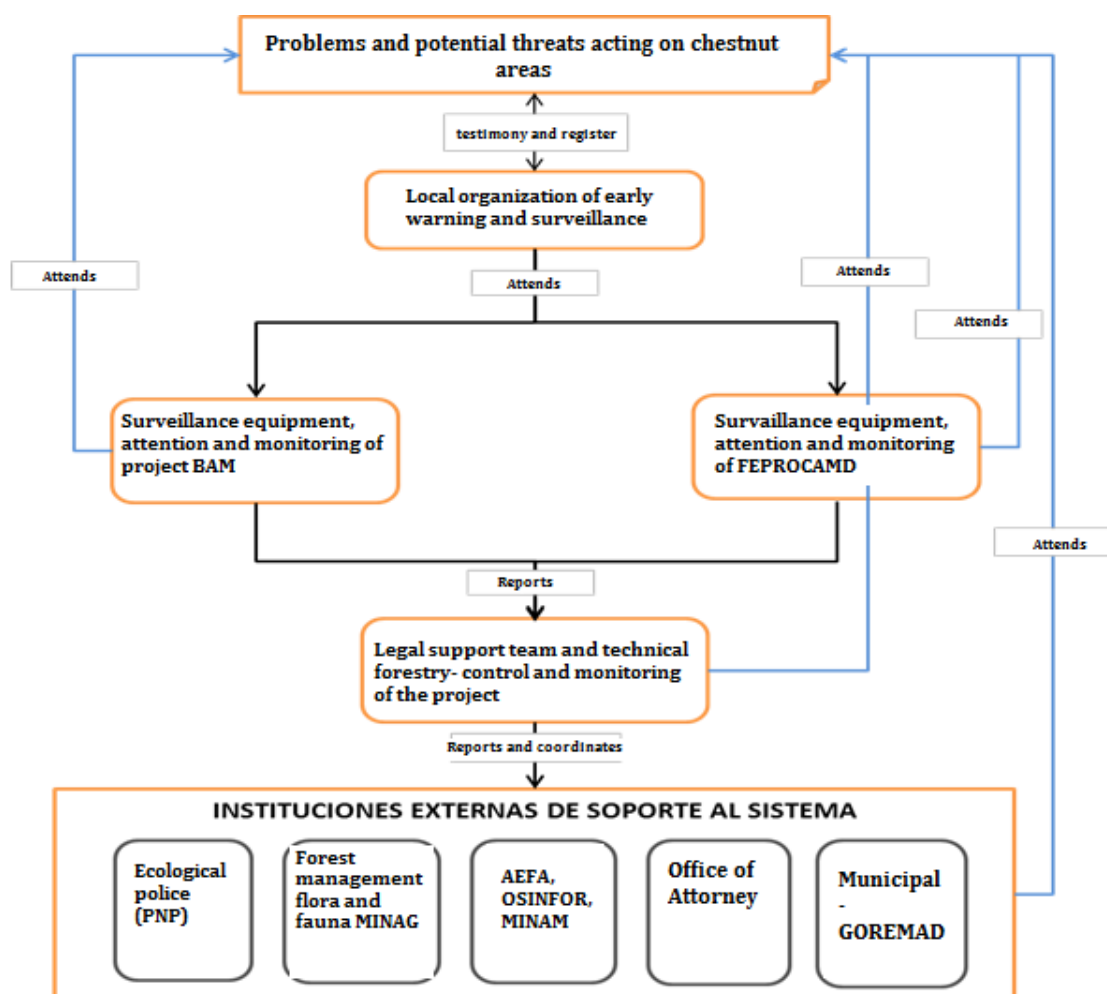
To achieve this result two main activities are executed:

A1. Control System and Monitoring Implementation of Forest

The Control System and Monitoring of the Forest will be launched where, the immediate goal is that at the end of the third year of the project initiation of the operation of the system of control and surveillance has been implemented, with checkpoints, necessary equipment and trained personnel. The project will develop a Monitoring and Control System of Brazil nut areas, which has as main actions, the following:

- 1. Diffusion and training of the control and surveillance system.** From the beginning of the implementation of the monitoring system, the project will spread, sensitize and train, with the participation of the Brazil nut organization, in the implementation of the C&V system, its components, and its strategy and functioning, to the local people, especially to the authorities, local leaders and groups present in the Project Zone.
Likewise, specialized training will be provided to developers of checkpoints in registration cases, reference and counter-reference system, conflict resolution, etc.
These outreach work and training will be conducted through workshops, introductory meetings, publicity spots, advertisements in the media, etc., steadily both in the implementation phases as the startup of the system.
- 2. Organization of Control and Surveillance System.** System Control and Monitoring Brazil nut areas, will be organized according to the following diagram:

Figure 21: Control and Forest Monitoring System



The Control and Monitoring System has the following components:

- Local early warning and surveillance.
- Surveillance Equipment, reporting and primary attention (both the project and the FEPROCAMD)
- specialized Team in handling cases and threats of the Brazil nut concessions.
- Institutional support system.

As shown in the Figure 19, these players organize and act in seeks to solve (for types and degrees of complexity) threats of the forests and will maintain a coordination and report (reference and counter) which will focus on the specialized C&V equipment of the project (located in the office of BAM in Puerto Maldonado).

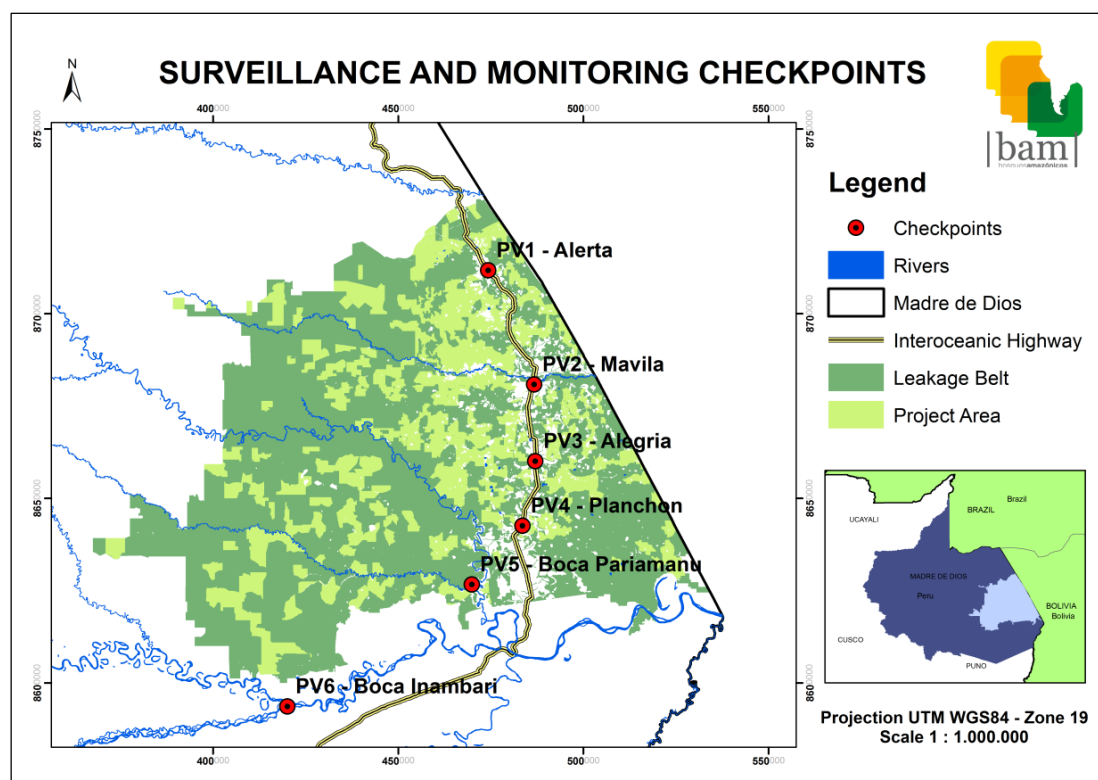
3. **Organization of Brazil nut harvesters for monitoring and surveillance.** The C&V system considers the relevant participation of organized Brazil nut harvesters as system basis. In this sense, the project will promote that the Brazil nut organizations implement **appropriate organizational forms for the surveillance and early warning systems** as well as the mechanisms and procedures for monitoring, care and case and conflict resolution.

In each Brazil nut sector, strategically, organizational forms will be promoted (the same local associations could assume on new roles) whose role would be surveillance, early referral and response (quick service), of the problems and threats identified. According to the type and seriousness of the threat, the reference will be derived to instances of Brazil nut organization and / or project Watchers.

It is expected that FEPROCAMD form a team or *Forest Monitoring Committee* to defend and manage complex cases that require an intervention or political organizational level.

4. **Checkpoints building.** Six permanent posts will be installed that will have the functions of monitor, provide information, record and attention of cases. These checkpoints would be managed and will have the recognition of the region's forest authorities (Forest department-GOREMAD) and will be strategically located in (or close to) agricultural offices and in major population centers in the Project Zone. Each monitoring center space will define a control space and design routes for monitoring Brazil nut areas.

Map 32. Location of control and surveillance checkpoints



We have determined the following checkpoints:

- a. PV1. Alerta C&V post: strategic location for being the last local town center of importance that has coverage of the Brazil nut concessions sector. Here is a station of the Agrarian Direction (Forestry Office) with which is worked in coordination. From here, it is possible to access sectors as La Novia, Tahuamanu, etc.
- b. PV2. Mavila C&V post: Strategic location for being the second town of importance on the road and access point of other Brazil nut sectors. Here is the one surveillance post of the

Directorate of Agriculture (Forestry Office). From here, it is possible to access other Brazil nut sectors as Shiringayoc, Nuevo Aposento, etc.

- c. PV3. Alegria C&V post: Another important town located on the margins of the XX km transoceanic highway. From that site, other important Brazil nut sectors such as Loreto, Nuevo San Juan, San Carlos, Varsovia, etc. are accessible.
- d. PV4. Planchón C&V post: Strategic location for being district capital of Las Piedras, where the agricultural site is also located (Forestry Office) of the Department of Agriculture. From that site, other important Brazil nut sectors like Savaluyoc, Lake Valencia, etc. are accessible.
- e. PV5. Boca Pariamanu C&V post: strategic zone from where the Brazil nut sector will be monitored which has access from Pariamanu and Las Piedras Rivers. This is a point of convergence and access to the Madre de Dios River, direct way for Brazil nut production to Puerto Maldonado. The main threats to be controlled will be the mining activity and illegal loggers.
- f. PV6. Boca Inambari C&V post: strategic zone to monitor the Brazil nut areas of Laberinto, Garrapatayoc, etc. This zone shall be designed unlike the other points, which previous to its installation there will be a coordination with relevant authorities and alliance with other organizations for feasibility and implementation. The threat to control is illegal mining and the favored strategy for this zone is the promotion and dissemination of reforestation projects low impact mining.

- 5. Equipment Implementation and monitoring and surveillance resources.** Based on the six implemented checkpoints, 6 control and surveillance teams will be organized consisting of 2-3 technicians. The 06 checkpoints will have machinery and equipment required for the control actions and surveillance, including:

- 02 communication equipment.
- 06 personal radios for personnel of the control posts
- 01 outboard motors for the control posts: PV6.
- 03 Peque-peque for the control posts PV2 y PV5
- 04 Motors for the control posts: PV1, PV2, PV3, PV4
- 02 camcorders for the posts: PV1, PV2.
- 03 picture camera: PV2, PV3, PV4
- 02 chainsaws
- 06 Equipment for maintenance of trails, each team consisting of 2 machetes, 2 winchas and flashlights

- 6. Implementation of action protocols.** The control system and surveillance will count with protocols, guidelines and manuals required for its post implementation. Protocols for collecting information and registration, reference and counter referral, field monitoring protocols, and security measures, etc.

Participants will be trained in the use of these protocols. Example: camera handling, first aid, handling formats, etc. All these aspects will be required to sustain an adequate defense or case management against threats of deforestation.

- 7. Generation of external supports to the monitoring system.** When cases outweigh the prompt attention of the control and monitoring centers and specialized care project support team (forestry, legal and social), the project will resort to external support institutions, such as institutions and organizations responsible for the case and related organizations.

To count with the institutions support, the project will count with alliances and inter-institutional agreements that ensure the timely, appropriate and legitimate resolution of the cases. Agreements and alliances will be done with the Regional Government, the Forestry Direction, OSINFOR regional office, district municipalities, etc.

A2. Training to deforestation agents in productive alternatives, sustainable projects (farmers) Environmental Education and Environmental Management Plans (PAMAS) (miners)

Even though in each of the components training activities has been included for communities in the Project Zone and project staff, as part of the strategy of control and surveillance of Brazil nut areas, it is considered to develop a series of specialized training (in the forest theme, agricultural and environmental) and focused (on potential agents of deforestation).

The trainings will be developed under a training plan. **Potential agents of deforestation** will be trained (farmers, foresters, miners and local people) in techniques to improving the soil management, agroforestry, agricultural eco-business and sustainable projects (especially farmers) and environmental education, waste management and PAMAS (especially the mining population).

The training activity is a measure to reduce the pressure on land, stop the advance of the agricultural frontier and reassess intervened forest areas and / or with little intervention. In order to reduce the tendency of deforestation in areas of the Project Zone, will seek to promote sustainable activities to major agents of deforestation in the zone.

Likewise, we will seek partnerships with private and public organizations for the development of projects or investments with productive economic activities of alternative sustainable development to the deforestation activities. Similarly, partnerships will be sought for the training and empowerment processes and management of activities identified as deforested.

Result 2. The leakage in the Project Zone has softened.

To achieve this result, the following activities will be launched:

A1. Establishment of the Nursery

One of the project's activities is the design, construction and operationalization of a permanent nursery. The nursery will be used for artificial regeneration and its aim will be to help reforest and enrich the Brazil nut concession.

The intention is to reach an annual production of 100,000 seedlings.

For the development of this activity, the following actions have been identified:

- Identification of seed trees
- Seed Collection
- Construction of the Nursery
- Production of seedlings
- Capacity-building in seedling production

The nursery will have an area of 1 ha and could be established in the School of Agricultural Raul Vargas Quiroz Village of Alegría, through an agreement with the institution that already has a

nursery, which could not be maintained due to lack of resources. If the nursery were located there, many advantages could be harnessed since the students would be in charge of the seedling production (with supervision of a forester technician), as part of their pre-professional practices and at the same time, saving transportation and personnel costs, since the village is located in the center of the Project Zone.

The maximum design capacity is of 120 000 seedlings per year, of which an estimated 20 000 are for security to cover possible losses generated in the different stages of the process. This will be accomplished in two stages: in a first stage, half of the maximum capacity will be built (0.5 ha and 60 000 seedlings per year) and in a second stage, when the capacity of the first phase is overtaken by the increasing demand of seedlings. The nursery Technology will be intermediate, including irrigation in dry season and fertilizer application. The staff of Bosques Amazónicos and local workers to be hired will directly coordinate this activity.

Regarding forest species to be produced, the most interesting, commercial, native species for the concessionaires are: Tornillo (*Cedrelinga catenaeformis*), Shihuahuaco (*Dipteryx odorata*) and Brazil nut (*Bertholletia excelsa*) although other species may be included.

The seeds will come from the concessions since they are natural forests with presence of these species. The trees identified as hotbeds will be geo-referenced and seed collection will be made according to the flowering period of each species.

The delivery of seeds will go from Alegría to different population centers across the Interoceanic by trucks. Since the number of seeds per concessionaire is not very big, they will easily transport their own plants to their concessions. This will mean savings in transportation costs and fuel consumption since high-capacity vehicles will be used only on paved road of the IOS.

The Forest engineer Jorge Chavez, who also directs the forest plantation and nursery project Campo Verde, validated under the VCS standard in 2009, will conduct the design and final supervision.

A2. Implementation of measures for the mitigation of leakage

In case that leakage is caused by the project, measures for forecasting and / or mitigation will be applied by **expanding the C&V system and the training of the Project Zone**. It is anticipated that in the eighth year of the project, the monitoring and control system has been extended to the Project Zone.

The project has identified leakage by type of actors and by threatened areas. The growing trend of slashing and burning of agricultural biomass, which is set at the edges along the Interoceanic highway (area mainly covered by agricultural land) and secondary roads in the Project Zone (area covered by Brazil nut concessions and farms), are the main factors acting and mobilizing of deforestation that will be controlled by the project. Actors who are diverted by this control could be constituted as leakage of the project and could be threats of the following areas within the Project Zone:

Other Brazil nut Concessions

As mentioned, the non-timber-Brazil nut forest concessions located at the top of the Madre de Dios River, exceeds the 1,000 units. These concessions would be potential areas if affected by the project leakage.

Forested Areas of Agricultural Land

The surrounding agricultural land have forest areas susceptible to be threatened by the leakage of the project.

Another threatening factor to be controlled is the growing trend of mining activity expanding from riverbeds of Tahuamanu and Madre de Dios Rivers to adjacent forests, either by invasion of areas or by the validity and application of the Emergency Decree No. 012-2010 (which includes areas of Brazil nut concessionaire, with mining activity potential).

No probable leakage was estimated out of the national boundaries, meaning the border with Bolivia, according to the majority of available methodologies.

2.2 Community Component

Community Result 1. FEPROCAMD has a formal and efficient organization for the defense and management interests of the Brazil nut concessionaires under a REDD mechanism.

A1 FEPROCAMD legal Formalization and Organization

The Brazil nut concessionaires of Madre de Dios have had and have various ways to organize as collective, in order to better utilize their product, defend their areas, obtain better prices in the market, ensure the management of their forests, etc. In this sense, the project has realized that, to the extent that such organization is legally constituted and recognized, their needs and interests will be satisfied and their goals fulfilled. The idea of investing in their organizational fortress by combining it with the protection and legal security of the same results in the following actions:

The project will work with organizations of Brazil nut in legal training to formalize their social institutions, meaning legal review of their associative documents, planning meetings for decision making and, finally, the registration of their organizations.

By March 2010, we obtained the formalization of eleven associations that also had their respective registration as well as updated documentation of their institutional life that sustained the story of their organizations.

The notary and registration paperwork for the subsequent registration of FEPROCAMD began in March and ended in April 2010, successfully fulfilling the legal formalization of the federation. It should be noted that all activities to fulfill the goal described above were led by the BAM and FEPROCAMD. BAM's role was to advise and train at all times, officials/social leaders belonging to each of the associations that today make up the FEPROCAMD.

FEPROCAMD association members identified as top priority the need to identify and define the areas granted in concession for its protection, defense and good handling. In this scenario, the main concern was the development of a database that gathered the essential documentation to prove ownership of their concessions Castañeros as well as fulfilling their commitments forest management with the Peruvian government.

To the date, the FEPROCAMD organization is legally constituted and is duly registered in public records. In addition, BAM and FEPROCAMD count with administrative documentation of each concession as well as updated management tools of each of the Brazil nut harvester. This will

serve to pursue the defense and support in managing Brazil nut areas. The legal defense of the areas of Brazil nut concessions is performed first with the identification of the areas of concessions and the problems that might exist in some of them.

FEPROCAMD members are: i) Brazil nut Producers Association and Agro-Forestry from Alerta - APROCAAL-, ii) Forest and Agricultural Extractors Producers Association of la Novia, iii) Brazil nut Producers And Extractors Association of Loreto-APECAL -iv) Agroforestry Brazil nut Association of Varsovia ASOCASVAR-, v) Brazil nut Association of Alegría, vi) Alegría Agroforestry Association, Alto Malecón, San Carlos, and annexes, vii) Brazil nut Agroforestry Association Carmen Rosa-ASOCAR- viii) Brazil nut Producers and Extractors Association of Mavila, ix) Brazil nut Producers and Extractors Association Planchon-APECAPLAN -, x) Brazil nut Producers and Extraction Association of Paríamanu River and Tributaries -APECARPA- and xi) Brazil nut Producers and Extractors Association of Shiringayoc -APECASHIR-.

Its principal functions (as foundation by-laws) are:

- To Integrate wills and initiatives of the associations that conform it, in order to contribute to economic, social and cultural development of individuals and families who are engaged in the extraction, collection, transformation and commercialization of Brazil nut in the Department of Madre de Dios.
- To protect the interests of the Associations that comprise it, defend their rights and support their managements against the political authorities, administrative and judicial, provided that the interest in question match the FEPROCAMD and do not oppose them
- Raise awareness to the Brazil nut forest concessionaires, regarding the appropriate and sustainable use of forest resources and the importance of conservation, proper management and sustainable use of natural resources.
- Promote the formalization of the owners of Brazil nut forests, advocating the subscription with the Peruvian government of the respective product concession contracts; beating overlaps with agricultural producers, wood and other forest products concessionaires
- Promote better practices for the collection, drying, handling, and transformation of the Brazil nut; assimilating new technologies, fostering the ongoing training and promote the use of modern machinery and equipment.
- Promote the conservation and repopulation of the Brazil nut forests, combating the logging and avoiding forest fires as well as the protection and defense of the local Brazil nut producer against the illegal importation of Brazil nut and concentration of prices.

A2 Organization for forest monitoring and protection

For an adequate and participatory forest defense, the FEPROCAMD and all its affiliated bases affiliates, organized the Brazil nut harvesters and other related people in local organizations that have as function to give and early warning (monitor, report, etc.) to the corresponding instances of the Control and Monitoring System.

The system will be designed to summon with immediacy, depending on the case, to surveillance and monitoring teams, members of FEPROCAMD or public authorities responsible for sanctioning environmental crimes such as Ecological Police, Prosecution (Attorney), Technical Administration of Forestry, General Environment Direction of the MEM, MINAM, among others.

Mainly leaders in their communities, youth and women, regardless of race, gender or occupation, will make up these local organizations. These people will be trained as community promoters in

REDD and will be supported for the timely and proper function within the control and surveillance system. These promoters will be opinion leaders and promotion of the project.

It is considered to count with at least 50 local promoters distributed in the community organizations who will be informing the communities of the Project Zone, on environmental offenses and penalties and the early warning system of the project. They will be the project community links for training to operate the warning system and early reaction mechanism of environmental crime. At the end of the third year, the Brazil nut harvesters will have an organizational structure to summon and respond with immediacy to threats in their areas.

Community result 2. The economic incomes have increased for the Brazil nut forest use

To achieve the compliance with result 2, the following activities will be carried out:

A1. Implementation and startup of a Brazil nut processor and marketer enterprise

At the end of the fourth year of the project a Brazil nut processing plant has been implemented and becomes operational.

The Brazil nut Processing Plant is the main strategic action project to find profitability and added value to the Brazil nut Concessionaires. It will be located in the zone of km 8 of the Inter-Oceanic Highway, which is located near the capital (Planchon) district of Las Piedras. This location is best suited to have access to this via of the Brazil nut coming from the camps that have access to the road mentioned, in addition to having proximity to fluvial access to stock up camps that take out their product from riverine zones.

This location also has the availability of Local Electricity Energy - Electro Sur Este S.A.A. with a capacity of high-voltage line 22.900 Kilo-volts. It also has availability of qualified technical personnel and qualified labor given the proximity to Puerto Maldonado.

The land for the plant will have an area of 1 hectare and the processing plant in the first phase will have 1,000 m² of covered area, where Brazil nuts in shell take delivery from FEPROCAMD producers and others who wish to sell their product.

The products to be obtained from the processing of Brazil nut are vacuum-packed peeled Brazil nuts, nut oil, soap nut and other derivatives that guarantee sustainability and added value.

The following steps will be done in the processing plant:

- Reception. The Brazil nut is received and temporarily stored, at this stage we proceed to perform quality control, is weighed, the moisture of arrival is controlled and the efficiency of the load is evaluated.
- Classification. At this stage through a sorting machine of rotary drum the Brazil nut is classified by size (large, medium and small), eliminating the cracked ones foreign material.
- Drying. After the classification, the Brazil nuts with shell proceed to dry in a rotary drum dryer until reaching a moisture content of 12% this may take between 20 and 30 hours depending on the humidity of the product's arrival.
- Steaming. To separate the seeds from the shell without damaging them, they are submitted to high pressure steam at 200 ° C. in an autoclave. Fresh seeds need approx. 55 seconds while the old vaporize up to 90 seconds.

- Cooling. Once opened the autoclave chamber, steamed Brazil nuts are poured into a basket and tempered with cold water, a process that involves the cooling and washing in one. The sudden drop of temperature and pressure cause the shell to separate from the seed thus facilitating subsequent rupture.
- Rupture (shelling). As a general rule rupture is carried out manually in a separate space. Prepared seeds are opened with special nutcracker. The net yield of seed ranged between 35 and 40%.

From 60 kg of seeds in shell - the daily labor performance - 25 kg of net peeled seed are obtained, of which 20 kg result to be top quality, 2 kg of second quality and 3 kg of third quality. During the rupture a preselection is performed by removing the damaged almonds and those of poor quality.

Next, the drying process is followed. From this moment the product must be in an isolated area to avoid contaminating the product.

- Dehydration of peeled Brazil nuts. The seeds are placed on trays which are inserted one above the other in the drying chamber. During this procedure, which takes 30 to 40 hours, the moisture is reduced to 4%. During the first 10 hours, the drying is performed at a temperature of 40 ° C, then at 60 ° C. During the last hours, the humidity will be controlled continuously.
- Selection and packaging. Prior to packing, the Brazil nuts will be cleaned of impurities (stones, shells residues, etc.) And classified in the following categories:

The detail of the development of this activity can be seen in the document: Business Plan for the production and export of Brazil nut and derived products¹¹¹.

A2 Brazil nut and by-products certification

At the end of the fifth year the Brazil nut management has been certified of at least 50% of the Brazil nut harvesters affiliated to the project.

For the relatively simple nature of the extraction of the Brazil nut, to obtain international certifications such as organic is sought, that generate a greater added value to the product.

Organic certification is a system that ensures the traceability of the origin of the product, as well as the absence of use of agrochemicals along the entire production chain. The organic agribusiness is a form of sustainable resource management, its main feature is growing, raising and manufacture of food products making maximum use of natural resources and avoiding the use of polluting agrochemical or synthetic agents.

Community result 3. The communities of the zone of the Project Zone and the Government of Madre de Dios have strengthened their capacities for sustainable forest management.

At the end of the fifth year and in subsequent years you can verify the launching of sustainable forest development policies and the increase of the development of forestry and socioeconomic activities in the Project Zone.

¹¹¹ Taken from Business Plan for Production and Exporting of the in Brazil nut, June 2010.

A1 Training in Forest Management, Reduced Impact Logging and Alert System to communities within the Project Zone (FEPROCAMD, Forest Concessions, Native Communities)

Training in forest management, reduced impact logging, monitoring and warning system will be given to forest concessioners, farmers, miners. Annually, at least four technical workshops are run with participation of the population in the Project Zone.

Training workshops will take place on issues relevant to improving the management of the forest of the Communities of the zone, including:

- The Implementation of Techniques for Reduced Impact Logging (RIL) will be given to concessionaires and communities. They will be trained in techniques of utilization of Reduced Impact, such as directional felling, dragging of little impact, forest road planning, among others.
- To the forest concessionaires, Training workshops will be held in the mechanism of forest certification and forest management and silviculture. They will be trained to improve their management plans and annual operating plans. They will be trained in the design and implementation of forest inventories and censuses, using GPS and forest measuring instruments of forest species recognition techniques, forestry, timber location, information processing forest certification standards among others.
- Design and implementation of inventories
- Training in plots monitoring and tree measurement techniques.

A2 Cooperation agreements, alliances and training with the Government of Madre de Dios and other public and private players.

The project will seek to raise awareness and influence the planners of the in territorial occupation and forest policy makers and local environmental, regional and national to improve the regulatory framework and the enactment and implementation of policies and regulations that benefit the Brazil nut sector and allow improving medium and long term conservation of forest ecosystems.

To achieve this, the project (especially the FEPROCAMD and its Brazil nut grassroots associations) will hold inter-institutional relations with various organizations and institutions of the department of Madre de Dios, participating in various public spaces and of concentration and forming part of encouraged work of the project or programmed by the institutions such as GOREMAD.

It is considered that the project will achieve cooperation agreements, alliances and training signed with the Government of Madre de Dios and other public and private players. Every two years, at least two agreements will be signed that benefit the Brazil nut project harvesters.

Cooperation agreements will be established with regional government authorities of Madre de Dios (GOREMAD) and other related institutions for the promotion and emission rules that guarantee the conservation of the Project Zone, for example: participate in the processes of Ecologic Economic and land management zoning of the region, to participate in building of a baseline of REDD projects in the region, incentive the exclusion Brazil nut concessions of areas declared as potential for mining activity (Mining Emergency Decree N ° 012 -2010), etc.

A3. Campaigns on conservation of forests and environmental goods and services

The project through the community relations strategy and communications plan will develop a series of regional and local campaigns promoting forest conservation, knowledge of the goods and services provided by the forest and disseminating the project characteristics of the REDD Brazil nut harvesters.

These campaigns will be through workshops, outreach materials, training materials, advertisements in media, public announcements, events, etc... These campaigns will be directed and focalized according to their objective within the project such as regional authorities, policy makers, local communities, the Brazil nut harvesters, and the community at large.

The overall objective for all these campaigns is that all communities in the Project Zone and the Region of Madre de Dios, are informed and reassess the importance of forest conservation and its ecosystem goods and services. It is considered that, annually, at least 2 outreach campaigns will run and promotion of Brazil nut forests, conservation and REDD project activities.

Being one of the objectives of these campaigns, political advocacy for forest governance, it is expected to reach agreements, conventions, regional and sector resolutions, work records, etc. that benefit the Brazil nut sector and the conservation of forests.

2.3 Biodiversity Component

Biodiversity component 1

The biodiversity in the Project Area has improved, as well as the water quality.

Activities

A1 Control of illegal hunting and flora trade

To Brazil nut the concessionaires of the Project Area, the Ministry of Agriculture gave them concessions to practice in them the handling and use of the Brazil nut and use of forest wood of low intensity up to 5 m³ / ha / year.

Regarding the use of the Brazil nut, the collection is very precarious and without proper tools or the necessary hygiene and does not provide an input of quality and thus low yields of manufacturing companies, which apply penalties in the price, reducing profit margins for the concessionaires.

The main forest management actions for the Brazil nut concessionaires, established in the project are as follows:

- Improvement and redesign of Forest Management Plans and Complementary Plans, after a diagnosis of concessions. Should also supervise the actions of the first stage or primary processing of the Brazil nut carried out in the forest and verify the actions of this first stage on site and that they follow the standards of quality required. They should also observe the fulfillment of authorized volumes and implementation of Reduced Impact Logging, in case of timber extraction.
- Establishment and development of activities in each concession or concession groups.

- Determination and implementation of reforestation areas, type of enrichment and enrichment.
- Determination and implementation of permanent plots and monitoring and tree measurement of species established.
- Determination and clearing or thinning for the development of commercial species.
- The quality, number and location of the roads which the concessionaires have implemented must be established, considering that they are concessions for the use of the Brazil nut
- Use of timber forest species (maximum of 5m³/ha/year)

These activities will be established after the total diagnosis is made of the Brazil nut concessions.

Regarding the collection and management of the Brazil nut, efficient and standardized actions before its processing will be done:

- Installation of the Camp. Activities begin with the conditioning of small areas usually near rivers or streams where the camps are located for the camp staff and the sheds or "Payoles" to store the Brazil nut.
- Rumbeo. In this operation usually participate brigades of 6 people led by an expert in the zone, and is in charge of the location of Brazil nut trees, is known by the name "Rumbeo" or "Mateo". This group locates between 20-40 trees per day.
- Opening of entrances. The "Trocheros" are People generally very skilled in the use of the machete, he is responsible for opening the "entrances" (trail or road) connecting the bare trees varying in length according to the population density of Brazil nuts
- Fruit gathering. The "pod" that falls is hand-picked and is gathered in piles according to their number and dispersal distance. In this activity a basket is used, which once filled is poured into the pile. The "pod" should not remain more than three months on the ground to prevent its putrefaction.
- Pods break up. This operation is performed on the same pile, using a machete for the fractionation, in order to avoid carrying these to the camp. A worker can break up from 600 to 800 coconuts per day (1.5 to 2 jute bags).
- Aeration. Once extracted, the seed is placed in jute bags for its transportation to the camp. In payoles it proceeds to a drying process and aired to prevent the growth of fungus that are responsible for the contamination; at this point Brazil nuts must reach a humidity between 18% to 20%
- Primary Processing Plants. Brazil nuts are transferred from the camp to the primary processing plant using carts pulled by a tractor as transportation. Eventually, in the processing plant, nuts can continue being aerated to dry to prevent the growth of fungi.

Biodiversity results 2

The areas with HCV identified in the Project Zone are recognized by the villager and have been maintained and improved the number endangered species in the Project Zone.

Activities

A1 Training and dissemination of HCV to the Communities of the Project Zone

A2 Training in environmental crime, endangered Fauna recognition project to the worker of the project and local resident (all communities in the Project Zone identified)

These two activities will be developed annually in training workshops and by disseminating of pamphlets where endangered fauna species are visualized to identify them by project workers, especially those who enter the forest and the local inhabitant in general (communities of the zone).

Impacts

Climate component

The only aspects that are adverse but not significant are given by the leakage that the project could cause and the increase of GHG that will cause by the implementation of some of the activities (monitoring and surveillance, hatchery and processing plant).

The leakage of the project will be prevented through training courses that will be given to selected communities in the Project Zone and the work performed by social promoters. And in case presented, leakage will be deducted from the project accounting.

The increase of the GHG for gasoline use (motorcycles, outboard, chainsaw) or energy of the processing plant is inevitable; however it will be discounted in carbon accounting of the project and the use will be the minimum required for the project to operate efficiently.

Community component

The displacement of deforestation activities meaning project leakage has also been identified as an alteration to the community component.

This will be mitigated by implementing the system for resolving conflicts and complaints, which must decide whether there is a conflict that is caused by leakage. Regarding the impact of conflicts arising from displacement of activities will be solved by techniques Alternative Mechanisms for Conflict Resolution-MARCs

Biodiversity component

Some activities such as of the Brazil nut management or monitoring and surveillance, could cause negative impacts to forest areas for bad behavior of their workers therefore the project will implement as measures:

- Plan for Solid Waste Management.
- Protocol for the good behavior of workers. Where among other things the prohibition on hunting, fishing and gathering by project workers will be established.

Table 76. Summary of Environmental Impacts to Climate, Biodiversity and Communities Components

Environmental Factors	Socio-Environmental Alterations	Project Activities									
		Monitoring and surveillance	Nursery implementation	FEPROCAMD organization	Alert system implementation and complaints	Brazil nut processing plant	Brazil nut and derived products certification	Cooperation agreements and alliances with the Government of MD	Local campaigns on forest, goods and services	Forest management of Brazil nut areas	Training plan
Climate	Reserve increase of C by plantations enrichment and others.	na	b	na	na	Na	na	na	B	B	B
	Decrease in carbon stocks (clearings, thinning)	na	na	na	na	Na	na	na	Na	Ns	Na
	Reduction of forest deforestation rates	b	na	na	b	B	na	b	B	B	B
	Project leakage	a/m	na	na	na	Na	na	na	Na	Na	B
	Increased GHG for machinery and equipment	a/ns	a/n s	na	na	a/ ns	na	na	Na	na	Na
Communities	Organization improvements for the sustainable forest activities	b	B	B	b	B	b	b	Na	b	B
	Economic income increase of the concessionaires	b	B	Na	b	B	b	na	na	b	B
	Greater knowledge to communities	na	B	Na	na	B	b	b	b	b	B
	Increased employment	B	B	Na	na	B	na	na	na	na	Na
	Increase in trade and services (restaurant, hotels etc)	na	na	Na	na	B	na	na	na	na	Na
	Variation of traditional subsistence activities	na	B	Na	na	B	na	b	b	na	B
	Forest conservation and ecosystem flows for the resident of the area.	B	B	B	b	B	b	b	b	b	B
	Displacement of activities causing deforestation (miners, farmers etc)	a/m	Na	Na	na	Na	na	na	na	na	Na
	Conflicts with agents of deforestation	a/m	Na	Na	na	Na	na	na	na	na	Na
Biodiversity	Impact in vegetation areas.	ns	Ns	Na	na	Ns	na	na	na	ns	Na
	Changing land use	a/m	Ns	Na	b	Na	na	b	b	b	B
	Endemic species impact	Na	Na	Na	b	Na	b	b	b	b	B
	Threatened, vulnerable or in danger species impact	B	Na	Na	b	Na	b	b	b	b	B
	Impact on water resource	B	Na	Na	b	Na	b	b	b	b	B
	Habitats: nesting, feeding, migration.	B	Na	Na	b	Na	b	b	b	b	B
	Impact by erosion of the mechanical disturbance	Na	Na	Na	na	Na	na	na	na	ns/m	Na
	Impact on National Protected Areas	B	Na	Na	b	Na	na	b	b	na	B
	Human activities: fishing, hunting, flora collection	ns/m	Na	Na	na	Na	na	b	b	ns/m	B
	Incorporation of liquid and solid organic wastes	ns/m	ns/ m	Na	na	ns/ m	na	na	na	ns/m	Na

na= doesn't apply / ns= not significant / b= beneficial / a= adverse / m= measures

3. Map of the Location and Project Boundaries

Section G1.1 already shows the location of Project boundaries (Map 1 and 2).

Since this is a “grouped project”, it is expected that more Brazil nut concessions join the project at their own discretion (i.e. voluntarily and when they deem appropriate). All non-project concessions are included in the Project Zone, specifically in the Leakage Belt.

Additionally, the concept of Leakage Belt was mentioned in previous sections. It is an area expected to receive the avoided deforestation from the Project Area, located inside the Project Zone. Because the Leakage Belt is large enough (over twice the project area) and is mainly composed by other BN concessions with equal risk of invasion and land use change, we consider that areas beyond this boundary will not suffer leakage. In the same way, people living outside the Project Zone whether forestry concessionaires, miners, native communities, etc. are unrelated to the project, therefore, they will not be affected either positively or negatively by the activities of it.

4. Project Lifetime and GHG Accounting Period

The Brazil nut concessions were granted by the Peruvian state between the years 2002 and 2007 for a total period of 40 years, with the possibility of renewal. The REDD project in Brazil nut Concessions has the following periods:

Project start date: September 24/09/2009

Project end date: 31/12/2040

GHG Accounting Period: From 01/01/2010 to 31/12/2040 (31 years, renewable)

The project has a GHG accounting period of thirty-one years, during which it proposes to reduce the deforestation rate to a minimal or zero level in the Project Areas by the seventh year. For other areas of the Project Zone, reducing the tendency of deforestation is also sought.

It was preferred to start the crediting period after the Project start date because of the easiness of accounting full years.

Logic Framework of the Project			
Components	Logic intervention	Objectively verifiable indicators	Sources and means of verification
Climate results	RCL1. The GHG emissions caused by deforestation of the Brazil nut forests in Madre de Dios have been reduced	Every 5 years of the project, quantification of the carbon stock that evidences a significant decrease in GHG emissions from deforestation, compared to Project baseline.	Registration in the Climate Monitoring; Monitoring of deforestation
	RCL2. It has controlled the potential leakage (deforestation activities in the Project Zone but outside the Project Area).	Every 5 years of the project, estimation of deforestation in the Project Zone.	Registration in the Climate Monitoring; Monitoring of deforestation
Climate activities	RCL1A1. Monitoring and surveillance system of the Forest Implementation	At the end of the 3 rd year of the project, the control and monitoring system has been implemented and launched, with a certain number of operative checkpoints with necessary equipment and trained and adequate personnel.	Log system monitoring and surveillance
	RCL1A2. Training of deforestation	Registration of the participation in	Training Plan and

	agents in productive alternatives, sustainable projects (farmers), Environmental Education and PAMAS (miners)	training Brazil nut workshops, farmers and miners in the area are registered. This will be done every year.	training reports
	RCL2A1. Implementation of nursery	At the end of the 5 th year, the project has implemented a permanent nursery for the management activities and enrichment of the areas of the project with a registry of number of plants produced every year.	Physical location of the nursery and the nursery registry system
	RCL2A2 Implementation of leakage mitigation system (expansion of surveillance and control system)	The 8 th year of the project, the monitoring and control system has been extended to the Project Zone mitigating project leaks.	Alliances and agreements between Brazil nut harvesters, farmers and forest concessionaires, authorities, other
Community results	RC1. FEPROCAMD has a formal organization and efficient management of its concession areas under a REDD mechanism	At the end of the 5 th year of the project, grantees are organized and with management tools for the adequate management of their concessions.	Memory of biannual management of the FEPROCAMD
	RC2. The economic incomes generated by the use of the Brazil nut forests have increased	At the end of the 5 th year, the economic income of the Brazil nut concessionaires members of the project has increased more than 10% of the baseline. Number of new jobs for the concessionaires in the project activities: reforestation activities, forest control activities (local park rangers), demarcation of concession boundaries, and long term monitoring.	Registry of the Communities Monitoring
	RC3. The communities in the Project Zone and the Regional Government of Madre de Dios have strengthened their capacities for sustainable forest management.	At the end of the 5 th year, and in subsequent years, the implementation of sustainable development policies and increasing sustainable activities in the Project Area can be verified	Registry of the Communities Monitoring
Community activities	RC1A1. Organization and legal formalization FEPROCAMD	At the end of the 1 st year, project concessionaires have a legal organization defined and formalized.	FEPROCAMD Organization with active record in the National System of Public Records
	RC1A2. Organization for forest monitoring and protection	At the end of the 3 rd year, the Brazil nut concessionaires have an organizational structure to convoke and respond with immediacy to threats in their areas.	Technical document and annual reporting of monitoring and observatory
	RC2A1. Implementation and launch of the Processing Plant	At the end of the 4 th year, a Processing Plant is implemented and is working	Physical location of the Processing Plant
	RC2A2. Forest certification and products certification	At the end of the 5 th year a BN management certification is obtained for a first group of concessions	Certificate issued by competent body
	RC3A1. Training in forest management and in low-impact harvesting to concessionaires and farmers	Annually, at least 4 technical workshops are carried with local communities of the Project Zone	Community Training Plan and Annual Report of Technical Trainings
	RC3A2. Cooperation agreements, partnerships and training agreements with the Government of Madre de Dios and other public and private actors	Every 2 years, at least 2 agreements that benefit the BN project concessionaires	Resolutions and agreements in FEPROCAMD and BAM offices
	RC3A3. Local campaigns of forest conservation, forest services, REDD mechanism, etc.	Annually, at least 2 campaigns are carried to promote BN forest importance, conservation and Project's REDD activities	Communication Plan and Annual Campaigns Reports
Biodiversity results	RB1. Biodiversity in the Project Area has been maintained in	Every 3 years, the Biological Monitoring Report shows the flora and fauna is being	Biodiversity Monitoring Program

	quality and quantity	maintained	
	RB2. The HCV identified for the Project are recognized and valued by the local people	At the end of the 5 th year, local population identifies and values the HCV of the Project Zone	Biodiversity Monitoring Program
Biodiversity activities	RB1A1. Forest management of the BN concessions	At the end of the 5 th year, forest activities (Castaña and timber) in the Project Area comply technical requirements engaged to the Peruvian State	OSINFOR records
	RB1A2. Control of poaching and other environmental crimes in the project area	At the end of the 4 th year, the control and monitoring system works with protocols for poaching and environmental crimes	Biodiversity Monitoring Report
	RB2A1. Dissemination and training on HCV to communities in the Project Zone	Starting from the 4 th year, there is at least an annual dissemination campaign directed to the communities of the Project Zone	Campaigns Reports
	RB2A2. Training in recognition of endangered wildlife, environmental crimes and environment care to local people	Starting from the 4 th year, there is at least an annual dissemination campaign or training directed to the communities of the Project Zone	Campaigns Reports

5. Likely Natural and Human Induced Risks

Table 77 shows the main risks to the expected climate, community and biodiversity benefits during the project lifetime.

Table 77. Project Risks

Risk Factor	Risk Level	Descriptions and Measures Proposed
Climate Risks		
Deforestation risk in the Project Area	Medium	There is a risk that some alternative economic activities (often informal and illegal) increase the opportunity costs and threaten the forests in the project zone. Activities such as informal gold mining (for its high return in the short term) and agriculture could distort the local economy and intensify the deforestation risks. To mitigate this, the project will put in practice different solutions: - The project will work closely with the local and regional authorities, as well as with the public security forces, to prevent or mitigate the invasions by informal miners and other environmental crimes affecting the concessions. - The Brazil nut concessionaires will organize forest monitoring committees, which will immediately report any invasion by illicit activities in the wider Project Zone that could potentially affect the Project Area itself. BAM will give support to the Ministry of Environment so that it can implement its gold mine use policy in Madre de Dios.
Risk posed by fires	low to moderate	There is low to moderate risk posed by fires in Madre de Dios arising from the local custom of forest clearing by fire, which could potentially cause leakages. The project will seek to mitigate this risk in different ways: - INDECI (Institute of Civil Defense) will be brought in to promote, together with the Civil Defense Committees, the execution of awareness programs on forest fire prevention in the Madre de Dios department. These programs will target the local population and will aim to build and strengthen its capacities vis-à-vis the technical directives of specialized entities.

		- The project's monitoring program will include monitoring of fires and burns, and for this reason the project will get actively engaged with the Regional Fire Plan designed specifically for the region of Madre de Dios. The project will also engage with the <i>Global System of Fire Alert</i> of Conservation International's Center for Applied Biodiversity Science (CABS), the University of Maryland/NASA's <i>Fire Information for Resource Management System</i> (FIRMS) and <i>MODIS Rapid Response System</i>. Organization at community-level will be key in the attempt to prevent the negative impacts of burning. One of the activities planned under the project is the strengthening of the surrounding communities' capacity to manage controlled fires as well as fire risk control.
Risk arising from implementation of other important projects in the Project's Zone	Low	Besides the Interoceanic Highway, there is no other significant project under way in the project zone. However, the establishing of agricultural programs for the generation of biodiesel are currently under study.
Risk of extreme meteorological events (floods, droughts, winds), geological risk (for example volcanoes, earthquakes, land slides)	Very low	Madre de Dios department does not pose significant risks when it comes to extreme climatic events. With the exception of one cyclical event called a 'freeze,' caused by invasions of polar air masses and leading to sudden decrease in temperature (up to 15% within the span of hours), increase in stratiform cloud cover, intensification of the wind and increase in atmospheric pressure. However, since this is a natural cyclical event, it does not pose a threat to the remaining standing forest. Madre de Dios is also a geologically stable department. According to the Nation Center for Geophysical Data (CNDG), it is a region without seismic activity (Bernal et al 2001) The very presence of the forests prevents any important risk of flooding or land slides. There are periodic floods on the alluvial plain but these are part and parcel of a natural dynamic in the local forests.
Communities Risk		
Risk arising from activities of the Project Area's mining concessionaires	Medium	In the polygon 2 and 3 of the Project Area, part of the Brazil nut concessions area overlaps with the zone of mining activity proposed by the Emergency Decree 012-2010, which declares the mine use plan in Madre de Dios to be of national importance. The risk is still uncertain since the same decree in its article 7 paragraph d. clarifies that in cases where mining rights overlap with the rights of the concessionaire, among them Brazil nut concessionaires, the mining entity has to obtain a favorable technical opinion from the Competent National Authority, in this case the General Directorate of Forests and Fauna, the same institution that granted the approval for Brazil nut concessions and has approved their forest management plans, and for this reason a favorable opinion would not make sense. The projects aims to carry out monitoring in the mining areas using its control checkpoints and the early warning system. The communications strategy also counts on government entities. Specifically, it plans to discuss the issue of overlaps and mining activities within the area of reforestation concessions with the regional government of Madre de Dios and the Ministry of the Environment.
Risk of social instability	Very low	The rural population and their organizations still have only an incipient knowledge of the scope and the benefits of the REDD mechanism, which could result in an a priori resistance to the mechanism. Hence the project's constant task will be to communicate and strengthen understanding of REDD and its implications. In order to achieve this, the project will work closely with the indigenous, rural and agricultural organizations representative of the areas where the project takes place, as well as with local public authorities. The uncontrolled increase in migration of the Andean population to the

		Madre de Dios department, facilitated by improved infrastructure (roads and other) and other projects in the Madres de Dios region, could translate into a risk of invasion into the territories where REDD projects take place. In order to mitigate this risk, the project plans to strengthen the organizational capacities of the Brazil nut concessionaires to monitor their territories. Public authorities at the local and regional level will be trained in the implementation of land use plans.
Risk of population growth and increase of unsustainable activities.	Very low	Madre de Dios is the least populated department of the country with 109,555 inhabitants and a population density of 1.28 inhabitants per km ² (INEI Census, October 2007). The changes precipitated by the construction of the Interoceanic Highway, together with the mining exploitation in the region, can engender demographic processes of a greater magnitude than those observed between 2002 and 2007 (with 20,437 immigrants 5 years or older).
Biological Risks		
Due to deforestation and human settlements in the Project Zone	Medium	The deforestation leads to a loss of biodiversity, therefore the deforestation risk described in climate factor has been the same as for biodiversity, however, the level of impairment would be given by the biological characteristics of the impacted area. In addition to the actions described, the project has proposed in the Plan of trainings, workshops to encourage sustainable activities in the forest the recognition and importance of endangered wildlife species.
Risk of attack by pests and diseases	Very low	For being the Project Area a natural heterogeneous forest the risk of diseases or pests is minimal
Risk of extreme weather events (floods, drought, wind). Geological risks (volcanoes, earthquakes, landslides)	Very low	As mentioned above, Madre de Dios is a geologically stable department. According to the Nation Center for Geophysical Data (CNDG), it is a region without seismic activity (Bernal et al 2001) Drought can affect agricultural production, the last major drought occurred in 2005 (Marengo J. et al 2008) which was the 6th lowest level measured in the black river in 103 years, the last major drought occurred in 1926 therefore is a rare phenomenon. Climate change can possibly increase the frequency of droughts and, unless appropriate conservation measures are undertaken, convert the tropical forest into a net emitter of CO₂. Recently, a study of the last big drought in the Amazon in 2005 (Phillips, et al 2009, published in Science) has found evidence that the Amazon forest, despite the fact that for years it has been helping to halt the advance of climate change, is surprisingly sensitive to drought, which has the potential to turn these forests into net CO₂ emitters. The very presence of the forests prevents any important risk of flooding or landslides.

6. Specific Measures to Ensure the Maintenance of High Conservation Value Attributes (HCV)

In the project, training to all the communities of the zone has been established for the identification and recognition of the HCV (High Conservation Values). In addition, the staff in charge of PV5, PV6 and PV4 checkpoints will patrol the buffer areas of the project to assist with their monitoring. To the south of the Project Zone, in the Bahuaja Sonene National Park and Tambopata National Reserve, Bosques Amazonicos has participated in the design and funding of a REDD project¹¹², to monitor and thus help to conserve these areas of negative impact for deforestation.

¹¹² Reduction of deforestation and degradation in Tambopata National Reserve and Bahuaja-Sonene

The Brazil nut forests are HCV areas for being vital areas for communities. Furthermore, as noted in G1 item 8, this specie is categorized as vulnerable, for which the activities of the project of Forest Management of Brazil nut forests, seek its conservation and good management ensures the maintenance and ecosystem improvement. Also, considering the connectivity between landscapes and habitats, the conservation of these areas will contribute to the HCVs as Conservation Corridor Vilcabamba-Amboró and other conservation areas identified in the Project Zone ensure the maintenance and improvement of its attributes.

7. Measures to Maintain Benefits beyond the Life of the Project

The measures undertaken to maintain and enhance the climate, community and biodiversity benefits beyond the project lifetime will form part of the majority of the project's activities, with emphasis on capacity-building activities offered to different communities in the project zone. The benefits will accrue through:

- Advice and support given to the concessionaires in their preparation of Management Plans and Annual Operations Plans. These plans need to be seen as strategic guidelines, which reach beyond the project lifetime. Achieving the implementation of sustainable forest management and raising of awareness (through capacity-building) on the criteria for the use of forest products, seed management and silvicultural best practices will together cause an attitude change in the workers, and this in turn will be beneficial for the climate, assuring reductions in deforestation and increases in carbon reserves which are sustainable over time.
- Identification of seed trees and setting-up of a seed harvest calendar. This activity will teach the population to make a more effective use of their resources in the attempt to generate commercially desirable species.
- Establishment of the processing plant, which will help generate value added beyond the project lifetime and will assure that the Brazil nut recollection and processing is an attractive productive activity. As a result, this will be a way to avoid deforestation caused by unsustainable activities.
- General organization of the concessionaires in the Project Area to form monitoring and surveillance teams, systems of patrol, the early warning system for Reduction in Forest Deforestation and Degradation and the Biodiversity monitoring program. These systems of organization will increase response effectiveness and the knowledge of biodiversity in the zone. In this way, climate and biodiversity benefits will be maintained beyond the project lifetime.
- Capacity-building in general, targeting different communities in the Project Zone, and encouragement of the use of agroforestry, pisciculture, ecotourism, etc, as well as alternative activities and development of capacities of the local promoters will increase the general abilities of the local population in sustainable forest management. This knowledge will be useful beyond the project lifetime, thus making the project sustainable.

8. Other Stakeholders Affected by the Project Activities

The continuous study workshops¹¹³, dissemination and consultation, as well as interviews and surveys to prepare the *Diagnóstico Socio-Económico del Concesionario Castañero de Madre de Dios* (Diagnóstico Castañero), has enabled the project to have a comprehensive record of the stakeholders that would participate and/or would be affected by the project. These workshops covered issues relating to relations between these stakeholders and the Brazil nut harvesters, also addressed the impacts associated with economic, political, social interests, and of access to resources.

Among the involved actors, we identified groups of interest, which are all those populations or organizations linked and/or involved with the Brazil nut REDD project, forming the basis for developing the strategy of citizen participation.

The technique that contributed to the identification of groups of interest was the application of directed interviews to the main stakeholders of the Project Area, interviewing NGO representatives, businesses, social base organizations, community boards, state authorities, among other social representative players and who show interest around the Brazil nut industry. Presented next is a matrix of the stakeholders and involved parties referred and mentioned by the interviewed as important for the Project.

Table 78. Matrix of the Stakeholders of the Project

Stakeholders and Others involved in the Project					
Institution/Organization		Areas	Relationship With the Activities of the Project	Level of Relationship	Impact
Madre de Dios Regional Government	Regional Natural Resources Management	Forestry and Wildlife management (Tambopata and Tahuamanu)	Will rely on the sustainable management of Brazil nut areas. Activity Monitoring and Surveillance	Player	Positive
Las Piedras district municipal	Tambopata Provincial Municipality	Hall, Citizen Participation Program, Economic, Productive and Social Development Management	Managements of social, economic and environmental projects that contribute to the REDD project	Involved	Positive
Tahuamanu district municipal	Provincial municipality of Tahuamanu	Hall, Citizen Participation Program, Economic, Productive and Social Development Management.	Managements of social, economic and environmental projects that contribute to the REDD project	Involved	Positive
Executive. Public Ministry		Mixed Provincial Prosecutor of Tahuamanu and the Provincial Crime Prevention Environmental	Investigation action will be in coordination with oversight research, and enforcement related to criminal acts and attacks against the rights of Brazil	Involved	Positive

¹¹³ Added to this is the work done by the consulting firm Social Consulting SAC, company hired by the Project for the elaboration of the Strategic Plan of FEPROCAMD. The methodology considered the elaboration of the diagnosis SWOT of the Brazil nut sector

	Matters Attorney of Tambopata	nut members		
Agency for Supervision of Forest and Wildlife Resources OSINFOR	Regional Headquarters	Actions to be coordinated and incised for proper application of regulations norms and legal defense to possible sanctions against unsubstantiated Brazil nut harvesters	Involved	Positive
Producers Departmental Federation of Madre de Dios Brazil nut (FEPROCAMD)	All base associations of Brazil nut harvesters involved in the Project	Brazil nut REDD project	Player	Positive
Bosques Amazónicos SAC	Private Enterprise	Proponent of the Project	Player	Positive
Community organizations (including populated centers and scattered population)	President and board of the community, Lieutenant Governor and municipal agent	Coordination of planning and community management of REDD project	Involved	Positive
Farmers	Associations and agricultural interest groups	Participants of the training and agroforestry economic managements projects	Involved	Positive
Brazil nut concessionaires	Associations and Brazil nut interest groups	Executors, participants and beneficiaries of REDD project Brazil nut	Player	Positive

The Project has prepared a Communication Strategy, detailed in Chapter 6.3 of the wider Community Relations Program. It is very important to keep the Community (Brazil nut concessionaires) and the identified stakeholders updated of the activities, schedules, incidentals and achievements of the project, in order to receive their feedback to maintain, improve or correct the project's activities. The main instances for discussion are:

Components of the Communication Plan	
Periodical Meetings and Workshops	Organized and leaded by BAM Staff, periodical meetings to communicate the general development of the project or to discuss about specific situations or activities of the project are one of the main components of the plan of communication of the project
Participation in Local and Regional Assemblies	Organized and leaded by FEPROCAMD Board, BAM staff is invited to update and discuss with delegates mainly about delays or conflictive situations or relevant announces that must be informed officially to the leaders of the sector
Direct meetings between FEPROCAMD Board and BAM Management	To follow-up the main agreements achieved in the assemblies or to discuss about specific implementation of certain activities or to introduce a new component in the project, non-periodic meetings are part of the communication plan of the project

Said meetings will be complemented with local campaigns in media and/or events to inform and involve more groups, indirectly impacted by the Project.

The results already obtain through communication during the design were the agreements on the terms and activities that the community wanted to include in the project. The most emblematic case was the specific demand to build a Brazil nut processing plant that they could own.

Table 79. Relevant Ways How the Project has Incorporated Stakeholders Feedback

Stage	Description
Financial Agreement	The general terms of the commercial agreement has been based on a negotiation between BAM and FEPROCAMD, and FEPROCAMD's position has been based on multiple decentralized workshops between Brazil nut leaders and Brazil nut concessionaries (including members and not members of the project). The final design of the commercial terms of the agreement, a critical part of the partnership, was based on a consensus between both parts.
Investment Design	From the general terms of the financial agreements, the agreement does not specify how the total initial investment was going to be distributed. Therefore, an investment plan, prepared mainly by the FEPROCAMD's leaders, was approved and is the main guideline of how the agreement has been implemented.
Implementation Process	During the implementation of the project, each activity includes many minor tasks with different alternatives to be applied. For instance, technical assistance could be done by an own team of BAM, or by the technical team of the Federation, or by a third party. FEPROCAMD has been very proactive in the process of receiving the feedback of the concessionaries and sharing these opinions to BAM to introduce changes in how the project is being implemented.

It should be stressed that the Communication Plan includes periodic meetings for accountability and the sharing of profits between project members will be fully informed, as has been happening during the past years. An example of this is the brochure widely distributed that included the profits distribution information:

Figure 22. Project Brochure with Profit distribution information



8.1 Project Consultation Process

The process of community consultation and project participants has pursued a work strategy based on the implementation of a community consultation protocol, which along the way has been adjusting according to the circumstances. For verification of the activities covered to achieve community consultation, see attached document. This protocol has followed the following components or stages:

Coordination with Brazil nut Leaders

The Project has begun the process of consultation and diffusion by establishing relations with the main leaders of each Brazil nut harvester sector. The project has put special emphasis on making contact with ALL of the leaders recognized by Brazil nut harvesters. To achieve this purpose BAM staff has visited all the Brazil nut sectors and has achieved to identify and verify the legitimacy and representativeness of the leaders in each area.

Diffusion of Project to Brazil nut Leaders

Once established the contact, we proceeded to spread and expose the possibility of executing a REDD Project, through several working meetings between BAM and Brazil nut leaders in each sector as in Puerto Maldonado.

Visit to BAM Experience

To reinforce carbon project knowledge and the experience and institutional seriousness of BAM, the principal leaders of each sector were invited to Pucallpa to visit and learn about the Campo Verde Project, an extensive, formerly degraded area that was reforested by BAM, representing the first reforestation with native species ever done in the country. This visit showed the Brazil nut harvesters the real possibility of being able to do REDD in Madre de Dios and BAM's high experience in carrying out such projects.

Establishment of Commitments, Act of Intention

Once the possibility of doing REDD was diffused and demonstrated, commitments at an institutional level were established and an Act of Intention between BAM and the former FEPROCAMD were signed. We believe this to be the most important step since it establishes the agreements and commitments; at this stage, the terms were negotiated.

Organizational Strengthening and Technical Assistance

One of the established agreements demanded by the leaders, considering the problems of social, legal and political fragmentation of the Brazil nut sector, was to support organizational strengthening of the sector.

Signature of Framework Agreement

This activity took place after a democratic process conducted by FEPROCAMD, where the base representatives elected and ratified their representatives (new Directing Board). After this reconstitution assembly, a plenary meeting was held with the presence of the Brazil nut leaders and BAM, where the terms of the main agreements and terms of the association were agreed and defined for the execution of the REDD project between BAM and the Brazil nut (through FEPROCAMD). This framework agreement has been physically distributed to all grassroots associations of FEPROCAMD.

Consultation Process and Brazil nut Affiliation–

Then, the REDD Brazil nut project (through alliance between BAM and FEPROCAMD with technical assistance CAMDE PERU) has begun the execution of this with processes and diffusion campaigns and consultations, through lectures, workshops and working groups with Brazil nut harvesters spreading the proposal and establishing the prior information in each sector. Currently, observing the wide acceptance, the diffusion process continues to recruit new Brazil nut harvesters with lectures, workshops and direct attention in the different sectors and at our office in Puerto Maldonado. We place special emphasis in demanding that the Brazil nut harvester start their participation with a **FREE PRIOR AND INFORMED CONSENT**.

Contract Signing

In this consultation process, the Brazil nut harvesters decide their participation or reserve it. The Brazil nut harvester's participation begins with the signing of a Contract on Transfer of Carbon Rights. In it, the concessionaire transfers their rights of environmental services of carbon capture to the FEPROCAMD and this transfers them to the Amazonian Forests (defined in the marco agreement, in return they get the benefits of the REDD project.

8.2 Public Dissemination Process of the Project

The process of public diffusion to communities, project participants and society in general, has followed a work strategy based on the implementing of criteria used for the communication strategy of BAM. For verification of the activities covered to achieve public Community dissemination we are attaching a document with graphic evidence.

Bosques Amazonicos SAC, as part of its institutional strategy of communication has organically established a Communications Area, the same which establishes the protocol and policies of communication for their REDD projects. In this sense, BAM is developing its communications strategy for the department of Madre de Dios, the same that will develop cross-institutional actions 1) internationally, nationally and regionally institutional image, 2) promotion and dissemination projects and 3) communication and advocacy activities of each project.

Therefore, in 2010, BAM work has grown to have an action coverage the national and regional level this is explained by the institutional presence deployed in the Madre de Dios region through its two large REDD projects (Brazil nut and Reforestors). This display of actions are being taken directly and indirectly to various institutions related to regional development.

To enforce the presence of BAM in the region, the area of communications has followed a protocol of basic steps to be able to establish a corporate communication strategy, a regional communication strategy applied to the Madre de Dios and a communications strategy for the REDD Brazil nut Project.

Stakeholder Analysis

Creates a database¹¹⁴ (directory) of the institutional players relevant and related to the BAM institution to its vision, mission, activities and projects that this does. This directory must have comprehensive data on institutional profile, objectives, communication strategies, inter-connectors and areas of operation.

¹¹⁴ Relating to have a database of communication hedging, relation connectors are identified and characterized having as parameters geographic factors, institutional affinities and alliances in the activities properly said

Create a directory of media (television, radio, newspapers, etc.). This directory must have comprehensive general data on their public or private institutional character, communicative strategies, costs and performance style. Sort this database according to each project (in this case to the REDD Brazil nut project). The idea is to be able to identify relevant players, this action strategies and possible affinities, risks and threats.

Communication Diagnosis at Players and Involved Level

Make a poll or diagnosis on communication strategies at local public spaces, where, it is necessary to know how the local people communicate, how information flows, which are the communication agents present (radio, rumors, assemblies, etc.). This step is essential because it is necessary to recognize the interlocutor, their communication perceptions and their communication ratings of information and knowledge.

Institutional and Project Communication Strategy

Once counting with a database related to the various institutions and acting means on the one hand and, having recognized and characterized our interlocutors (public, beneficiaries, etc...) We proceed to develop a communication strategy first at an institutional level, institutional and later at a project level.

Communication Plan

Once the strategy and the communicational guidelines are established we proceed to develop communitarian communication plans (project level). In this part is where we set the operating levels of the communication strategy.

In this part is where local factors and dynamics are taken into account for the work plan and this becomes into supply to be able to feed the annual operational planning (POA) of the institution and of each project.

8.3 Activities of Project Communication

In the framework of these guidelines is where the area of BAM communications has implemented various activities for adequate public diffusion of the REDD Brazil nut Project.

Table 80. Dissemination activities of the Project period January 2010-October 2010

Communication And Dissemination Process Of The Brazil Nut Project Of Madre De Dios					
N	Communication Activity	Quantity	Public	Date	Place
1	RADIO MADRE DE DIOS, 1pm news: Interview explaining the project to the CEO of Amazon rainforest and to the Bosques Amazonicos Technical manager.	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Monday, January 11, 2010	Puerto Maldonado
2	DIARIO EL JAQUE: Interview explaining the project to the CEO of Bosques Amazonicos.	2 pages	Brazil nut harvesters of Madre de Dios and institutions	Monday, January 11, 2010	Puerto Maldonado
3	PROMOTIONAL SPOTS of the REDD BRAZIL NUT project on Radio Madre de Dios, La Exitosa y Radio Sinfonía.	172 spots in a month	Brazil nut harvesters of Madre de Dios and institutions	Monday, January 11, 2010	Puerto Maldonado
4	H VISION TV, news see to believe: Interview explaining the project to the CEO of Bosques	10 minutes	Brazil nut harvesters of	Tuesday, January	Puerto Maldonado

	Amazonicos.		Madre de Dios and institutions	12, 2010	
5	H VISION TV, see to believe news: Interview about the Brazil nut harvesters' position about the project to president of FEPROCAMD.	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Tuesday, January 12, 2010	Puerto Maldonado
6	H VISION TV, Realities news: Interview explaining the project to the CEO of Bosques Amazonicos.	15 minutes	Brazil nut harvesters of Madre de Dios and institutions	Tuesday, January 12, 2010	Puerto Maldonado
7	RADIO LA EXITOSA, newscast La Voz de Madre de Dios: Interview explaining the project to the CEO of Bosques Amazonicos.	30 minutes	Brazil nut harvesters of Madre de Dios and institutions	Tuesday, January 12, 2010	Puerto Maldonado
8	H VISION TV, Magazine program LA PALABRA: Interview explaining the project to the CEO of Bosques Amazonicos.	15 minutes	Brazil nut harvesters of Madre de Dios and institutions	Tuesday, January 12, 2010	Puerto Maldonado
9	H VISION TV, regional news INTERCAMBIO: Interview explaining the project to the CEO of Bosques Amazonicos.	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Tuesday, January 12, 2010	Puerto Maldonado
10	RADIO SINFONÍA, news la Voz Dirigencial: Interview explaining the project to the CEO of Bosques Amazonicos.	15 minutes	Brazil nut harvesters of Madre de Dios and institutions	Wednesday, January 13, 2010	Puerto Maldonado
11	H VISION TV, main news Tiempo de Cambio: Interview explaining the project to the CEO of Bosques Amazonicos.	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Wednesday, January 13, 2010	Puerto Maldonado
12	H VISION TV, main news Tiempo de Cambio: Interview explaining the project to the CEO of Bosques Amazonicos.	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Wednesday, January 13, 2010	Puerto Maldonado
13	Publication in DIARIO GESTIÓN: El Oro ecológico. Article that suggests the projects of BOSQUES AMAZÓNICOS as sustainable alternatives to the developments of the Amazonia regarding gold extraction	30 thousand	National level	Monday, May 10, 2010	National level
14	Participation in event organized by the forest engineering of the UNAMAD	20 minutes	Teachers and students	June 25, 2010	University population
15	Impresion of graphic informative material (brochure) explanatory about the REDD BRAZIL NUT project: What are carbon bonds, contracts of transfer of rights, the benefits of the project.	1 thousand	Brazil nut harvesters of Madre de Dios and institutions	Thursday, July 01, 2010	Madre de Dios
16	GRAPHIC MATERIAL: Poster of the first meeting of Partners of the REDD BRAZIL NUT Project	200 units	Brazil nut harvesters of Madre de Dios and institutions	Thursday, July 01, 2010	Puerto Maldonado
17	GRAPHIC MATERIAL: banderole of the first meeting of Partners of the REDD BRAZIL NUT Project	10 units	Brazil nut harvesters of Madre de Dios and institutions	Thursday, July 01, 2010	Puerto Maldonado

1 8	GRAPHIC MATERIAL: Flier of the first meeting of Partners of the REDD BRAZIL NUT Project	2 thousand	Brazil nut harvesters of Madre de Dios and institutions	Thursday, July 01, 2010	Puerto Maldonado
1 9	INFORMATION BULLETIN: of the FEPROCAMD with information to members of that institution.	2 thousand	Brazil nut harvesters of Madre de Dios and institutions	Thursday, July 01, 2010	Puerto Maldonado
2 0	TV SHOW PRENSA REAL: interview to the Bio. Juan Carlos Flores, Regional Manager of Bosques Amazonicos to explain about the Brazil nut in Madre de Dios and explaining the BRAZIL NUT REDD project	15 minutes	Brazil nut harvesters of Madre de Dios and institutions	Monday, July 12, 2010	Local Comunal del C.P. San Carlos.
2 0	TV SHOW PRENSA REAL: interview to the Ant. Marco Villegas, Social Specialist of Amazonian forests to explain the consultation process and the social problems of the Brazil nut harvesters in the frame of the BRAZIL NUT REDD project	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Monday, July 12, 2010	Local Comunal del Centro Poblado San Carlos.
2 1	TV SHOW PRENSA REAL: interview to the Bio. Juan Carlos Flores, BAM regional manager to explain the Project and to invite to the first partner encounter of the BRAZIL NUT REDD project	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Tuesday, July 13, 2010	Local Comunal del Centro Poblado San Carlos.
2 2	TV SHOW PRENSA REAL: Interview with the President of the FEPROCAMD, to comment on the favorable position of the Brazil nut harvesters to the BRAZIL NUT REDD Project and invite its affiliates TO THE FIRST PARTNER ENCOUNTER OF THE BRAZIL NUT REDD PROJECT.	15 minutes	Brazil nut harvesters of Madre de Dios and institutions	Tuesday, July 13, 2010	Local Comunal del Centro Poblado San Carlos.
2 3	TV SHOW PRENSA REAL: Interview to the BAM Technical Manager, to absolve doubts of the Brazil nut REDD project and explain the information to be provided in the FIRST PARTNER ENCOUNTER OF THE BRAZIL NUT REDD PROJECT.	20 minutes	Brazil nut harvesters of Madre de Dios and institutions	Friday, July 16, 2010	Local Comunal del Centro Poblado San Carlos.
2 4	RADIO LA EXITOSA: interview to the president of FEPROCAMD about the Project and its perspectives and inviting to the first partner encounter of the BRAZIL NUT REDD PROJECT	15 minutes	Brazil nut harvesters of Madre de Dios and institutions	Friday, July 16, 2010	Puerto Maldonado
2 5	ARTICLES OF IDENTITY: T-shirts of the Project provided to the Brazil nut partners to promote its identity	500 units	Brazil nut harvesters of Madre de Dios	Sunday, July 18, 2010	Madre de Dios
2 6	DIFFUSION FAIR: Stand of diffusion of the HCESTNUT REDD Project and of identity in the región Madre de Dios, fair frame organized by Ombudsman	1 stand with 8 explanato ry billboards	Population in general of Puerto Maldonado	Friday, July 23, 2010	Plaza Mayor de Puerto Maldonado
2 7	Reprint of graphic material information (Triptych) explanatory about the BRAZIL NUT REDD project: What are carbon bonds, contracts of transfer of rights, the benefits of the project.	2 thousand	Brazil nut harvesters of Madre de Dios and institutions	Sunday, August 15, 2010	Madre de Dios

28	Publication DIARIO GESTIÓN: map for quantifying carbon its relation with Project REDD, article which comments the experience in the development in REDD of AMAZINIAN FORESTS of Madre de Dios	30 thousand	National level	Tuesday, September 07, 2010	National level
29	Publication in MAGAZINE CARETAS: Notice in supplement on Forest Conservation, published by the Ministry of Environment.	30 thousand	National level	Thursday, September 09, 2010	National level
30	RADIO LA EXITOSA: Interview to the president of FEPROCAMD about the projects and paper work that the Brazil nut harvester must do to meet commitment with the State.	15 minutes	Brazil nut harvesters of Madre de Dios and institutions	Wednesday, September 15, 2010	Puerto Maldonado
31	RADIO LA EXITOSA: interview to William Moreno, regional coordinator of CAMDE PERU, NGO in charge of supporting the technical work of the Brazil nut partners of the REDD Project, explaining the requirements and dates of attention of the Brazil nut partners	10 minutes	Brazil nut harvesters of Madre de Dios and institutions	Wednesday, October 06, 2010	Puerto Maldonado

9. Public Consultation Period CCBA to the Communities and Other Players

To reinforce the communication with the community, two CCBA public comment periods were held. During the first period, BAM's team met with public officers of the forestry regional offices, local authorities and Brazil nut leaders to make a power point presentation of the Project and the CCBA validation process.

Table 81. Meetings with authorities and leaders during the first comment period

Date	Place	Participants
06/07/2013	FEPROCAMD office	FEPROCAMD Assembly where all the presidents and representatives of Castañeros associations involved participate
08/07/2013	Forest Program Checkpoint in Alerta	Mayor, technical staff and program officials of the agricultural agency
09/07/2013	Planchón Town	Municipal government officials and local Castañeros
09/07/2013	Municipality of Mavila office	Town Mayor
09/07/2013	DRFFS-ATFFS-Tahuamanu office	Technical staff of ATFFS-Tahuamanu
10/07/2013	Bosques Amazonicos office	Presidents of base associations from Rio Pariamanu, Alto Mercedes, Planchón, Alegría, Mavila and Alerta
11/07/2013	Direction of Natural Resources and Environment of GOREMAD office	Officers and technical staff of the Direction of Natural Resources and Environment of

In the second period, from July 22 to August 21 of 2013, several actors related to the Brazil nut activity like local authorities, public officials, project members, other Brazil nut associations and local leaders were invited to participate in workshops made on the most important towns of the Brazil nut region: Puerto Maldonado, Planchón, Alegría, Mavila, La Novia and Alerta. A list of the official letters of invitation send can be seen next.

Table 82. List of Local Authorities and Leaders invited to CCBA's public comment period workshops

N°	Nombres y Apellidos	Cargo	Organización	Documento de referencia	Fecha de convocatoria
1	Miltón Emérito Moreno Reátegui	Presidente	Castañeros Alto Malecón, San carlos y Anexos	CARTA N° 047-2013	25/07/2013
2	Eduardo Palomino Melo	Presidente	Castañeros Shiringayoc	CARTA N° 051-2013	26/07/2013
3	Aurelio Layme Chiclla	Presidente	Castañeros Varsovia	CARTA N° 055-2013	25/07/2013
4	Jorge Ríos Ingaruca	Jefe de Agencia Las Piedras	DRA-MDD	CARTA N° 062-2013	24/07/2013
5	Kaleb Ruiz Vera	Sub-Director de Tahuamanu	DGFFS-MDD	CARTA N° 063-2013	26/07/2013
6	Ronald Rojas Villalobos	Gerente Regional	GRRNYGMA	CARTA N° 065-2013	25/07/2013
7	Homer Amulfo Tuesta Díaz	Director Regional	DGFFS-MDD	CARTA N° 066-2013	25/07/2013
8	Teobaldo Aristides Reátegui Trigoso	Presidente	Castañeros Carmen Rosa	CARTA N° 070-2013	25/07/2013
9	Pedro Liberato Amau Gallegos	Presidente	Castañeros Alegría	CARTA N° 071-2013	25/07/2013
10	Dante Racua Sánchez	Presidente	Castañeros Planchón	CARTA N° 073-2013	25/07/2013
11	Eleuterio Jurado Frisancho	Presidente	Castañeros Mavila	CARTA N° 074-2013	25/07/2013
12	Abigail Sanz Salinas	Presidente	Castañeros Río Pariamanu y Afluentes	CARTA N° 077-2013	06/08/2013
13	Santiago Taype Chuima	Presidente	Castañeros Alerta	CARTA N° 078-2013	25/07/2013
14	Marco Antonio Jurado Rodríguez	Alcalde Delegado	Municipalidad De Mavila	CARTA N° 079-2013	25/07/2013
15	Jorge Celestino Coahua Mamani	Alcalde Delegado	Municipalidad de Alegría	CARTA N° 080-2013	25/07/2013
16	José Cahuana Saravia	Alcalde Delegado	Municipalidad de Alerta	CARTA N° 081-2013	25/07/2013
17	Jorge M. Maytahuari Sánchez	Jeje de Agencia Alerta	DGFFS-MDD	CARTA N° 082-2013	25/07/2013
18	Róger Effio Tuesta Pérez	Alcalde Distrital	Municipalidad Iberia	CARTA N° 085-2013	26/07/2013
19	Luis Tapia Pimentel	Alcalde Distrital	Municipalidad Las Piedras	CARTA N° 089-2013	25/07/2013
20	Leslie Aguilar Bravo	Presidente	ASCART	CARTA N° 092-2013	30/07/2013
21	Freddy Fuentes Rodríguez	Encargado de Castaña	ASCART	CARTA N° 094-2013	30/07/2013
22	Luz Marina Amasifuén Tangoa	Presidente	Castañeros Alto Mercedes	CARTA N° 095-2013	05/08/2013
23	Ernesto Vargas Guevara	Jeje de Agencia Alerta	DGFFS-MDD	CARTA N° 106-2013	08/08/2013
24	Fátima Mozo Zárate	Sub-Directora de Tahuamanu	DGFFS-MDD	CARTA N° 107-2013	08/08/2013
25	Miguel Zamalloa Condori	Presidente	RONAP	CARTA N° 111-2013	14/07/2013
26	Santos Máximo Tapia	Presidente	ASECAMD	CARTA N° 112-2013	14/08/2013

The workshops began with a presentation about the Project, the CCBA standard and the status of the validation process; after which the audience raised questions and comments that were recorded in films and forms. At the end of the meeting, BAM's personnel gave an executive summary of the Project and information of CCBA's web page, including a link to get to the public comment platform.

The majority of the public interventions show the public's interest in forest conservation and the need to speed up the Brazil Nut Processing Plant construction. A frequent request posed on the expositors was the need of more trainings and workshops on reforestation, sustainable management and alternative activities, as well as assistance in the elaboration of the

management plans. In the same way, the public recognized the work of BAM and FEPROCAMD and the opportunities created by the project to increase their well-being, provided the proposed activities take place.

It is to mention that, being aware of these expectations, the Project was designed from start to include the activities requested (see G3.4). The Processing Plant, probably the most important milestone awaited by the project community, is to be constructed early next year, which will cement the commitment to the project on every side.

Figure 23. CCBA's public comment period workshops



Participants with executive summary in Mavila
July 26, 2013



Participants of workshop in Planchón
August 1, 2013



Participants of workshop in Alerta
August 10, 2013



Mr. David Asturima, President of FEPROCAMD,
leading the workshop in Puerto Maldonado
August 16, 2013

The results in extend can be seen in the attached document *Proceso de Consulta Pública del Documento de Diseño del Proyecto, 22 Julio al 21 Agosto 2013*.

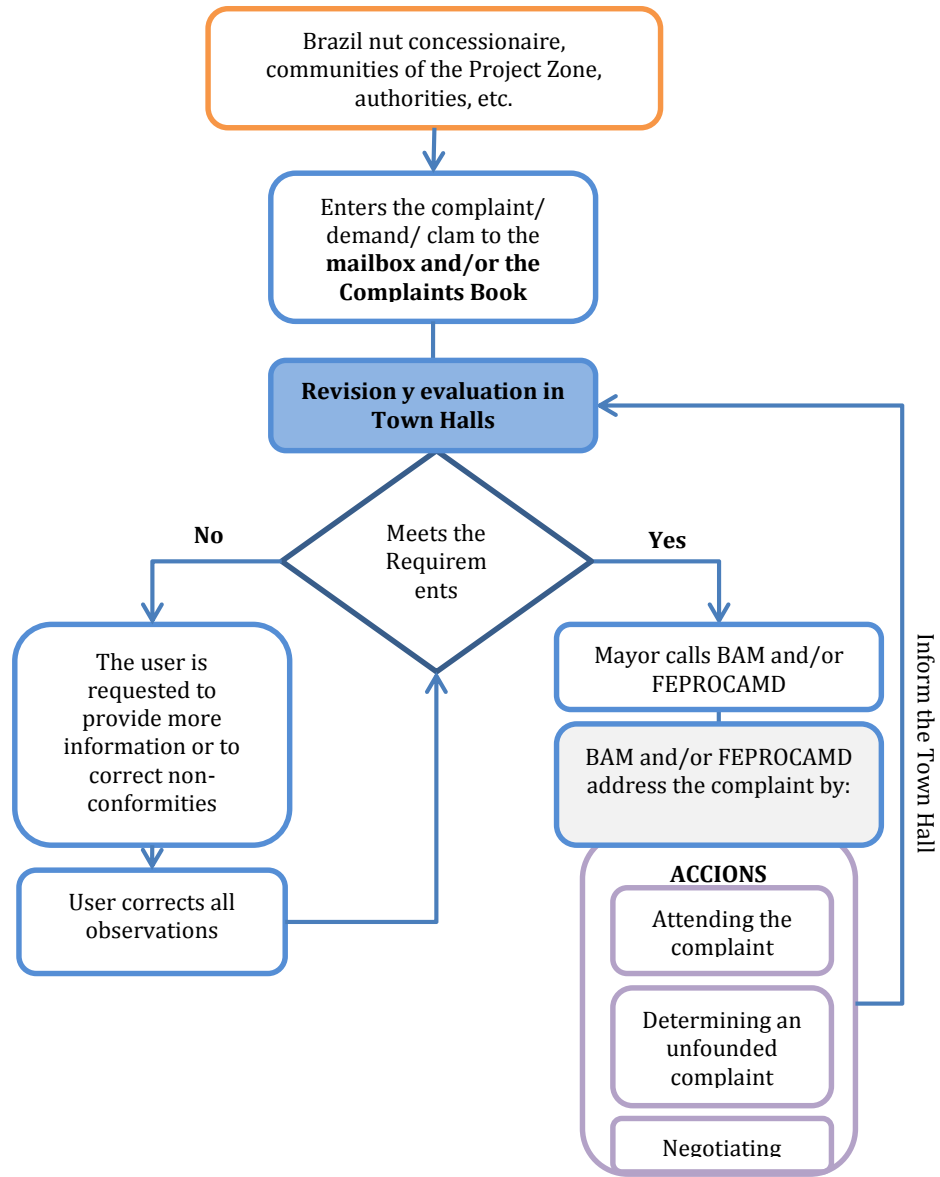
10. Process to Handling Unresolved Conflicts and Complaints

The project will implement a system of conflict resolution and complaints handling, the same that will serve to inform, communicate, meet and engage in project activities to the communities of the Project Zone. For conflict resolution, the project has developed a Guide for the Analysis and

Resolution of Conflicts and Negotiations, which follows the criteria known as alternative mechanisms of conflict resolution (MARCs).

Considering that the project will develop actions that will promote processes or changes, we foresee the possible appearance of claims or complaints about any activity or project participant. For that, BAM will implement a system for handling complaints. This system considers stages graphed in the following flowchart:

Figure 24. Process Flow for Handling Complaints



In-house elaboration

Steps for handling complaints:

Dissemination

FEPROCAMD and BAM will disseminate by different media (workshops, meetings, visits, radio, etc.) the setup and implementation of the mechanism to address complaints and suggestions. This broadcast will be constant throughout the execution of the Project. This activity considers

putting informative signs in public places (such as the municipal offices and the offices of BAM and FEPROCAMD) and in different places of transit of Castañeros and locals. An initial dissemination of the complaints system has occurred during the second consultation period made in August 2013.

Mailbox and Complaints-Suggestions Book Installation

The Project will install mailboxes and Books of complaints and suggestions at the following locations: Alerta Municipality, Mavila Municipality, Alegría Municipality, Las Piedras Municipality, Bosques Amazónicos Office and FEPROCAMD office.

Reception of Complaints and/or Suggestions

The people responsible for receiving and guiding the filling of mailboxes and books are the mayors and/or the respective secretaries. These people will be trained properly so that they can attend and help users wanting to make use of the mailboxes and books.

Coordination of the Solution

Once the complaints/suggestions are received, the custodians of the mailboxes and books (the municipalities) will verify and evaluate the claims made every 15 days. FEPROCAMD and BAM will deliver the claims collected in their offices to any of the mentioned municipalities. If Mayors consider relevant, according to the claims received, they will call on BAM and FEPROCAMD, to give them the requests for their resolution.

Communication of results

After the coordination phase, BAM and FEPROCAMD will proceed to address (resolve, inform, negotiate, declare unfounded, etc.) the claims. The period considered to answer the claim is 20 working days, after which a written response will be issued to the complainant and the Municipality that received the claim.

11. Financial Mechanisms Adopted

BAM has secured sufficient debt and equity to cover all investment commitments and working capital through the end of 2013.

The project will generate income through two sources:

- The sale of emission reductions of the Verified Carbon Standard (VCS) or Verified Carbon Units (VCUs) and
- Profits from a newly-created special purpose company, specializing in the production and commercialization of value-added Brazil nut products.

The Processing and Marketing Company of Brazil nut

The project considers the establishment of a company specialized in the production and commercialization of value-added Brazil nut products, with the participation of BAM and the Brazil nut concessionaires, members of the Project. The company will have an economically viable business plan, a technical dossier and will be the sole owner of the processing plant facilities and equipment (including the tractors).

A combination of general business rules and traditional knowledge of the Brazil nut activities will be followed to better ensure the successful development and long-term viability of the business.

Most of the production will be first class peeled Brazil nuts to be sold in the external markets (in slices and/or vacuum packed). The plant will also produce Brazil nut oil and soap. The company is expected to generate financial benefits that will be distributed to the shareholders once the plant secures the working capital required to operate for the next harvesting season. In that way the Project aims to have a positive impact in the quality of life of the Brazil nut concessionaires.

The business structure of this strategic partnership contemplates that the Brazil nut concessionaires, members of the project will own a 70% stake in the company and BAM will have a 30% stake. The partnership also divides the net revenues from the sale of the carbon credits in 70% for BAM and 30% for the Brazil nut concessionaires.

The project is financially attractive for BAM as long as it produces financial benefits related to the sale of emission reductions in the carbon market. Given the amount of funds that BAM has already invested and has committed to invest in the facility, the equipment, the working capital to the concessionaires for the recollection of Brazil nuts during the harvesting season (and without counting the monitoring and carbon inventory, validation, verification, etc.) the return on the *productive* component of the project is not sufficient to meet BAM's cost of capital.

The revenues forecast is US\$3 million per year under conservative volume sales and price assumptions. The initial investment costs are approximately US\$1.5 million and the annual operating costs are US\$600,000.

G4. Management Capacity and Best Practices

1. Project Proponent

Bosques Amazonicos (BAM SAC)

Bosques Amazónicos (BAM) is a Peruvian company founded in 2005 dedicated to the conservation, protection, restoration and sustainable management of tropical forests in the Amazon. The company's mission is to maximize the value of forest assets while contributing to the preservation of the environment and biodiversity.

Financial Health of the Implementing Organization

Bosques Amazonicos has US\$ 40 million in assets, including 16 000 hectares of private property. The property, which is located in Campo Verde, Ucayali, comprises primary and secondary forest and 1000 hectares of a plantation of native species with commercial value.

Bosques Amazonicos has secured sufficient funds to cover all investment and working capital expenses for the first years. The company has a good credit rating in the local banking system. In addition, Bosques Amazonicos forecasts to obtain revenues from the sale of carbon credits during the second semester of 2013.

2. Key Technical Skills to Successfully Implement the Project

For the start-up of the project, Bosques Amazonicos has institutional capacities and highly qualified professionals in the management, administrative, technical and operational areas to

develop environmental and development projects; as well as knowledge and experience required to implement REDD projects.

As already mentioned, the REDD project develops two executive components:

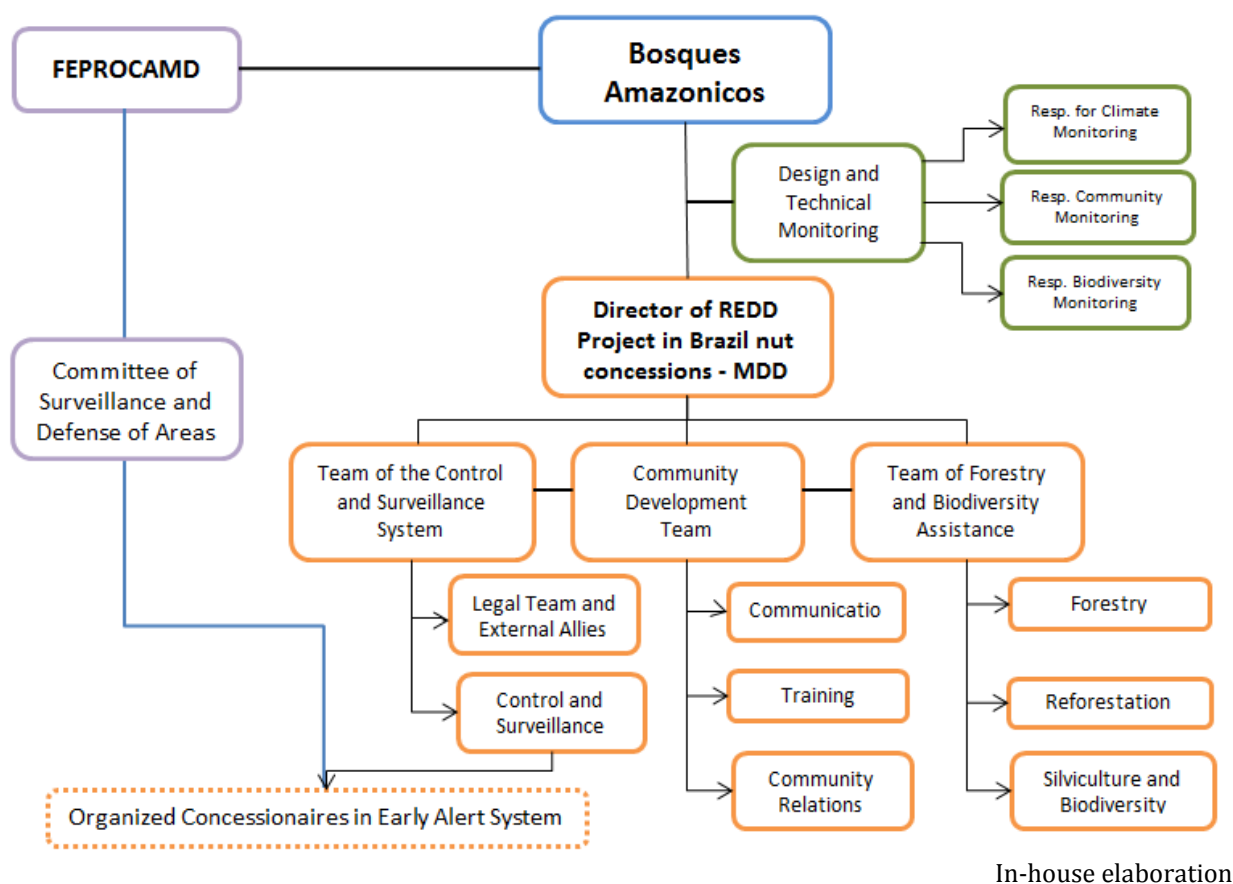
1. Non-commercial activity component. The non-commercial component relates to all activities linked to the deforestation control of Brazil nut forests and capacity building and benefits to the local population.
2. Entrepreneurial component. Composed primarily with the implementation of Brazil nut and sub products processing and marketing company.

The project will have and develop the required skills for the management and execution of the two components.

2.1 For the Non-Commercial Activity Component

Next you will find the organizational chart for the project development led by the company Bosques Amazonicos and a profile depiction of the personnel that will manage directly the REDD project and their previous experience in similar projects.

Figure 25. Project Organizational Chart



REDD Project Director

Professional with knowledge in the environmental business and forest environmental services. Experience in managing projects, mainly in environmental service and carbon projects.

Mr. Jorge Antonio Torres Padilla has been assigned to this position; economist from the Universidad Católica del Perú. With studies in Voluntary Carbon Markets (ECODES, Spain, 2008), Modeling and deforestation (Madre de Dios Government, 2009), Reducing Greenhouse Gas Emissions due to Deforestation and Degradation (ACCA, TNC/WWF/CI, 2008), design of CDM (*Clean Development Mechanism*) projects (CATIE, Costa Rica, 2006-2007) and in economic tools for conservation (Stanford University/CSF/TNC – USA, 2008).

Currently, he is the Technical Manager of Bosques Amazonicos. He was Director of the Environmental Services Program, Regional Coordinator in Madre de Dios and economic specialist for the NGO AIDER, (2002-2009). He has performed consultancy works related to this issue for the UNODCC Peru Office advising in the preparation of an Executive Development Programme (EDP) of a Clean Development Mechanism (CDM) Reforestation Project (Pasco); to SNV Peru - Socio-economic impacts of biofuel initiatives in the Peruvian Amazon (6 Amazon regions); for ACCA - Cost-Benefit Analysis of the Brazil nut and Agro forestry projects (Madre de Dios); to SEM: Cost-Benefit Analysis of soybean and cotton projects (Ucayali); to ERP / PDAP Projects - Cost Analysis -Benefit of rubber, cotton, palm oil, corn, milk and livestock, projects and rubber promotion of the SMEs (Ucayali-Huánuco); to Alpirosa - Cost-Benefit Analysis of Reforestation Project (Ucayali); to GRADE - Research on the socioeconomic activity of the Brazil nut (Madre de Dios); and, to NRI (UK) - Research on the socioeconomic activity of Brazil nut (Madre de Dios).

Responsible of Climate Monitoring

Professional with Forestry Engineering education, with knowledge in conservation and forest management, specialized in the design and monitoring of REDD projects, modeling and quantification of forest carbon.

Ms. Natalia Woo Poquioma has been assigned to this position; she has a Bachelor's degree in Forestry from the Universidad Nacional Agraria La Molina - UNALM (2010). With studies in economic tools for conservation (Stanford University/CSF – USA, 2012), she was in charge of the elaboration of the VCS-PD of the current project and of the follow up of the validation process, attained in 2012. She also participated in the Carbon Inventory made inside the Brazil nut concessions (2011). She was co-responsible for the study "Rentabilidad Económica de la Reforestación en Parcelas Agroforestales de Café y Cacao" held in the province of Satipo - Junín, in the framework of the project "Frutas Del Bosque" driven by Agronomes et Vétérinaires Sans Frontières (AVSF) and the Cooperativa Agraria Cafetalera de Satipo (2010). She has worked in the area of Information Technology-GIS in the Peru LNG project, elaborating digital data base and thematic maps for different areas of the project (2009).

Responsible of Community Monitoring

Professional with knowledge and experience in community work, community relations, participatory methodologies, socioeconomic analysis and diagnostics.

Mr. Marco Aquiles Villegas Paucar has been assigned to this position. He has a Bachelor's degree in Anthropology from the Universidad Nacional Mayor de San Marcos, a Master degree in Social Politics, with a major in gender, population and development (UNMSM).

He has held the positions of Director of Development Promotion and Coordinator of the Selva Central Program in the NGO Educational Services Promotion and Rural Support- SEPAR Group, (May 2008 – July 2009); Technical and Social Advisor of the Indigenous Association Contract Executor of the Purus Communal Reserve ECOPURUS (2007); external consultant in the preparation of 02 regulatory technical papers: "Policy Guidelines for a Health Promoter" and "Promoter Profile of the Peruvian Amazon, Loreto" for the PROJECT VIGIA /MINSA; Responsible of the social component for projects implemented by the NGO Amazon Conservation Association (ACCA) (2003-2006); Social Specialist for the NGO Research and Comprehensive Development Association AIDER (2002-2003).

Responsible of Biodiversity Monitoring

A professional with expertise in biological assessments is required, with knowledge in endangered species and in national and international laws that protects them. The candidate must have worked in biological monitoring and special habitat census. It will be in charge of the biological monitoring and monitoring actions of the mitigation measures for biodiversity. The Field Manager should have knowledge about environmental assessments.

Ms. Claudia Lozano has been assigned to this position. She has a Bachelor's degree in Forestry from the Universidad Nacional Agraria La Molina - UNALM (2009). Inside Bosques Amazonicos, she was in charge of the elaboration of the monitoring report of the ARR project "Reforestation with pastures in Campo Verde with native species, Pucallpa – Peru", already verified by VCS in 2012. In addition, she has recently participated in the Carbon Inventory in agroforestry plots, which will be part of the baseline of ECOTERRA's project in Bagua – Amazonas (under design). She has worked in the Camisea Biodiversity Monitoring Program (PMB), implemented by the Centro de Datos para la Conservación - CDC and the Environmental Resources Management (ERM) - Peru office (2010-2011), updating data of the species of flora and fauna present in the Camisea pipeline.

She has also been part of the Project "Actualización de información clave para la propuesta de estrategias de conservación en el Perú, a través de la metodología de KBA's" by the CDC and Conservation International (CI) - Peru office (2009) in the development of a database of the inventories conducted in areas of Conservation Corridor Vilcabamba - Amboró, Condor - Kutukú and Pichis valley.

Execution Components

The personnel for executing the planned activities are professionals from the region, with much insight of the Brazil nut concession's problematic and experience in working in forestry, environmental and social topics:

Forest Responsible in Puerto Maldonado Office

Mr. César Huisa has been assigned to this position. He is a Forest Engineer, formerly the Regional Manager of Natural Resources and Environment of the Regional Government of Madre de Dios (GOREMAD), where he first worked as a GIS specialist. César has been the Project Coordinator of

the projects "Strengthening of Sustainable Forestry Management in indigenous lands in the Peruvian Amazon-FORIN" and "Brazil nut harvesting under an entrepreneurial approach in Tahuamanu Province, Madre de Dios, Peru", executed by CESVI. In addition, He was the Field Coordinator of the project "Preserving Brazil nut Forests", executed by ACCA NGO.

Legal Responsible in Puerto Maldonado Office

Mr. Abel Flores has been assigned to this position. He is a Lawyer with Master studies in Commercial Legislation at Pontificia Universidad Católica del Perú (PUCP). He has worked as advisor of Sawmill Vracko, Congressman Salhuana and Federation of Forestation and Reforestation Concessionaries of Madre de Dios (FEFOREMAD). He was also staff of the Regional Legal Office of GOREMAD and Director of Personnel Office of GOREMAD.

Community Responsible in Puerto Maldonado Office

Mr. César Badillo has been assigned to this position. He has a Bachelor degree in Forestry, and studies in tourism and corporate law. He has experience in Penalty Area of the Forest and Wildlife Administration of Tahuamanu and Tambopata. With experience in tourism service with Wasai Expedition Travel. Since 2010, he is the social specialist of BAM.

Surveillance and Control System Coordinator

Mr. Jerry Martinez has been assigned to this position. He is a Forest Technician with studies in business administration. He has 10 years of experience in the management of private conservation concessions and in leading private guard parks. He has large experience in forest control and surveillance strategies. He also has experience in community relationships, mainly with indigenous people.

As evidenced, BAM's team has strengths in design and management of REDD initiatives, as well as experience in Madre de Dios and its forestry sector, especially Castañeros Sector.

In order to carry activities with other stakeholders in the Project Zone (mainly farmers), and to reduce the risk of leakage or to mitigate it, the Project will support local producers focusing on:

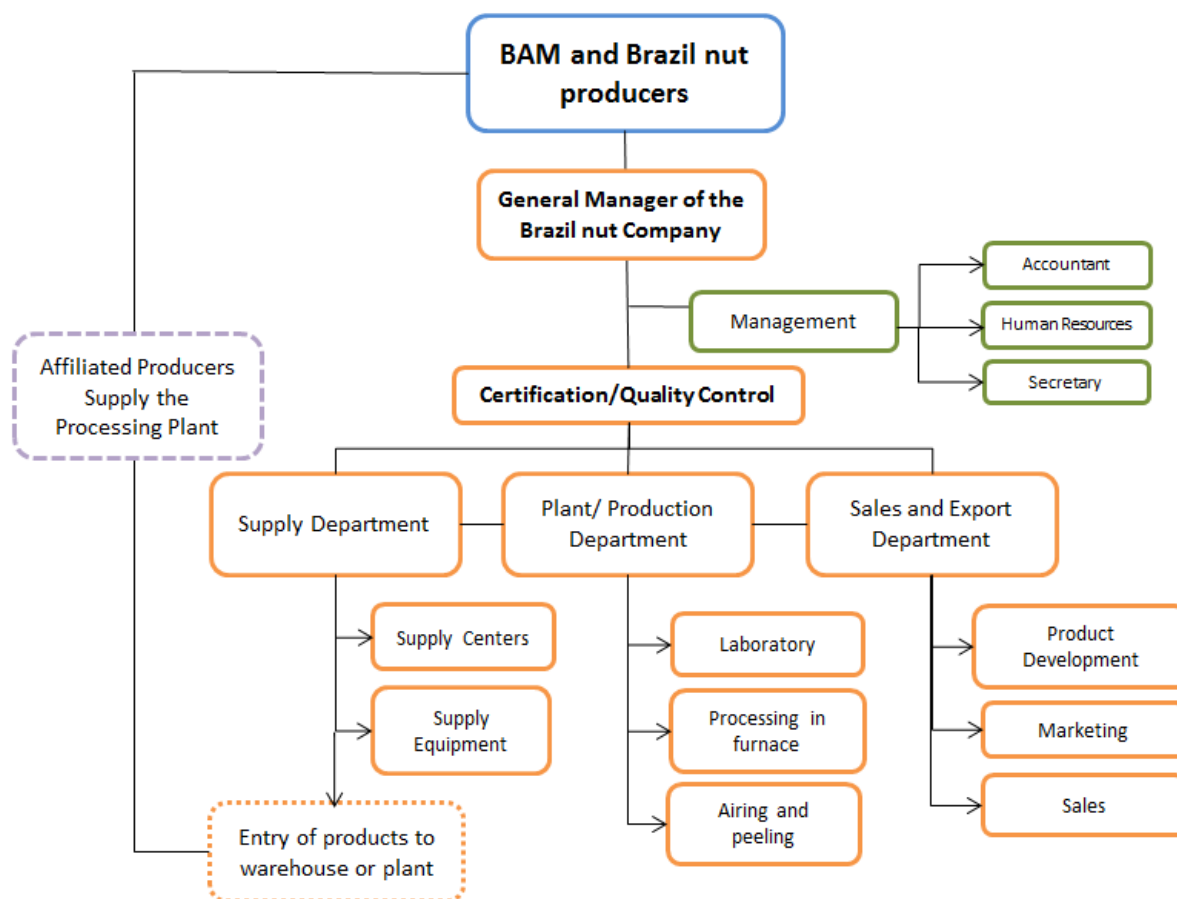
1. Facilitate local producers the access to sustainable productive development initiatives, promoted by the Peruvian State and the Government of Madre de Dios, such as:
 - a) PROCOMPITE. Approved by Law N° 29337, it consists on grant funds directed to cofound productive proposals (Business Plans), with local and regional governments' budgets.
 - b) AGROIDEAS. Consists on grant funds to cofound Agribusiness Plans promoting the organization, management and execution of sustainable proposals.
2. Hiring consultants with the expertise required in each activity (i.e. economists, agronomists, agroforestry, reforestation experts, etc.), as needed.

With these initiatives, the Project seeks to promote the strengthening of the productive base of rural families, adding value to its natural assets. Likewise, it seeks to improve the agricultural production and facilitate the processing and marketing of agro-products to enter markets and increase revenues. There will be a focus on Agroforestry and reforestation with native species.

2.2 For the Commercial Activity Component

The entrepreneurial activity will be undertaken jointly between the Brazil nut producers affiliated to the project and Bosques Amazonicos SAC. The flowchart considered for the start-up of the Brazil Nut Company is presented below:

Figure 26. Brazil Nut Company Organizational Chart



In-house elaboration

Brazil Nut Company Manager

The General Manager will be a professional with knowledge in administration, management and processing of the Brazil nut. He will be responsible for the proper management of the Brazil nut in the forest, the good performance of the processing plant and the quality of the Brazil nut sub products. He will be supported by the following professional staff:

- Head of Supply
- Head of Production
- Head of Marketing and Sales

The following table presents the staff profile required for the Brazil Nut Company.

Table 83. Brazil Nut Plant Personnel

Human Resource	Profile
General Manager	Professional with expertise and experience in Brazil nut processing and export companies
Directors / Area Managers	Professionals trained and with experience in each area (supply, production and commerce)
Administrator	Professional with experience in managing export companies
Accountant	Professional ad-hoc
Quality Inspector (Lab)	Professionals with experience in laboratory and quality analysis products for export
Staff and workers	Worker with knowledge and experience in handling Brazil nut
Brazil nut in shell drying and classifying worker	Worker with knowledge and experience in handling Brazil nut
Peelers (service) Optional	Worker with knowledge and experience in handling Brazil nut
Buyers (promoters, storekeepers on site and machine operators)	Worker with knowledge and experience in handling Brazil nut

3. Orientation and Training to the Project Staff

Bosques Amazonicos has, as part of its entrepreneurial policy, the management of human resources. During the project life span and according to the capacities and duties exercised, BAM will provide all opportunities and accesses to training required by the project staff, from the professionals involved in the design of the project to those involved in its implementation. It has been considered to provide all new staff members an induction process to the company, the project and the participants involved. In addition, there will be training workshops for all staff members so that everyone becomes familiar with the objectives and activities of the project and with the requirements under the CCB Standard (and any other standard) that ought to be complied with.

4. Equal Opportunities

The project as well as BAM has established the following criteria to ensure equal employment opportunities:

Job Profile Based on Expertise

The project requires professionals based on their professional skills and expertise to hold the position. Thus, there are no distinctive preferences for male or female nor there is any physical capacity exclusion criteria (e.g. disabled people are not excluded), consistent with the Plan for Equal Opportunities for Persons with Disabilities –PIO 2009-2018 (Supreme Decree No. 007-200-MIMDES, published in the Official Gazette *El Peruano*, December 23th, 2008).

Within the criteria for selection of new workers, the project will prioritize the local workforce as its purpose is to contribute to benefit the communities from the Project Zone. For example, for the construction of the plant there will be equitable proportions of unskilled labor from each community. Therefore, the labor for the construction of the plant will be selected using the proportion criterion, based on the needs of the contractor, qualifications, training and experience of the applicants.

Broad and Transparent Call

Job offers or services required by the project will be released and promoted mainly in the Project Area. The project, especially the area of Community Relations, will announce the job positions available in a transparent and organized manner using several media tools such as: flyers, informational posters, etc., written using clear and concise language with illustrations, like tables and photos, as applicable; Meetings with authorities, leaders and local representatives, “spots” on the radio, television and newspaper ads. The messages will include at least the following information: the type and number of job offers, duration of the position, working conditions, remuneration and recruitment and selection process.

The Project is committed to providing free access to local employment and to respect the local culture and customs. Therefore, the Project will enable local organizations and families to propose the candidates that will better fill the job offers available, assuming that they are capable to perform the job adequately and have the skills required.

Complaints’ Management System

Both the project, as well as the Brazil Nut Company, will have this system to manage the complaints of the local people, including the complaints expressed by job candidates and project workers. Local workers may submit such claims through the community relations representatives, the Project offices at the communities, or by using the suggestion boxes to be placed in working areas. Complaints about labor relations will be received and resolved by applying the procedures established for employee relations and dispute resolution.

5. Labor Laws

The Castañeros REDD Project articulates the policy of encouraging employment and labor rights that Peruvian government has regulated by Legislative Decree 728. This is because that will create permanent and temporary jobs, especially in the design, construction, implementation and administration of the Brazil nut processing plant, which is the activity that will create the majority of work positions.

Moreover, Project’s workers enjoy fair wages (above the minimum established by the Peruvian government), have employment benefits established in Peruvian law (e.g., vacation, bonuses, compensation for length of service, etc.) and have a high expectation of the duration of their job. This way we can ensure the project not only complies with labor standards but also the protection of the worker through an employment relationship that will improve employment conditions in the project area.

Considering that the majority of project beneficiaries (potential employees) are people over 50 years, the project recognize fringe benefits to seniors established in the Peruvian labor legislation. Notwithstanding the foregoing, employees may be divided into unions to negotiate better employment benefits and working conditions if they find it convenient. This will be secured by the Brazil nut company area in charge of human resources and labor relations.

All the worker’s rights and benefits will be fully informed to each new employee when they start working for the project.

BAM is committed to comply with the labor laws, ensuring an equitable relationship with its employees. Following is a list of laws and regulations on the workers' rights considered and taken into account by the Project.

Table 84. Labor Regulations applied by the Project

Labor Regulations	
Productivity and labor competitiveness	Labor Productivity and Competitiveness Act - Consolidated Text of Law Decree 728, S.D. N° 003-97.
	Regulations on Labor Productivity and Competitiveness Act - S.D. N° 001-96-TR.
Outsourcing	Law regulating the activity of special services companies and worker cooperatives. Law N° 27626 - Law on Mediation.
	Law regulating outsourcing services - Law N° 29245.
	Legislative Decree which provides the scope of Law N° 29245, Law regulating outsourcing services - Legislative Decree N° 1038.
	Regulations on Law N° 29245 and Legislative Decree N° 1038, that regulate outsourcing services - Supreme Decree N° 006 - 2008 - TR.
Compensation for Time of Service	Consolidated Text of the Compensation for Time of Service Act - S.D. N° 001-97-TR.
	Regulations on Compensation for Time of Service Act - S.D. N° 004-97-TR.
Paid holidays and breaks	Consolidates the legislation on paid breaks for workers subject to the private sector labor regime - Law Decree N° 713.
	Regulations on Legislative Decree N° 713 on paid breaks for workers subject to the private sector labor regime - S.D. N° 012-92-TR.
Bonuses	Law regulating the granting of bonuses for workers in the private sector regime for national holidays and Christmas - Law N° 27735.
	Regulations on Law regulating the granting of bonuses for workers in the private sector regime for national holidays and Christmas - S.D. N° 005-2002-TR.
Profit Sharing	Governs the workers right to participate in the profits of the companies developing income generating activities of the third category - L.D. N° 892.
	Regulations for the implementation of the workers right in the private sector to participate in the profits generated by the companies they serve - S.D. N° 009-98-TR.
Life Insurance Law	Consolidation of Social Benefits Act - Legislative Decree N° 688.
	Regulations on the Consolidation of Social Benefits Act - S.D. N° 024-2001-TR.
Minimum Wage	Readjusts minimum wage amount of workers subject to the private sector regime. - S.D. N° 016-2005-TR.
	Increases the Minimum Wage of workers subject to the private sector regime - S.D. N° 022-2007-TR.
Family Allowance	Private sector workers whose wages are not regulated by collective bargaining, will receive the equivalent of 10% of the legal minimum wage for all family allowance. (Family Allowance Act) - Law N° 25129.
	Regulations on the Family Allowance Act - S.D. N° 035-90-TR.
Food Services	Food Services Act for the benefit of workers subject to the private sector regime - Law N° 28051.
	Regulations on the Food Services Act - Supreme Decree N° 013-2003-TR.
Working Hours	Consolidated Text of the Regulations on the Working Hours and Overtime Act - S.D. 007-2002-TR.
	Regulations on the Text of the Regulations on the Working Hours and Overtime Act - S.D. 008-2002-TR.
	Provisions on the arrival and ending time registration control system in the private sector labor regime - S.D. N° 004-2006-TR.

Collective relations	Consolidated Text of D.L. N° 25593 – Law on Collective Work Relations – Supreme Decree N° 010-2003-TR.
	Regulation of the Law on Collective Labour Relations - Supreme Decree N° 011-92-TR.
People with Disabilities	General Law for Persons with Disabilities - Law 27050
	Regulation of the General Law for Persons with Disabilities - Supreme Decree N° 003-2000-PROMUDEH.
Protection to Working Mothers	Grants the right of Maternity Leave to Pregnant Workers - Law N° 26644.
	Act granting permission for Breastfeeding - Law N° 27240.
	Law extending the duration of breastfeeding leave - Law N° 2873.
Social Security	Social Security in Health Modernization Act - Law N° 26790.
	Regulations to the Social Security in Health Modernization Act - Supreme Decree N° 009-97-SA.
	Social Security Agreement between the Republic of Peru and the Republic of Chile.
	Safety and Health Regulations at Work - Supreme Decree N° 009-2005-TR.

6. Occupational Safety

In case there would be any situations of risk to the safety of workers, these may be given only in the activities involved in *forest management* and the *Brazil nut Processing Plant management*.

In addition, the activity of Control and Surveillance poses extra risks to the patrolling groups than those naturally faced when working in forest. These risks are mainly caused by the chance of finding people (invaders) developing illegal activities like timber harvest, clearance of forestland for agriculture or gold mining and Brazil nut crop stealing. In such cases, conflicts may arise, threatening the integrity of the teams.

To minimize the risks in forest management, the project has established criteria and processes of management and use of forest resources with the necessary safety guarantees for the participants. Moreover, training courses will be carried out periodically in the use of chainsaws, first aid, safety measures in the collection and crushing of Brazil nut, etc., so that concessionaires internalize these procedures in their daily activity in the forest.

To minimize the risks in the implementation and operation of the processing plant, both in the construction and operation phases, the company will ensure to take all safety measures set forth for such cases. From safety plans, training, first aid, evacuation measures, contingency measures, etc. that will be informed and shared from the workers, the technical team up to the directors of the company. These plans will be shared with the local population involved, especially in matters involving safety impacts to the population.

Every worker and volunteer (in C&V activity case) will be informed of the risks that the job position implies before the hiring. The Project will emphasize the responsibility of every worker and the need for them to comply with all the mitigation measures, work practices and protocols used to ensure risk minimization. To ensure these compliance, the Project will constantly train workers and people involved in any project activity on the mitigation measures, reminding the threats and risks they are exposed to. Some incentives could be offered to boost the appliance of all measures and protocols, like rewards for having a considerable amount of time without accidents in the processing plant.

Examples of safety measures to be taken:

- Safety during personnel transportation: good practices in the use of vehicles, responsibilities of drivers and outboard-motor drivers, travel restrictions at night and during rainfall, etc.
- Safety during overnight in the forest: safety gear, first aid kit, best practices for installation of camps, etc.
- Safety during overnight in settlements: relations with local villages, caution for the equipment and materials, use of alcohol, etc.
- Safety for specific risk activities (as patrolling to prevent illegal activities), include measures as patrolling in pairs (mentioned in the Control and Surveillance Plan)
- Finally, all staff should be trained in first aid and must have a primer on the subject that should be taken by the project staff to all field trips.

The Control and Surveillance Plan (*Estrategia de Control y Vigilancia de las Concesiones Castañeras*) already includes measures to reduce risks for every sub-activity. An extra set of regulations for forest custodians was added to this plan (Section 4.1.1). Additionally, this protocol will be updated and improved with the feedback coming from the field cases.

7. Financial Health of the Implementing Organization

Bosques Amazonicos has assets amounting to US\$ 40 million, 16 000 ha of private property of primary and secondary forest and 2000 hectares of plantation of native species with commercial value.

Bosques Amazonicos has secured sufficient funds to cover all investment and working capital expenses for the first years. The company is creditworthy in local banking. In addition, Bosques Amazonicos anticipates an income coming from carbon credits sale at the end of 2013.

G5. Legal Status and Property Ownership

1. Laws and International Agreements

BAM declares and assures the fulfillment of national and regional laws, established by the legal system, meaning that the Project respects rights and agreements signed by the Peruvian State.

A prove of the previous statement is that BAM actively participates on different instances of government and civil society, in the regulation of REDD projects and several criteria for their implementation, as well as in the debate of the new forest law in Madre de Dios and Peru. In that sense, Bam has:

- a. Been part of the Official Delegation of Peru in the Conference of Parts of UNFCCC in Copenhagen (2009)
- b. Been part of the Official Delegation of Madre de Dios in the GCF Annual Meetings 2011 (Indonesia), 2012 (Mexico) and 2013 (Peru). BAM has supported the incorporation of Madre de Dios Government to GCF Task Force in 2011, the election of MDD Regional Government as Chair 2013 and the organization of GCF Annual Meeting 2013 in Puerto Maldonado, Madre de Dios

- c. Supported the incorporation of 3 new Peruvian members to GCF Task Force (San Martin, Loreto and Ucayali)
- d. In the framework of a partnership with CIAM, a member of BAM has been proposed to be the Country Coordinator of GCF in Peru
- e. Supported the sign of the MOU between the Government of Madre de Dios and the VCSA to implement a pilot project for VCS Jurisdictional Nested REDD Initiative (JNRI) now being executed in Peru by CI
- f. Promoted meetings between the Government of Madre de Dios and the World Bank to apply to Carbon Fund and with the Government of California referred to the California Cap-and-Trade Mechanism
- g. Actively participated in the National REDD Group. As part of this group, we supported MINAM to update the RPP, in Section 3 (Reference Scenario)
- h. Actively participated in the discussions about the new forestry law and its specific regulation (in process), specially the articles referred to the forest ecosystem services
- i. Subscribed and Inter-institutional Agreement with the Regional Government of Madre de Dios to strengthen the regional forest competencies
- j. Actively participated in the Regional REDD Group, especially in the Technical Group in charge of the jurisdictional baseline. BAM has supported the preparation of historic deforestation maps, the carbon stock map and the choice of land use change monitoring methodology
- k. Actively participated in the Forest Dialogue Roundtable in Madre de Dios

The current legal framework relevant for the Project is detailed below. This legal framework comes from different levels of government and different sectors, such as central and regional governments, and sectors including the environment, agriculture, among others. The norms whose summary is included below have been ordered according to their substance (from general to specific) and their scope of application (from national to regional).

Table 85. Legislation Related to the Project

Regulation	Effective Date	Relevant articles evidencing the compatibility with the formulation / implementation of the Project
Political Constitution	October 31, 1993	The Constitution includes a chapter establishing the State policy with regard to the environment and natural resources. Article 66 of the Constitution declares all natural resources to be national heritage. That being the case, it is the organic law that establishes the conditions for their use and their transfer to private parties. The National Environmental Policy, Article 67 of the Constitution, recognizes the promoting role of the use of natural resources, assuring the State's commitment to develop possible mechanisms for the conservation and sustainable use of biodiversity. Article 68 provides that it is the responsibility of the State to promote the conservation of the biological diversity and Natural Protected Areas.
Law N° 28611 Environmental Law	October 15, 2005	Article VI of this Act provides that environmental management has as priority objectives to prevent, monitor and avoid environmental degradation, and when it is not possible to eliminate the generating causes, mitigation, recovery, restoration or eventual compensation measures will be adopted as appropriate. Likewise, Article XI states that the design and implementation of environmental public policies are governed by the principle of environmental governance, leading to the harmonization of policies, institutions, regulations, procedures, tools and information so as to allow the effective and integrated participation of public and private

Regulation	Effective Date	Relevant articles evidencing the compatibility with the formulation / implementation of the Project
		stakeholders in decision-making, conflict management and consensus building on the basis of clearly defined responsibilities, legal certainty and transparency. On the other hand, Article 150 of the Act provides that any measures or processes that by initiative of the holder of title are implemented and executed with the purpose to reduce and/or prevent environmental pollution and degradation of natural resources will be rewarded with incentives. Article 94 states the protection of water resources, the protection of biodiversity, the mitigation of emissions of greenhouse gases and scenic beauty, among others, will be considered as environmental services, and as they generate benefits that are used without remuneration or compensation, establishes the need for the State to provide mechanisms to value, reward and maintain the provision of such environmental services, aimed at the conservation of such ecosystems, the biodiversity and other natural resources. This article concludes by mentioning that the National Environmental Authority (Ministry of Environment) promotes the creation of financing mechanisms, payment and monitoring of environmental services.
Supreme Decree No. 12-2009-MINAM National Environmental Policy	May 24, 2009	The National Environmental Policy is a mandate that comes from the Political Constitution of Peru and the General Environmental Law, constituting a set of guidelines, objectives, strategies and tools of public nature that are intended to define and guide the actions of National, Regional and Local Governments entities, the private sector and civil society, on environmental issues. An objective of the National Environmental Policy relevant to the Project is to achieve the sustainable conservation and use of the country's natural heritage, with efficiency, equity and social welfare, prioritizing the comprehensive natural resources management. Environmental services are identified at different points, stating the need to promote their economic value through economic and financial instruments, highlighting the importance of implementing forest conservation systems and their protection from degradation and deforestation.
Climate Change National Strategy ¹¹⁵	In restructuring process	Principle 13 of the Strategy provides the following: "Reduce deforestation seeking to control shifting cultivation and unplanned human settlements in unsuitable forest areas originating land use changes". Likewise, the strategic guidelines related to the development of the project are as follows: (9) "Management of forest ecosystems to mitigate the climate change vulnerability and improve carbon capture" and (11) "Management fragile ecosystems, especially highland ecosystems to mitigate climate change vulnerability".
Legislative Decree No. 1013 Law creating the Ministry of Environment	May 15, 2008	Through this rule the Ministry of Environment is established, its sectorial competence scope is set and regulates its organizational structure and functions. The Ministry of Environment governs the environmental sector of the Executive Branch which develops, manages, supervises and runs the National Environmental Policy. It also serves to promote the conservation and sustainable use of natural resources, biodiversity and Natural Protected Areas. The environmental sector includes the National Environmental Management System as a functional system, which integrates the National System of Environmental Impact Assessment, the National Environmental

¹¹⁵ The National Climate Change Strategy is currently under revision, by the General Directorate of Climate Change, Desertification and Water of the MINAM.

Regulation	Effective Date	Relevant articles evidencing the compatibility with the formulation / implementation of the Project
		Information System and the National System of Natural Protected Areas by the State, as well as the management natural resources within its jurisdiction, biodiversity, climate change, soil management and other subject matters provided by law.
Supreme Decree No. 006-2009-MINAM Description and operation of the National Climate Change Commission in accordance with Executive Order No. 1013	March 29, 2009	The National Commission on Climate Change has as general function to follow-up the various public and private sectors involved in the matter, through the implementation of the United Nations Framework Convention on Climate Change, as well as the design and promotion of the National Strategy for Climate Change, whose content should guide and inform about the strategies, plans and national, sectorial and regional development projects.
Law 26821 Constitutional Law for the Sustainable Use of Natural Resources	June 27, 1997	Regulates the general framework for the sustainable use of natural resources, which are part of the national patrimony. This law provides that the natural resources held in its source, whether renewable or non-renewable, are Patrimony of the Nation. The fruits and products of natural resource obtained in the manner provided in this Act are of the domain of the holders of the rights conferred on them. The rights over natural resources are granted to individuals through concessions, permits, and authorizations according to the special provisions set forth for each resource. The special regulations include economic compensation mechanisms to the State for its granting, the validity right maintenance, and the conditions for its registration in the relevant register as well as the ability to be assigned between individuals. The domain, this is, the ownership of the fruits and products obtained under this constitutional law, is applicable to the holders of the rights granted over the areas where the natural resources providing them are. The regulation for the concession to individuals of the rights of use of natural resources, renewable and non-renewable, is different according to the nature of such resources.
Law 26839 Law on the Conservation and Sustainable Use of Biodiversity	July 17, 1997	Regulates the general framework for biodiversity conservation and the sustainable use of its components. Contains provisions relating to planning, inventory and monitoring, conservation mechanisms, rural and indigenous communities and the scientific and technological research. The Act provides that the principles and definitions of the Convention on Biodiversity govern its enforcement, contains a Title on Natural Protected Areas consistent with the provisions set forth in Law 26834.
Law 28852 Law on Promotion of Private Investment in Reforestation and Agroforestry	July 26, 2006	It is aimed to declare of national interest the promotion of private investment in reforestation activities with forest plantations, agroforestry and environmental services. The State promotes the use of securities of the domestic financial system and any other instrument of fixed and/or variable income, allowing the financing of forest plantations projects, agroforestry and environmental services in the country. Likewise, it also promotes the establishment and development of Private Funds of Forest Investment destined for the purposes thereof. Article 6 of this Act provides that the State fosters the negotiation of environmental services, in particular the carbon sequestration, involving the private sector in the framework of the agreements subscribed by the country.
Law 25268 Law declaring of public requirement	June 22, 1990	This Law declares of public and national interest the protection, preservation and reforestation of natural grasslands and trees within the national territory, prohibiting the irrational and unrestricted exploitation,

Regulation	Effective Date	Relevant articles evidencing the compatibility with the formulation / implementation of the Project
and of national interest the protection, preservation or reforestation of natural grasslands and trees.		as well as the pastures' burning.
Ministerial Resolution 104-2009-MINAM Approves the procedure for the evaluation and approval of Greenhouse Gas Emissions (GHG) and carbon sequestration projects.	May 24, 2009	With the approval of this procedure, the Ministry of Environment intends to promote the environmental conservation, ensuring the sustainable use of natural resources within the framework of projects developed within the Clean Development Mechanism (CDM) under the Kyoto Protocol, forestry projects, Reducing Emissions from Deforestation and Forest Degradation projects (REDD), and CDM programmatic. The General Directorate of Climate Change, Desertification and Water Resources of the Ministry of Environment the competent authority to respond on the compliance of the project.
Regional Order No. 007-2009-GRMDD/CR	February 17, 2009 (Date of issue). Not published in the Official Gazette	Approves Ruling No. 003-2009-GOREMAD/CAMAYA that creates the Technical Commission on Climate Change of the Madre de Dios region, which has a mandate to propose measures in the short, medium and long term to raise awareness and establish plans and programs in order to avoid the intensification of the conditions affecting the Amazon region, in the framework of the capacity of regional governments on sustainable management of natural resources and improving environmental quality and the preservation and protection of the reserves and Regional Natural Protected Areas.
Regional Order No. 032-2009-GRMDD/CR	Promulgated on December 4, 2009. Still pending its publication in the Official Gazette	Approves Ecological and Economic Zoning of Madre de Dios at a macro level on a scale of 1:250,000 as a base instrument of territorial planning for the implementation of development policies, programs, projects, public and private investment projects that lead to the achievement of sustainable development of the department. Identifies the Ecological and Economic Units from which are defined the most appropriate use for each space. This involves identifying areas suitable for agriculture, livestock, forestry, fishing, mining and energy, protection, biodiversity conservation, ecotourism, urban-industrial, among others. The Ecological and Economic Zoning of Madre de Dios establishes 20 productive zones and within them, 14 agricultural production areas and 4 forestry production areas and other associations. In all of them it is established as recommended use the agriculture, agroforestry, tourism, conservation, reforestation and research.
Law 27308 Forestry and Wildlife Law	July 8, 2000	This Law is aimed at regulating and monitoring the sustainable use and conservation of forest and wildlife resources of the country, combining its use with the gradual valuation of forest ecosystem services, in accordance with the provisions set forth in Articles 66 and 67 of the Political Constitution of Peru, in the General Environmental Law, Law No. 26821, Constitutional Law for the Sustainable Use of Natural Resources and the existing International Conventions for the Peruvian government. Provides the terms of use of forest resources in concessions (for timber and non-timber purposes), permits (for private owned forests, secondary forests and forestry plantations) and authorizations (for dry forests and nurseries). Acknowledges the private sector participation in the

Regulation	Effective Date	Relevant articles evidencing the compatibility with the formulation / implementation of the Project
		development and marketing of environmental services, including the Emission Reduction through Avoided Deforestation.
Law 27795 Demarcation and Territorial Organization Act	February 24, 2003 and amended in February 15, 2006	The aim of this law is to set out basic definitions, technical criteria and procedures for territorial demarcation, which is under the exclusive jurisdiction of the Executive, in accordance with paragraph 7) of Article 102 of the Constitution, so as to achieve the consolidation of boundaries and rational organization of the territory of the Republic. This law establishes as settlements a population over 150 individuals, less people will be defined as sparse population.
Supreme Decree No. 14-2001-AG Regulations of the Forestry and Wildlife Law	April 10, 2001	It is worth to mention that governs the terms of use of forest resources. These include conservation concessions, concessions for the use of other forest products (among them the Brazil Nut) and reforestation and afforestation concessions.
Law 27783 Decentralization Basis Law	July 17, 2002	Regulates the structure and organization of the State under a democratic and decentralized manner, for the National Government, Regional Governments and Local Governments. Likewise, it also defines the rules governing the administrative, economic, productive, financial, tax and fiscal decentralization. In addition, this law establishes the capacities of the three government levels and determines the assets and resources of the regional and local governments; and, regulates the government relations at several levels. Article 36 provides the shared capacities, one of which is the promotion, management and regulation of economic and productive activities in their scope and level, corresponding to the different sectors, including the environmental sector.
Law 27867 Regional Government Constitutional Law	November 19, 2002	Law which in its Articles 9 and 10 provides constitutional capacities, exclusive and shared to the regional governments on environmental issues to promote and regulate activities or services of the environmental sector. They also establish exclusive capacity to promote the sustainable use of forest and biodiversity resources; and shared capacities for the sustainable management of natural resources, environmental quality improvement and the preservation and management of the reserves and regional natural protected areas. Article 53 provides the functions of Regional Governments on environmental and land use planning. In order that the Regional Governments may exercise the capacities conferred by this Law, a process of transfer of those powers must be followed, which is aimed at evidencing that this level of government has the institutional capacity to assume them.
Legislative Decree No. 1085 Creates the Supervisory Board of Natural Resources and Wildlife (OSINFOR)	June 28, 2008	Creates the OSINFOR, which is responsible for the supervision and control of the sustainable use and conservation of forest and wildlife resources, as well as the environmental services coming from forests, granted by the State through various forms of exploitation, acknowledged in the Forestry and Wildlife Law and its regulations.
Law 29263 Environmental Crimes Act	October 2, 2008	This Act amends the criminal offenses of ecological crimes against the environment and typifies its aggravated status, such as illegal trafficking of wildlife protected species, illegal trafficking of aquatic wildlife protected species, illegal extraction of aquatic species, protected wildlife predation,

Regulation	Effective Date	Relevant articles evidencing the compatibility with the formulation / implementation of the Project
		illegal trafficking of genetic resources, crimes against forests and forest formations, among other related offenses.
Supreme Decree No. 010-2004-AG	2004	Provides the presentation of an implementation plan and forest management including the use of natural resources complementary activities, for the granting of several reforestation concession contracts.
Supreme Decree No. 003-2005-AG	2005	Declares Reforestation as of national interest in lands which major use capacity is of forestry and in protection lands with no vegetation cover or with sparse tree cover.
Mining Emergency Decree N° 012-2010	February 18, 2010	Declares of public need, national interest and priority execution the gold mining planning in the department of Madre de Dios, in order to ensure the population health, the people's safety, the tax collection, the conservation of natural heritage and the development of sustainable economic activities.

2. Authorities, Policies and Procedures

2.1 Authorities

Ministry of Environment

Is the governing body of the National Environmental Management System and the National System of Natural Protected Areas. Among its duties is to develop and coordinate the national strategy on climate change and adaptation and mitigation measures, as well as monitoring their implementation. Also responsible for establishing policies on environmental services, preparing the inventory and establishing mechanisms to value, compensate and maintain the provision of environmental services, and to promote the financing, payment and supervision thereof. It is responsible for promoting the creation of financing mechanisms, payment and monitoring of environmental services.

Ministry of Agriculture

Is the governing body of the National Water Resources and is the National Forestry Authority, for which it will establish the sectorial policies regarding the forest environmental services within the framework established by the National Environmental Policy.

Regional Governments

In the scope of their jurisdiction, they will formulate plans and sales programs for environmental services in regions with natural forests, as soon as the capacity transfer process is over.

2.2 Procedures

Ministry of Agriculture

Through the General Directorate of Forestry and Wildlife has jurisdiction to grant concessions, permits and authorizations for the management and use of forest resources. It grants conservation concessions, ecotourism concessions, concessions for the use of other forest products, reforestation and forestry concessions, and timber forest concessions. The use of environmental services is compatible with all these type of concessions, subject to the compliance with the requirements and formalities provided in the Forestry and Wildlife Law, its regulations and supplementary regulations.

Regional Governments

This level of government will be responsible for granting concessions, permits and authorizations for the management and use of forest resources in their jurisdiction as soon as the capacity transfer process of the Central Government is over. In addition, it has the capacity to implement plans, develop and implement programs for the sale of environmental services in regions with natural forests or protected areas.

2.3 Supervision

Environmental Assessment and Control Agency (OEFA)

Supervises and controls the compliance with the general provisions for environmental protection in all sectors. It includes the supervision in Natural Protected Areas.

Supervisory Agency of Natural Resources and Wildlife (OSINFOR)

Supervises and controls the use and conservation of forest and wildlife resources, as well as the environmental services coming from forests, for its sustainability, according to the national and strategy policy for integrated management of natural resources and policies to be established on environmental services by the Ministry of Environment.

2.4 Granting of Forest Concessions to Individuals

The administrative procedure to grant non-timber concessions is governed by the Regulations of the Forestry and Wildlife Law. It provides that the requirements to request a Brazil nut concession are: name or registered name of the applicant, perimeter map with UTM coordinates and a brief description of the project to be developed. It should be noted that the legislation provides that the granting is made in a maximum area of 10,000 hectares and up to 40 years renewable. The legislation also states that concessions are granted under exclusivity, for which the forest authority is unable to grant other rights over the same area (it is understood forest or wildlife rights) to third parties.

With respect to the authority to sign contracts of Brazil nut concessions, it should be remembered the particular context of the geographic location of the Brazil nut. In Peru, the areas where there are clusters of Brazil nuts in quantities that make its use relevant, and where their use is traditional are in the department of Madre de Dios. This is why the provisions for its use with rules that normally are within the national scope, have been designed to be implemented by the Forestry Directorate of Madre de Dios, through forest and wildlife technical administrations - ATFFS of Tambopata- Manu and Tahuamanu.

Even though these two ATFFS, had the faculty to sign contracts with Brazil nut producers, since April 2009, the Peruvian government established by Supreme Decree the capacities of the forest and wildlife technical administrations; by this regulation, the ATFFS would have lost the power they previously had to sign contracts, for which today this capacity is in the hands of the Ministry of Agriculture, with the support of the General Directorate of Forestry and Wildlife as instructing body of the procedure, at least until the forest capacity transfer to regional governments process is over.

As from the legal forestry and wildlife framework of year 2000, all forest use should follow technical parameters using management plans that allow efficient and sustainable use of the forest. For this reason, the rule provides that the Brazil nut concessionaire is obliged to present the General Forest Management Plan - GFMP and Annual Operating Plan - AOP (both with Terms

of Reference approved in 2002) 30 days after the start of the second year of harvest. Thus, the holder of title may begin its activities in accordance with the GFMP and AOP at the beginning of the second harvest. The Brazil nut producer is committed to develop and implement the **Brazil Nut Management Plans**.

It is worth to mention that in 2005 it was defined that the authority responsible for the approval of these management documents (the GFMP and AOP for Brazil nut, and FMP for shiringa) are the forest and wildlife technical administrations of Tambopata-Manu and of Tahuamanu, a situation which, as aforementioned, has changed since 2009, being currently the General Directorate of Forestry and Wildlife the responsible body for this approval.

3. Approval of Competent Authorities

As mentioned in the previous chapter, each concessionaire, by means of a contract entered with the Peruvian State has the right to usufruct the benefits granted by the forest concession by signing the Concession Agreement for Management and Use of Forest Products other than Timber in the Department of Madre de Dios that each of the concessionaires that are part of the project have signed with the Peruvian Government, as shown in the contract example in attached document.

The project has the approval of the participating Brazil nut concessionaires thereof, through the assignment of their rights, titles and interests over the environmental services of carbon sequestration resulting from conservation, preservation and other activities, granted to the Departmental Federation of Brazil nut Producers of Madre de Dios – FEPROCAMD, and, the latter in turn, assigns these rights to the company Bosques Amazonicos SAC, by signing the Contract named: Investment Commitment and Carbon Emission Reductions Credit Transfer Master Agreement in attached document.

Bosques Amazonicos SAC, has a file with documents for each of the Brazil nut Concessionaires of the project, consisting in: Concession Contract for Management and Use of Forest Products other than Timber in the Department of Madre de Dios; Assignment of Rights Agreement; Copy of the Identity Card of the Concessionaire; Administrative Resolution of the General Forest Management Plan and Administrative Resolution of Annual Operating Plan. All of this documentation may be submitted upon requirement of the Auditor.

The project will not invade the private property; it has the invitation of the Brazil nut Concessionaires, as evidenced in the Master Agreement attached in attached document. A series of consultations have been carried with the Brazil nut concessionaires, all of such consultations are presented in the indicator 9 of Section G3.

4. Involuntary Relocation of People or Activities

The development of the project activities develops in concessionaire areas conducting Management and Use of Brazil nut activities. The installation and operation of the Processing Plant activities will be held in deforested areas and intended for population, owned by BAM. There are no settlements, indigenous communities or houses within the project area that need to be removed or relocated to develop project activities.

In relation to the mining activities, whose concessions (67) overlap with the project area, they have not been executed to date, and as of the Mining Emergency Decree No. 012-2010 is an area

where legally no mining activity can be performed, and in addition, for the execution of mining exploitation a permit from the Forest Authority is required. The Forestry Authority of the Ministry of Agriculture has given consent for the management and use of the forest.

The project strategy is framed in a legal context, for which it will work with Brazil nut Concessionaires. The mining concessions activities are not legal as mentioned in the previous paragraph; however, the project intends to work with them through deterrence and training in order to provide sustainable alternative activities.

In the current national context to counteract the informal and aggressive mining activity to the environment, is framed in the search for the formalization of mining and work under legal and environmental regulations, for which enter into agreements with deforestation agents would constitute jurisprudence and will provide a path for future conflicts.

5. Impact of Illegal Activities

In recent years, Madre de Dios has seen its population increase by a migratory wave mainly coming from the Southern Andes of Peru, especially in the last decade, originating the increase of resource demands and job seekers around the most important activities in the department.

In the analysis of the deforestation causes in the project area, two activities were reviewed that have been exacerbated by this migratory wave, in some cases, incurring in illegal practices such as the invasion of public or private areas. The causes of these illegal practices have ranged from the lack of supervision and monitoring of the deforestation in the project area; the corruption of some officials of the Ministry of Agriculture who grant proof of possession without objective verification; the illegal land trafficking, up to the lack of implementation of ecological and economic zoning processes and the subsequent land-use planning.

These activities are alluvial gold mining and shifting agriculture:

Shifting Agriculture and Livestock Activities

Migrant farmers usually come from Andean communities from the regions of Cusco, Puno and Arequipa, to settle along the transoceanic highway (it is estimated that 300 migrants arrive daily to Puerto Maldonado); they practice the slash and forest burning to build farms that due to weathering rapidly lose fertility and productivity, forcing them to continue deforesting for new places to grow, producing a vicious circle of poverty and environmental degradation. This threat is distributed along the road and the points of access to secondary roads of this highway and main settlements (Mavila, Planchon, Alegria and others).

A variant of these invasions are those that are oriented at expanding agricultural activities, felling and burning forests surrounding the properties or residences of local people who, due to the exhaustion of their areas invade neighboring areas to continue and expand its exploitation.

Mining

The Southern area of the project is geologically linked to alluvial deposits belonging to the Holocene Quaternary era, where is found the major gold component, for which the alluvial gold mining is a constant threat in this area causing directly the change in the land use, the total destruction of the original vegetation and of the poor organic soil that could give rise to natural regeneration. This mining enters illegally into the project area invading some Brazil nut concessions or with a partial legality, through mining concessions granted by the Ministry of

Energy and Mines (47.701 ha), that have been granted in conflict of use, overlapping with the project area and without a favorable report from the forest authority (General Directorate of Forestry and Wildlife).

Based on the analysis of causality, 5 agents have been identified who participate and generate that the deforestation processes are implemented through illegal activities.

Table 86. Identified Deforestation Agents in the Project Area

Agent	Link with deforestation
Slash and burn farmers	Slash and deforest to grow subsistence crops and other cash crops.
Loggers	Log commercial timber; the roads opened by loggers allow the open access to other land users.
Alluvial gold miners	Perform change of land use by removing large amounts of soil and destroying the ecosystem. In addition, contaminate with mercury the river waters involved and eliminate the ichthyologic fauna of the same.
Corrupt or without information officials	Grant permits for mining extraction in areas of use conflict or with already granted rights. Other grant rights of possession and titles to invaders of forest under concession.
Infrastructure planners and of territorial occupation	The roads and highways built through forest areas provide access to other land users; ZEE classifies the forests of the area and zones with potential for agricultural, livestock and mining activities in the South area. No Brazil nut concessions are included in mining exclusion areas.

The project through its Monitoring and Control System of areas and political advocacy activities, partnerships and agreements with authorities, training to officials and others, will control these illegal acts in the project area reaching a concerted process of forest governance.

6. Title of Carbon Rights

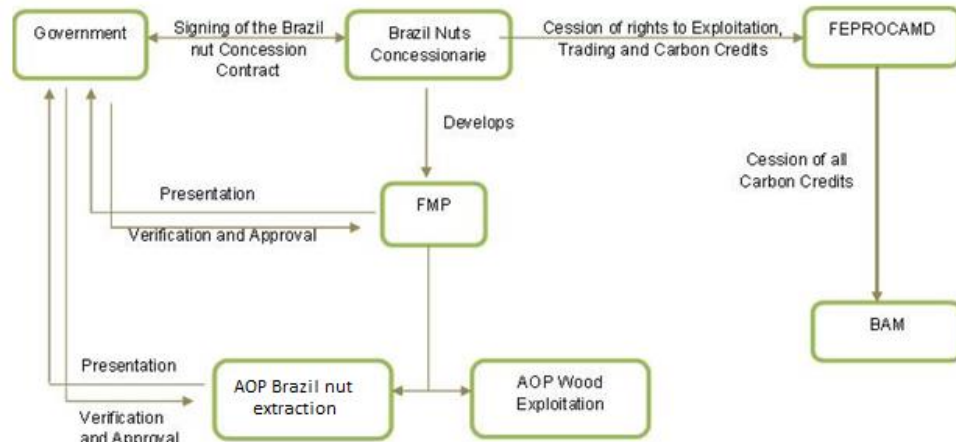
The following are presented as proof of title:

- The Investment Commitment Agreement between BAM and FEPROCAMD
- The Assignment of Rights Contract from an individual concessionaire to the federation (FEPROCAMD)
- Concession Contract for the Management and Utilization of Non-Timber Forestry Products, entered into by and between the State and the Concessionaires

These documents are being attached and belong to just one concessionaire. The contracts of the 405 concessionaires that are part of the project can be found in the BAM files if required. It is very important to emphasize that all concessionaires of the Project comply with all requirements imposed by the State: Forest Management Plan (FMP) and Annual Operating Plan (AOP).

Below there are the legal steps followed for the Assignment of Carbon Rights from FEPROCAMD to BAM SAC.

Figure 27: Flowchart of Carbon Rights



In-house elaboration

Everything related to the carbon market is new in the country, so the concession contracts so far have made no mention of carbon as a resource. However, because of the new projects being developed, with BAM's help, concessioners are presenting supplementary plans to FMP, so they can use this resource following the established legislation, which requires that all development be adequately supported by a plan management. Nevertheless, from the Civil Code and the Organic Law for Sustainable Use of Natural Resources (Law N° 26821) among others, it can be assumed that the Brazil nut concessionaires have the right over the carbon resource.

This is documented in the attached document: *Ownership and use rights for environmental services of carbon capture hold by Brazil nut concessioners of Madre de Dios*, made by the law firm REBAZA, ALCAZAR & DE LAS CASAS.

CLIMATE SECTION

CL1. Net Positive Climate Impacts

1. GHG Emissions in the Project Case

The ex-ante estimations of total emissions due to project activities were developed according to the module "*Methods for monitoring of greenhouse gas emissions and removals*" (M-MON)¹¹⁶. These activities are currently under implementation and ex-post results will be monitored and reported for verification purposes.

The total emissions under the project case are estimated with:

$$\Delta C_p = \sum \sum (\Delta C_{p,defPA,i,t} + \Delta C_{p,Deg,i,t} + \Delta C_{p,DistPA,i,t} + GHG_{p-E,i,t} + \Delta C_{p,Enh,I,t})$$

(Eq. N° 1 M-MON Module, VCS Modular Methodology)

Where,

ΔC_p Net greenhouse gas emissions within the project area under the project scenario;
t CO₂-e

¹¹⁶ Approved VCS Module VMD0015 v2.1, available at <http://v-c-s.org/methodologies/VMD0015>

$\Delta C_{p,defPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i at time t , t CO ₂ -e
$\Delta C_{p,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum i at time t , t CO ₂ -e
$\Delta C_{p,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum i at time t , t CO ₂ -e
$GHG_{p-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the PA in the project case in stratum i at time t , t CO ₂ -e
$\Delta C_{p,Enh,I,t}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum i at time t , t CO ₂ -e
i	1,2,3 ... M strata
t	1,2,3 ... t^* years elapsed since the start of the REDD project activity

Each parameter mentioned comes from particular equations and procedures, which are explained next. Those results were then used in the final equation (above) to obtain:

Table 87. Cumulative GHG Emissions in the Project Area under the Project Scenario

T	Year	ΔC_P (Ex-ante) t CO ₂ -e
1	2010	132,868.9
2	2011	265,737.7
3	2012	398,606.6
4	2013	531,475.4
5	2014	664,344.3
6	2015	797,213.2
7	2016	930,082.0
8	2017	1,062,950.9
9	2018	1,195,819.8
10	2019	1,328,688.6
11	2020	1,461,557.5
12	2021	1,594,426.3
13	2022	1,727,295.2
14	2023	1,860,164.1
15	2024	1,993,032.9
16	2025	2,125,901.8
17	2026	2,258,770.6
18	2027	2,391,639.5
19	2028	2,524,508.4
20	2029	2,657,377.2
21	2030	2,790,246.1
22	2031	2,923,115.0
23	2032	3,055,983.8
24	2033	3,188,852.7
25	2034	3,321,721.5

26	2035	3,454,590.4
27	2036	3,587,459.3
28	2037	3,720,328.1
29	2038	3,853,197.0
30	2039	3,986,065.8
31	2040	4,118,934.7

1.1 Carbon Stock Change in the Project Case

It is set in M-MON that carbon stock change should be attributed to three main activities: Deforestation, Degradation and Natural Disturbances that may occur inside the PA in the with-project case.

Carbon Stock Change in the Project Case due to Unplanned Deforestation

The monitoring of deforestation will be made through the analysis of satellite images in order to obtain the areas of change inside PA. The description of techniques and assumptions to be used are explained in the Monitoring Section (CL3). Once the deforested areas are estimated, the following equation must be used:

$$\Delta C_{p,DefPA,i,t} = \sum (A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \quad (\text{Eq. N° 3 M-MON Module, VCS Modular Methodology})$$

Where,

$\Delta C_{p,defPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i at time t , t CO ₂ -e
$A_{DefPA,u,i,t}$	Area of recorded deforestation in the project area stratum i converted to land use u at time t ; ha
$\Delta C_{pools,P,Def,u,i,t}$	Net carbon stock changes in all pools in the project case in land use u in stratum i at time t , t CO ₂ -e
i	1,2,3 ... M strata
t	1,2,3 ... t^* years elapsed since the start of the REDD project activity

And,

$$\Delta C_{pools,P,Def,u,i,t} = C_{BSL,i} - C_{P,post,i} - C_{WP,i} \quad (\text{Eq. N° 5 M-MON Module, VCS Modular Methodology})$$

$C_{BSL,i}$	Carbon stock in all pools in the baseline case in stratum i , t CO ₂ -e ha ⁻¹
$C_{P,post,i}$	Carbon stock in all pools in post-deforestation LU u in stratum i , t CO ₂ -e ha ⁻¹
$C_{WP,i}$	Carbon stock sequestered in wood products from harvest in stratum i , t CO ₂ -e ha ⁻¹
u	1,2,3 ... U post-deforestation land uses

This calculation will be undertaken for each monitoring period. In the present case, the ex-ante emissions resulting from deforestation in the project scenario were set to zero since the Project activities are being implemented, and these include a Monitoring and Surveillance System in the Project Area as well as an Early Alert System. These activities are preventing deforestation from occurring inside the PA.

Moreover, it is considered that no timber extraction occurs in the process of deforestation. In any case, not accounting for carbon stock sequestered in wood products is conservative, and will not be considered in the N°5 M-MON equation.

Carbon Stock Change in the Project Case due to Degradation

Degradation in the PA can occur through either selective legal logging or illegal extraction of trees for timber or fuel and charcoal. The methodology suggests the use of ground-based methods to account for degradation like the Participatory Rural Appraisal (PRA) or the systematic sampling. The general formula for total degradation is:

$$\Delta C_{P,Deg,i,t} = \Delta C_{P,DegW,i,t} + \Delta C_{P,SelLog,i,t} \quad (\text{Eq. N° 7 M-MON Module, VCS Modular Methodology})$$

Where,

$\Delta C_{P,Deg,i,t}$	Net carbon stock change as a result of degradation in the PA in the project case in stratum i at time t , t CO ₂ -e
$\Delta C_{P,DegW,i,t}$	Net carbon stock change as a result of degradation through extraction of trees for illegal timber or fuelwood and charcoal in the PA in the project case in stratum i at time t , t CO ₂ -e
$\Delta C_{P,SelLog,i,t}$	Net carbon stock change as a result of degradation through selective logging of FSC certified forest management areas in the PA in the project case in stratum i at time t , t CO ₂ -e
i	1,2,3 ... M strata
t	1,2,3 ... t^* years elapsed since the start of the REDD project activity

The specific equations for each source of degradation are described in the Monitoring Section (CL3).

At present, no degradation by illegal timber extraction or fuelwood production is expected, according to the prior results of the PRA developed in 2011 (see *Degradation Monitoring Report.docx*) and the analysis made of reference data (see *Analysis of Collection of Firewood and Coal inside Project Area.docx*). If any pressure over the concessions by these activities is identified, then it will be accounted and the emissions deducted for the monitoring period.

On the other hand, degradation by legal timber extraction is expected to occur every year in different concessions. In year 2010, the 23% of project members did logging (Extraction Balance 2010, Forestry Directorate). In general, this proportion is similar to those seen in previous years, but since the start of the Project, it has decreased considerably.

The extraction of timber depends on many factors, being the most important the economic needs of the concessionaires. As seen in the first 3 years of the project, we foresee that the increase of income resulting from the improves made to the Castaña activity as well as the improves in the extraction practices, would keep the degradation emissions from logging in lower values to those seen in 2010. Hence, an estimation of the emissions from legal logging was made using 2010-year field data. For said calculation, we followed the methodological steps from M-MON Module, Section 5.2.2.2. The entire procedure can be revised in attached document *Degradation Estimations.xlsx*

The value obtained represents the maximum expected for each year. Ex-post data will be available for every monitoring period.

Table 88. Yearly Degradation Emissions in Project Scenario

Cp,Deg,i,t			
Stratum	Cp,DegW,i,t	Cp,SelLog,i,t	TOTAL
BTI	-	785.54	785.54
PA	-	2 876.22	2 876.22
BPT	-	6 694.19	6 694.19
BT	-	103 731.73	103 731.73
P	-	1 819.07	1 819.07
BCB	-	12 444.26	12 444.26
BPCB	-	3 534.32	3 534.32
TOTAL	-	131 885.33	131 885.33

Table 89. Cumulative Degradation Emissions in the Project Area in Project Scenario

T	Year	Cp,Deg,i,t
1	2010	131 885.33
2	2011	263 770.66
3	2012	395 655.99
4	2013	527 541.33
5	2014	659 426.66
6	2015	791 311.99
7	2016	923 197.32
8	2017	1 055 082.65
9	2018	1 186 967.98
10	2019	1 318 853.31
11	2020	1 450 738.64
12	2021	1 582 623.98
13	2022	1 714 509.31
14	2023	1 846 394.64
15	2024	1 978 279.97
16	2025	2 110 165.30
17	2026	2 242 050.63
18	2027	2 373 935.96
19	2028	2 505 821.30
20	2029	2 637 706.63
21	2030	2 769 591.96
22	2031	2 901 477.29
23	2032	3 033 362.62
24	2033	3 165 247.95
25	2034	3 297 133.28
26	2035	3 429 018.61
27	2036	3 560 903.95
28	2037	3 692 789.28
29	2038	3 824 674.61
30	2039	3 956 559.94
31	2040	4 088 445.27

Carbon Stock Change in the Project Case due to Natural Disturbances

Regional and national data of occurrence of natural disturbances such as forest fires, pests and disease outbreaks and extreme weather (flooding) were analyzed and revealed that the kind of disturbances do not have significant impacts in the forest of the PA.

Fire

Due to the climatic characteristics of the area: high humidity, annual average rainfall of 2000 mm also considered as high, maximum moderate temperatures; there is a very low incidence of natural fires in the Amazon region, which correspond to the department of Madre de Dios and the project area. In Wildfire (2007) Manta¹¹⁷ states that "Forest Fires of natural cause in South America are associated mainly to thunderstorms (lightning).... and fortunately tropical thunderstorms of the Oriental plain are accompanied by heavy rains that keep the flame lit by lightning most of the time off". In the specific case of Peru, she affirms that forest fires are 100% anthropic and explicitly intentioned, whose main cause is the burning for grazing and agriculture activities. However, she also mentions that other factors such as the promotion of agriculture and stock farming, oil exploitation and construction of pipelines and roads, etc., make the natural forests to be more vulnerable to fire.

There has only been one considerable fire in 20 years (dated in 1999) and it affected 90 has of agricultural parcels. This information is confirmed by INEI¹¹⁸, although it only has information recorded for period 1996 – 1999. On the other hand, the international forest fire alert system "Fire Alert System" shows that from years 2002 to 2009 there have been many outbreaks of fire. The map shows that these outbreaks were distributed throughout the Interoceanic Highway, for which it can be deduced that they correspond to the burning of agricultural areas and/or for the opening of new ones, since these are located just around the road axis. The difference between these sources of information shows that the official data only includes data from large-scale forest fires, which compromise forested areas.

Pests and Disease Outbreaks

The tropical rain forest, due to its great diversity of species, is very resistant to plagues and endemic diseases. They usually occur in areas of homogeneous vegetation such as plantations, especially the ones with non-native species. In the Amazon forest there are no reports on plagues and endemic diseases in the natural forests of Madre de Dios.

Extreme Weather

In the INEI and INDECI statistics there are many weather events considered as natural emergencies. However, the region of Madre de Dios has only records of floods that mostly affect pastures and agricultural and urban areas. For the forest, periodic flooding of the floodplain is part of its natural dynamic and does not represent a risk of change in carbon stocks.

Another event that affects population is "Friaje" which occur cyclically and can be described as the incursion of polar air masses associated to the sudden decrease in air temperature (15 °C in

¹¹⁷ Manta Nolasco, María. Assessment of natural and socio-economical causes of forest fires in South America. Wildfire 2007.

¹¹⁸ INEI. <http://www.inei.gob.pe/biblioineipub/bancopub/Est/Lib0351/indice8.htm>

just a few hours), increase in the cloudiness of strati form type, intensification of the winds and increase of the atmospheric pressure. According to Marengo (1983) the most affected department is Madre de Dios, but as is a natural cyclical event, do not represent a danger to the permanence of the standing forest.

Geological Risk

Madre de Dios is also a geologically stable department. According to the National Center of Geophysical Data (CNDG) is a region with no seismic activity (Bernal et al 2001). This is because it is far from the Fire Belt and the main seismic epicenters of the country.

Therefore, ex ante the net carbon stock change as a result of a natural disturbance in project case equals zero. However, if some natural disturbance occurs within the PA it will be monitored and reported.

Carbon stock change in the project case due to forest growth

Carbon stock enhancement was not included either in the baseline or the project scenario. This activity will not be monitored in order to be conservative.

1.2 Non-CO₂ Greenhouse Gas Emissions in the Project Case

When significant, GHG emissions different to CO₂ will be calculated with the following equation:

$$GHG_{P,E,i,t} = E_{FC,i,t} + E_{BiomassBurn,i,t} + N_2O_{direct-N,i,t} \quad (\text{Eq. N° 30 M-MON Module, VCS Modular Methodology})$$

Where,

$GHG_{P,E,i,t}$ Greenhouse gas emissions as a result of deforestation activities within the project area in the project case in stratum i in year t ; t CO₂-e

$E_{FC,i,t}$ Emissions from fossil combustion in stratum i within the PA in year t ; t CO₂-e

$E_{BiomassBurn,i,t}$ Non-CO₂ emissions due to biomass burning in stratum i in year t ; t CO₂-e

$N_2O_{direct-N,i,t}$ Direct N₂O emissions as a result of nitrogen application on the alternative land use in stratum i within the PA in year t ; t CO₂-e

i 1,2,3 ... M strata

t 1,2,3 ... t^* years elapsed since the start of the REDD project activity

GHG Emissions from Biomass Burning

No deforestation or degradation, and therefore emissions from biomass burning, are considered inside the Project Area in the with-project case, because of the expected results of the proposed activities.

GHG Emissions from Fossil Fuel Combustion

The implementation of some activities in the with-project scenario will result on emissions due to fossil fuel combustion, which were ex-ante estimated using the procedures detailed in the “Estimation of emissions from fossil fuel combustion” module (E-FFC)¹¹⁹.

¹¹⁹ Approved VCS Module VMD0014 v1.0, available at <http://v-c-s.org/methodologies/VMD0014>

The equations used in said estimations, approved by IPCC (2006), are:

$$E_{FC,i,t} = \sum (Fuel_{a,i,t} \times EF_a) \quad (\text{Eq. N}^\circ 1 \text{ E-FCC Module, VCS Modular Methodology})$$

Where,

$E_{FC,i,t}$ Net CO₂-e emissions of fuel consumption in stratum i in year t ; t CO₂-e

$Fuel_{a,i,t}$ Amount of fuel of type a consumed in stratum i in year t ; terrajoule (Tj)

EF_a Emission factor of fuel type a ; t CO₂-e/Tj

a 1,2,3 A fuel types (e.g. diesel, gasoline, etc.)

And,

$$Fuel_{a,i,t} = Liters_{Fuel_{a,i,t}} \times Density_{Fuel_{a,i,t}} \times NCV_{Fuel} \div 10^6 \quad (\text{Eq. N}^\circ 2 \text{ E-FCC Module, VCS Modular Methodology})$$

$Liters_{Fuel_{a,i,t}}$ Quantity of fuel type a consumed in in stratum i in year t ; ltr

$Density_{Fuel_{a,i,t}}$ Density of fuel type a ; kg/ltr

NCV_{Fuel} Net caloric value of fuel type a ; Tj/Gg

The parameters used in both equations are:

Table 90. Emission Factors

EF_a	Default effective CO ₂ emission factor (EF)	Unit	Source
Electric Energy	0,472	t CO ₂ /MW-hour	Emission Factor Used in Kyoto mechanisms
Caloric Energy	69.3	t CO ₂ /TJ	Table 1.4 Chapter 1 Vol. 2 of IPCC, 2006.
Motor Gasoline	69.3	t CO ₂ /TJ	Table 1.4 Chapter 1 Vol. 2 of IPCC, 2006.
Gas/Diesel Oil	74.1	t CO ₂ /TJ	Table 1.4 Chapter 1 Vol. 2 of IPCC, 2006.

Table 91. Density and NCV values

Variable	Type of fuel	Value	Liters per ton	Source
Density	Motor Gasoline	0.7407 kg/Lt	1350	Table A.3 Page 181 of the Energy Statistics Manual of OECD/IEA, 2004.
Net Calorific Value (NCV)	Motor Gasoline	44.75 TJ/Gg	1350	Table 1.12, Chapter 1, Volume 2, IPCC 2006 Inventory Guidelines and Table A.3 Page 181 of the Energy Statistics Manual of OECD/IEA, 2004.
	Gas/Diesel oil	43.38 TJ/Gg	1185	

The activities that were estimated are listed below, and more calculation details can be found in the excel document *Ex-ante GHG Emissions in the with-project case.xlsx*.

Brazil nut Processing Plant

The implementation of the Brazil nut processing plant will present emissions mainly from the installation and use of equipment for processing the nuts. All the machines needed to process the Brazil nut were listed, and the consumption of fuel and energy was estimated per machine, per hour, per day and finally per year (see specifically the *Plant's Energetic Consumption* spreadsheet). Then, by using Eq. N°1 E-FCC, the annual expected emissions were estimated:

Table 92. Equivalent emissions from the Processing Plant

Equipment's Source of Energy	Annual Consumption	Total Emissions t CO ₂ -e/year
Electric Energy	659.72 MW-hour	311.39
Caloric Energy	9.15 TJ	633.98
Total		945.37

Tree Nursery

The emissions calculated for this activity will proceed mainly from the transport of construction materials and annual inputs like sand, soil, seeds, etc., and the transport of seedlings. The emissions of N₂O from applying nitrous fertilizers inside the Tree Nursery have not been considered, in spite of being planned, because E-NA Module¹²⁰ states that when it happens in tree nurseries outside Project Area, they may be considered as negligible.

The items considered can be seen in spreadsheets *Tree Nursery Calculations* and *Tree Nursery Emissions*, and are based on the preliminary design of the implementation and operation of the tree nursery, made by Engineer J. Chavez, who is also in charge of the Forest Plantation and tree nursery of the Campo Verde Project (*Reforestation of Pastures in Campo Verde with native species, Pucallpa, Peru*; validated by VCS in 2009).

The tree nursery at a first stage, will have a capacity of 60 000 seedlings, and during a second stage of implementation it is expected that it will double its production (with 120 000 seedlings). During first stage the emissions will be 5.53 t CO₂-e/year, while in full capacity they will be 11.06 t CO₂-e/year. This final amount was considered for the total emissions calculation.

Table 93. Equivalent emissions from the Tree Nursery

Total Emissions		1st stage	Full capacity
$E_{FC, TreeNursery} =$	$\sum (E_{FC1}, E_{FC2}, E_{FC3}, E_{FC4}) =$	5.53	11.07

Surveillance Emissions

Concessionaires will organize a Ground Team of Monitoring and Surveillance, formed by 12 people divided into sub-teams of two people for each of the 6 Checkpoints that will also be implemented. A weekly preventive patrolling system will be implemented throughout the boundaries of the project area, highlighting some critical points.

¹²⁰ Name under the Modular Methodology of the A/R Methodological tool "Estimation of direct N₂O emissions from nitrogen application", available at http://cdm.unfccc.int/EB/033/eb33_repan16.pdf

The Forest Surveillance Committee will be formed by active members of the Federation, who will directly receive the reports and findings of the Monitoring and Surveillance Team. A protocol is being elaborated to gather graphic information and statements to legally prosecute those ecological crimes committed within the project area.

The patrolling system includes 4 different river routes as well as a number of routes along roads per sectors. For each means of transport, we have estimate the fuel (gasoline) consumption per month.

Table 94. Consumption of gasoline from Monitoring and Surveillance activity

	Total gallons
River	170
Roads	90
Month	260
Year	3120

The emissions are estimated using the annual gasoline consumption and the equations mentioned before:

Table 95. Equivalent emissions from Monitoring and surveillance

Type of Fuel	Annual Consumption (ltr)	<i>EFC,Surveillance</i> t CO ₂ -e
Gasoline	11 793.60	27.09

Construction of Checkpoints

Six checkpoints will be constructed. All of the Checkpoints will be located in strategic places in order to monitor and control illegal logging activities, migratory agriculture and mining activities in PA and its surroundings.

Part of the plan is to adapt 4 premises of the Agricultural Agencies, located in the road axis: Planchon, Alegria, Mavila and Alerta. The arrangement of these offices will include: placement of mesh nets (mosquito nets), painting of furniture and installing equipment.

To monitor the Brazil nut forests next to the river, two more checkpoints shall be implemented considering the availability of land, construction materials and workforce. It is assumed that for their construction, local materials will be employed.

Furthermore, two extra checkpoints are planned to be constructed in areas with larger concentration of Brazil nut concessionaires (in support of the 4 first mentioned), more likely in Varsovia or Lucema, and another one in Nuevo San Juan. These offices will have a small size (16m²) and shall be constructed using rustic materials from the surroundings, to allow their mobility.

Since already constructed infrastructure will be used, the emissions from this activity were set to zero. Also, the new infrastructure to be implemented does not present emissions from transportation of materials or from use of machinery, as the materials used will be those available in the area and the construction of the premises will be artisanal.

By summing these emissions, we obtained the total result for fossil fuel combustion, which can be seen in the following table:

Table 96. Emissions from fossil fuel combustion due to implementation of Project Activities

Activity	Emissions of Project Activities (ex-ante) t CO ₂ -e/year
Brazil Nut Processing Plant	945.37
Surveillance and Monitoring Patrolling	27.09
Tree Nursery	11.07
TOTAL ($E_{F,C,i,t}$)	983.53

GHG Emissions from Nitrogen Application

Nitrogen applications will not occur inside the Project Area, with the exception of the fertilizer applications inside the Project's tree nursery that will be located outside the PA. Therefore, direct N₂O emissions resulting from these applications were not accounted¹²¹ as they do not exist in the project area.

The final sum of all preceding calculations, make up the ex-ante total emissions under the project scenario (Table 87).

1.3 Other GHG Emissions (Section CL1.3)

No other GHG emissions were estimated.

2. Net GHG Emissions and Significance Test (Section CL1.1 and CL1.2)

In the former sub-section, we estimated the with-project scenario carbon stock change and non-CO₂ GHG emissions, which together make up the total with-project GHG emissions (ΔC_P). This value, together with the baseline emissions ($\Delta C_{BSL,unplanned}$), is necessary to estimate the net change. As $\Delta C_{BSL,unplanned}$, calculated in Section G2, also combines the carbon stock change and non-CO₂ GHG emissions, we have determined a total net change by subtracting this value from ΔC_P . The difference can be seen in Table 97.

According to the methodology, only the significant emissions should be considered in the final calculations of the net emission reductions. Therefore, a significance test was done following the procedures of T-SIG module¹²². The relative contributions were estimated using the equation:

$$RC_{E_i} = \frac{E_i}{\sum E_i} \quad (\text{Eq. N° 5.4.1 IPCC 2003})$$

Where,

¹²¹ E-NA module sets out that when the only source of N₂O emissions is due to the application of fertilizer in tree nurseries outside the PA, then these emissions may be considered as negligible.

¹²² Name under the Modular Methodology of the A/R Methodological tool "Tool for testing significance of GHG emissions in A/R CDM project activities" Version 01, available at <http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-04-v1.pdf>

RC_{Ei}	Relative contribution of each source to the sum of project and leakage carbon stocks
E_i	Carbon stocks by sources
i	Index for individual sources of project and leakage stocks

Therefore, the total baseline emissions ($\Delta C_{BSL,unplanned}$) were compared with the total ex-ante project emissions (ΔC_P). The results show project emissions add little when compared to baseline emissions.

Table 97. Total GHG emissions in baseline and ex-ante with-project case scenarios

T	Year	$\Delta C_{BSL,unplanned}$ t CO ₂ -e	ΔC_P (Ex-ante) t CO ₂ -e	Net change in total GHG Emissions	Summed C_{BSL} and C_P Emissions (for Sig. test)
1	2010	3 059 016.64	132 868.9	-2 926 147.74	3 191 885.5
2	2011	6 126 613.66	265 737.7	-5 860 875.96	6 392 351.4
3	2012	9 144 678.28	398 606.6	-8 746 071.68	9 543 284.9
4	2013	12 518 993.54	531 475.4	-11 987 518.14	13 050 469.0
5	2014	15 750 806.49	664 344.3	-15 086 462.19	16 415 150.8
6	2015	19 079 030.69	797 213.2	-18 281 817.49	19 876 243.9
7	2016	22 190 218.06	930 082.0	-21 260 136.06	23 120 300.1
8	2017	25 181 267.82	1 062 950.9	-24 118 316.92	26 244 218.7
9	2018	28 294 738.86	1 195 819.8	-27 098 919.06	29 490 558.6
10	2019	31 166 325.78	1 328 688.6	-29 837 637.18	32 495 014.4
11	2020	33 971 621.15	1 461 557.5	-32 510 063.65	35 433 178.6
12	2021	36 786 138.40	1 594 426.3	-35 191 712.10	38 380 564.7
13	2022	39 762 626.53	1 727 295.2	-38 035 331.33	41 489 921.7
14	2023	42 599 093.94	1 860 164.1	-40 738 929.84	44 459 258.0
15	2024	45 593 699.93	1 993 032.9	-43 600 667.03	47 586 732.9
16	2025	48 592 792.04	2 125 901.8	-46 466 890.24	50 718 693.8
17	2026	51 573 146.92	2 258 770.6	-49 314 376.32	53 831 917.6
18	2027	54 565 429.60	2 391 639.5	-52 173 790.10	56 957 069.1
19	2028	57 578 382.12	2 524 508.4	-55 053 873.72	60 102 890.5
20	2029	60 436 491.98	2 657 377.2	-57 779 114.78	63 093 869.2
21	2030	63 431 236.17	2 790 246.1	-60 640 990.07	66 221 482.3
22	2031	66 475 500.84	2 923 115.0	-63 552 385.84	69 398 615.8
23	2032	69 507 620.30	3 055 983.8	-66 451 636.50	72 563 604.1
24	2033	72 543 765.62	3 188 852.7	-69 354 912.92	75 732 618.3
25	2034	75 487 049.22	3 321 721.5	-72 165 327.72	78 808 770.8
26	2035	78 719 046.69	3 454 590.4	-75 264 456.29	82 173 637.1
27	2036	81 567 760.37	3 587 459.3	-77 980 301.07	85 155 219.6
28	2037	84 506 925.24	3 720 328.1	-80 786 597.14	88 227 253.4
29	2038	87 343 191.48	3 853 197.0	-83 489 994.48	91 196 388.5
30	2039	90 207 325.33	3 986 065.8	-86 221 259.53	94 193 391.2
31	2040	92 954 858.06	4 118 934.7	-88 835 923.36	97 073 792.8

Table 97 shows that the total emissions in the project case are not significant as their sum is lower than 5% of total emissions. For this reason, ΔC_P is neglected in the final sum of GHG reductions.

Table 98. Relative contributions analysis of baseline and project case emissions

Emission	Relative contribution	RC _{Ei} (%)	Rank	Sum of RC _{Ei} (%)
$\Delta C_{BSL,unplanned}$ t CO ₂ -e	0.96	95.76	1	95.76
ΔC_P (Ex-ante) t CO ₂ -e	0.042	4.243		

3. Net Climate Impact of the Project (Section CL1.4)

To calculate the total net GHG reductions of the REDD Project activity, we have used the net results from baseline estimations (Section G2), the net results from project-case estimations (Table 83 of this Section), and the estimated net emissions due to leakage (to be seen in Section CL2). The net emission includes the carbon stock changes and the non-CO₂ GHG emissions under each scenario.

The general formula presented in REDD-MF Module was changed to fit the calculation method required in this standard:

$$C_{REDD,t} = \Delta C_P - (\Delta C_{BSL} - \Delta C_{LK}) \quad (\text{Modified from Eq. N°1 REDD-MF Module VCS Modular Methodology})$$

Where,

$C_{REDD,t}$	Total net greenhouse emission reductions at time t ; t CO ₂ -e
ΔC_{BSL}	Net greenhouse gas emissions under the baseline scenario, t CO ₂ -e
ΔC_P	Net greenhouse gas emissions within the project area under the project scenario; t CO ₂ -e
ΔC_{LK}	Net greenhouse gas emissions due to leakage; t CO ₂ -e

As shown in the calculations developed, there is no variation in carbon stocks in the with-project case (ex-ante), because the Castañeros REDD Project will carry out activities to avoid the projected deforestation in 100%; and the GHG emissions have been dismissed as non-significant.

The emissions due to leakage (in- and outside the Leakage Belt) amount to 2 273 989 t CO₂-e during the first 10 years. The percentages and indexes used in the different steps of the estimation are based on the analysis of official information, like the National Census of 2007 and studies of the area carried out by NGO's and different researchers.

Therefore, for the first 10 years of the project:

$$C_{REDD10} = 0 - (31\,166\,326 - 2\,273\,989) = -28\,892\,337 \text{ t CO}_2\text{-e, and}$$

For the entire crediting period:

$$C_{REDD31} = 0 - (92\,954\,858 - 6\,801\,255) = -86\,153\,603 \text{ t CO}_2\text{-e}$$

The value of C_{REDD} represents the total greenhouse gases that will not be emitted to the atmosphere because of the implementation of the project activity inside the Brazil nut concessions. Hence, it is evident that the climate impact is positive. It should be stressed that there will be constant monitoring, to verify real emissions.

4. Measures to Avoid Double Counting of Emission Reductions (Section CL1.5)

Currently the Ministry of Environment of Peru (MINAM) is leading the national preparation process for implementing REDD mechanism, for which it has developed a Readiness Plan (under the sponsorship of the World Bank's FCPF), which includes a component of Monitoring, Verification and Registration (MRV) for the country.

This MRV system is being developed in the framework of the “Programa Nacional de Conservación de Bosques” (forest conservation program) of MINAM that seeks to conserve 56 million hectares of forests in Peru.

Bosques Amazónicos has participated actively through the Peru REDD Group (group of institutions including government agencies, NGOs, regional governments, private companies, indigenous communities, etc.) in the construction of the Readiness Plan and particularly the MRV mechanism, so that the projects could be properly registered avoiding double counting of carbon credits.

Figure 28. Program outline of MINAM's Programa Nacional de Conservación de Bosques



In addition, MINAM has prepared a legal ordinance for a National Registry of REDD Projects which is soon to be launched. And, finally, VCS has also an official record of projects and each VCU has a unique code for transactions and retirements which can be seen in www.vcsprojectdatabase.org.

CL2. Offsite Climate Impacts (“Leakage”)

1. Leakage Emissions Due to Project Activities

The Leakage Belt (LB), according to the Modular Methodology, is the area where the deforestation agents are expected to enter in presence of the project activity. We are using this concept to account for the expected leakage in the surroundings of the PA and in areas that are more distant.

The LB of the Project has been determined by the remaining BN region surrounding the PA. Because of the similarity of conditions inside the PA and the LB, it is assumed that the deforestation agents will displace their traditional activities from the PA to this region, and as in the first one, they will start by deforesting the LB areas closest to roads.

As analyzed by independent studies, the main drivers of deforestation in the Project Area and Leakage Belt are the rural families, local and migrants, who expand the agrarian frontier mainly for installing subsistence crops and cattle ranching as near as possible to local markets.

For them, the Brazil nut concessions are very attractive areas as they are unoccupied most part of the year because of the Castaña’s seasonality. Enforcement is still weak as it is very difficult for concessionaries to legally expulse invaders if they can stay at least for 48 hours.

With the recent paving of IOS, the accessibility to enter forest areas has increased and so has the profitability of agricultural and grazing activities and the migration rate. It must be remarked that Madre de Dios has the largest internal migration rate from the country so the problem has deepened.

The project plans to increase the (economic) incentives and improve the conditions of Brazil nut concessionaries to protect their areas while giving options and training to deforestation agents to switch to other alternative activities. Reforestation, Brazil nut processing, patrolling are labor-intensive activities which will generate employment and incomes for the population. In addition, the surveillance system (that includes legal advisory) should inhibit migrants to come to these areas.

Nevertheless, leakage due to the avoided unplanned deforestation project is expected and was calculated in the following steps.

1.1 Baseline Carbon Stock Changes and Greenhouse Gas Emissions in the Leakage Belt

In order to estimate the leakage due to project activities, the Modular Methodology requires the prior estimation of baseline deforestation inside the Leakage Belt area. Therefore, it was constructed according to BL-UP module. The same criteria to estimate the carbon stock change in the Project Area (Section G2) was used in this step. Some of them are:

- The Forest Stratification is based on the Forest Map of the Madre de Dios ZEE, developed by the *Peruvian Amazon Research Institute* (IIAP) and the *Regional Government of Madre de Dios* (GOREMAD) in 2009. This stratification will remain the same for the entire baseline period.
- The post-deforestation land-uses were defined based on the analysis made of the study of land use monitoring, in 3 points in time of the Interoceanic Highway, stretch 3 (CDC-

UNALM/SZF/INRENA, 2007). These land-use-post-deforestation classes will also remain the same for the entire baseline period.

- The carbon stocks in pre- and post-deforestation classes are fixed for the entire baseline period.

The whole procedure can be seen in detail in the excel document: *Castañeros REDD Project Calculations CCB.xls*. The cumulative results for each year in the baseline are shown in Table 97.

Table 99. Total Carbon Stock Change in the Leakage Belt in Baseline

T	Year	Total carbon stock change in baseline (t CO ₂ -e) $\Delta C_{BSL,LK,unplanned}$
1	2010	5 300 084.75
2	2011	10 308 114.05
3	2012	15 538 968.68
4	2013	20 689 658.44
5	2014	25 686 756.01
6	2015	30 862 440.19
7	2016	36 362 406.24
8	2017	41 819 891.84
9	2018	47 083 900.24
10	2019	52 526 195.36
11	2020	58 023 748.87
12	2021	63 458 158.31
13	2022	68 851 037.66
14	2023	74 109 771.25
15	2024	79 350 342.35
16	2025	84 521 826.64
17	2026	89 652 401.30
18	2027	94 884 946.66
19	2028	99 805 582.09
20	2029	104 997 733.42
21	2030	109 814 057.91
22	2031	114 603 273.39
23	2032	119 520 794.31
24	2033	124 463 797.74
25	2034	129 294 242.03
26	2035	133 975 947.53
27	2036	138 732 243.19
28	2037	143 517 124.03
29	2038	148 385 871.65
30	2039	153 159 465.19
31	2040	158 055 109.37

1.2 Estimation of Unplanned Deforestation Displaced from the Project Area to the Leakage Belt

According to the module, the estimated carbon stock changes and the GHG emitted in the Project Area should be multiplied by a factor less than 1, which represents the percentage of deforestation that would be displaced into the Leakage Belt. This factor has been obtained by

analyzing the activities that cause deforestation within groups of people in the districts of Tahuamanu and Las Piedras.

The Project Area and Leakage Belt are located in the provinces of Tahuamanu (covering the District of Tahuamanu) and Tambopata (covering the districts of Tambopata, Laberinto and Las Piedras). However, only the districts of Tahuamanu and Las Piedras were considered to calculate the proportion of deforestation by leakage, as only 5.4% of Laberinto is included in the project area (quite unrepresentative) and Tambopata has 70% of its population in the city of Puerto Maldonado, which is outside the PA and LB and has very different economic activities (mostly services as it is the largest urban area in the region).

In order to calculate the proportion of deforestation by immigration, the information provided in the National Census of 2007¹²³ has been considered as showed in the following table.

Table 100. Population by Economic Activity and Residence Period in the

Activity by group	Las Piedras			Tahuamanu			TOTAL			
	≥ 5 yr in the district	< 5 yr in the district	Total ₁	≥ 5 yr in the district	< 5 yr in the district	Total ₂	≥ 5 yr in the district	< 5 yr in the district	Total	%
Agriculture - cattle raising, hunting and forestry	869	133	1 002	354	99	453	1 223	232	1 455	40.4
Mining and quarrying	13	19	32	-	1	1	13	20	33	0.92
Fishing	5	4	9	3	-	3	8	4	12	0.33
Construction	26	21	47	196	333	529	222	354	576	16
Manufacturing industries	130	49	179	36	92	128	166	141	307	8.52
Retail Trade	166	46	212	45	30	75	211	76	287	7.97
Wholesale trade	5	1	6	2	3	5	7	4	11	0.31
Transport, storage and communications	143	32	175	30	50	80	173	82	255	7.08
Hotels and restaurants	106	24	130	23	24	47	129	48	177	4.91
Teaching	26	15	41	27	20	47	53	35	88	2.44
Private households and domestic services	34	19	53	4	5	9	38	24	62	1.72
Pub. Admin. and defence	12	9	21	12	28	40	24	37	61	1.69
Other act. Com. Serv. and personal	20	8	28	11	11	22	31	19	50	1.39
Health and Social services	9	15	24	5	6	11	14	21	35	0.97
Sale, maint. and repair of motor vehicle and motorc.	15	12	27	-	7	7	15	19	34	0.94
Real state act., business and rents	4	6	10	-	3	3	4	9	13	0.36
Electricity supply, gas and water	2	-	2	-	2	2	2	2	4	0.11
Unspecified economic activity	88	21	109	22	11	33	110	32	142	3.94
Total	1 673	434	2 107	770	725	1 495	2 333	1 127	3 602	100

Source: National Census 2007. Compiled by author

¹²³ Data Consult System of Settlements and Disperse Population. National Census 2007: XI of Population and VI of Housing. INEI.

Of all the activities carried out by the population, only Agriculture and Livestock (presented under the same cell of the table) and Mining are considered a direct cause of deforestation. Taking the sum of both districts it results that 41% of the population is engaged in activities that cause deforestation, of which 34.31% are residents and 7.0% are migrants.

Table 101. Percentage expected at the Interior of the Leakage Belt

Deforestation Agents			Proportion not changed by Project Activity	Expected Proportion of Inhabitants engaged in deforestation		
Type	Activity	%				
Migrants (7%)	Agriculture - livestock	6.44	0.1	0.64	1.2	5%
	Mining	0.56	1	0.56		
Residents (34.31%)	Agriculture - livestock	33.95	0.1	3.4	3.76	
	Mining	0.36	1	0.36		
		41.31				

Source: In-house calculations

In both cases, there are people who will be dedicated to agriculture, livestock or mining. Conservatively, it is believed that people engaged in mining activities, whether be residents or migrants, will not change their line of business, as mining is currently the activity that produce the largest revenues in the region, and which growth in recent years evidence a tendency to a further increase¹²⁴.

With the farmers, whose activity is often of subsistence and from which they obtain a low revenue, the REDD Project aims to work and conduct surveillance, monitoring and training activities for the implementation of sustainable activities. Thus, it is estimated that 10% (worst scenario) of such population will not change their line of business and will maintain the deforestation activity.

It is expected then that the population that will cause deforestation and will migrate to the Leakage Belt will be **5%**. As mentioned, this percentage has to be multiplied by the baseline emissions in the PA (in table 75, section G2-3.6), and the result is added to the estimated baseline in LB to obtain the emissions in the Leakage Belt under the project scenario. Finally, the difference between the project and baseline emissions in the LB is the ex-ante estimated leakage due to displacement of deforestation from the PA to the LB. this can be resumed in the following equation:

$$\Delta C_{LK-ASU-LB} = [(\Delta C_{BSL,unplanned} \times 0.05) + \Delta C_{BSL,LK\ unplanned}] - \Delta C_{BSL,LK\ unplanned}$$

(Developed according to Step 3.a LK-ASU Module, VCS Modular Methodology)

Where,

$\Delta C_{LK-ASU-LB}$	Net CO ₂ emissions due to unplanned deforestation displaced from the Project Area to the Leakage Belt; t CO ₂ -e
$\Delta C_{BSL,unplanned}$	Net GHG emissions in the baseline from unplanned deforestation; t CO ₂ -e
$\Delta C_{BSL,LK\ unplanned}$	Net CO ₂ emissions in the baseline from unplanned deforestation in the Leakage Belt; t CO ₂ -e

¹²⁴ Artisanal Mining Assessment in Madre de Dios. Mosquera et al. International Conservation Foundation. 2009

0.05

Proportion of population causing deforestation that will be displaced from Project Area to Leakage Belt due to project implementation

Table 102. Cumulative Emissions due to Unplanned Deforestation displaced from the PA to LB

T	Year	Net CO ₂ emissions due to displaced unplanned deforestation from PA to LB $\Delta C_{LK-ASU-LB}$
1	2010	152 950.83
2	2011	306 330.68
3	2012	457 233.91
4	2013	625 949.68
5	2014	787 540.32
6	2015	953 951.53
7	2016	1 109 510.90
8	2017	1 259 063.39
9	2018	1 414 736.94
10	2019	1 558 316.29
11	2020	1 698 581.06
12	2021	1 839 306.92
13	2022	1 988 131.33
14	2023	2 129 954.70
15	2024	2 279 685.00
16	2025	2 429 639.60
17	2026	2 578 657.35
18	2027	2 728 271.48
19	2028	2 878 919.11
20	2029	3 021 824.60
21	2030	3 171 561.81
22	2031	3 323 775.04
23	2032	3 475 381.02
24	2033	3 627 188.28
25	2034	3 774 352.46
26	2035	3 935 952.33
27	2036	4 078 388.02
28	2037	4 225 346.26
29	2038	4 367 159.57
30	2039	4 510 366.27
31	2040	4 647 742.90

1.3 Estimation of Unplanned Deforestation Displaced from the Project Area to Outside the Leakage Belt

The leakage outside the LB must be accounted as well, and it is estimated by calculating a number of factors detailed in LK-ASU module. These are:

Available National Forest Area for Deforestation (AVFOR)

It has been defined as the total area of forest available nationwide, which has been equaled to the total area of forest in the country (TOTFOR) minus the areas under protection (PROTFOR) and under management (MANFOR).

Table 103. Forest Area divided by availability in the country

Category	Ha	Source
TOTFOR	70 180 130.4	PROCLIM, 2000
PROTFOR	16 452 255.7	Forest Bureau of the Ministry of Agriculture
MANFOR	8 586 493.6	DGFFS - Ministry of Agriculture

$$AVFOR = TOTFOR - PROTFOR - MANFOR \quad (\text{Eq. N}^\circ 2 \text{ LK-ASU Module, VSC Modular Methodology})$$

$$45\,141\,381.13 = 70\,180\,130.4 - 16\,452\,255.7 - 8\,586\,493.6$$

Available forest area in Leakage Belt (PROP_{LB})

It is the available forest area in the Leakage Belt (LBFOR) as a proportion of the total available national forest area (AVFOR).

The LBFOR area was defined as the total forest area in the LB minus the areas under active management, represented by Forest Timber Concessions (16 788.71 ha) and Ecotourism and Conservation Concessions (10 347.01 ha). The Brazil nut concessions present in the LB (598 374.25 ha) are not being considered for the total managed areas in this calculation, because they are under the same conditions and suffer the same risk of deforestation as the PA (composed by this kind of concessions). Their legal status of “concession” will not prevent the possible leakage.

$$PROP_{LB} = LBFOR / AVFOR \quad (\text{Eq. N}^\circ 3 \text{ LK-ASU Module, VSC Modular Methodology})$$

$$0.01531 = [718\,282.33 - (16\,788.71 + 10\,347.01)] / 45\,141\,381.13$$

Proportional Difference in Carbon Stocks in and Outside LB (PROP_{CS})

According to the methodology, a stratification of AVFOR by carbon stocks has to be made. There are studies of carbon stock nationwide, in different stratum or types of forests. However, such studies have not been homogenized to date, but there is an ongoing work. For this step, the data established for Peru in the Second Communication on Climate Change¹²⁵ was used to derive the country's average carbon stock: the emissions by land use change in natural forests for period 1990 – 2000 (56,827 Gg CO₂ equivalent) divided by the deforested areas on the same period (149,631.76 has). The resulting carbon stock for available forest outside LB (C_{OLB}) is 379.779 t CO₂/ha

The average of the carbon stock in the Leakage Belt (C_{LB}) has been determined based on the average carbon stock by stratum and the representation of each in the Leakage Belt (weighted average), being equal to 688.39 t CO₂

¹²⁵ <http://www.minam.gob.pe/dmdocuments/SCNCC-MINAM.pdf> (page 72).

$$PROP_{CS} = C_{OLB} / C_{LB}$$

(Eq. N° 4 LK-ASU Module, VSC Modular Methodology)

$$0.55 = 379.78 \text{ t CO}_2 / 688.39 \text{ t CO}_2$$

Proportional Leakage for Areas with Immigrating Populations (LK_{PROP})

$$LK_{PROP} = PRO_{IMM} * (1 - PROP_{LB}) * PROP_{CS}$$

(Eq. N° 5 LK-ASU Module, VSC Modular Methodology)

$$0.03803 = 0.07 * (1 - 0.01531) * 0.55$$

The PRO_{IMM} value, which was taken from Table 99, refers to the proportion of the population composed by migrants who carry out deforestation activities.

Finally, the leakage caused by deforestation actors that will be displaced outside the Leakage Belt is equal to:

$$\Delta C_{LK-ASU,OLB} = (\Delta C_{BSL,LK,unplanned} - \Delta C_{P,LB}) * LK_{PROP} \quad \text{(Eq. N° 6 LK-ASU Module, VSC Modular Methodology)}$$

Where,

$\Delta C_{LK-ASU,OLB}$	Net CO ₂ emissions due to unplanned deforestation displaced outside the Leakage Belt; t CO ₂ -e
$\Delta C_{BSL,LK,unplanned}$	Net CO ₂ equivalent emissions in the baseline from unplanned deforestation in the Leakage Belt; t CO ₂ -e
$\Delta C_{P,LB}$	Net CO ₂ equivalent emissions within the Leakage Belt in the project case; t CO ₂ -e
LK_{PROP}	Proportional leakage for areas with immigrating populations; proportion

The ex-ante value of $\Delta C_{P,LB}$ was calculated according to the M-MON Module (Section 6.2, table 5), more details of the procedure can be seen in *Castaños REDD Project Calculations v5.xls* (spreadsheets *Auxiliar 2* and *Auxiliar 3*).

Table 104. Net cumulative CO₂ emissions due to unplanned deforestation displaced outside LB

T	Year	Total carbon stock change in baseline in LB (t CO ₂ -e) $\Delta C_{BSL,LK,unplanned}$	Net CO ₂ emissions within the LB in project case (t CO ₂ -e) $\Delta C_{P,LB}$	Net CO ₂ emissions due to displaced unplanned deforestation outside LB $\Delta C_{LK-ASU,OLB}$
1	2010	5 300 084.75	3 401 063.88	152 950.83
2	2011	10 308 114.05	6 614 715.25	306 330.68
3	2012	15 538 968.68	9 971 353.60	457 233.91
4	2013	20 689 658.44	13 276 550.03	625 949.68
5	2014	25 686 756.01	16 483 186.45	787 540.32
6	2015	30 862 440.19	19 804 421.51	953 951.53
7	2016	36 362 406.24	23 333 748.13	1 109 510.90
8	2017	41 819 891.84	26 835 814.90	1 259 063.39
9	2018	47 083 900.24	30 213 727.43	1 414 736.94
10	2019	52 526 195.36	33 706 046.26	1 558 316.29
11	2020	58 023 748.87	37 233 824.51	1 698 581.06
12	2021	63 458 158.31	40 721 083.12	1 839 306.92
13	2022	68 851 037.66	44 181 691.79	1 988 131.33
14	2023	74 109 771.25	47 556 218.92	2 129 954.70
15	2024	79 350 342.35	50 919 091.10	2 279 685.00
16	2025	84 521 826.64	54 237 630.15	2 429 639.60
17	2026	89 652 401.30	57 529 917.66	2 578 657.35
18	2027	94 884 946.66	60 887 639.76	2 728 271.48
19	2028	99 805 582.09	64 045 209.13	2 878 919.11
20	2029	104 997 733.42	67 377 010.11	3 021 824.60
21	2030	109 814 057.91	70 467 643.07	3 171 561.81
22	2031	114 603 273.39	73 540 880.57	3 323 775.04
23	2032	119 520 794.31	76 696 451.22	3 475 381.02
24	2033	124 463 797.74	79 868 373.66	3 627 188.28
25	2034	129 294 242.03	82 968 066.90	3 774 352.46
26	2035	133 975 947.53	85 972 314.16	3 935 952.33
27	2036	138 732 243.19	89 024 425.75	4 078 388.02
28	2037	143 517 124.03	92 094 880.59	4 225 346.26
29	2038	148 385 871.65	95 219 152.61	4 367 159.57
30	2039	153 159 465.19	98 282 364.18	4 510 366.27
31	2040	158 055 109.37	101 423 895.82	4 647 742.90

1.4 Emissions from Leakage Prevention Activities

The proposed activities were designed to reduce deforestation inside both, Project Area and Leakage Belt, given that the latter is principally formed by other Brazil nut concessions. Thus, the activities cannot be divided in leakage prevention activities and project activities inside PA.

The emissions arising from the implementation of these activities were estimated ex-ante according to E-FFC Module and were already included in the GHG project activity emissions in Section CL1. Therefore the GHG emissions from leakage prevention activities ($GHG_{LK,E}$) were set to zero. The ex-post calculations will also be included as emissions from project activities.

The total GHG emissions due to total leakage are finally calculated with the following equation. The results are shown in Table 105 for baseline period.

$$\Delta C_{LK-AS,unplanned} = \Delta C_{LK-ASU-LB} + \Delta C_{LK-ASU,OLB} + GHG_{LK,E} \text{ (Eq. N° 13 LK-ASU Module, VSC Modular Methodology)}$$

Where,

$\Delta C_{LK-AS,unplanned}$ Net GHG emissions due to activity shifting leakage for projects preventing unplanned deforestation Net CO₂ emissions; t CO₂-e

$\Delta C_{LK-ASU-OLB}$ Net CO₂ emissions due to unplanned deforestation displaced outside the Leakage Belt; t CO₂-e

$\Delta C_{LK-ASU,LB}$ Net CO₂ emissions due to unplanned deforestation displaced from the Project Area to the Leakage Belt; t CO₂-e

$GHG_{LK,E}$ GHG emissions as a result of leakage of avoided deforestation activities; t CO₂-e

Table 105. Total leakage due to the displacement of unplanned deforestation

T	Year	Net CO ₂ emissions due to displaced unplanned deforestation from PA to LB $\Delta C_{LK-ASU-LB}$	Net CO ₂ emissions due to displaced unplanned deforestation outside LB $\Delta C_{LK-ASU,OLB}$	Emissions from leakage prevention activities $GHG_{LK,E}$	Total Leakage due to displacement of unplanned deforestation (t CO ₂ -e) $\Delta C_{LK-AS,unplanned}$
1	2010	152 950.83	72 213.96	-	225 164.80
2	2011	306 330.68	140 448.68	-	446 779.36
3	2012	457 233.91	211 719.40	-	668 953.31
4	2013	625 949.68	281 897.87	-	907 847.55
5	2014	787 540.32	349 983.64	-	1 137 523.97
6	2015	953 951.53	420 502.68	-	1 374 454.21
7	2016	1 109 510.90	495 440.08	-	1 604 950.98
8	2017	1 259 063.39	569 798.68	-	1 828 862.07
9	2018	1 414 736.94	641 521.15	-	2 056 258.09
10	2019	1 558 316.29	715 672.79	-	2 273 989.08
11	2020	1 698 581.06	790 577.33	-	2 489 158.39
12	2021	1 839 306.92	864 621.53	-	2 703 928.45
13	2022	1 988 131.33	938 099.88	-	2 926 231.21
14	2023	2 129 954.70	1 009 750.50	-	3 139 705.20
15	2024	2 279 685.00	1 081 153.65	-	3 360 838.65
16	2025	2 429 639.60	1 151 615.50	-	3 581 255.10
17	2026	2 578 657.35	1 221 519.95	-	3 800 177.30
18	2027	2 728 271.48	1 292 813.75	-	4 021 085.23
19	2028	2 878 919.11	1 359 857.77	-	4 238 776.88
20	2029	3 021 824.60	1 430 601.21	-	4 452 425.81
21	2030	3 171 561.81	1 496 223.99	-	4 667 785.80
22	2031	3 323 775.04	1 561 477.39	-	4 885 252.43
23	2032	3 475 381.02	1 628 478.98	-	5 103 860.00
24	2033	3 627 188.28	1 695 827.78	-	5 323 016.06
25	2034	3 774 352.46	1 761 642.96	-	5 535 995.42
26	2035	3 935 952.33	1 825 431.57	-	5 761 383.91
27	2036	4 078 388.02	1 890 236.49	-	5 968 624.51
28	2037	4 225 346.26	1 955 430.87	-	6 180 777.13
29	2038	4 367 159.57	2 021 767.95	-	6 388 927.53
30	2039	4 510 366.27	2 086 808.55	-	6 597 174.82
31	2040	4 647 742.90	2 153 512.10	-	6 801 255.00

2. Mitigation of Leakage

As mentioned before, many of the proposed activities have been designed so that, in addition to preventing deforestation in PA, they also face up leakage. This will be done by including the different stakeholders from the Project Zone into the project activities. Thus, there are no activities meant for leakage management per se.

Below is a summary of these activities, whose effectiveness will be evaluated constantly throughout the project's life. If necessary, new activities could be implemented during the project life span.

Project Activities that include leakage prevention measures:

- Implementation of the Forest Monitoring and Surveillance System. This is not just limited to the project area, but also includes the leakage belt. The Checkpoints are to be located in the most critical access points throughout the area.
- Training in sustainable activities among neighboring residents, where especial interest will be given to Agro-forestry, usage of non-timber forest resources, Fish farming, etc. to encourage the rational use of forest resources, on which many people depend. For people involved in the mining sector, it will include waste management training.
- Development of local environmental education campaigns.
- Creation of alliances with local NGOs or Technical Institutes to develop pilot projects for alternative activities.
- Improvement of the organizational capacity of FEPROCAMD, given that it comprises all Brazil nut concessions, not only the ones associated to the project.

Since the deforestation agents are migrants and residents doing farming and mining activities, it is to be supposed that migrants and miners in general are the actors who are most difficult to include - and convince of participating - in the project activities. Nonetheless, from the proportion of migrants undertaking deforestation activities very few are involved in mining (7%), hence we expect to reach everybody but miners.

3. Exclusion of Leakage Emissions from Project Climate Benefits

The emissions from leakage have already been removed from the expected climate benefits as seen in Section CL1-2. All the same, a chart with net benefits per year during the baseline period can be seen next:

Table 106. Total net greenhouse emission reductions of the project

T	Year	$\Delta C_{BSL,unplanned}$	ΔC_p	$\Delta C_{LK-AS,unplanned}$	CREDD,t
1	2010	3 059 017	-	225 165	2,833,852
2	2011	3 067 597	-	221 615	2,845,982
3	2012	3 018 065	-	222 174	2,795,891
4	2013	3 374 315	-	238 894	3,135,421
5	2014	3 231 813	-	229 676	3,002,137
6	2015	3 328 224	-	236 930	3,091,294
7	2016	3 111 187	-	230 497	2,880,691
8	2017	2 991 050	-	223 911	2,767,139
9	2018	3 113 471	-	227 396	2,886,075
10	2019	2 871 587	-	217 731	2,653,856
11	2020	2 805 295	-	215 169	2,590,126
12	2021	2 814 517	-	214 770	2,599,747
13	2022	2 976 488	-	222 303	2,754,185
14	2023	2 836 467	-	213 474	2,622,993
15	2024	2 994 606	-	221 133	2,773,473
16	2025	2 999 092	-	220 416	2,778,676
17	2026	2 980 355	-	218 922	2,761,433
18	2027	2 992 283	-	220 908	2,771,375
19	2028	3 012 953	-	217 692	2,795,261
20	2029	2 858 110	-	213 649	2,644,461
21	2030	2 994 744	-	215 360	2,779,384
22	2031	3 044 265	-	217 467	2,826,798
23	2032	3 032 119	-	218 608	2,813,512
24	2033	3 036 145	-	219 156	2,816,989
25	2034	2 943 284	-	212 979	2,730,304
26	2035	3 231 997	-	225 388	3,006,609
27	2036	2 848 714	-	207 241	2,641,473
28	2037	2 939 165	-	212 153	2,727,012
29	2038	2 836 266	-	208 150	2,628,116
30	2039	2 864 134	-	208 247	2,655,887
31	2040	2 747 533	-	204 080	2,543,453
Total		92 954 858	-	6 801 255	86 153 603

4. Exclusion of Non-CO₂ Leakage Emissions from Project Climate Benefits

The non-CO₂ greenhouse gas emissions due to leakage are already included in $\Delta C_{LK-ASU,OLB}$ values. The other GHG emissions caused by Project activities were estimated and included in CL1.

CL3. Climate Impact Monitoring

The Monitoring Plan has been developed following the guidelines of M-MON module. Its aim is to establish the parameters to be monitored and to guide the collection of all necessary information

for assessing the development of the project activities and especially, for estimating the real (ex-post) net GHG reductions attributable to the project activity.

The monitoring for verification will be conducted every 5 years maximum, and for revisiting the Baseline, it will happen every 10 years as required by the methodology. During this time, some parameters will be recorded according to their occurrence (i.e. PRA, training courses), and others by the end of each monitoring event (i.e. deforested area through satellite images).

In the same way, the project will monitor some parameters directly in field and others by gathering indirect information, like satellite images as well as representative studies of the area and official information, if necessary.

1. Climate Impacts Monitoring Plan

This section defines the Monitoring Plan that will be periodically undertaken to evaluate the carbon stock changes and GHG emissions that could occur along the project lifespan. This plan will also allow the project to calculate and report the carbon reductions attributable to the project activity, through the verification processes under the VCS Standard in order to claim carbon credits.

The Monitoring Plan is detailed below:

1.1 Monitoring Parameters

Each monitoring event will produce the following pre-results:

Parameter	SI Unit	Description
$\Delta C_{p,defPA,i,t}$	t CO ₂ -e	Net carbon stock change due to deforestation in the Project Area in the project case
$\Delta C_{p,Deg,i,t}$	t CO ₂ -e	Net carbon stock change due to degradation in the Project Area in the project case
$\Delta C_{p,DistPA,i,t}$	t CO ₂ -e	Net carbon stock change due to natural disturbance in the Project Area in the project case
$GHG_{p-E,i,t}$	t CO ₂ -e	Greenhouse gas emissions due to deforestation and degradation within the Project Area in the project case
$\Delta C_{p,DefLB,i,t}$	t CO ₂ -e	Net carbon stock change due to deforestation in Leakage Belt in the project case

The last parameter from the table, referred to emissions in LB, is used to estimate the leakage emissions caused by the project activities (procedures described in CL2); while the first four parameters are combined (using Equation N°1 M-MON module) to finally obtain:

Parameter	SI Unit	Description
ΔC_P	t CO ₂ -e	Net greenhouse gas emissions within the project area under the project scenario

As can be inferred, the previous parameters are each one the result of several calculations framed in the Modular Methodology. Therefore, in order to get any of them, the parameters under monitoring (according to the objective) are:

Data and Parameters Monitored for Baseline Renewal

Parameter:	Regional Forest Cover/ Non-Forest Cover Benchmark Map
Data unit:	n/a
Description:	Map showing the location of forest areas in the Reference Region (RRD) at the beginning of the crediting period
Source of data:	Landsat satellite images or similar and ground truthing
Justification of choice or description of measurement methods/procedures applied:	The Landsat images have an adequate resolution and they are an available tool. The map shall have a minimum accuracy of 90%. At minimum 3 times over the baseline period
Any comment:	The forest cover will be stratified using the Forest Classes of the Ecologic and Economic Zoning (ZEE) of the Madre de Dios Region, developed by the IIAP and GOREMAD in 2009

Parameter:	A_i
Data unit:	Ha
Description:	Area of stratum i
Source of data:	
Justification of choice or description of measurement methods/procedures applied:	At a minimum every 10 years prior to baseline renewal
Any comment:	n/a

Parameter:	$A_{RRD,unplanned,hrp}$
Data unit:	Ha
Description:	Total deforested area during the Historical Reference Period in the RRD
Source of data:	Analysis of Landsat satellite images
Justification of choice or description of measurement methods/procedures applied:	The Landsat images have the adequate resolution and they are a free and available tool to all public
Any comment:	Monitored for baseline revisions

Parameter:	CF
Data unit:	t C t ⁻¹ d.m
Description:	Carbon fraction of dry matter
Source of data:	Value taken from IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3
Justification of choice or description of measurement methods/procedures applied:	Equal to 0.47 t C t ⁻¹ d.m. for non-trees species
Any comment:	n/a

Parameter:	CF_j
Data unit:	t C t ⁻¹ d.m.
Description:	Carbon fraction of biomass for tree species j
Source of data:	Value taken from IPCC 2006 INV GLs AFOLU Chapter 4 Table 4.3

Justification of choice or description of measurement methods/procedures applied:	Equal to 0.49 t C t ⁻¹ d.m. for trees in Tropical Forests
Any comment:	n/a

Parameter:	D_j
Data unit:	t d.m. m ⁻³
Description:	Basic wood density for species j
Source of data:	National species-specific densities For species-specific wood densities not available, it was used the regional average wood density value (0.60 t d.m.m ⁻³ - tropical America) from Reyes 1992 and Brown, S. 1997
Justification of choice or description of measurement methods/procedures applied:	Species densities have been taken from different sources of national species-specific researches being the main ones: Evaluation of mechanical and physical properties and probable uses of the wood of 20 species in Jenaro Herrera, Loreto – Perú (Aróstegui and Acevedo) Summary of technical information of 32 tree species. Peruvian Confederation of Wood. 2008. CPM. CITE Madera Global wood density database (Chavé et al., 2009)
Any comment:	n/a

Parameter:	$f_j(X,Y)$
Data unit:	t d.m. tree ⁻¹
Description:	Allometric equation for species j linking measured tree variable (s) to aboveground biomass of living trees
Source of data:	The Chavé equation for trees and Winrock equation for palm trees
Justification of choice or description of measurement methods/procedures applied:	Both formulas have been taken from: Pearson, T., Walker, S. and Brown, S. 2005. Sourcebook for Land Use, Land-Use Change and Forestry Projects. Winrock International and the World Bank Biocarbon Fund. 57pp Chave, J, et. Al. 2005. Tree allometry and improved estimation of carbon stocks and balance in tropical forests. <i>Oecologia</i> 145: 87-99
Any comment:	

Data and Parameters Monitored for Verification

Parameter:	Project Forest Cover Monitoring Map
Data unit:	n/a
Description:	Map evidencing location of forestland in the Project Area at the beginning of each verification period.
Source of data:	Remote sensing
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	ERDAS Software, GIS Software, available satellite images
QA/QC procedures to be applied:	Accuracy assessment through ground truthing or high-resolution satellite images
Any Comment:	This map will be updated after each monitoring event. The base forest area for the first monitoring period will be equal to the Project boundary It is also called Project Forest Cover Benchmark Map when is used for Baseline renewal

Parameter:	Leakage Belt Forest Cover Monitoring Map
Data unit:	n/a
Description:	Map evidencing location of forestland in the Leakage Belt at the beginning of each verification period.
Source of data:	Remote sensing
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	ERDAS Software, GIS Software, available satellite images
QA/QC procedures to be applied:	Accuracy assessment through ground truthing or high-resolution satellite images
Any comment:	This map will be updated after each monitoring event. The base forest area for the first monitoring period will be equal to the Leakage Belt boundary It is also called Leakage Belt Forest Cover Benchmark Map when is used for Baseline renewal

Parameter:	Degradation PRA Results
Data unit:	n/a
Description:	Potential pressure of illegal extraction of trees inside PA
Source of data:	PRA
Justification of choice or description of measurement methods/procedures applied:	Interviews and/or surveys to local actors to identify potential existence of illegal extraction inside PA due to: · Extraction of firewood · Illegal logging If the $\geq 10\%$ of the surveys show possible degradation then

	on-the-ground surveys will be executed. Additionally, a penetration distance should be obtained
Frequency of monitoring/recording:	Every 2 years
Value applied:	n/a
Monitoring equipment:	n/a
QA/QC procedures to be applied:	Templates for surveys and/or interviews
Any comment:	Degradation is considered 0 at the beginning of the project

Parameter:	Results of Limited Degradation Survey
Data unit:	n/a
Description:	Verification of degradation processes in the project area
Source of data:	Field measurements
Justification of choice or description of measurement methods/procedures applied:	Sampling transects with known length and width, distributed across the buffer to identify existence of new tree-stumps. Transects should cover $\geq 1\%$ of the buffer area
Frequency of monitoring/recording:	Each time the PRA indicates potential degradation in PA
Value applied:	n/a
Monitoring equipment:	GPS, field notebooks
QA/QC procedures to be applied:	Trained staff for field measurement
Any comment:	n/a

Parameter:	$A_{DefPA,iu,t}$
Data unit:	Ha
Description:	Area of recorded deforestation in the Project Area in stratum i converted to land use u at time t
Source of data:	Remote sensing imagery
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	GIS Software, available satellite images
QA/QC procedures to be applied:	n/a
Any comment:	Ex-ante estimation equal to zero in the with-project case

Parameter:	$A_{DefLB,iu,t}$
Data unit:	Ha
Description:	Area of recorded deforestation in the Leakage Belt in stratum i converted to land use u at time t
Source of data:	Remote sensing imagery
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	Software GIS, available satellite images

QA/QC procedures to be applied:	n/a
Any comment:	Ex-ante values calculated according to M-MON module

Parameter:	$A_{DegW,i}$
Data unit:	Ha
Description:	Area potentially impacted by degradation process
Source of data:	GIS delineation and ground truthing
Justification of choice or description of measurement methods/procedures applied:	The length is obtained from the PRA results, and the width shall be equal to the length
Frequency of monitoring/recording:	Must to be repeated each time the PRA indicate a potential for degradation
Value applied:	n/a
Monitoring equipment:	GIS software
QA/QC procedures to be applied:	n/a
Any comment:	n/a

Parameter:	$A_{DECKS,i,t}$
Data unit:	Ha
Description:	Area of logging decks in stratum i at time t
Source of data:	Field measurements or post-harvest reports
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	GPS MAP 60 CSX, Arc GIS Software
QA/QC procedures to be applied:	Randomly verification of 10% field data
Any comment:	n/a

Parameter:	$A_{DistPA,q,i,t}$
Data unit:	Ha
Description:	Area impacted by natural disturbance in the project stratum i converted to natural disturbance stratum q at time t
Source of data:	Satellite images and ground verification
Justification of choice or description of measurement methods/procedures applied:	Minimum monitoring unit equal to a minimum of 11 Landsat pixels or one hectare
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	GIS Software, available satellite images
QA/QC procedures to be applied:	Contrast the information from the Remote sensing with field verification
Any comment:	Ex ante estimated as zero hectares

Parameter:	$A_{ROAD,i,t}$
Data unit:	Ha
Description:	Area of roads in stratum i at time t
Source of data:	Post-harvest assessment reports and maps or field measurements
Justification of choice or description of measurement methods/procedures applied:	The area of roads is based on the length of roads times the average width of roads Systematic samplings may be used to estimate the width of roads, achieving a precision equal or less than 15% of the mean at 95% confidence interval
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	GPS MAP 60 CSX, Arc GIS Software
QA/QC procedures to be applied:	Randomly verification of 10% field data
Any comment:	n/a

Parameter:	$ARRL_{forest,t}$
Data unit:	Ha
Description:	Remaining area of forest in RRL
Source of data:	Satellite images and ground verification
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	GIS Software, available satellite images
QA/QC procedures to be applied:	n/a
Any comment:	n/a

Parameter:	AP_i
Data unit:	Ha
Description:	Total area of degradation sample plots in stratum i
Source of data:	Ground measurement
Justification of choice or description of measurement methods/procedures applied:	Systematically placed plots, covering at least 3% of the buffer zone
Frequency of monitoring/recording:	Every time the Limited Degradation Survey indicates degradation (existence of stumps), or at least every 5 years
Value applied:	n/a
Monitoring equipment:	GPS, field equipment: tape line, compass and field staff
QA/QC procedures to be applied:	Trained staff for field measurement
Any comment:	Ex-ante, there is no evidence of degradation within PA

Parameter:	$C_{DegW,i,t}$
Data unit:	t CO ₂ -e
Description:	Biomass carbon of trees cut and removed through illegal

	logging and charcoal extraction degradation process from plots measured in stratum i at time t
Source of data:	Field measurement
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Every time there is a degradation event or at least every 5 years
Value applied:	n/a
Monitoring equipment:	GPS, field equipment: tapeline, compass and field staff
QA/QC procedures to be applied:	n/a
Any comment:	Ex-ante estimated as zero

Parameter:	$C_{AB_tree_dest,i}$
Data unit:	t CO ₂ -e ha ⁻¹
Description:	Carbon stock in aboveground tree biomass assumed to be killed per unit area resulting from the creation of the skid trail in stratum i
Source of data:	Forest carbon inventory
Justification of choice or description of measurement methods/procedures applied:	n/a
Frequency of monitoring/recording:	Carbon stocks will be re-assessed for baseline renewal
Value applied:	$C_{AB_tree_dest,i} = C_{AB_tree,i}$
Monitoring equipment:	n/a
QA/QC procedures to be applied:	n/a
Any comment:	n/a

Parameter:	$C_{BB_tree_dest,i}$
Data unit:	t CO ₂ -e ha ⁻¹
Description:	Carbon stock in belowground tree biomass assumed to be killed per unit area resulting from the creation of the d trail in stratum i
Source of data:	$C_{AB_tree_dest,i}$
Justification of choice or description of measurement methods/procedures applied:	Root-to-shoot used in baseline (0.24)
Frequency of monitoring/recording:	Carbon stocks will be re-assessed for baseline renewal
Value applied:	$C_{BB_tree_dest,i} = C_{AB_tree_dest,i} * 0.24$
Monitoring equipment:	n/a
QA/QC procedures to be applied:	n/a
Any comment:	n/a

Parameter:	L_{sk}
Data unit:	m
Description:	Length of skid trail

Source of data:	Post-harvest assessment reports and maps or field measurements
Justification of choice or description of measurement methods/procedures applied:	A systematic sampling may also be used, if reports are insufficient
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	GPS MAP 60 CSX
QA/QC procedures to be applied:	Randomly verification of 10% field data
Any comment:	n/a

Parameter:	$V_{EXT,z,i,t}$
Data unit:	m ³
Description:	Extracted volume from logging stratum z in stratum i at time t
Source of data:	Records and post-harvest reports
Justification of choice or description of measurement methods/procedures applied:	Described below
Frequency of monitoring/recording:	Gathering of records every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	Designed forms for FSC certification
QA/QC procedures to be applied:	Training of concessionaries in wood volume measurement
Any comment:	n/a

Parameter:	$V_{EXT,j,z,i,t}$
Data unit:	m ³
Description:	Volume of timber extracted of species j for logging stratum z in stratum i at time t
Source of data:	Records and post-harvest reports
Justification of choice or description of measurement methods/procedures applied:	Same procedures applied in the estimation of $V_{EXT,z,i,t}$
Frequency of monitoring/recording:	Gathering of records every ≤ 5 years
Value applied:	n/a
Monitoring equipment:	Designed forms for FSC certification
QA/QC procedures to be applied:	Training of concessionaries in wood volume measurement
Any comment:	n/a

Parameter:	W_{SKID}
Data unit:	m
Description:	Mean width of skid trails
Source of data:	Post-harvest assessment reports and maps or field measurements
Justification of choice or description of measurement methods/procedures applied:	Described below

Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	n/a
Monitoring equipment:	GPS MAP 60 CSX
QA/QC procedures to be applied:	Randomly verification of 10% field data
Any comment:	n/a

1.2 Monitoring Deforestation

The changes in forestland, detection, and mapping of deforestation inside the Reference Regions, and Project Area and Leakage belt (ergo Project Zone) will be periodically monitored through the analysis of satellite images. As for baseline validation, the entity in charge of said analysis will be the *Instituto de Investigaciones de la Amazonía Peruana* (IIAP), who developed the ZEE for Madre de Dios. This public institution is well renowned for their continuous research and work in the Amazon basin.

The mapped boundaries are selected according to the monitoring objectives:

- For verification purposes: Project Area, Leakage Belt and RRL.
- For baseline renewal: RRD, in the same year of baseline renewal or no further in the past than a year prior to it.

The mapping products expected are the areas of change (from forest stratum *i* to post-deforestation land-use *u*) and the updating of the Forest Cover Benchmark Maps, for all mentioned boundaries.

To carry out the analysis the next steps will be followed:

Selection and Analysis of Sources of Land-Use and Land-Cover (LU/LC) Change Data

The remotely sensed spatial data to be used are Landsat images from sensors 5TM and 7TM, which have a resolution of 30x30 m. The selection and acquisition of the most adequate satellite images will be accomplished by:

- Search of images in the web sites of *National Institute for Space Research from Brazil* (INPE) and *USGS Global Visualization Viewer*.
- Selection of 5TM and Landsat 7TM satellite images, with less than 10% cloud cover over the desired areas. This will be achieved by comparing quick looks and their %CC reported for each quadrant, shown in both websites. If not possible, then images with the lowest overall percentage of cloud cover will be selected and a mosaic constructed.

As stated in the methodology, if a new source with higher resolution becomes available or if the used source is no longer available, then a change of source will only occur if the new data complies with the requirement these requirements.

Processing LU/LC Change Data

The pre-processing techniques to be used met all recommendations given in the Sourcebook on REDD (GOFC-GOLD, 2009) and follows the *Manual for Elaboration of Mosaics* developed by IIAP. The process is detailed below:

- Image conditioning
The images are generally acquired in compressed TIFF format. Decompression and export to ERDAS IMAGINE matrix format (*.img) will be done, to proceed to the union of spectral bands.
- Geo referencing
The geo-referencing locates the image according to a coordinate system. It can be done by either using the National Charter vector data of the National Geographic Institute (IGN) in 1:100,000 scale as a reference, or the Image-to-Image technique, which consists of using an image that already has a projection system. However, the latter needs a reference for validation and the IGN National Charter can be used for it.

The RMSE (Root Mean Square Error) is used to measure if there is image shift at the time of the junction with another adjacent image, as by definition it shows the variation between an actual observation and a calculated value. Larger RMS error indicate poor correspondence, therefore RMSE must be minimal in all cases, complying with all the requirements for this step as explained in ERDAS field guide.

- Detection and removal of clouds and shadows
Satellite images with less than 10% cloud cover shall be selected. The remaining corrections will be made by making up a mosaic, explained on the next step. According to the Sourcebook on REDD (GOFC-GOLD, 2009), the preferred method for analyzing images with cloud cover is the visual interpretation.
- Radiometric enhancement
It will be performed with ERDAS IMAGINE software if visual appearance of images needs to be improved.
- Mosaic construction
It is necessary to merge of all the scenes collected to cover the entire area (especially in the case of RRD). Consideration will be given to the date of the image, to allow the information in the overlapped area to be the most current.

If in the resulting images, the remaining areas with cloud cover ($\leq 10\%$) are not removed by doing a mosaic (with multiple images of the same 12-month period), then the indications set forth in modules BL-UP (section 2.1.3) and M-MON will be considered. That is to say, only the visible areas from both images will be used when calculating the rate of deforestation of the new baseline period. Then the maximum forest cover at the start of the new period will be multiplied by this rate, to obtain the total area of deforestation during the period.

Interpretation and Analysis

After completing the former actions, the following will be done:

- Generation of vector data by visual interpretation of patterns of deforestation
One of the main analysis methods for moderate resolution images is Visual Interpretation (Sourcebook on REDD GOFC-GOLD, 2009). According to this document, it is a simple and robust method but time consuming, which also requires that an experienced interpreter perform the image analysis. As for the historical-period images, the work will be done by

the GIS department of IIAP. This step will consist of interpretation, digitizing, editing and encoding of deforestation.

- Map accuracy assessment
An accuracy assessment of maps will be carried in order to produce credible results of deforestation. Ground-truthing and/or high-resolution images will be used to assess the classified images, and the results will be analyzed by using a Confusion Matrix. A minimum of 90% is the targeted accuracy for both, forest and non-forest land.

Table 107. Example of Confusion Matrix

Predicted Class	Actual Class		Σ	Commission Errors %
	A	B		
A	n_{AA}	n_{AB}	n_{A+}	
B	n_{BA}	n_{BB}	n_{B+}	
Σ	n_{+A}	n_{+B}	n	
Omission Errors %				

As BAM is the map's user, attention is focused on the commission errors and a user's accuracy shall be estimated. It can be done with the following formula¹²⁶ for every map class:

$$\text{User's Accuracy} = (n_{ii} / n_{i+}) * 100\%$$

Once the classification of images is completed, the BAM's GIS expert will estimate the following parameters for the monitored period:

- Area of change (deforestation) in the PA ($A_{DefPA,u,i,t}$) and LB ($A_{DefLB,u,i,t}$) per stratum
- Update of Forest Cover Monitoring Maps for PA and LB
- Update the remaining area of forest in RRL ($A_{RRL,forest,t}$)
- Total area deforested during the baseline in RRD ($A_{RRD,unplanned,hrp}$), only for baseline renewal

The Area of Change data should specify to which post-deforestation land use (u) forest strata (i) was converted, so by the end of baseline period the fixed proportions of u types used for ex-ante baseline estimations can be reassessed.

Finally, the deforested areas are multiplied by the emission per unit area, to get the Net carbon stock change for the period. Nonetheless, the following criteria will be considered:

- The forest strata will remain the same during baseline period
- The selected pools for the baseline estimation will be maintained during baseline period. All carbon pools excluded are counted as zero
- The carbon stocks in the forest strata and the post-deforestation land-uses will be constant during baseline period

¹²⁶ Strahler, A. *et al.* Global Land Cover Validation: Recommendations for Evaluation and Accuracy Assessment of Global Land Cover Maps. GOF-C-GOLD. 2006.

The next equations, taken from M-MON module and already described in Section CL1, will be used to that end:

$$\begin{aligned}\Delta C_{p,DefPA,i,t} &= \sum (A_{DefPA,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \\ \Delta C_{p,DefLB,i,t} &= \sum (A_{DefLB,u,i,t} * \Delta C_{pools,P,Def,u,i,t}) \\ \Delta C_{pools,P,Def,u,i,t} &= C_{BSL,i} - C_{P,post,i} - C_{WP,i}\end{aligned}$$

1.3 Monitoring Degradation

The project will account for any emissions due to degradation activities, which are represented by:

- Degradation through extraction of trees for illegal timber or fuelwood and charcoal ($\Delta C_{P,DegW,i,t}$)
- Degradation through extraction of trees for selective logging from forest management areas possessing FSC certificate ($\Delta C_{P,SelLog,i,t}$)

Where:

$$\Delta C_{P,Deg,i,t} = \Delta C_{P,DegW,i,t} + \Delta C_{P,SelLog,i,t}$$

This equation was explained in detail in Section CL1. The parameters inside it are explained next.

Degradation by Illegal Extraction or Fuel Wood and Charcoal

Tracking this type of degradation activity has many steps. First, a possible pressure on the PA from illegal extraction of trees shall be assessed. In this sense, a Participative Rural Assessment (PRA) will be developed with the concessionaries given that, for being users of the project areas, they can identify the occurrence of any disruption in their areas. The PRA will consist of interviews and/or surveys.

If the PRA results show there is no considerable pressure over PA ($\geq 90\%$ of surveys indicate no pressure), then degradation is assumed to be zero and no field survey is needed. On the contrary, if PRA suggests potential degradation, the project will carry out the following sub-steps:

- a) A **Penetration Distance** should be obtained (distance that degradation agents can entry from all access points) from PRA.
- b) All **Access Points** were identified and can be seen in Map 33. Nonetheless, after every PRA we could identify new points or determine if any of the existent ones are not relevant for the period and should not be monitored.
- c) From each point, **Buffer Areas** will be established with wide and longitude equal to the penetration distance.
- d) A **Limited Sampling** of transects will be carried to evaluate the buffer zone. The evaluated area should be no less than 1% of the buffer area.
- e) If tree-stumps are not found or barely found (exploited trees) then it would be assumed that $\Delta C_{P,Deg,i,t} = 0$ and the limited sampling repeated every time a PRA indicates potential of degradation.
- f) If the tree-stumps are found, then a **Systematic Sampling** should be made. To this purpose, an area $\geq 3\%$ of the buffer area will be assessed with plots systematically placed.
- g) The diameter of all tree-stumps will be measured and assumed to be equal to DBH. If they are too big, (i.e. due to buttress roots) the specie should be identified and other individuals

of the same species standing next to it should be measured. Their DBH and tree-stumps diameter will be recorded, and a ratio DBH /tree-stump diameter will be calculated. With this data, DBH of cut trees should be estimated.

- h) Once DBHs are known, the carbon stock of cut individuals will be estimated with the allometric equation of Chave for moist tropical forest (used in baseline carbon stocks estimations). It will be assumed that all carbon stock (in AG and BG biomass) are emitted and lost in the atmosphere.

Finally, the carbon stock changes due to degradation by illegal extraction of trees are calculated with the equation:

$$\Delta C_{P,DefW,i,t} = A_{DegW,i} * C_{DefW,i,t} / AP_i \quad \text{(Equation N° 8 of M-MON Module, VCS Modular Methodology)}$$

Where:

$\Delta C_{P,DefW,i,t}$ Net carbon stock changes as a result of degradation in stratum i in the project area at time t ; t CO₂-e

$A_{DegW,i}$ Area potentially impacted by degradation processes in stratum i , ha

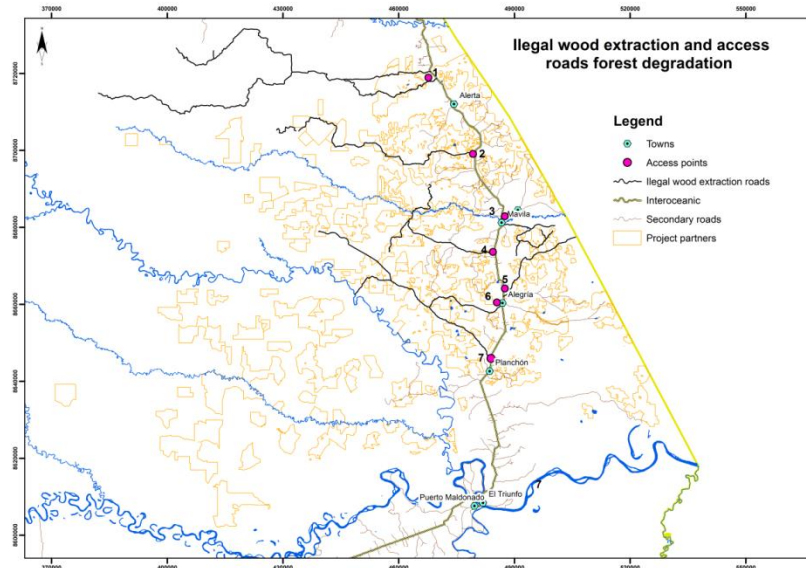
$C_{DefW,i,t}$ Biomass carbon of trees cut and removed through degradation process from plots measured in stratum i at time t ; t CO₂-e

AP_i Total area of degradation sample plots in stratum i , ha

i 1,2,3 ... M strata

t 1,2,3 ... t^* years elapsed since the start of the REDD project activity

Map 33. Access Points of degradation identified for the Project Area



The Access Points identified for the Project Area consists of 7 points located along the Inter-oceanic Highway. These points were identified by the Brazil nut concessionaires and local experts (Brazil nut leaders) to be the access points for illegal logging inside the Brazil nut region, and were generally created for wood extraction by timber concessionaires located beyond the Brazil nut concessions (especially in the north-west). Parting from these 7 access points, we will do the respective survey every time the results suggest there is degradation.

These seven Access Points are:

- a) **Road 01:** Locally called Schipper road, named after one of the best-known wood extractors of the zone who has a saw-mill on the access point to the highway. Today, this road is included in the project folder by the Ministry of Transport and Commerce to be enlarged and improved.
- b) **Road 02:** Locally called Mono Mejia, named after another well-known wood extractor in the area. This road articulates the production of the La Novia sector to the Brazil nut concessions, the wood products and other agriculture products.
- c) **Road 03:** Locally called Mavila-Aposento road, it branches and runs parallel to the road Mavila-Shiringayoc. This network of roads is being articulated by the growth of rural properties and the trade with the border of Bolivia, place from where smuggled goods enter such as Brazil nuts and timber.
- d) **Road 04:** Locally known as Nueva Vista Road, it is connected to the Miraflores road. It is projected to be articulated with the system of roads Varsovia-Lucerna-Loreto.
- e) **Road 05:** Locally known as San Juan-Piñal road, is one of the roads that is recently articulating to the border zone with Bolivia. The town of Alegria is projecting a rapid growth to different fronts; one of those fronts is driving this road.
- f) **Road 06 and 07:** Locally called Alto Malecon - San Carlos road and Varsovia-Lucerna-Loreto road. These two roads go inside the northwest of the Brazil nut sector, the first road, has an efficient maintenance system and the second was driven by the Municipality of Las Piedras. Both are projected as main roads of trade of agricultural and forest products.

The project will conduct a PRA every two years even if there are longer gaps of time between verification events. Field technicians will record all information created during each PRA and samplings. Survey and sampling templates will be available for them to use, and all information will be saved in physical records and in the digital database.

Degradation due to Selective Logging of Forest Management Areas

This source of degradation accounts for the loss of carbon stock due to removal of trees for timber purposes and the derived damage in non-commercial trees during harvest (logging gap), and due to the logging infrastructure created. These emissions, however, will be discounted for any stock retained in wood products resulting from timber extraction. The following equation resumes the procedure:

$$\Delta C_{P,SelLog,i,t} = \sum (CLG_{i,t} * CLR_{i,t} - CWP_{i,t}) \quad \text{(Equation N°9 M-MON Module, VCS Modular Methodology)}$$

Where:

$\Delta C_{P,SelLog,i,t}$	Net carbon stock change as a result of degradation through selective logging of FSC certified forest management areas in the PA in stratum i at time t ; t CO ₂ -e
$CLG_{i,t}$	Actual net project emissions arising in the logging gap in stratum i at time t ; t CO ₂ -e
$CLR_{i,t}$	Actual net project emissions arising from the logging infrastructure in stratum i at time t ; t CO ₂ -e
$CWP_{i,t}$	Carbon stock in wood products pool from stratum i at time t ; t CO ₂ -e
i	1,2,3 ... M strata
t	1,2,3 ... t^* years elapsed since the start of the REDD project activity

The resulting emissions will be excluded if found not significant by using the T-SIG module.

It is worth noting that not all Brazil nut concessionaires harvest timber from their areas. Indeed, around 30% of concessionaires do selective logging as a complementary activity¹²⁷, for which they are compelled to sub-divide their concessions into several parcels – called *Parcelas Anuales de Corta* (PCA) – and use only one of them each year. Thus, a much smaller area than PA is actually degraded by logging every year.

The monitoring of these areas will occur before every verification event or at least every 5 years.

Emissions Arising in the Logging Gap

These are the emissions occurring due to the death of the timber tree and the death of all trees incidentally killed during felling. For estimating the biomass of the total volume extracted, we will collect the concessionaires' field records when possible. Forms have been developed to correctly measure all necessary variables for this end. Otherwise, we will use the official information gathered yearly in the extraction balances of each ATFFS. From these balances it is possible to get the totalized extracted volume and also the detailed volume per specie, of each concessionaire.

Once volumes are known, the emissions will be estimated using the following equations:

$$C_{LG,i,t} = \sum (C_{EXT,z,i} + (LDF_{z,i} * V_{EXT,z,i,t} * 44/12)) \quad (\text{Eq. N° 10 M-MON module, VCS Modular Methodology})$$

Where:

$C_{LG,i,t}$	Actual net project emissions arising in the logging gap, in stratum i at time t ; t CO ₂ -e
$C_{EXT,z,i}$	Biomass carbon stock of timber extracted within the project boundary for logging stratum z , in stratum i at time t ; t CO ₂ -e
$LDF_{z,i}$	Logging damage factor for logging stratum z , in stratum i at time t ; t C/m ³
$V_{EXT,z,i,t}$	Volume extracted from logging stratum z , in stratum i at time t ; m ³
i	1,2,3 ... M strata
t	1,2,3 ... t^* years elapsed since the start of the REDD project activity

And,

$$C_{EXT,z,i} = \sum (V_{EXT,j,z,i,t} * D_j * CF_j * 44/12) \quad (\text{Eq. N° 11 M-MON module, VCS Modular Methodology})$$

$V_{EXT,j,z,i,t}$	The volume of timber extracted of species j for logging stratum z , in stratum i at time t ; m ³
D_j	Basic wood density of species j ; t d.m. /m ³
CF_j	Carbon fraction of biomass for trees; t C/ t d.m
z	1,2,3 ... Z logging strata

The Carbon Fraction (CF) is equal to 0.49 t C/t d.m., value used in baseline calculations.

¹²⁷ Balance de Extracción 2011. Administración Técnica Forestal y de Fauna Silvestre (ATFFS) of Tambopata-Manu and Tahuamanu provinces.

The Logging Damage Factor (LDF) is equal to 0.67 t C per unit of extracted timber (m³), value for broadleaf and mixed forest.

Emissions by Logging Infrastructure

The logging infrastructure includes skid trails, logging roads and logging decks, needed for transporting the logs. To monitor the emissions due to their creation, we will use field reports when available; otherwise, we will make field measurements to estimate accurately the cleared area. In this case, as no guidance is available for monitoring extraction of wood in BN concessions, we will use some of the criteria from the methodology proposed by Sabogal *et al* (2007).

Said methodology was developed to monitor the logging impacts in timber concessions whose working conditions differ from ours in scale, used technology and management among other variables. Still, it is the only tool with defined procedures. It poses the use of transects to monitor 0.5% or 1% depending if the affected area (sum of PCAs) is larger or smaller than 500 ha, respectively.

The resulting monitoring area will be distributed in a number of no less than 5% of PCAs, which will be randomly selected. Transects could measure 10m x 500m but the final size may vary to ease the work. Such change could only take place before the fieldwork per se, and will be applied to all transects. Inside them, we will evaluate the dimensions of roads, skid trails and decks. The specific considerations and the equations for estimating emissions from the field measures are:

a) Skid Trails

The mean length per unit area (m/ha) and the mean width (W_{SKID}) will be produced. The total length (L_{sk}) is obtained by multiplying the mean length by the total area logged.

In addition, it is assumed that all carbon stocks in above- and belowground biomass are lost during the creation of skid trails. Since tree biomass was the only pool considered, the mean live carbon stock assumed to be killed is equal to: $C_{dest,i} = C_{tree_AB,i} + C_{tree_BB,i}$.

The emissions from the soil pool ($\Delta C_{SOC_sk,i}$) will not be included in the calculation since its exclusion is considered conservative.

The equation for estimating total emissions from the creation of skid trails is:

$$\Delta C_{SKID,i,t} = L_{SKID,i,t} * SK_i \quad (\text{Eq. N°13 M-MON module, VCS Modular Methodology})$$

Where:

$\Delta C_{SKID,i,t}$	Change in carbon stock resulting from skid trail creation in stratum i at time t ; t CO ₂ -e
$L_{SKID,i,t}$	Length of skid trails in stratum i at time t ; m
SK_i	Skid trail emissions factor (average emissions resulting from dead wood created in the process of skid trail creation per length of skid trail) in stratum i at time t ; t CO ₂ -e/m
t	1,2,3 ... t^* years elapsed since the start of the REDD project activity

And,

$$SK_i = (C_{dest,i} + \Delta C_{SOC_sk,i}) * 1/10\,000 * W_{SKID} \quad (\text{Eq. N}^\circ 14 \text{ M-MON module, VCS Module Methodology})$$

$C_{dest,i}$	Mean live carbon stock of trees and non-trees biomass assumed to be killed per unit area in creation of skid trails in stratum i ; t CO ₂ -e/ha
$\Delta C_{SOC_sk,i}$	Carbon stock change in organic carbon resulting from skid trail creation in stratum i ; t CO ₂ -e/ha
W_{SKID}	Mean width of skid trails in stratum i ; m

b) Logging Roads

Generally, in large-scale operations there are two types of roads created during a harvest period, determined by their width and use, which are the Principal Roads and the Secondary Roads. This may not be the case in BN concessions given the low-intensity exploitation inside them but we will indicate the type, if applicable.

We will measure the widths and lengths of road sections inside the transects, which will produce a mean width value and a total estimated length. The estimated total area of road is obtained by multiplying said values.

Once the total area is known, the following equation will be used to calculate the emissions caused by road creation.

$$\Delta C_{ROAD,i,t} = A_{ROAD,i,t} * C_{BSL,i} \quad (\text{Eq. N}^\circ 17 \text{ M-MON module, VCS Modular Methodology})$$

Where,

$\Delta C_{ROAD,i,t}$	Change in carbon stock resulting from logging road creation in stratum i at time t ; t CO ₂ -e
$A_{ROAD,i,t}$	Area of roads in stratum i at time t ; ha
$C_{BSL,i}$	Carbon stock in all pools in baseline case in stratum i at time t ; t CO ₂ -e/ha

c) Logging Decks

We will estimate a value of logging deck area per unit area from the widths and lengths that were measured inside transects. Then, it will be multiplied by the total area logged to produce the estimated total area of decks. The emissions caused by deck creation are estimated with:

$$\Delta C_{DECKS,i,t} = A_{DECKS,i,t} * C_{BSL,i} \quad (\text{Eq. N}^\circ 18 \text{ M-MON module, VCS Module Methodology})$$

Where,

$\Delta C_{DECKS,i,t}$	Change in carbon stock resulting from logging road creation in stratum i at time t ; t CO ₂ -e
$A_{DECKS,i,t}$	Area of roads in stratum i at time t ; ha

Finally, the total emissions arising from logging infrastructure will be estimated by adding the change in carbon stocks from the creation of skid trails, logging roads and logging decks:

$$C_{LR,i,t} = \Delta C_{SKID,i,t} + \Delta C_{ROAD,i,t} + \Delta C_{DECKS,i,t} \quad (\text{Eq. N}^\circ 12 \text{ M-MON module, VCS Module Methodology})$$

The uncertainty of the emissions estimates will be included in the uncertainty analysis of with-project scenario, made by using the X-UNC Module.

Emissions from Harvested Wood Products

The module “*Estimation of carbon stocks in the long-term wood products pool - CP-W*” (VMD0005) will be used to calculate ex-post the carbon stock in the wood products pool per stratum.

$$C_{WP,i} = \sum C_{XB,ty,i} * (1 - WW_{ty}) * (1 - SLF_{ty}) * (1 - OF_{ty}) \quad (\text{Eq. N}^{\circ}2 \text{ CP-W module, VCS Modular Methodology})$$

Where,

$C_{WP,i}$	Carbon stock in wood products pool (stock remaining in wood products after 100 years); t CO ₂ -e
$C_{XB,ty,i}$	Mean stock of extracted biomass carbon by class of wood product ty from stratum i ; t CO ₂ -e/ha
WW_{ty}	Wood waste. The fraction immediately emitted
SLF_{ty}	Fraction of wood products that will be emitted to the atmosphere within 5 year of timber harvest by class of wood product ty ; dimensionless
OF_{ty}	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product ty ; dimensionless
ty	Wood product class

The expected wood products are sawn wood, sold in the local sawmills or markets; therefore, the values for the equation parameters are:

Data	Value	Observation
WW	0.24	Developing countries
SLF	0.2	Sawn wood
OF	0.84	Tropical / Sawn wood

Source: CP-W Module

1.4 Monitoring Areas Undergoing Natural Disturbance

The areas under natural disturbance will be identified at the same time monitoring deforestation occurs and by using the same procedures.

The areas disturbed will be delineated and emissions calculated. The net carbon stock change equals the area disturbed times the emission per unit area.

$$\Delta C_{P,DistPA,i,t} = \sum (A_{DisPA,q,i,t} * \Delta C_{P,Dist,q,i,t}) \quad (\text{Eq. N}^{\circ}20 \text{ M-MON module, VCS Modular Methodology})$$

Where,

$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum i at time t ; t CO ₂ -e
$A_{DisPA,q,i,t}$	Area impacted by natural disturbance in post-natural disturbance stratum q in stratum i at time t ; ha
$\Delta C_{P,Dist,q,i,t}$	Net carbon stock changes in pools as a result of natural disturbance; t CO ₂ -e

The disturbed areas will result from the overlap between the area disturbed and the summed area of unplanned deforestation in the PA (to the year where the disturbance occurred). If the natural disturbance is fire, then the area burned will be assumed to be equal to A_{DistPA} . In this case, emissions will be calculated using module E-BB.

It will be conservatively assumed that the post-natural disturbance pools are equal to zero. Carbon stock in wood products won't be considered as the disturbance most likely to happen is fire and no harvest will follow this natural disturbance.

In addition, the uncertainty will be included in the estimation of ex-post with-project scenario uncertainties calculations (using X-UNC).

1.5 Monitoring of Project Emissions

When significant, it will be calculated GHG emissions different to CO₂ with the following equation (described in Section CL1):

$$GHG_{P,E,i,t} = E_{FC,i,t} + E_{BiomassBurn,i,t} + N_2O_{direct-N,i,t} \quad (\text{Eq. N}^\circ 30 \text{ M-MON module, VCS Modular Methodology})$$

All sub calculations and assumptions made for estimating each parameter are presented also in Section CL1. Thus, extra details are mentioned below. After their estimation, each parameter will be addressed using T-SIG module to determine whether the emission sources are significant.

N₂O and CH₄ Emissions from Agriculture and Forest Biomass Burning

It is performed on areas that suffer a change in land use. To estimate ex-ante biomass burnt in forests, it was calculated (according to MINAM, 2009) that 55% of the deforested forest is burnt. This index will be the same for the entire baseline period. Nevertheless, it should be corroborated (based on measures made of the own experience or a new bibliographic search) for baseline renewal.

For the case of agriculture biomass burnt, it has been determined based on traditional management of farmland that stubble burning is made every year in all parcels at the end of the harvest period. In the calculations ex-ante, Corn is used as farmland reference because is the most representative crop of the area. However, for real estimations the crop that is actually in the parcel or the one with major representation in the area could be taken as reference, when known. This reference crop should be corroborated for baseline renewal.

Emissions from Fossil Fuel Combustion

The implementation of project activities will result on emissions, mainly due to the use of fuel for transporting goods and materials and of the patrolling personnel activities. Another considerable source of emissions is the use of fuel for the plant's energy demand. Registries of fuel demand per activity will be carried, and with the total amount of used fuel we will estimate the total emissions using E-FFC module.

Direct N₂O Emissions as a Result of Nitrogen Applications

Nitrogen applications will not occur inside the Project Area, with the exception of the fertilizer applications inside the Project's tree nursery which will be located outside the PA. Therefore direct N₂O emissions resulting from these applications are not accounted¹²⁸ as they do not exist in the project area.

1.6 Responsibilities

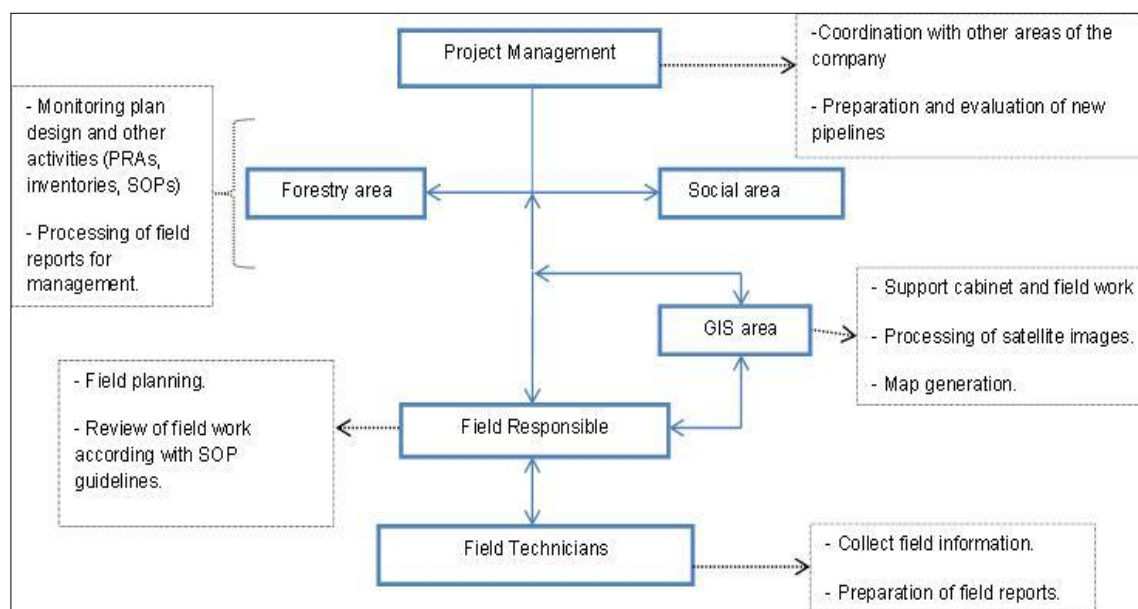
The design and execution of the Project and its Monitoring is handled by a multidisciplinary technical team, duly qualified and with experience in Project development. In addition, it is supported by recognized institutions related to the Amazon investigation as the IIAP.

Specialists in forest, social, and economic areas lead the team, who are in charge of defining the objectives and provide guidelines to the correct development of the activities. The Head of Monitoring is in charge of the implementation. He organizes the work and staff in field and keeps the Specialists informed about everything that is in progress through periodic reports of the activities and permanent communication about the outcome and contingencies arising out.

The field staff is in charge of gathering all parameter information that will be monitored to evaluate the performance of the project. They will be constantly trained to improve their skills in the use of: standard procedures to collect information, measurement instruments, and outcome processing, etc.

It is worth to mention that all staff will be permanently in contact to coordinate the activities, discuss problems and difficulties arising out and take relevant decisions, so there will be a feedback at all level. The organizational chart is presented hereunder:

Figure 29: Organizational chart of the team in charge of monitoring



¹²⁸ E-NA module sets out that when the only source of N₂O emissions is due to the application of fertilizer in tree nurseries outside the PA, then these emissions may be considered as negligible

1.7 Information Management

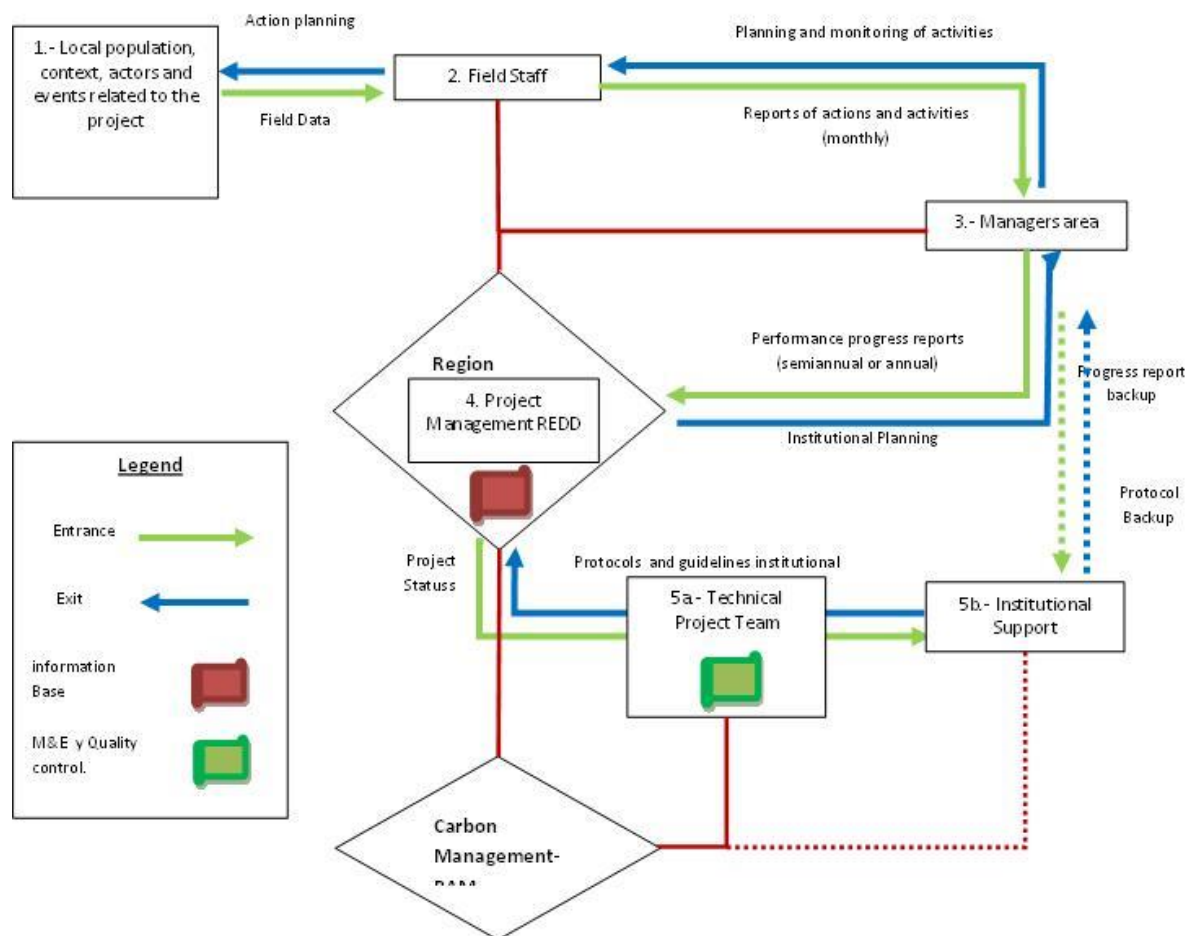
There will be Standard Operating Procedures (SOPs) that will guide the monitoring activities, limiting the change that the incorporation of new staff members would cause. There will also be forms and templates for each parameter that will allow documenting them clearly and consistently through time. Additional information considered as relevant by the field operator would be included.

Furthermore, unique procedures will be fixed (SOPs Quality Control) for the management, processing and archive of the gathered information with the purpose to secure information and availability to any subsequent revision.

To that end, it has been determined that all physical data of field forms and reports generated will be stored in a safe space specially enabled to the purposes thereof, as well as using a codification that will avoid errors in time and/or activities referred thereto.

Likewise, all data shall have to be digitized in Excel or Word documents, according to each type and following the forms format, saved in files with the same code used in all hard copies, sent to the headquarters of the company and regularly updated. Information flow is presented herein below:

Figure 30: Information Flow among the staff in charge of Monitoring



1.8 In-House Audit

The use of SOPs will minimize the error information to handle the project, both in terms of procurement (field survey) as well as in processing and storage. It will also allow us to estimate the uncertainty in the monitoring of each parameter, as required by module X-UNC, and keep it within the allowed range.

As additional information conservation measures, there will be:

Training

It includes training of the staff in general in different roles to play within the structure of the project. However, in the aim to always have quality information, training will be prioritized at the critical points of management, which are the field collection and processing (head of evaluation and monitoring, field staff and GIS specialist). All staff must pass an induction process prior to execution of any activity related to monitoring.

Field Verification

For each measurement made directly in the field, especially in the case of inventory (carbon stock, growth, degradation, etc.) or use of satellite images, verification will be designed to meet the statistical criteria allowing corroborating reliability of the information.

It will also be verified that the staff using the SOPs in their daily activities would do it without any difficulty.

Reviewing Monitoring Reports before Delivery and Storage

Prior to the delivery of the reports to the headquarters, the Head of Monitoring and Evaluation will review all reports that have been made in field and by sub processing, in order that the information reaching the next team is completely cleared.

2. Commitment to Develop a Monitoring Plan

The Monitoring Plan was already explained in the previous sub-section. Nonetheless, the project commits to include or adapt monitoring criteria if deemed necessary in the future, based on the results as they are obtained from continuous monitoring, with the aim to improve the analysis and reporting of impacts.

The plan and the monitoring results will be disseminated among the concessionaires, so they are aware of the activities and their impacts on their concessions. To do that, we will post these documents in BAM's website; we will give digital and hard copies to FEPROCAMD, its grassroots organizations and other local organizations (i.e. farming organizations), as well as to the forest offices of Tambopata and Tahuamanu. In addition, we will hold extra meetings if needed to ensure that the project communities and other stakeholders are kept informed.

COMMUNITY SECTION

CM1. Net Positive Community Impacts

1. Methodologies to Estimate the Net Benefits for the Communities

1.1. Methodology Approach to estimate the Impact

The Brazil nut REDD Project uses the impact assessment framework known as the Causal Modeling Approach or Theory of Change. It will adopt a specific methodology with potential use in terrestrial carbon projects (with some adaptations): The approach of Review of Results to Impacts (ROtI)¹²⁹. Although this approach (ROtI) develops a methodology designed primarily for ex-post evaluation, this is possible to be adapted for evaluation in the validation phase.

This approach aims to follow up along the chain of cause and effect or 'results chain' based on the strategy of the project to a set of desirable impacts. The fundamental premise of the ROtI approach is that when the theory of change is drawn and data for appropriate indicators have been collected it should be possible to confirm whether the project is on good track to be able to generate the expected impacts. The ROtI approach consists of three main stages:

Stage 1: Identification of the projects expected impacts

The Project has identified five social and environmental impacts that can be seen in the following table.

Table 108: Social-environmental Impact to due Project

Socio-environmental Impacts	Project Activities								
	Implementation of monitoring and surveillance of areas	Implementation of Nursery	FEPROCAMD Strengthening	Implementation of complaints protocol	Brazil nut Processing Plant	Brazil nut and sub products Certification	Establishment of cooperation agreements and alliances	Forest and environmental goods and services conservation campaigns	Forest Management of Brazil nut Areas
Improved organization for sustainable forest activities	g	Na	g	g	na	g	G	g	g
Increase of economic income of Concessionaires	na	G	na	na	g	g	G	Na	g
Change from traditional subsistence activities to sustainable activities	na	G	na	na	g	g	G	g	g
Forest conservation and ecosystem flows for local families	G	G	na	na	na	g	G	g	g
Control of activities causing deforestation (miners, farmers, etc)	b	Na	na	na	na	na	Na	na	na

eg: Good impact/positive, b: Bad impact/negative, na: No effect /impact

¹²⁹ This approach was developed by the Conservation Development Centre for the Global Environment Facility (GEF) Evaluation Office.

Description of Impacts

The community impacts of the project have been estimated based on permanent consultation and work with local settlements, especially with Brazil nut families. As a result of this dissemination and consultation work the following impacts have been identified:

1. **Sustainable Forest Management.** Consequence of the activities of legal formalization, organizational strengthening, partnerships, and advocacy campaigns, learning and leaders' empowerment, Brazil nut organizations will be prepared to manage Brazil nut forests. Additionally, they will be co-managers in the implementation and monitoring of the Brazil Nut REDD Project.
2. **Increase of Economic incomes of Concessionaires.** Consequence of the improvement of Brazil nut and other forest resources use, the implementation of the Brazil nut processing plant, and the certification processes, the Brazil nut producer will increase its revenues due to the improvement of its Brazil nut activity.
3. **Change from traditional subsistence activities to sustainable activities.** Consequence of forestry technical assistance, organizational strengthening, the Brazil nut processing plant and certification processes, it is considered that traditional strategies of extraction of forest resources, will change to strategies of sustainable livelihoods environmentally friendly, with the improvement of life quality of Brazil nut families and community development.
4. **Forest conservation and ecosystem flows for local families.** The set of activities of the project will help to conserve the forests, and their goods and services, which will be resources for current and future population.
5. **Control of activities causing deforestation.** The set of activities related to the control and supervision: legal defense, conflict resolution mechanisms, Brazil nut use planning, delimitation, etc., along with a training process in agroforestry management in spaces outside the project area, will control and/or mitigate the entry of deforestation activities.

As noted, the Project considers to generate five community impacts, from which the impact: *Control of deforestation activities in the project area*, could have negative effects, before its achievement and consolidation. These negative effects have been identified as *leakage* and conflicts.

The leakage and conflicts will be caused mainly by the activities carried out by the control and monitoring system of Brazil nut areas. To mitigate and/or control these adverse effects, the project will implement strategies to promote alternative activities such as agroforestry, tourism, or others. Technical assistance in forest and agricultural management will be provided to allow that the pressure on the Brazil nut area decreases and relevant dispute resolution mechanisms will be established. In this sense, given that the five impacts consider positive benefits for the populations, the calculation of the net impact will be positive in the communities.

On the other hand, the project has identified key areas, which consists of the entire water system (mainly structured in the micro basins formed by rivers Pariamanu and Tahuamanu). These areas will not be affected by the project activities; on the contrary, it is expected that the rivers will improve their quality given the implementation of sustainable forest management, the

certification and the control and monitoring system of the areas threatened by the deforestation activities.

Likewise, the critical resources identified in the project area are the timber and the Brazil nut: two vital products for human use and income generation in the local and regional population. On these critical resources, the project, through the management and enrichment (reforestation) of timber and Brazil nut resources of the forests will preserve and enhance the economic value of these areas. This maintenance and/or increase in the stock of critical resources will benefit to the communities that use these resources.

Stage 2: Revision of the Logical Framework of the Project

Depending on the development and progress of the project, it is considered to review and modify (if necessary) the activities of the project, reviewing the causal relationships, between activities, the goals, products and project results. As a result of this review the framework of the project that can be seen in the following table.

Table 109: Logical Framework of the Project

Components	Intervention Logic	Verifiable Indicators
Climate Results	RCL1 The GHG emissions caused by deforestation of the Brazil nut forest have been reduced	Every five year, a significant decrease in GHG emissions due to deforestation, in comparison to the projected emissions is monitored
	RCL2. Eventual leakage of deforestation activities has been controlled in the project	Every five year, minimal negative alterations in relation to the projected deforestation in the project area is monitored
Climate Activities	RCL1A1 Implementation of the Monitoring and Surveillance System	At the end of the third year of the project the monitoring and surveillance system was implemented and launched, with the control posts, the necessary equipment and with the trained and adequate personnel
	RCL1A2 Training to deforestation agents in productive alternatives, sustainable projects (farmers), Environmental Education and PAMAS (miners)	Every year the participation in training workshops for Brazil nut producers, farmers and miners in the area have been recorded
	RCL2A1 Implementation of nursery	At the end of the fifth year a permanent nursery has been implemented for management activities and enrichment of the project area
Community Results	RC1 FEPROCAMD has a formal organization and efficient management of its concession areas under a REDD mechanism	At the end of the fifth year of the project, all concessionaires are organized and have management tools for running adequately their concessions
	RC2 The income generated from the use of Brazil nut forests have increased	At the end of the fifth year of the project, the income of the Brazil nut producers has increased in more than 10% of the baseline
	RC3 Communities in the project area and the government of Madre de Dios have strengthened their capacities for sustainable forest management and the project contributes to improving the quality of life of local people	At the end of the fifth year and in subsequent years the implementation of sustainable development policies and the increase of sustainable activities in the project area can be verified
Community Activities	RC1A1 Organization and legal formalization of FEPROCAMD	At the end of the first year, the Brazil nut producers have a legally formalized organization
	RC1A2 Implementation of the Alert System	At the end of the third year, the Brazil nut producers have an organizational structure to call

		and respond to threats in their areas with immediacy
	RC1A3 Implementation of the Conflict Resolution and Complaint System	At the end of the third year, FEPROCAMD has a structure to resolve conflicts and complaints during the project implementation
	RC2A1 Implementation and start-up of the Brazil nut Processing Plant	At the end of the fourth year, a Brazil nut Processing Plant has been implemented and begun its operations
	RC2A2 Forest, Brazil nut, and sub products certification	At the end of the fifth year, management and processing of Brazil nut has been certified organically
	RC3A1 Training in forest management, reduced impact logging, monitoring and alert system of forest concession areas, farmers, miners, etc	Annually, at least 4 technical workshops have been carried out with the participation of the population of the project area
	RC3A2 Cooperation agreements, alliances and training signed with the Government of Madre de Dios and other public and private stakeholders	Every two years, at least two agreements or contracts are signed that benefit the Brazil nut producers of the project
	RC3A3 Local campaigns for conservation of forests and environmental goods and services	Annually, at least 2 dissemination and promotional campaigns of Brazil nut forests, conservation and REDD project activities have been launched
	RC3A4 Training in sustainable projects: Agroforestry, tourism and aquaculture	Annually, at least 2 training workshops for the population of the project area have been carried out
Biodiversity Results	RB1 Biodiversity in the project area has remained in quality and quantity	At the end of the fifth year and within a period of every three years, the wildlife monitoring report presents maintenance of biodiversity stock.
	RB2 The HCV identified in the project area are recognized and valued by the settler	At the end of the fifth year, the HCV in the project area are identified and valued by the local population
Biodiversity Activities	RB1A1 Forest management of Brazil nut concessions	At the end of the fifth year forestry (Brazil nut and timber) activities of the project area meet the technical criteria committed with the Peruvian State
	RB1A2 Control of hunting and other environmental crimes in the project area	At the end of the fourth year, the area monitoring system runs with poaching and environmental crime control protocols
	RB2A1 Dissemination and training on HCV to the communities of the project area	As from the fourth year, each year at least one dissemination or training campaign is launched destined for local people in the project area
	RB2A2 Training in recognition of endangered wildlife species, environmental crimes and care for the environment applied to local people	As from the fourth year, each year at least one dissemination or training campaign is launched destined for local people in the project area

Stage 3: Analysis of the Results- Impacts of the Project.

Once established the Logical Framework and the projected impacts, the processes involved in the conversion of the results of the project into impacts are defined. The R0tI methodology considers to perform analysis considering the intermediate states and within it the assumptions and impact drivers.

Using an adaptation of this analysis, we obtain the following flowchart of activities, goals and results towards the expected impacts of the project. Among them, intermediate states are projected, raising the impact drivers and the assumptions to reach the desired impact.

Figure 31. Flowchart of Activities, Goals and Results the Expected Impacts of the Project



Once performed this identification and distinction of the intermediate states between results and impacts, it will proceed to score the degrees to be achieved in each of the points of the flowchart, according to the following valuation table.

Table 110: Score of Intermediate States

Score	Description	Detail
0	Not achieved	There is no theory of change clearly identifiable and the conditions for future progress are not met
1	Poorly achieved	There are no adequate mechanisms to achieve the project's theory of change, although the conditions for future progress can be met
2	Partially achieved	The project has a recognizable theory of change, but the mechanisms for its achievement are insufficient; mild progresses have been carried out to achieve the impacts' delivery
3	Full achievement	There is a clearly recognizable theory of change, and a substantial progress has been carried out to achieve it with the appropriate mechanisms clearly in place. The project is strongly positioned to deliver its products

The stage of qualification/assessment of progress and achievement (last stage of the model) ideally, should be applied to the three hierarchical levels of the causal model.:

The ROtI impact assessment model level applied to each of the individual elements and components (results, impact drivers, assumptions and impacts) of the revision of results to ROtI impacts model.

The overall strategy level applied to each of the elements and components of the project's management (review project management document).

The Logical Framework level applied to each of the elements and components of the logical framework, activities, goals and results (review the project's design and goals chapter).

1.2. Data Collection and Analysis Methods

The methods for data collection and analysis (indicators) of the net benefits that the Brazil Nut REDD Project will generate to the communities will be qualitative (based on the assessment and perception of the local people in relation to the benefits of the project) and quantitative (based in the socioeconomic improvements that can be measured). The data collection of the net benefits of the project will be measured by the indicators detailed in the starting point or baseline. For the purposes thereof, BAM has a socioeconomic diagnosis of the project area, with basic information of the communities.

Among the methods of data collection and analysis, according to its utility and functionality for measuring results and impacts, the following will be preferred:

Participatory Impact Assessment (PIA)¹³⁰

¹³⁰ The Participatory Impact Assessment (PIA or EPI, *for its Spanish acronym*) was created by the Feinstein International Center and designed mainly to assess humanitarian emergency and livelihood projects. The approach is based on the acknowledgement that "local people are capable to identify and measure their own change indicators" (Catley et al., 2008:9).

The project privileges the participatory evaluation in the design and implementation of the project, as well as the monitoring and impact assessment. Therefore, products, activities, results and impacts are agreed by consensus through workshops, meetings and assemblies held between Bosques Amazonicos and the Brazil nut concessionaires. At the same way, the identification, assumptions and impact monitoring will be assessed with their participation. This assessment is enriched by previous technique analysis such as: stakeholders analysis, problem tree and scenario analysis.

The PIA aims to answer three key questions: What changes have occurred in the community since the beginning of the project? Which of these changes are attributable to the project? What differences have these changes caused in the people's lives? The PIA guide proposes eight steps:

- a) Define the questions to be answered
- b) Define the geographical and time limits of the project (participatory mapping and historical timelines)
- c) Identify and prioritize the impact indicators defined locally, what changes do you expect or have occurred in your life as a result of the project?
- d) Decide which methods will be used and test them (data collection methods used to measure the indicators selected)
- e) Decide which sampling method and sample size will be used
- f) Evaluate the project allocation (separate the causal and non-causal factors of the project)
- g) Triangulation (e.g. Use secondary data to verify whether the estimates are more or less accurate)
- h) Feedback and verification of the results with the community

Directed Surveys

The project favors the use of surveys as a method of data collection both of quantitative and qualitative nature (perception of improvement and change), for example, to collect demographic, financial, health or educational data. It is considered to apply to a representative sample of a population group (in this case could be the Brazil nut concessionaires). In other case it could be applied to farmers (production, property, etc.), miners or local population (as variant of household survey).

Focus Group Discussions

Discussions are held on specific topics (often using an interview checklist) with small groups (4-10), sometimes selected to be representative of the stakeholders sub-groups (for example, women, the elderly, poor people or landless people, etc.). Focus groups are usually used at the beginning of a study to obtain a general understanding of the important issues or at a later stage to obtain a thorough understanding, for example, a specific topic that has come from a household survey.

Reviews from secondary sources

In addition to the direct application methodologies of the project, the project also privileges official information coming from the government sectors such as the National Institute of Statistics and Data Processing, the General Directorate of Forestry and Wildlife of the Regional Directorate of Agriculture, COFOPRI, the Agricultural Census, the National Census, the ecological and economic zoning, the Land-use Planning of Madre de Dios and other relevant work, coming

from public and private institutions, which will be reviewed and consulted to measure their compliance and eventual readjustments to the design and implementation of the project and compliance with the impacts.

1.3. Scenario Comparison "With the Project" and "Without the Project"

According to the projection of future scenarios worked between BAM and Brazil nut producers, the following scenario projections are described with the project and without the project:

Table 111. Scenario With the Project and Without the Project

N°	Impact	Indicator	Nature of Future Conditions				
			Existing Conditions	Impact without project	Resulting Conditions	Impact with Project	Resulting Conditions
1	Sustainable forest management	FEPROCAMD is strengthened as leader organization in the sector	The Brazil nut organization has no skills nor capacities developed to manage forests	Neutral	Conditions remain. Concessionaires manage their concessions individually, with occasional and sporadic organizations.	Positive	FEPROCAMD strengthens for the organized management of Brazil nut forest.
		Brazil nut concessionaires are efficiently organized and complying with their commitments with the State	Brazil nut producers with problems before OSINFOR, under supervision, with fines and penalties for violations due to concession misdirection	Negative	Penalized cases increase and contracts with the State are terminated, leaving concessionaires' areas vulnerable to deforestation activities.	Very positive	Criteria and commitments of the concessionaires are met before the Peruvian state.
2	Concessionaires income increase	Annual revenue as a result of economic activities carried out in their concession	Average annual income per concession amounting to US\$ 7204.22, selling conventional Brazil nut and with no value added	Negative	Revenues from Brazil nut concessions maintained and/or decreased.	Very positive	Increasing revenues of certified Brazil nut, with value added and under management that raise the productivity.
3	Variation of traditional subsistence activities to sustainable activities	Number of agroforestry, aquaculture and tourism enterprises implemented	Local population develops single-crop agriculture, slash and burn, and forest resource extraction.	Negative	Increase of agricultural perimeter and eroded areas. Quality and stock of forest resources decrease.	Very positive	Increase of economic activities that maintain the quantity and quality of forest resources.
4	Forest conservation and ecosystem flows for the resident of the area.	Maintaining the quantity of wildlife	Poaching, deforestation and indiscriminate forest use reduce the stock of existing wildlife.	Negative	Wildlife stock decreases due to poaching, deforestation and indiscriminate forest use.	Positive	Wildlife amount is maintained (big mammals)
		Maintaining the Brazil nut ecosystem integrity	Inadequate forest use and the advance of deforestation fragment the forest ecosystems	Negative	Forest ecosystem fragmentation increases	Positive	Forest ecosystems are maintained and regenerated
5	Control of activities causing deforestation	Cases solved versus cases unsolved of the monitoring and surveillance system	There is no defense system of endangered areas to be deforested	Negative	Increased incursion and invasion events in Brazil nut areas	Very positive	Deforestation projection decreases in the area and the project area.
		Cases solved versus cases unsolved of the conflict resolution and leakage management system	Increasing conflicts between concessionaires and deforestation agents	Negative	Vulnerability and loss of Brazil nut areas increase due to conflicts between concessionaires and deforestation agents	Very positive	Conflicts decrease and leakage of deforestation agents is mitigated

2. High Values of Conservation being affected by the Project

The project will not affect negatively any High Conservation Values; on the contrary, the project aims to preserve the ecosystem and the environmental services it gives with a minimal but efficient intervention of the forest by improving the traditional Brazil nut activity.

As the Brazil nut activity is mainly harvesting and seasonal, it won't affect the soil (compact and pouring of fuel or mercury) nor the regeneration of the forest (intense logging, slash and burn) nor the production of Brazil nuts. This activity is not a threat for fauna like other activities as cattle ranching, agriculture or mining are.

The proposed activities in table 104 – community section search to maintain the Brazil nut forests and the services they supply and, at the same time, increase the incomes of Brazil nut harvesters through the organizational strengthening of FEPROCAMD, the development of new skills, the involvement of concessionaries in the monitoring of their areas. In that sense, the project will not affect negatively critical ecosystems as hydrographic basins nor will not decrease the quantity and quality of basic services (water, food, building materials, etc.) will not be a threat for the cultural identity of communities that depend on the Brazil nut forests.

CM2. Impacts on Offsite Stakeholders

1. Potential Negative Impact on Offsite Stakeholders

As mentioned herein, the project does not expect negative impacts on the project zone. No potential negative impacts on offsite stakeholders are projected; in case such an event occurs, it would be as an extension of probable leakage of the project.

Displacement of Activities Causing Deforestation or *Leakages*

This is a likely direct effect of the control and monitoring activities of areas that occurs when deforestation agents (invaders, illegal loggers, informal miners and other agents), unable to affect the project area, travel to other areas of the project area (with the intention to carry out the same deforestation activities).

One aspect arising out from leakage is the possible **conflict with deforestation agents**: There can be two types of conflicts:

Legal conflict. With mining concessionaires that have overlapping titles with the Brazil nut area, as well as with farmers and other concessionaires who have not carry out landmarks or disencumbrance of areas.

Social conflict. With invaders from the Brazil nut area, among them there would be the informal miners, farmers, illegal loggers, hunters and others.

2. Offsite Impact Mitigation

The project will mitigate these social conflicts through the Dispute and Complain Resolution System. It is worth mentioning that to significantly improve the effectiveness; this system will

have the participation of government entities related to the topic such as: the Ombudsman, the prosecutor's office, among others.

Even though the project has an area delimited by the 405 Brazil nut concessions joining the project, the control and surveillance strategy will cover the whole area of Brazil nut concessions (around a thousand of concessions, including the ones that are not partners of the project), that will be benefited with the defense of their forest.

In that sense, the activities to protect the forest, the technical assistance and legal advisory protocols and the agreements with forest authorities will benefit to all concessionaries. This is the strategy to mitigate the risk of leakage.

In addition, the joint work with FEPROCAMD, that represents most of the Brazil nut concessionaries (including some that are not part of the project), that is being strengthened through the project, will also be a benefit that will not distinguish to the concessionaire who is member of the project and to the concessionaire who is not.

3. Negative Impacts on Other Stakeholder Groups

The project does not consider to likely generating net negative impacts on other stakeholder groups.

CM3. Community Impact Monitoring

The Project, for the community component intends to generate net positive impacts on the social and economic welfare of the community and ensure that the costs and benefits are equitably shared among the community members and groups during the life of project.

These actions (and their impacts) require a system to review, collect, analyze, evaluate and propose adjustments (if necessary) and systematize the progress, results and achievements of the planned objectives.

This system is organized in the present Community Impact Monitoring Plan of the Brazil Nut REDD project. The Community Impact Monitoring Plan (CIMP) is based on the fact that indicators have already been identified, which will bring the processes and changes planned for the project. The first measurement of these indicators is registered in the previous moment before starting the project; this is referred to as the Community Baseline.

This monitoring plan presents, defines and details the indicators, methodologies, techniques and schedules of data collection.

1. Community Impact Indicators

Bosques Amazónicos has identified the community impact to be achieved through the activities to be implemented with the Brazil Nut REDD project. These impacts will be obtained and achieved gradually throughout the project.

In the VCS PD, 9 impacts were presented; however, in order to get a better classification of the indicators they have been adjusted to 5 impacts. The impact *job offer increase* has been included

in the impact *revenue increase*. The impacts *displacement of activities* and *conflicts* have been merged into one. The *economic flow increase in the processing plant* has been removed.

Table 112. Community Impacts by Type of Activity

N	IMPACTS	ACTIVITIES									
		Monitoring and surveillance	Nursery implementation	FEPROCAMD formalization	Alert and complaint system implementation	Brazil nut Processing plant	Brazil nut and sub product certification	Cooperation agreements and partnerships with the Government of MD	Local conservation, goods and services campaigns	Forest Management of Brazil nut areas	Training Plan
1	Improved organization for sustainable forest management	Positive	Non apply	Positive	Positive	Non apply	Positive	Non apply	Non apply	Positive	Positive
2	Increase of economic incomes of Concessionaires	Non apply	Positive	Non apply	Non apply	Positive	Positive	Non apply	Non apply	Non apply	Non apply
3	Change from traditional subsistence activities to sustainable activities	Non apply	Positive	Non apply	Non apply	Positive	Positive	Positive	Non apply	Positive	Positive
4	Forest conservation and community ecosystem flows in the area.	Positive	Positive	Non apply	Non apply	Non apply	Positive	Positive	Positive	Positive	Positive
5	Conflictive displacement of activities causing deforestation (miners, farmers, etc.).	Negative	Non apply	Non apply	Negative	Non apply	Non apply	Non apply	Non apply	Negative	Non apply

Thus, the Brazil Nut REDD project starts from the premise that the 10 activities identified will achieve to generate 5 impacts. To monitor the achievement of these impacts, the indicators that will boost such impacts have been identified.

Improved Organization for Sustainable Forest Management

This impact refers to the improvement of the organizational capacity of Brazil nut producers in order to coexist and thrive as a collective, as well as to cover its needs as an organization and solve their organizational and management problems. These capabilities are required to contribute to the sustainable management of the concessions of each associate, as well as to manage the forest agenda (collective actions) of Brazil nut producers.

Indicators

The indicators are:

- a) Brazil nut regional organization formally constituted developing its organic institutional life.
 - 01 regional organization legally constituted
 - Number of management tools applied
 - Number of interagency agreements
- b) Brazil nut organization successfully monitoring areas with forest custodians certified by a competent authority
 - Surveillance organization implemented
 - Number Custodians certified by competent authority
- c) Brazil nut producers organized on the basis of a system of organic certification.
 - 01 Brazil nut organization leading the certification
 - Number Brazil nut producers organized with certification
- d) One Brazil nut regional organization formally constituted developing its organic institutional life.
 - 01 regional organization legally constituted
 - Number of management tools applied
 - Number of campaigns in defense of the Brazil nut sector
 - Number of campaigns with proposals and agenda of the Brazil nut sector

Collection Technique and Schedule

The data collection techniques to monitor this impact would privilege the document review and FEPROCAMD files and the project. These reviews will be periodic (biannual) according to the management periods established by Brazil nut organizations. The techniques and schedule for each indicator are detailed in the following table.

Table 113: The Techniques and Schedule for each Indicator

Indicators	Collection technique	Period	SCHEDULE																			
			YEAR 01		YEAR 02		YEAR 03		YEAR 04		YEAR 05		YEAR 06		YEAR 07		YEAR 08		YEAR 09		YEAR 10	
			Sem 01	Sem 02	Sem 03	Sem 04	Sem 05	Sem 06	Sem 07	Sem 08	Sem 09	Sem 10	Sem 11	Sem 12	Sem 13	Sem 14	Sem 15	Sem 16	Sem 17	Sem 18	Sem 19	Sem 20
01 regional organization legally constituted.	Documentary Review: testimony, preliminary deed and registration in public registries	Every 02 years (under management period)	X				X				X				X				X			
# of management tools applied.	Documentary Review: Strategic Plan, minute book, register and rules of procedure. Annual project report. Annual management report of FEPROCAMD	Every 01 year of FEPROCAMD management	X		X		X		X		X		X		X		X		X		X	
# of interagency agreements.	Document review of FEPROCAMD: Proceedings of agreements signed	Every 2 years (closing period of FEPROCAMD management)					X				X				X				X			
Surveillance organization implemented	Review of project files: Act of incorporation, field report, field verification, equipment, surveillance posts, and invested resources.	Every 01 year, since its creation					X		X		X		X		X		X		X		X	
# Custodians certified by competent authority.	File review: Application to the Forestry Directorate, workshops report, resolution of custodians, reports of the activities of custodians.	Every 01 year, since its recognition					X		X		X		X		X		X		X		X	
01 constituted organization.	File review: Act of incorporation, registration in public registries.	Every 02 years, since its recognition									X				X				X			
# Brazil nut producers organized with certification.	Documentary review: relationship of partners in the register	Every 02 years, since its recognition									X				X				X			

Income Increase

The income is the cash flow received by local people (among them, the Brazil nut producers) as remuneration (in case of sale or lease) and salary (if working). In general, the income¹³¹ may take the form of extra wages, interest, dividends or rents to be achieved with the implementation and start-up of the project.

As already mentioned herein, the Brazil nut producers obtain income from selling the Brazil nut collected from the forests (in some cases from logging). Sales prices of the Brazil nut regularly are determined by several factors, among the most important ones: 1) external demand conditions, 2) the prices established by intermediary companies which process and trade the Brazil nut in Madre de Dios, 3) the competition from Brazil and Bolivia, and 4) the phytosanitary management at the time of harvest and post-harvest of the Brazil nut.

The project, by improving the conditions of numerals 2 (implementing a Brazil nut processing and trading company) and 4 (improving the Brazil nut harvest and post-harvest management) will increase the Brazil nut price.

The project will impact on these factors (especially in factor 1) by promoting the regional competition, which will bring better prices. The proposal implies to transform Brazil nut producers (along with BAM) into Brazil nut entrepreneurs at an international level. Then the Brazil nut producers will increase their dividends because they will receive better prices for their Brazil nut and because they will receive profits as they are shareholders of the Brazil nut processing and marketing company.

Likewise, it will improve the income of Brazil nut families through the job offers provided by the project throughout the process of implementation of REDD activities and in special, job offers in the construction area, implementation and start-up of the Brazil nut processing plant and the nursery. It is considered that at least 50 % of the project's workers will be local people (especially coming from Brazil nut families).

On the other hand, the project will also generate more income from materials procurement (wood, seeds, fruits, leaves, etc.), goods, supplies (fuel, energy, etc.) and various products offered by the department of Madre de Dios and especially the communities in the project area.

Indicators

- a) Percent of increase of Brazil nut price
Refers to the price increase of the Brazil nut produced by the organic certification and higher market valuation for the competition generated.
- b) Number of job offers created
Refers to the generation of stable and temporary jobs offered for construction, implementation and start-up of the Brazil nut processing plant. Also, at the stage of

¹³¹ They are not considered complementary revenues from other grant resources as timber harvesting and other sources such as work or business of the holder, wife, children or other external.

implementation and operation of the nursery, temporary and stable jobs created for locals.

c) Investment in goods and services

Refers to the funds disbursed to local residents to purchase local inputs and services specially commissioned for the implementation of the Brazil nut processing plant and implementation and operation of the nursery.

d) Number of income from the Brazil nut company profits

Refers to the profits to be obtained with the Brazil nut company (plant), these profits can be assumed as an increase in the share value or as profits distributed.

Collection Technique and Schedule

The data collection techniques to monitor this impact will be located mainly in the administration of the project and the Brazil nut Company. It will be revised the status of the investments in salary, workers, acquisition of assets and income from the sale of Brazil nut (for the case of the Brazil nut company).

The collection period will be systematized and will be adjusted annually (according to the accounting closing period of BAM and the Brazil nut Company).

Table 114: The Techniques and Schedule for Each Indicator

Indicators	Disaggregated	Collection technique	Collection period	SCHEDULE									
				YEAR 03		YEAR 05		YEAR 07		YEAR 09		YEAR 10	
				Sem 05	Sem 06	Sem 09	Sem 10	Sem 13	Sem 14	Sem 17	Sem 18	Sem 19	Sem 20
# of increase of Brazil nut price.	# increase of Brazil nut price generated by competition.	Statistical Review of local prices (annual fluctuation since entry of the project)	Every 02 years	X		X		X		X			
	# increase of Brazil nut price generated by organic certification.	Review of annual accounting records of the Brazil nut company.	Every 02 years, since the startup of operations of the Brazil nut company			X		X		X			
#of job offers created.	# of local jobs created.	Review of the project accounting records. Line processing plant and nursery.	Every 02 years, since the beginning of implementation (plant y nursery)			X		X		X			
	# of annual revenues generated (salary).	Review of the project accounting records. Line processing plant and nursery.				X		X		X			
Investment in goods and services.	# of investment in goods.	Review of the project accounting records.	Every 02 years, since the startup of the project activities.			X		X		X			
	# of investment in services.	Review of the project accounting records.				X		X		X			
# of income from the Brazil nut company profits.	# of income distributed among Brazil nut producer partners.	Review of annual financial reports of the Brazil nut company.										X	
	# of increase in the value of shares.	Review of annual financial reports of the Brazil nut company.										X	

Further information and knowledge to the communities

The project will promote the capacity building through the increase in the information flow and knowledge related to the sustainable management of the concessions, the technical forest harvesting and the micro entrepreneurial development of the Brazil nut producer.

These trainings will be provided to Brazil nut concessionaires, project workers and local people in general (farmers, miners, loggers, government officials, etc.). The topics will be decided according to the stakeholders and aligned with the objectives and the stages of the project. Among these, REDD issues, the promotion of sustainable alternative activities such as agroforestry and organic agriculture, environmental education, low impact forest management, biodiversity valuation, among others.

This impact considers generating knowledge and practical skills for sustainable forest management and awareness and environment and biodiversity assessment.

Indicators

- a) Number of Brazil nut leaders trained in management, leadership and direction.
- b) Number of Brazil nut producers trained in surveillance – forest custodians.
- c) Number of Brazil nut producers trained in nursery management and reforestation.
- d) Number of Brazil nut producers trained in entrepreneurship.
- e) Number of Brazil nut producers trained in Brazil nut organic management.
- f) Number of Brazil nut producers trained in timber certified management.
- g) Number of Brazil nut producers trained in Brazil nut harvest and post-harvest.
- h) Number of Brazil nut producers and local people trained in alternative economic activities (agroforestry, ecotourism, handicrafts, etc.).
- i) Number of Brazil nut producers and local people trained in REDD and carbon issues.

Collection Technique and Schedule

The monitoring collection technique of this impact will be mainly the revision of reports of training activities reported by the project (community area). The reports will be organized and scheduled in accordance with the training plan designed by the community area of the project.

Table 115: The Techniques and Schedule for Each Indicator

Indicators	Collection technique	Collection period	SCHEDULE																	
			YEAR 02		YEAR 03		YEAR 04		YEAR 05		YEAR 06		YEAR 07		YEAR 08		YEAR 09		YEAR 10	
			Sem 03	Sem 04	Sem 05	Sem 06	Sem 07	Sem 08	Sem 09	Sem 10	Sem 11	Sem 12	Sem 13	Sem 14	Sem 15	Sem 16	Sem 17	Sem 18	Sem 19	Sem 20
# of Brazil nut leaders trained in management, leadership, and direction.	Systematization of the reports of project training workshops.	Every 01 year, since the beginning of the Project activities.	X		X		X		X		X		X		X		X		X	
# of Brazil nut producers trained in surveillance – forest custodians.					X		X		X		X		X		X		X		X	
# of Brazil nut producers trained in nursery management and reforestation.									X		X		X		X		X		X	
# of Brazil nut producers trained in entrepreneurship.									X		X		X		X		X		X	
# of Brazil nut producers trained in Brazil nut organic management.											X		X		X		X		X	
# Brazil nut producers trained in timber certified management.													X		X		X		X	
# of Brazil nut producers trained in forest management Brazil nut harvest post-harvest.											X		X		X		X		X	
# of Brazil nut producers and local people informed about REDD.			X		X		X		X		X		X		X		X		X	
# of Brazil nut producers and local people trained in REDD and carbon.			X		X		X		X		X		X		X		X		X	

Change from traditional subsistence activities to sustainable activities

The project will promote a change in strategies and livelihoods, passing from subsistence to sustainable livelihood. In that sense, there are 2 strategies to be implemented:

1. Improvement of Forest Management. This will be sought in the BN concessions and forested areas of farms, to improve or, in some cases, to introduce a technical exploitation of the forestry resources, adding to the productivity and value of the forestlands and creating more economic and environmental benefits.
2. Development of Agroforestry Projects. To boost the sustainability of economic activities of local people, the Project will encourage and facilitate the design and implementation of agroforestry projects by creating micro-entrepreneurial initiatives, strengthening productive units, improving productivity and quality of forested areas.

Therefore, the following indicators will help to monitor the results:

Indicators

- a. Increment in number of projects / agroforestry business plans implemented by farmers
- b. Income increment (%) from agroforestry activities
- c. Increment in number of productive organizations
- d. Increment in the productivity of forest products: Brazil nuts, timber, etc.

Collection technique and schedule

The monitoring collection technique of this impact will be mainly reviewing field reports of the technical assistance activities and training in productive activities reported by the project. Additionally, it will consider the revision of management reports of Brazil nut associations and events and executed projects and/or projected in the project area (detecting the initiatives facilitated by the Brazil Nut REDD project). The reports will be organized and scheduled in accordance with the project's annual operating plan.

Table 116: The Techniques and Schedule for Each Indicator

Indicators	Collection technique	Collection period	Schedule											
			YEAR 05		YEAR 06		YEAR 07		YEAR 08		YEAR 09		YEAR 10	
			Sem 09	Sem 10	Sem 11	Sem 12	Sem 13	Sem 14	Sem 15	Sem 16	Sem 17	Sem 18	Sem 19	Sem 20
Increment in number of projects / agroforestry business plans implemented by farmers	Review of technical assistance reports	Every 01 year, since the beginning of the technical assistance activities	X		X		X		X		X		X	
Income increment (%) from agroforestry activities	Review of technical assistance reports								X		X		X	

Increment in number of productive organizations	Review of technical assistance reports		X		X		X		X		X		X	
Increment in the productivity of forest products: Brazil nuts, timber, etc	Review of technical assistance reports				X		X		X		X		X	

Forest conservation and ecosystem flows for local families

The project will manage to maintain the sustainable forest management, ensuring the compliance with the technical criteria, according to the requirements of the Peruvian forest regulations. This application of technical criteria for forest management ensures the adequate access to resources coming from the forest and maximizes the benefits to the local population. Good Brazil nut concessions management will improve the forest performance and valuation, achieving greater environmental benefits.

Indicators

- a) Number of hectares with planning (land marking) of Brazil nut concessions
- b) Number of management documents prepared and approved by the competent authority
- c) Number of reforested and/or under enrichment hectares
- d) Number of certified forest areas (BPMF, FSC)

Collection technique and schedule

The monitoring collection technique of this impact will be mainly reviewing field reports of technical assistance activities and reforestation reported by the project.

Table 117: The Techniques and Schedule for Each Indicator

Indicators	Collection technique	Collection period	SCHEDULE																	
			YEAR 02		YEAR 03		YEAR 04		YEAR 05		YEAR 06		YEAR 07		YEAR 08		YEAR 09		YEAR 10	
			Sem 03	Sem 04	Sem 05	Sem 06	Sem 07	Sem 08	Sem 09	Sem 10	Sem 11	Sem 12	Sem 13	Sem 14	Sem 15	Sem 16	Sem 17	Sem 18	Sem 19	Sem 20
# of hectares with planning (land marking) of Brazil nut concessions.	Review of technical assistance reports	Every 01 year, since the beginning of the technical assistance activities	X		X		X		X		X									
# of management documents prepared and approved by the competent authority.	Review of technical assistance reports and documentary files of Brazil nut producers		X		X		X		X		X		X		X		X		X	
# of reforested and/or under enrichment hectares.	Review of project reports. Nursery and Reforestation										X		X		X		X		X	
# of certified forest areas (BPMF, FSC).	Review of technical assistance reports and documentary files of Brazil nut producers										X		X		X		X		X	

Conflictive displacement activities causing deforestation

The implementation of the project and in particular the implementation of the control and surveillance system of the project areas will generate impacts that affect (limiting and preventing the access) to the deforestation agents within the project area. This displacement constitutes the leakage of the project. This displacement could trigger tensions with the project.

This eventual conflict presence in the area, generated by the presence and activities of the project will be differentiated between those that are handled as from a social awareness and conviction (with MARCs¹³² techniques) and those demanding legal and judicial attention. Given this impact the project will develop control activities and conflict mitigation.

Indicators

- a) Number of social and legal interventions against deforestation agents
- b) Number of alerts and complaints addressed
- c) Number of conflicting events with deforestation agents

Collection technique and schedule

The displacements, tensions and conflicts generated by the project will be identified and registered by the community early alert system, the control and surveillance program and the community relations area of the project. The systematization of this information will be executed each year after the start-up of each concerned area.

¹³² Alternative Ways for Solving Conflicts

Table 118. The Techniques and Schedule for Each Indicator

Indicators	Collection technique	Collection period	SCHEDULE																	
			YEAR 02		YEAR 03		YEAR 04		YEAR 05		YEAR 06		YEAR 07		YEAR 08		YEAR 09		YEAR 10	
			Sem 03	Sem 04	Sem 05	Sem 06	Sem 07	Sem 08	Sem 09	Sem 10	Sem 11	Sem 12	Sem 13	Sem 14	Sem 15	Sem 16	Sem 17	Sem 18	Sem 19	Sem 20
# of social and legal interventions against deforestation agents.	Review of project reports (legal department).	Every 01 year, since the start-up of the legal area activity.	X		X		X		X		X		X		X		X		X	
# of alerts and complaints addressed.	Review of project reports (community area and control and surveillance system.	Every 01 year, since the start-up of the control and surveillance activity.					X		X		X		X		X		X		X	
# of conflicting events with deforestation agents.	Review of project reports (community area, control and surveillance system and legal area).	Every 01 year, since the start-up of the legal area and control & surveillance activity.					X		X		X		X		X		X		X	

2. HCV Assessment Plan

The project considers revaluating the Brazil nut forests and thereby the Brazil nut concessionaires and/or producers, as regional culture identity typical of Madre de Dios. In this sense, it will affect in the comprehensive promotion of the Brazil nut at a regional and national level. In the Biodiversity Monitoring Program, as here it will be measured the improvement of the biodiversity in their areas.

3. Commitment to Develop a Monitoring Plan

The monitoring plan to assess the community impacts mainly consists on the indicators and the techniques presented above. BAM agrees to complete it within six months after validation against the standard. BAM also engages to publicize the full plan and the results after each monitoring period with the communities and the public in general by posting them in BAM's website, by giving hard copies to FEPROCAMD, its grassroots organizations and other local organizations (i.e. farming organizations), as well as to the forest offices of Tambopata and Tahuamanu. In addition, we will hold extra meetings if needed to ensure that the project community and other stakeholders are kept informed.

BIODIVERSITY SECTION

B1. Impacts within the Project Area

1. Use Appropriate Methodologies to Estimate Changes in Biodiversity as a Result of the Project in the Project Area and During the Life of the Project

In the with-project scenario, the ecological integrity within Brazil nut concessions will be ensured and maintained, which in turn will allow the protection of the biodiversity within the Project Area. This means that the project will ensure that 291 567 ha of forest (PA) will maintain their ecological functions under a sustainable management. Additionally, the project will seek to avoid the increase of deforestation activities in 1 015 316 ha (PZ) by committing to reduce the deforestation rate tendency, thus maintain biodiversity levels.

This will happen due to the implementation of activities such as monitoring and surveillance that will allow constant monitoring in the project area at strategic points to detect illegal activities. Training workshops for Brazil nut producers will be implemented in topics like Reduced Impact Logging (RIL), solid waste management, wildlife hunting, among others, and consultancy in elaborating Annual Operating Plans (AOPs) and Complementary Plans. A constant biological monitoring will be carried out to identify the status of specimens during the project lifespan. All these activities will result in a positive benefit for biodiversity, considering that in the 'without project' scenario the pressure on the area will be increased, resulting in the continuous deforestation and forest degradation, fragmenting habitats and isolating wildlife populations, as well as the discontinuation of ecological processes.

In order to assess the status of wildlife populations within the project area, it was conducted the evaluation to the "wildlife Baseline in Brazil nut concessions" carried out by an external consultant¹³³. Resulting in the current characterization of wildlife population as a basis for the

¹³³ Loja, J; *et al.* 2013. Proposal for the wildlife Baseline survey of Brazil nut Concessions in Madre de Dios

Biodiversity Baseline, data was also collected in relation to the wildlife use by local population and the presence or absence of species taxa: mammals, birds, amphibians and reptiles, focusing the efforts on the conservation and maintenance of the most sensitive populations “Indicator Species for their tracking and monitoring in the project areas.

A Rapid Biological Assessment was developed using methodologies raised by the Rapid Assessment Program (RAP) of International Conservation¹³⁴. Such assessments are suggested to collect information about the presence/absence of species in areas of all kind (aquatic and terrestrial) and data of relative abundance. For the development of a RAP it is required to properly identify the methods that will allow collecting the information in a short period of time.

From the results obtained and the importance of the Brazil nut activity in the area, the main Conservation Components in the project area were selected.

Brazil nut Forest

The Brazil nut is the main non-timber forest product marketed in the region, being the support of 30% of the families in Madre de Dios. However, the constant ecosystem deterioration mainly due to forest burning and clearing to expand the agricultural and livestock frontier is causing the reduction of wildlife populations and their capacity for regeneration. For this reason, it is considered as a vulnerable species by the IUCN.

The Brazil nut ecosystem, hosts countless wildlife species that benefit from its presence. Thus, there is the *Agoutis*, *Guacamayos*, *Añuje*, *Ardilla roja*, *Sajino*, *Machín negro*, etc., which eat its fruits and seeds; the *Venado rojo*, *Venado cenizo*, *Sachavaca* that eat the seedlings and also serves as a nesting site for birds of prey like the *Águila arpía* and *Águila encrestada*.

Monitoring is carried out through indirect indicators by monitoring mammals, mainly the population of the *Dasyproctidae* family and particularly of the *Dasyprocta variegata* (Añuje) species as it is the main Brazil nut seed disperser.

Regarding the flora, trees for timber purposes are the most likely to be logged because of its high commercial value. Species such as Cedar, Mahogany, *Shihuahuaco*, *Tornillo*, *Pumaquiro*, etc. would be harvested; in addition, the agriculture expansion and overgrazing would lead to the ecosystem degradation. **Myers (1980)**¹³⁵ estimates that for every m³/ha harvested, farmers invading the areas subsequently destroy approximately 1/5 ha of forest. The project through monitoring the Brazil nut areas, will carry out every two years the Participatory Rural Appraisal (PRA), which is a survey regarding the perception of the Brazil nut producer on the current situation in its area, which will allow focusing the efforts on areas potentially affected and implement appropriate measures to safeguard the forests.

Rivers and Lakes

Water bodies are complex ecosystems that host habitats for countless species. The continuous pollution of the water as a consequence of insufficient or uncontrolled unsustainable activities

¹³⁴ Conservation International, 2012. Available in the following website:
<https://learning.conservation.org/biosurvey/RAP/Pages/default.aspx>

¹³⁵ Myers, N. 1980. Conversion of Tropical Moist Forests. National Research Council, Washington D.C. In: Lamprecht, Hans. 1990. Forestry in the Tropics: forest ecosystems in tropical forests and their tree species, possibilities and methods for sustainable harvest. GTZ

impact on the hydrobiological processes, unchaining the biodiversity reduction and ecosystems resilience capacity¹³⁶. In that sense, the monitoring of indirect indicators will be carried out by analyzing the Herpetofauna, with the presence/absence of species that top the food chain such as the *Caiman crocodilus* (Lagarto blanco), *Paleosuchus trigonatus* (Lagarto enano), *Eunectes murinus* (Anaconda), *Boa constrictor* (Boa) and *Lachesis muta* (Shushupe) that are good indicators of the site's health.

Jaguar (*Panthera onca*)

The largest cat in America, it used to live in large areas from the Southwestern of the United States to Argentina but the pressure due to hunting and its habitat fragmentation has caused its population to reduce, leading to extinction in the United States, El Salvador, Uruguay, Guatemala and parts of Brazil¹³⁷. The reduction of their territory and preys has caused their displacement to villages where livestock farming is carried out; therefore, the community sees them as livestock predators, which has caused their indiscriminate hunting. This species is listed in Appendix I of the CITES, meaning that its international trade is prohibited by the imminent danger of extinction.

The Jaguar is considered an umbrella species because as it is the major predator in the region requires large areas to hunt their prey regulating such population. Preys are commonly large herbivores that require large amounts of food to be fed. This implies that the presence of the Jaguar indicates that the ecosystem is a healthy environment and has the ability to support the entire food chain. The monitoring of this solitary and nocturnal species will be carried following its tracks, to determine the presence/absence in the Brazil nut forest and conclude the population abundance to be compared with field records.

Threatened Big Mammals

The Giant Armadillo (*Priodontes Maximus*), a species listed as endangered by the IUCN (2013) and in Appendix I of the CITES due to their constant hunting for subsistence and due to the reduction and destruction of its habitat. Likewise, its population is very sensitive to human presence, decreasing or disappearing rapidly in the disturbed site¹³⁸.

The Lobo de río (*Pteronura brasiliensis*), emblematic species of aquatic habitats, sensitive to human presence. Today is considered as an endangered species by the IUCN (2013) and in the Appendix I of the CITES, because its population has been reduced by hunting pressure and disturbance of its habitat due to river pollution and deforestation; this species is a great indicator of the quality of the lakes and rivers they inhabit.

The Maquisapa (*Ateles chamek*). Despite there is no field records of its presence in the field assessment, it was considered to be important, as it is a preferred species by hunters and are the first to disappear in intervened areas because it does not tolerate major disturbance of its habitat. It is considered an endangered species by the IUCN (2013) and is found in Appendix II of the CITES.

¹³⁶ Capacity of ecosystems to regenerate.

¹³⁷ De la Peña, P. 2007. The Jaguar: important indicator of environmental balance. El Faro Magazine. May, 2007, Mexico. (74): 8 - 9

¹³⁸ Walsh Peru S.A, 2007. Social Environmental Impact Study "Southern Inter-Oceanic Corridor, Peru - Brazil: Stretch 3". Lima - Peru

The monitoring will be carried out to determine the absence/presence of the species by direct methods (viewed (v) and heard (e)) and indirect methods (smell (o), traces (r) and footprints (h))¹³⁹ (Carrillo et al. 2000); in some cases the abundance of the population in the project will be compared with studies performed within the area.

Endangered Birds

Huishuíncho (*Lipaugus vociferans*), indicator species of the forest condition, generally are associated to Brazil nut forests. Higher values of relative abundance will indicate that the Brazil nut forests are healthy.

The Family of the Psittacidae (parrots and macaws) are natural controllers of the Brazil nut population; the reduction of their population would assume that activities affecting their sites used for nesting or feeding are being carried out. Fragile species due to hunting because they are sold as pets.

Águila Harpia (*Harpia harpyja*), is an indicator species of forest structure, as it requires big size trees for nesting. Although it was not found in the field evaluation, is likely to be present in the area. It is associated mainly to the presence of Cumaru and Brazil nut trees, for which logging activities and removal of forest cover can reduce their population.

Bird species will be monitored by direct methods (viewed (v) and heard (e)) and indirect methods (traces (r)) for analyzing the abundance and its presence/absence; also mist nets will be installed to capture birds and identify them.

2. Demonstrate that No Conservation Value Identified in G.1.8.1-3 will be Negatively Affected by the Project

The project will not adversely affect any conservation value; on the contrary, the project aims at preserving the ecosystem and sustainably manages the forest with respect to the traditional activities of the partners, Brazil nut and timber.

The Brazil nut extraction is carried out in undisturbed natural forests for a period of up to 4 months per year, as it is considered a low-impact activity that promotes forest conservation, since the activity is profitable only in undisturbed forests. Attempts to establish plantations have been made without success; for this reason it is essential to safeguard the Brazil nut productive forests, by strengthening the techniques for forest management and provide resources to increase the Brazil nut product and sub products value, as well as to conduct workshops on wildlife hunting, solid waste management, among others. Likewise, the Brazil nut activity is regulated by the State and requires a General Management Plan for Brazil nuts harvesting which must be approved by the Regional Directorate of Forestry and Wildlife (DRFFS) and the AOPs to be authorized annually.

Logging is an emerging activity complementary to the Brazil nut activity, carried out by only a third of Brazil nut producers to obtain greater revenues yearly and it is not carried out by the same Brazil nut producers who continuously harvest in the following years. Forestry requires

¹³⁹ Carrillo E, Wong G, and Cuaron A. 2000. Monitoring mammal populations in Costa Rican Protected Areas under different hunting restrictions. *Conservation Biology*. 14 (6): 1580 – 1591

special permits along with its respective management complementary plan approved by the DRFFS for its execution; the plan details which tree are going to be logged (georeferenced), the minimum cut diameter for each species, the volume to be harvested, etc. in order to ensure the forest regeneration ability. As such, the project will provide permanent advice on how to improve the techniques of Reduced Impact Logging (RIL); construction of roads, clearing of treetops and lianas; operational safety, chainsaw handling; solid waste management, etc., to ensure forest maintenance, biological processes, wildlife biodiversity and the integrity of the operators and Brazil nut producers.

Likewise, the project will promote the enrichment of forest areas with native species such as Brazil nut, Cumaru and Tornillo, among others to add value to the forest. In this sense, negative impacts on high conservation values will be minimal in the project area.

3. Identify All Species to be used by the Project and Evidence that No Known Invasive Species

As mentioned in item B.1.2 above, it will only be enriched with native species of high economic value; these ones are detailed the species to be planted:

Brazil nut (*Bertholletia excelsa*)

It lives in the high forests of the Peruvian, Bolivian and Brazilian Amazon floodplain. It's a big size tree, reaching 60 m of heights and with a diameter greater than 2 m; cylindrical shaft, smooth and without branches until the treetop; of dark and split bark; deciduous leaves of shiny green color on the upper surface and pale green on the underside; capsular fruit of incomplete pyxis type, spherical or slightly flattened, with hard and woody shell, with a diameter of 10-25 cm and with an average of 18 seeds¹⁴⁰. Fruit bearing occurs just during the eighth year, requiring an average of 15 months to ripen the fruit, the harvest season begins in mid-December and is extended until March. The dispersion of the seed is produced mainly by the Añuje, which gnaws the pyxidium and leave the seed exposed. In addition, the Añuje buries the Brazil nut fruit, allowing environmental factors to disintegrate the hard shell of the Brazil nut to get the food with the least amount of energy but sometimes the Añuje forgets where it stored the fruit allowing in many cases the seed germination.

Shihuahuaco or Cumaru (*Dipteryx odorata*; synonym: *Coumarouna odorata*)

Typical species of the Amazon Basin, it is found in Brazil, Venezuela, Guyana, Peru and Colombia. Tree of great bearing, reaching heights of 50 m and diameters greater to 1 m; of cylindrical log, no branches until the treetop; of compound leaves; flowers with terminal inflorescence in panicle, pulpous fruit in the form of drupe. Fruit bearing is produced at 4 years old and the dispersion is performed by minor rodents. It is considered a Medicinal plant widely used by indigenous peoples; the seed oil is used to fight ear pain and inflammations, the seed submerged in alcohol is used for snake bites, cuts, contusions, cough, rheumatism, etc. and the bark for fevered patients¹⁴¹.

¹⁴⁰ ACCA, 2005. Information and experiences on managing the Brazil nut, *Bertholletia excelsa* of the program – Conserving Brazil nut areas PCC of ACCA. Period 1993-2010. Madre de Dios – Peru.

¹⁴¹ *Dipteryx odorata*; Syn.: *Coumarouna odorata* IN: Dominica Botanic Gardens, 2013. Website available In: http://www.da-academy.org/dagardens_tonkabean1.html

Tornillo (*Cedrelinga catenaeformis*)

Species with wide distribution found in tropical, subtropical and very sub-tropical moist forests and tropical dry forest; it is also considered a flexible species in relation to height, as it can be found as from 120 masl to 800 masl. Dominant stratum tree, between 25 to 40 m of height and diameters in the range of 60 to 150 cm; tubular roots, straight log of fissured bark; terminal inflorescence in small head; hermaphrodite flowers; its fruit is classified as membranous loment, of three to six knuckles folded to zigzag. Fruit bearing begins in February in Iquitos and in December in Tingo Maria; the seeds within the loment lose moisture quickly, which determines the low germination power of the seed, for which it is recommended to harvest the seeds in December and harvest immediately. It is a rustic species due to its high resistance to physical damage, to plague attacks and diseases due to its competition for light because in its early stage is semi shade-loving plant and while ripening becomes light-demanding species¹⁴².

4. Describe the Possible Adverse Effects of Non-native Species used by the Project

As detailed in section B.1.3 above, native species will only be used in forest enrichment such as the Shihuahuaco, Tornillo and Brazil nut, for which there will be no negative effect on their use.

5. Ensure that No GMOs will be used to Generate GHG Emission Reductions or Removals.

The project will not use any Genetically Modified Organism within the forest enrichment; used seeds will come from seed trees of the area. Furthermore, this enrichment will not be considered in the GHG reductions.

B2. Offsite Biodiversity Impacts

1. Negative Impacts to the Biodiversity Off-Site

Brazil nut Management activities will not generate negative off-site impacts, however, the Brazil nut harvesters will be trained to implement better measures for the conservation of the biodiversity, likewise forest management training will be given to the Brazil nut harvesters that have selective logging permits and native species with economic value will be planted to improve the quality of the site in the partner concessions.

The control and monitoring activities in the zone of the project will produce the displacement of deforestation and degradation agents (non-members of the project), mainly related to illegal logging, burning and mining.

2. Mitigation of Impacts on Off-Site Biodiversity

The measures taken to counteract the impacts of illegal logging, fires and mining will be carried out mainly by training local people. It will impact on the awareness of good management of forest resources and conservation benefits of these resources. Likewise, for the case of the

¹⁴² López, R. s/f. Silvicultural Study of the Tornillo (*Cedrelinga catenaeformis* DUCKE) IN: Forestry Magazine of Peru. V. 10 (1-2):1-7. Faculty of Forestry – Cedinfor.

miners informative talks will be given on waste management, occupational safety and especially friendlier environment methods for extracting pluvial gold in the lower part of the project.

3. Likely Unmitigated Negative Impacts

Under the principle of adaptive management, unmitigated impacts on the offsite biodiversity in the life cycle of the project will be identified and the strategies and actions to reduce the negative impacts generated on it will be re-evaluated.

The adopted measures will focus mainly on continuously training the local population (members and non-members) on the appropriate use of the forest resources and improving of gold activity process (mining). Control and surveillance at major entry points of the zone will be implemented, by both land and river to ensure that no illegal activities are made to increase the deforestation and degradation near the project, ensuring the continuity of ecological process. In this regard, positive net benefits on biodiversity are ensured.

B3. Biodiversity Impact Monitoring

1. Selection of the Biodiversity Variables to be Monitored

The objective of biodiversity monitoring will be to analyze and interpret changes in biodiversity due to strategies and activities proposed in the project. In this regard, the biodiversity variables were determined in respect to:

- a) **Objectives and Goals of Biodiversity component**, Maintain and Conserve Biodiversity in the Project Area; Safeguard the High Conservation Values of the project.
- b) **Key elements that reflect the state of biodiversity**, Threatened Species, fragile ecosystems, important sites for breeding, feeding or shelter for wildlife, resources traditionally used by the local population (Brazil nut, Hevea, Aguaje, etc.).
- c) **Criteria for measuring variables**, Easily identifiable, abundant species, indicator species (react easily to changes in the environment), accessibility for data collection and measurement equipment.

Given these parameters, the variables to be monitored were identified and the frequency will depend on the selected items, with the assessment period in the range of 2-5 years.

The monitoring system will focus on obtaining information at a given time at fustal, saplings and seedling flora level; and in fauna in its Herpetofauna, birdlife and Mastozoofauna components in different Brazil nut concessions. The methodology used for data collection was raised by Conservation International's Rapid Assessment Program¹⁴³ (RAP). The results obtained will be contrasted with baseline data for analysis, which will focus on diversity patterns as follows:

¹⁴³ Conservation International. 2013.

Available in: <https://learning.conservation.org/biosurvey/RAP/Pages/default.aspx>

- a) **Deforestation rate.** Main indicator to monitor since it is the forest who holds all ecological processes; change in the rate of deforestation by analyzing satellite images will be assessed.
- b) **Presence / absence of Threatened Species.** According to the conservation status of the IUCN, CITES and nationally by the Endangered Species List mentioned in the DS-034-2004-AG for Wildlife and the DS-043-2004-AG for Flora.
- c) **Relative abundance of species.** Expressed as individuals by sampling effort (hours traveled, km traveled) in one place.
- d) **Alpha Diversity (α).** Indicator that relates the relative wealth using indices-Shannon-Wiener, Simpson Dominance, Pielou equity, Margalef
- e) **Beta Diversity (β).** Indicator that relates the similarity of species between sites, which can be: Jaccard and Sorensen, Fishers alpha
- f) **Trophic Structure.** Allows to determine how healthy the ecosystem is, because the more complex the structure is, better maintained it will be. Umbrella species play a greater role in this area.

2. Evaluation of the Effectiveness of Measures

The monitoring of the identified conservation components based on the high conservation values would indicate the status of the zone of the project, allowing continuous feedback on the activities and strategies implemented by execution of the project. In the following table details the monitoring of conservation components:

Table 119. Monitoring methodologies Matrix of the Conservation Components

N°	Conservation component	Method	Description of the Method	Information processing	Monitoring zone	Monitoring frequency	Indicators methodology	Responsible for data collection and analysis
1	Brazil nuts Forest	Brazil nut Concessions Monitoring	Evaluation of the relative abundance of <i>Dasyprocta</i> sp.	Brazil nut report sheets	Brazil nut Concessions	Every 2 years	Relative abundance comparison with previous monitoring	Technical area of BAM-Madre de Dios
			Participatory Rural Assessments	Surveys conducted to the Brazil nut harvesters			Areas potentially affected by illegal logging	
		Monitoring of flora / carbon inventory	Gentry transects / plots nested overall dimensions of 50x20m2	Monitoring Formats		Every 5 years / When verifying	Species diversity index and comparison between sites / importance value index	External Consultant / Technical area of BAM-Madre de Dios and Lima
2	Rivers, Lake	Herpetofauna monitoring	Observation of lizards, boas and Wolf River	Monitoring Formats	Brazil nut concessions and Valencia Lake	Every 5 years	Presence / Absence	External consultant
3	Jaguar	Jaguar monitoring	Indirect method by fingerprint and Camera traps	Monitoring Formats	Brazil nut concessions	Every 5 years	Presence / Absence	External consultant
4	Threatened large mammals	Monitoring transects	Direct and indirect methods in transects	Monitoring Formats	Brazil nut concessions	Every 5 years	Presence / Absence	External consultant
5	Threatened birds	Bird Count	Direct method and flooded sites in transects	Monitoring Formats	Brazil nut concessions and palm swamps	Every 5 years	Presence / Absence	External consultant

3. Commitment to Develop a Monitoring Plan

At this time, a draft of the Monitoring Plan for biodiversity has been made. It was used to raise the field data for making the biodiversity baseline. Nonetheless, it will be completed and will be ready in detail in the first 6 months after validation. Additionally, BAM commits to publicize the plan and its results after each monitoring period with the communities, by making it available in BAM's web page, providing hard copies to FEPROCAMD and its root organizations, and through meetings.

GOLD LEVEL SECTION

GL1. Exceptional Climate Benefits

Not Applicable

GL2. Exceptional Community Benefits

Not Applicable

GL3. Exceptional Biodiversity Benefits

1. Vulnerability

1.1 Critically Endangered Species (CR) and endangered (EN)

The presence of endangered species listed by the IUCN ENDANGERED (2013) in the vicinity of the project, have been identified by direct (seen, heard) and indirect methods (nests, tracks, scat, burrows, etc.) which are listed in the next table.

Table 120. Endangered Species of Wild Fauna in the Project

Scientific name	Local name	IUCN Category	CITES Category	DS-034-2004-AG
<i>Pteronura brasiliensis</i>	Lobo de Río	EN	I	EN
<i>Prionomys maximus</i>	Armadillo Gigante	EN	I	VU

1.2 Vulnerable Species (VU)

In the project, species in Vulnerable state were according to IUCN (2013), were also found, which are listed in the followings tables, both by fauna and flora respectively

Table 121. Wildlife Species in Vulnerable state in the Project

Scientific name	Local name	IUCN Category	CITES Category	DS-034-2004-AG
<i>Tapirus terrestris</i>	Sachavaca	VU	II	VU
<i>Amazona festiva</i>	Loro	VU		NT
<i>Pipile cumanensis</i>	Paujil	VU		NT
<i>Chelonoidis denticulata</i>	Motelo	VU		

Table 122. Flora species in vulnerable state in the Project

Scientific name	Local name	IUCN Category	CITES Category	DS-034-2004-AG
<i>Dipteryx alata</i>	Shihuahuaco	VU		
<i>Bertholletia excelsa</i>	Castaña	VU		
<i>Cedrela odorata</i>	Cedro	VU	II	VU

2. Irreplaceable Character

2.1 Restricted range species - species with global range less than 50,000 km² or 5% of the global population at the site

No available information

2.2 Species with large but clumped distributions - 5% of the global population at the site

No available information

2.3 Globally significant congregations - 1% of the global population seasonally at the site

No available information

2.4 Globally significant source populations - 1% of the global population at the site

No available information

LIST OF ANNEX

Annex 1. Centroid Coordinates of Concessions in Project Area

ID	Concessioner's Name	Contract Code	X	Y
1	Sebastian Tapuy Panduro	17-TAH/C-OPB-A-001-05	463346	8701437
2	Víctor Encinas Espinoza	17-TAH/C-OPB-A-002-09	399309	8702281
3	Eufrasia Parillo Quispe	17-TAH/C-OPB-A-003-05	467251	8696897
4	Edgar Collado Delgado	17-TAH/C-OPB-A-004-05	439345	8706091
5	Florencia Paredes Dueñas	17-TAH/C-OPB-A-004-06	479559	8671876
6	Josú Carmen Saavedra Damian	17-TAH/C-OPB-A-004-08	437167	8697515
7	Miguel Silva Pereira	17-TAH/C-OPB-A-005-05	464818	8719263
8	Flor De María Cumari De Mori	17-TAH/C-OPB-A-005-06	477412	8671304
9	Ignacio Noa Grifa	17-TAH/C-OPB-A-006-05	470414	8709776
10	Miriam Laura Quispe	17-TAH/C-OPB-A-007-06	429180	8688810
11	Asunta Olivia Díaz Moreno	17-TAH/C-OPB-A-009-06	458403	8705563
12	Carlos/Catalina Mamani C Dea Campo	17-TAH/C-OPB-A-010-06	460166	8698356
13	Juana Contreras Suclli	17-TAH/C-OPB-A-010-08	422925	8699007
14	Daniel Mamani Jaramillo	17-TAH/C-OPB-A-011-06	455171	8692685
15	Edilberto Dea Rodríguez	17-TAH/C-OPB-A-013-06	458302	8702335
16	Húctor Ernesto Pizango Navi	17-TAH/C-OPB-A-014-06	458179	8687741
17	Hilda Dea Rodríguez	17-TAH/C-OPB-A-015-06	456936	8698632
18	Josú Mario Noa Grifa	17-TAH/C-OPB-A-017-06	455298	8701554
19	Martina Sabina Mamani Cahuana	17-TAH/C-OPB-A-018-06	461745	8695550
20	Teresa Pizango Navi	17-TAH/C-OPB-A-019-06	460143	8690912
21	Ulises Arimuya Grifa	17-TAH/C-OPB-A-020-06	457186	8692949
22	Elkjaer Albert Farfán Noa	17-TAH/C-OPB-A-033-08	462666	8722152
23	Isabel Vizcarra Yatto	17-TAH/C-OPB-A-034-08	456190	8717243
24	Elena Paredes Espinoza	17-TAH/C-OPB-A-036-08	390717	8702769
25	Josú Cahuana Saravia	17-TAH/C-OPB-A-038-08	455197	8710035
26	Urias Valdúz Tapuy	17-TAH/C-OPB-A-041-08	479904	8712312
27	Rocío Luz Mamani Ancoco	17-TAH/C-OPB-A-046-08	457364	8719960
28	Pascual Flores Castillejos	17-TAH/C-OPB-A-048-08	434279	8707456
29	Nelson Herrin Noa Grifa	17-TAH/C-OPB-A-051-08	468962	8707945
30	María Mory Cumary	17-TAH/C-OPB-A-053-08	458972	8721997
31	Luis Alberto Ingaruca Báez	17-TAH/C-OPB-A-056-08	439748	8711250
32	Aidú Ramírez Gastelú	17-TAH/C-OPB-A-075-08	458199	8715660
33	Lázaro Marín Rodríguez	17-TAH/C-OPB-A-076-08	455731	8714634
34	Juan Gualberto Chota Leon	17-TAH/C-OPB-J-002-04	496751	8694038
35	Alicia Fatima Noa Grifa	17-TAH/C-OPB-J-004-04	461565	8717998
36	Lina Sahuarico Begazo	17-TAH/C-OPB-J-007-03	463304	8716393
37	Madeley Tapuy Palla	17-TAH/C-OPB-J-008-03	463955	8704690

38	Luis Collque Quispe	17-TAH/C-OPB-J-009-03	459230	8714253
39	María Zaida Rodriguez Tapuy	17-TAH/C-OPB-J-010-03	459066	8718386
40	Sixto Carazas Quispe	17-TAH/C-OPB-J-011-04	482993	8709020
41	Emilio Macocha Noa	17-TAH/C-OPB-J-012-04	455725	8712166
42	Hilario Grifa Palla	17-TAH/C-OPB-J-015-03	473248	8720856
43	Andres Cutipa Gonzales	17-TAH/C-OPB-J-017-03	499837	8687548
44	Pedro Quispe Kana	17-TAH/C-OPB-J-018-04	451698	8703109
45	Mohasi Vasquez Rolin	17-TAH/C-OPB-J-019-04	444656	8701150
46	Alejandrina Huesembe De Marchena	17-TAH/C-OPB-J-020-04	479878	8688668
47	Jeronimo Emiliano Taie Chuima	17-TAH/C-OPB-J-021-04	439252	8703142
48	Santiago Taie Chuima	17-TAH/C-OPB-J-023-04	435872	8703059
49	Julia Saca Alvarez	17-TAH/C-OPB-J-024-04	468109	8700866
50	Rosa Tapia De Ramirez	17-TAH/C-OPB-J-025-04	485040	8691808
51	Melchor Huaracha Yauri	17-TAH/C-OPB-J-026-04	449767	8697154
52	Wilfredo De La Peña Gonzales	17-TAH/C-OPB-J-028-04	484694	8694672
53	Carlos Antonio Valdivia Sanchez	17-TAH/C-OPB-J-030-04	476855	8696905
54	Fidel Yupanqui Dueñas	17-TAH/C-OPB-J-031-04	469367	8703277
55	Ana Jacinto Quispe	17-TAH/C-OPB-J-032-04	464524	8707659
56	Braulio Valencia Valencia	17-TAH/C-OPB-J-035-04	469813	8695708
57	Armando Mejia Lopez	17-TAH/C-OPB-J-036-04	474968	8699102
58	Encarnación Mamani Larico	17-TAH/C-OPB-J-037-04	473757	8696362
59	Enrique Tije Arasaire	17-TAH/C-OPB-J-038-04	470512	8698457
60	Adolfina Yalta Gonzales	17-TAH/C-OPB-J-042-04	478001	8695674
61	Luz Marina Grandiller Olivera	17-TAH/C-OPB-J-043-04	481680	8695700
62	Wilfredo Valdez Macocha	17-TAH/C-OPB-J-045-04	482521	8715347
63	María Adela Moreno Tapuy	17-TAH/C-OPB-J-046-04	476783	8711696
64	Manuel Vargas Cucho	17-TAH/C-OPB-J-047-04	474312	8688238
65	Macario Dionicio Cuadros Quispe	17-TAH/C-OPB-J-048-04	472278	8691500
66	Vidal Diaz Vargas	17-TAH/C-OPB-J-049-04	472382	8700315
67	Martin Laura Herrera	17-TAH/C-OPB-J-050-04	474221	8702059
68	Rigoberto Paredes Martinez	17-TAH/C-OPB-J-051-04	477901	8698429
69	Cancio Huaman Hurtado	17-TAH/C-OPB-J-052-04	486690	8695974
70	Marcelino Cruz Apaza	17-TAH/C-OPB-J-053-04	490757	8696571
71	Miguel Farfán Gómez	17-TAH/C-OPB-J-057-04	468728	8687180
72	María Elvira Cahuana Tapuy	17-TAH/C-OPB-J-058-04	478593	8717665
73	Saturnino Demetrio Parillo Quispe	17-TAH/C-OPB-J-060-04	417969	8705485
74	Jacinto Parillo Quispe	17-TAH/C-OPB-J-061-04	466818	8718164
75	Alejandrina Mendoza Cuaresma	17-TAH/C-OPB-J-063-04	464305	8685481
76	Blanca Victoria Sahuarico De Aradivi	17-TAH/C-OPB-J-065-04	480323	8702234
77	Alberto Garcia Rojas	17-TAH/C-OPB-J-066-04	478759	8704953
78	Josú De La Cruz Carrasco	17-TAH/C-OPB-J-067-04	482859	8693165

79	Gerónimo Quispe Quispe	17-TAH/C-OPB-J-068-04	463012	8698727
80	Celinda Gonzales Carrillo	17-TAH/C-OPB-J-070-04	483513	8697736
81	Adelma Alicia Palla Dea	17-TAH/C-OPB-J-072-04	466005	8699154
82	Cipriano Tito Quispe	17-TAH/C-OPB-J-074-04	495321	8693729
83	Clemente Ccolque Champi	17-TAH/C-OPB-J-075-04	466078	8702869
84	Marcelino Sayago Ortega	17-TAH/C-OPB-J-080-04	465468	8696599
85	Laura Palla Panduro	17-TAH/C-OPB-J-084-04	483216	8703680
86	Lucio Andrés Pizango Navi	17-TAH/C-OPB-J-085-04	463526	8689712
87	Rodolfo Herrera Inuma	17-TAH/C-OPB-J-088-04	496643	8689543
88	Zenobio Grandiller Olivera	17-TAH/C-OPB-J-090-04	482072	8695121
89	Alfredo Zambrano Tapia	17-TAH/C-OPB-J-091-04	480721	8690682
90	Felix Alvarez Gonzales	17-TAH/C-OPB-J-092-04	491258	8700854
91	Mirian Marice Herbozo Reategui	17-TAH/C-OPB-J-095-04	479092	8685871
92	Miguel Antonio Grandiller Olivera	17-TAH/C-OPB-J-097-04	482106	8696693
93	Sergio Flores Lloza	17-TAH/C-OPB-J-098-04	488766	8701305
94	Cesar Gerardo Macocha Noa	17-TAH/C-OPB-J-100-04	477817	8721656
95	David Rodriguez Grifa	17-TAH/C-OPB-J-101-04	473280	8717863
96	David Rodriguez Tenoy	17-TAH/C-OPB-J-102-04	474042	8704548
97	Juan Saavedra Meza	17-TAH/C-OPB-J-105-04	475933	8722821
98	Regina Palla De Calle	17-TAH/C-OPB-J-108-04	470683	8720320
99	Mariano Barbaro Jacinto Irco	17-TAH/C-OPB-J-109-04	477608	8701691
100	Alberto Alfredo Palla Panduro	17-TAH/C-OPB-J-115-04	486421	8706088
101	Alejandro Vilca Mamani	17-TAH/C-OPB-J-116-04	466747	8705249
102	Luis Enrique Del Aguila Sinuire	17-TAH/C-OPB-J-119-04	444259	8704670
103	María Jesús Grandiller Olivera	17-TAH/C-OPB-J-120-04	482178	8698222
104	Oscar Sahuarico Begazo	17-TAH/C-OPB-J-122-04	470655	8705786
105	Luz Eva Valdivia Sanchez	17-TAH/C-OPB-J-123-04	486790	8703843
106	Nelson Arnaldo Morey Silva	17-TAH/C-OPB-J-124-04	464979	8694324
107	Angel Augusto Cespedes Tapia	17-TAH/C-OPB-J-125-04	494108	8697089
108	Aurelio Armando Mamani Mamani	17-TAH/C-OPB-J-126-04	469884	8690664
109	Ursula Ursina Pizango Navi	17-TAH/C-OPB-J-127-04	417347	8699487
110	Julio Chambi Cahuana	17-TAH/C-OPB-J-129-04	470539	8727729
111	Juliana Parillo Quispe	17-TAH/C-OPB-J-131-04	415259	8703979
112	Eduardo Palomino Melo	17-TAH/C-OPB-J-132-04	498168	8690215
113	Victor Macocha Machoa	17-TAH/C-OPB-J-133-04	472629	8698837
114	Hipolito Cesar Condori Limpe	17-TAH/C-OPB-J-136-04	466883	8691340
115	Nancy Rosmeri Macocha Tapia	17-TAH/C-OPB-J-137-04	480639	8709498
116	Máximo Julio Ventura Monasterio	17-TAH/C-OPB-J-139-04	462948	8696343
117	Carlos Gongora Cabaña	17-TAH/C-OPB-J-142-04	489039	8694687
118	Paola Dulanto Chapiama	17-TAM/C-OPB-A-001-05	430058	8658555
119	Guillermo Rios Pickman	17-TAM/C-OPB-A-001-07	438862	8640680

120	Eduardo Cumari Papa	17-TAM/C-OPB-A-002-07	480190	8670064
121	Nicanor Kuno Peña	17-TAM/C-OPB-A-002-08	483146	8639854
122	Nora Albina Grifa Horiuchi	17-TAM/C-OPB-A-003-06	408335	8626321
123	Leonor Quispe Huaman	17-TAM/C-OPB-A-006-05	426575	8691000
124	Walter F Pinche Guzman/ Marilyn Luz Bautista Barros	17-TAM/C-OPB-A-007-06	413105	8649238
125	María Francizca Barros Guerra	17-TAM/C-OPB-A-008-06	415961	8647005
126	Pascual Huaman Fuentes	17-TAM/C-OPB-A-009-05	478362	8649384
127	Sara Hurtado Orosco	17-TAM/C-OPB-A-009-06	476185	8662412
128	Andres Avelino Rojas Aguirre	17-TAM/C-OPB-A-010-05	437117	8648301
129	Felix Antonio Huaman Gutierrez	17-TAM/C-OPB-A-010-07	429056	8649144
130	Nimia Medina Bate	17-TAM/C-OPB-A-011-06	404849	8622321
131	Wilson Guzman Ramirez	17-TAM/C-OPB-A-014-05	435853	8644986
132	Georgina Sangama Huesembe	17-TAM/C-OPB-A-014-06	467386	8655405
133	Rosa Graciela Sanchez Arquino	17-TAM/C-OPB-A-015-07	399952	8630898
134	Bacilia Mamani Sucasaire	17-TAM/C-OPB-A-017-06	501054	8672824
135	Eloy Bernabe Cassanca Mosombite	17-TAM/C-OPB-A-018-06	440761	8686952
136	Adrian Canelos Quiróz	17-TAM/C-OPB-A-020-05	421139	8619979
137	Fredy Aliaga Condori	17-TAM/C-OPB-A-021-05	409992	8617323
138	Faustina Quispe Carrasco	17-TAM/C-OPB-A-026-07	443998	8668012
139	José Cotaluque Maihua	17-TAM/C-OPB-A-027-05	458720	8664762
140	Sonia Victoria Santibanez Caceres	17-TAM/C-OPB-A-028-06	402641	8623985
141	Julia Sahuarico Ovalle	17-TAM/C-OPB-A-029-05	402203	8657743
142	Edinson Eloy Gongora Martinez	17-TAM/C-OPB-A-032-04	473627	8625752
143	Gustavo Alejandro Rios Hermoza	17-TAM/C-OPB-A-033-07	412321	8629031
144	Héctor Cardicel Perez	17-TAM/C-OPB-A-037-05	419980	8644333
145	Jacinta Huaman Apaza	17-TAM/C-OPB-A-039-04	495334	8671433
146	Erasmus Cardicel Tananta	17-TAM/C-OPB-A-039-05	421621	8641716
147	Rocio Miluska Durand Chavez	17-TAM/C-OPB-A-041-07	425225	8654611
148	Luis Alberto Farfan Pezo	17-TAM/C-OPB-A-043-07	404517	8637188
149	Marly Villavicencio Mamani	17-TAM/C-OPB-A-044-07	373557	8636761
150	Juan Vargas Ramirez	17-TAM/C-OPB-A-045-05	424730	8641798
151	José Chavez Chambi	17-TAM/C-OPB-A-047-07	411892	8652199
152	Elmer Perez Piño	17-TAM/C-OPB-A-049-07	423514	8655549
153	Saul Abuid Vargas	17-TAM/C-OPB-A-050-05	474143	8654002
154	Dolores Chavez Yumacal	17-TAM/C-OPB-A-053-05	409140	8655322
155	Orfelinda Ochoa Pizango	17-TAM/C-OPB-A-054-05	419125	8652528
156	Juan Ernesto Rivera Lazo	17-TAM/C-OPB-A-057-05	412862	8636630
157	Raul Vargas Racua	17-TAM/C-OPB-A-058-05	490589	8661414
158	Dagui Marilu Ynuma Beyuma	17-TAM/C-OPB-A-058-07	414450	8675175
159	Eugenia Ramos Salcedo	17-TAM/C-OPB-A-059-04	470729	8662055
160	Edgar Tipula Mullisaca	17-TAM/C-OPB-A-062-07	405286	8662040

161	Oswaldo Saavedra Gongora	17-TAM/C-OPB-A-074-07	426241	8663189
162	Andres Ernesto Cachique Chapiama	17-TAM/C-OPB-A-075-07	431960	8677943
163	Liliana Solis Chalco	17-TAM/C-OPB-A-076-07	434430	8675508
164	Faustina Vicente Paucar	17-TAM/C-OPB-A-080-07	440414	8670372
165	Jorge W. Galindo Tineo	17-TAM/C-OPB-A-107-04	449033	8644562
166	Maximo Eleuterio Tapia Santos	17-TAM/C-OPB-A-109-04	439386	8631018
167	Jorge Carlos Gonzales Irarica	17-TAM/C-OPB-A-110-04	505326	8671054
168	Carlos Revilla Gonzales / Valerio Carrasco	17-TAM/C-OPB-A-111-04	465318	8678708
169	Abigail Sanz Salinas	17-TAM/C-OPB-A-112-04	447626	8639704
170	Segundo Moreno Caypo	17-TAM/C-OPB-A-118-04	464391	8665967
171	Pablo Bolivar Alvarez	17-TAM/C-OPB-A-122-04	468767	8666628
172	Mateo Vargas Dueñas	17-TAM/C-OPB-A-125-04	495144	8641190
173	Leoncio Jasmani Huaraca Jaquehua	17-TAM/C-OPB-A-127-04	460835	8665132
174	Jesús Racua Rodriguez	17-TAM/C-OPB-A-131-04	485505	8644951
175	Felix Armando Arimuya Inuma	17-TAM/C-OPB-A-137-04	472942	8669111
176	Felipe Mosqueira Trujillo/Miriam Yoni Aragon Paredes	17-TAM/C-OPB-A-138-04	516874	8655796
177	David Asturima Huamantica	17-TAM/C-OPB-A-141-04	440534	8681496
178	Bethy María Antas Vasquez	17-TAM/C-OPB-A-143-04	496067	8676968
179	Jorge Castillo Pacherez	17-TAM/C-OPB-A-146-04	447067	8643754
180	Francisco Chavez Chura	17-TAM/C-OPB-A-147-04	483946	8649774
181	Nelson Belluma Huanuyre	17-TAM/C-OPB-A-150-04	474512	8622421
182	Carmelo Moreno Cachique	17-TAM/C-OPB-A-154-04	460792	8669746
183	Jesús Econema Cacuna	17-TAM/C-OPB-A-155-04	469679	8673766
184	Justo Ticona Colquehuanca	17-TAM/C-OPB-A-158-04	414778	8607281
185	Saturnino Villafuerte Blanco	17-TAM/C-OPB-A-160-04	490740	8669093
186	Felicitas Macocha Grifa	17-TAM/C-OPB-A-161-04	470633	8652396
187	Enrique Navio Arias	17-TAM/C-OPB-A-163-04	477628	8682141
188	Teodocia V Huaraca Maquehua/ Aurelio Layme	17-TAM/C-OPB-A-164-04	461043	8663210
189	Bladimira Cevallos Cachique	17-TAM/C-OPB-A-165-04	461636	8681606
190	David Palomino Turpo	17-TAM/C-OPB-A-169-04	494943	8670608
191	Rene Gualberto Mejia David	17-TAM/C-OPB-A-172-04	483601	8665404
192	Celso Flores Sanipico	17-TAM/C-OPB-A-177-04	466399	8650534
193	Ana Gonzales De Rodriguez	17-TAM/C-OPB-A-179-04	431565	8679467
194	Reynaldo Kuno Cumpa	17-TAM/C-OPB-A-182-04	472586	8650293
195	Lucas Gallegos Mejia	17-TAM/C-OPB-A-183-04	475018	8651198
196	Humberto Ovalle Arana	17-TAM/C-OPB-A-185-04	399546	8657858
197	Julian Mamani Chino	17-TAM/C-OPB-A-189-04	491545	8664915
198	Leopoldo Flores Rodriguez	17-TAM/C-OPB-A-190-04	462883	8636440
199	Ysela Aida Bolivar Barriga	17-TAM/C-OPB-A-194-04	470410	8666166
200	Gerardo Cesar Guzman Quispe	17-TAM/C-OPB-A-198-04	490172	8644598
201	Agustin Huamani Anco	17-TAM/C-OPB-A-199-04	515826	8658410

202	Alfonso Vicente Quispe Quiñones	17-TAM/C-OPB-A-204-04	494318	8674734
203	Alfonsa Moreno Aguirre	17-TAM/C-OPB-A-207-04	457916	8628418
204	Eleuterio Jurado Frisancho	17-TAM/C-OPB-A-209-04	435296	8690666
205	Alvino Lima Conchay	17-TAM/C-OPB-A-215-04	434432	8685864
206	Aide H. Mejia Ramirez Viuda De Valera	17-TAM/C-OPB-A-230-04	491012	8679209
207	Victoria Ortega Flores	17-TAM/C-OPB-J-001-04	425809	8685592
208	Antonio Mamani Conto	17-TAM/C-OPB-J-002-04	437881	8685151
209	Estanislao Lopez Vera	17-TAM/C-OPB-J-004-03	445596	8624928
210	Hortensia Canelos Macochoa	17-TAM/C-OPB-J-007-02	430940	8624089
211	Sofia Del Carpio Chair	17-TAM/C-OPB-J-007-04	522696	8633362
212	Nelson Lopez Aguirre	17-TAM/C-OPB-J-008-03	443253	8626650
213	Cesar Augusto Reyna Durand	17-TAM/C-OPB-J-008-04	515098	8659679
214	Luz Angelica Roca Guerra	17-TAM/C-OPB-J-010-02	501950	8663742
215	Delio Mendiguri Mendoza	17-TAM/C-OPB-J-011-04	475983	8658044
216	Segundino Torres Huaman	17-TAM/C-OPB-J-012-04	430959	8684178
217	Domingo Carpio Claros	17-TAM/C-OPB-J-013-02	464245	8676141
218	Juan Manuel Huamani Anco	17-TAM/C-OPB-J-013-04	515160	8655235
219	Pedro Liberato Amau Gallegos	17-TAM/C-OPB-J-014-03	501956	8669963
220	Elena Mamani Huallpa	17-TAM/C-OPB-J-015-04	446839	8679261
221	Francisco Diaz Vargas	17-TAM/C-OPB-J-016-04	468131	8679169
222	Martin Ascue Sallo	17-TAM/C-OPB-J-017-04	421007	8687337
223	Pedro Surco Achahuanca	17-TAM/C-OPB-J-019-03	494338	8666846
224	Armando Taricuarima Mozombite	17-TAM/C-OPB-J-019-04	497171	8668466
225	Faustino Chalco Paucar	17-TAM/C-OPB-J-020-03	435957	8680436
226	Sergio Cusi Huaman	17-TAM/C-OPB-J-022-04	482963	8676759
227	Miguel Torres Cuevas	17-TAM/C-OPB-J-025-02	506907	8659999
228	Manuel Quispe Gutiérrez	17-TAM/C-OPB-J-025-03	485721	8641050
229	Martha Huaman Quispe	17-TAM/C-OPB-J-026-04	496888	8659631
230	Wilbert Mesco Zevallos	17-TAM/C-OPB-J-027-03	478060	8656977
231	Alfredo Ubaldo Moreno Fuller	17-TAM/C-OPB-J-027-04	466646	8665735
232	Soledad Ruiz Torres	17-TAM/C-OPB-J-029-04	428184	8645152
233	Cornelio Bolívar Vizarrata	17-TAM/C-OPB-J-030-04	485678	8643417
234	Constantino Huaman Casas	17-TAM/C-OPB-J-031-03	497740	8673499
235	Ruben Uartiaga Murrieta	17-TAM/C-OPB-J-032-03	451374	8665712
236	Jacinto Moscoso Ramirez	17-TAM/C-OPB-J-033-04	476659	8634293
237	Juan Flores Machaca Clara Flores Panduro	17-TAM/C-OPB-J-035-02	481737	8672338
238	Alcides Ccuno Chahuara	17-TAM/C-OPB-J-035-03	523182	8641824
239	Leonidas Cuno Solis	17-TAM/C-OPB-J-038-02	464795	8638480
240	Nicolas Argandoña Piña	17-TAM/C-OPB-J-038-04	480948	8676289
241	Felipe Mauricio Limachi Paucar	17-TAM/C-OPB-J-040-02	520042	8632727
242	Elvira Jaqueline Vizcarra Yatto	17-TAM/C-OPB-J-043-03	407620	8621318

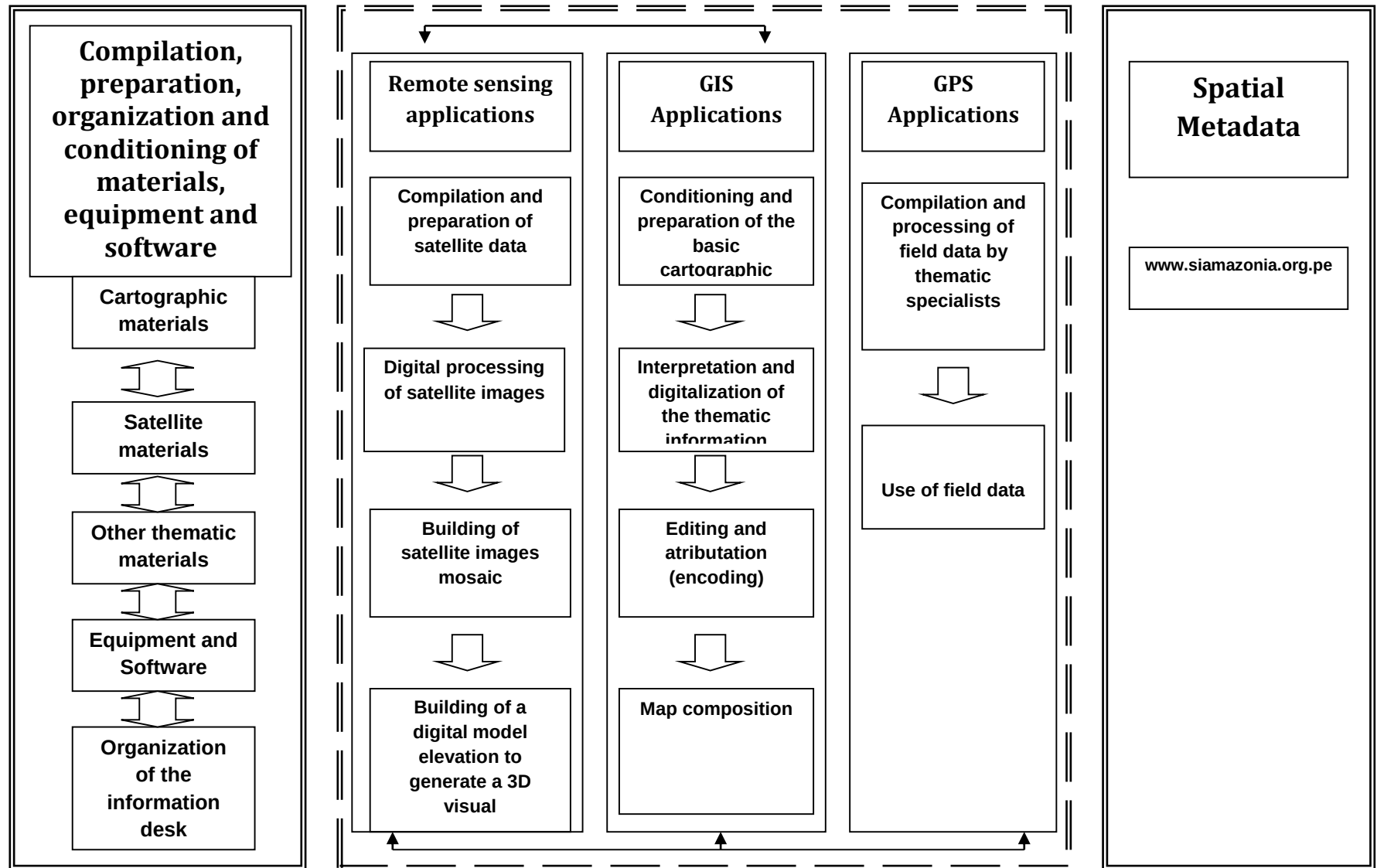
243	Joyse Magdalena Moreno Inuma	17-TAM/C-OPB-J-045-04	460968	8671996
244	Pedro Crisologo Moreno Huanuyre	17-TAM/C-OPB-J-047-03	467680	8660439
245	Cristobal Sullca Huaman	17-TAM/C-OPB-J-049-04	442165	8689546
246	Eulogio Quispe Chani	17-TAM/C-OPB-J-051-02	493502	8656521
247	Julian Mora Huaman	17-TAM/C-OPB-J-052-03	434832	8678498
248	Rufino Condori Cahuata	17-TAM/C-OPB-J-052-04	472402	8665199
249	Guillermo Miguel Racua Caya / Rolando Racua Reaño	17-TAM/C-OPB-J-053-04	484360	8640397
250	Mateo Tejeira Huillca	17-TAM/C-OPB-J-056-03	500551	8676106
251	Juan Tito Condori Suyo	17-TAM/C-OPB-J-058-04	474156	8666271
252	Jorge Vargas Quiróz	17-TAM/C-OPB-J-059-03	491585	8653611
253	Marcos Olgado Quispe	17-TAM/C-OPB-J-060-03	490151	8642471
254	German Revilla Gonzales	17-TAM/C-OPB-J-060-04	484770	8655000
255	María B Sangama De Benites/ Aldo Herrera G	17-TAM/C-OPB-J-061-02	498763	8654116
256	María Salome Mendivil Medina	17-TAM/C-OPB-J-061-03	468033	8681865
257	Catherine Melendez Vargas	17-TAM/C-OPB-J-062-04	483550	8656576
258	Jaime Llamas Martinez	17-TAM/C-OPB-J-063-04	463207	8625674
259	Washinton Maceda Irarica	17-TAM/C-OPB-J-064-03	411171	8626557
260	Avelino Ricardo Tuesta Guevara	17-TAM/C-OPB-J-064-04	464182	8621404
261	Juana Julia Gongora Cabana	17-TAM/C-OPB-J-067-03	428978	8633533
262	Rodolfo Mamani Yari	17-TAM/C-OPB-J-067-04	476958	8644210
263	Delfin Rodriguez Flores	17-TAM/C-OPB-J-070-03	444923	8682837
264	Mauricio Cassa Champi	17-TAM/C-OPB-J-070-04	480366	8652520
265	Erasmo Condori Flores	17-TAM/C-OPB-J-071-03	516671	8636701
266	Andres Guerra Irarica	17-TAM/C-OPB-J-072-03	504764	8659035
267	Siles Flores Rengifo	17-TAM/C-OPB-J-072-04	440399	8624150
268	Florencia Ascue Sallo	17-TAM/C-OPB-J-073-03	439700	8679003
269	Luz Mila Cachique Perdiz	17-TAM/C-OPB-J-073-04	457269	8682362
270	Hermelinda Pacco Molina	17-TAM/C-OPB-J-074-04	468533	8637665
271	Paula A. Guerra Flores	17-TAM/C-OPB-J-076-03	503524	8659209
272	Fidelia Mamani Pari	17-TAM/C-OPB-J-077-02	451664	8668312
273	Sofia Rosa Paredes Dueñas	17-TAM/C-OPB-J-078-03	511343	8660963
274	Luis Racua Salazar	17-TAM/C-OPB-J-078-04	491254	8641567
275	Marcos Maximiliano Gonzales Gamarra	17-TAM/C-OPB-J-079-02	449699	8677661
276	Elvis Ivan Barriga Guevara	17-TAM/C-OPB-J-079-03	509167	8632370
277	Serapio Velasquez Limpi	17-TAM/C-OPB-J-080-04	473947	8645454
278	Rafael Lorenzo Jara Quispe	17-TAM/C-OPB-J-081-04	494157	8645866
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281	Saturnina Maileva Chavez	17-TAM/C-OPB-J-088-02	423510	8630174
282	Froilan Quispe Ttupa	17-TAM/C-OPB-J-091-03	473123	8660474
283	Leonardo Aladino Racua Cacuna	17-TAM/C-OPB-J-091-04	492955	8641586

284	Gregoria Roca Guerra	17-TAM/C-OPB-J-092-03	500398	8663532
285	Juan Carlos Flores Del Castillo	17-TAM/C-OPB-J-092-04	447820	8627540
286	María Rosa Vargas Racua	17-TAM/C-OPB-J-093-04	492598	8662007
287	Eulogio Puma Checcori	17-TAM/C-OPB-J-095-04	475653	8681983
288	Leoncio Pacheco Ayala	17-TAM/C-OPB-J-096-03	457397	8674710
289	Oscar Angel Alvarez Belson	17-TAM/C-OPB-J-096-04	436048	8656126
290	Nicomedes Ayte Vargas	17-TAM/C-OPB-J-097-03	480204	8665003
291	Juan Vicente Sanchez Pinedo	17-TAM/C-OPB-J-097-04	442600	8659316
292	Victor Econema Pacaya	17-TAM/C-OPB-J-098-04	400000	8623505
293	Jesús Torres Vasquez	17-TAM/C-OPB-J-100-02	418570	8639528
294	Bonifacio Rocca Ttito	17-TAM/C-OPB-J-101-04	502607	8667779
295	Florentino Cañari Turpo	17-TAM/C-OPB-J-102-02	440981	8650743
296	Ladio Bolivar Huamani	17-TAM/C-OPB-J-102-04	438226	8621239
297	Cosme Dueñas Merma	17-TAM/C-OPB-J-103-03	495277	8655655
298	Bernardino Villafuerte Mamani	17-TAM/C-OPB-J-104-04	463200	8653121
299	Asunta Amasifuen De Llamas	17-TAM/C-OPB-J-106-04	440088	8655480
300	Carlos Gutierrez Villamar	17-TAM/C-OPB-J-108-03	467985	8652607
301	Edith Glady Herboso Reategui	17-TAM/C-OPB-J-112-03	444880	8652235
302	Carlos Miguel Caviña Balarezo	17-TAM/C-OPB-J-114-03	450081	8685235
303	Juan Enrique Pereyra Guerra	17-TAM/C-OPB-J-116-03	454203	8664797
304	Wilfredo Mendiguri Mendoza	17-TAM/C-OPB-J-117-03	474554	8659111
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306	Ulises Moreno Huanuire	17-TAM/C-OPB-J-123-03	461661	8667355
307	Victor Alfredo Zeballos Mozombite	17-TAM/C-OPB-J-124-03	455479	8679873
308	Luis Hernan Lopez Torres	17-TAM/C-OPB-J-126-03	467035	8624140
309	María Estela Perdiz Valera	17-TAM/C-OPB-J-128-03	460952	8677241
310	Paulino Roca Guerra	17-TAM/C-OPB-J-130-03	501846	8665949
311	Juan Bautista Uscamayta Huillca	17-TAM/C-OPB-J-138-03	469874	8670575
312	Edelmira Flores De Vela	17-TAM/C-OPB-J-143-03	500319	8661008
313	Alfredo Gonzales Romero	17-TAM/C-OPB-J-144-03	479966	8680332
314	Cecilio Reategui Aguirre	17-TAM/C-OPB-J-151-03	476481	8664889
315	Cecilia Cacuna Racua	17-TAM/C-OPB-J-152-03	472789	8683323
316	Alipio Acha Calla	17-TAM/C-OPB-J-153-03	471803	8680587
317	Carlos Aguilar Huaman	17-TAM/C-OPB-J-158-03	499855	8672037
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319	Pablo Alegre Usca	17-TAM/C-OPB-J-162-03	498536	8677275
320	Margarita Venilda Rodriguez Benites	17-TAM/C-OPB-J-165-02	495546	8649555
321	Samuel Huamani Aranguri	17-TAM/C-OPB-J-167-02	489078	8639490
322	Pacifico Ferro Capa	17-TAM/C-OPB-J-168-02	503139	8650450
323	Zoila Norma Racua Guerra	17-TAM/C-OPB-J-169-03	461896	8657227
324	Rene Florencio Vargas Pineda	17-TAM/C-OPB-J-170-02	496010	8652254

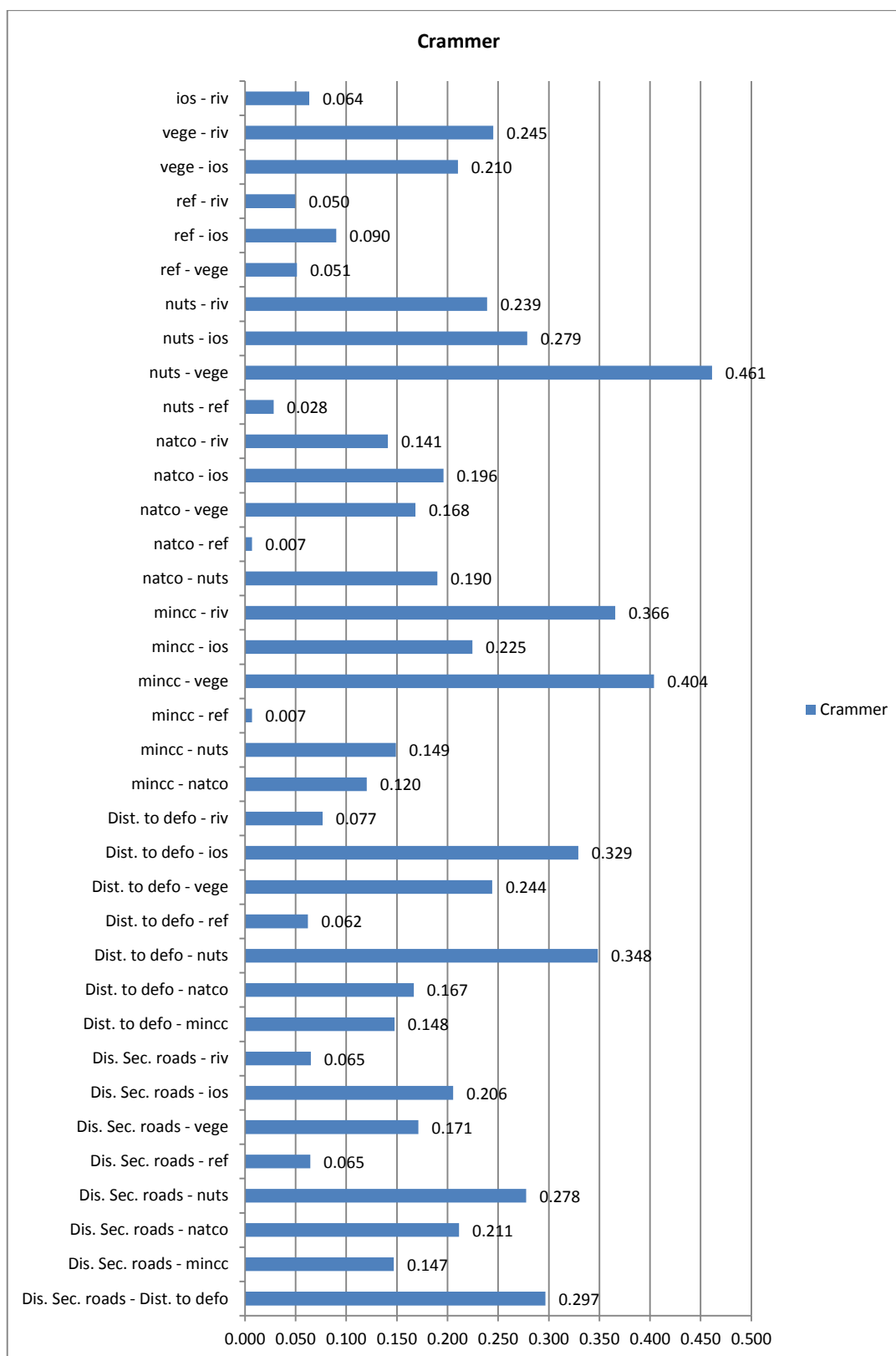
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327	Carlos Narciso Moreno Fuller	17-TAM/C-OPB-J-179-02	467332	8662841
328	Benito Escalante Quispe	17-TAM/C-OPB-J-179-03	476625	8648953
329	Agapito Delgado Cruz	17-TAM/C-OPB-J-180-03	460435	8635025
330	Benilde Pacherras Salazar	17-TAM/C-OPB-J-184-02	422687	8652332
331	María Carmen Abarca Choque	17-TAM/C-OPB-J-189-03	452987	8624693
332	Maximo Loayza Benites	17-TAM/C-OPB-J-190-03	472587	8667592
333	Anselmo Racua Mariche	17-TAM/C-OPB-J-196-03	485444	8642345
334	Federico Barrientos Martinez	17-TAM/C-OPB-J-197-03	460134	8638436
335	Bernardo Flores Pereira	17-TAM/C-OPB-J-204-03	435804	8660520
336	Justo Montaña Avila	17-TAM/C-OPB-J-205-03	512348	8654978
337	José Oswaldo Saavedra Alvarado	17-TAM/C-OPB-J-209-03	437628	8659307
338	Juan De La Cruz Cusihuaman Condori	17-TAM/C-OPB-J-210-03	490512	8670454
339	Julian Condori Atamari	17-TAM/C-OPB-J-215-03	436263	8635819
340	Wilfredo Ahuanari Patiño	17-TAM/C-OPB-J-219-03	495663	8672879
341	Luciano Mamani Perez	17-TAM/C-OPB-J-220-03	492359	8669627
342	Moises Gutierrez Galicia	17-TAM/C-OPB-J-221-03	454327	8667888
343	Pilar Mandujano Baca	17-TAM/C-OPB-J-224-03	405297	8652269
344	José Flores Pereyra	17-TAM/C-OPB-J-233-03	504366	8674014
345	Héctor Pautre Miashiro	17-TAM/C-OPB-J-240-03	442893	8640411
346	Leonardo Sanchez Pinedo	17-TAM/C-OPB-J-248-03	451643	8671117
347	Gueisa Gonzales De Rodriguez	17-TAM/C-OPB-J-250-03	483663	8667047
348	Saturnino Solis Muñoz	17-TAM/C-OPB-J-251-03	448077	8667241
349	Teofilo Pedraza Ariza	17-TAM/C-OPB-J-254-03	482895	8661489
350	Cirilo Torres Ttito	17-TAM/C-OPB-J-256-03	488154	8643470
351	Francisco Mamani Condori	17-TAM/C-OPB-J-258-03	513792	8661428
352	Igidio Mamani Ccorimanya	17-TAM/C-OPB-J-263-03	494932	8675551
353	Juan Huanuire Econema	17-TAM/C-OPB-J-265-03	491413	8677466
354	Elvira Yatto Tibubay	17-TAM/C-OPB-J-271-03	421931	8636905
355	Daniel Suclli Laura	17-TAM/C-OPB-J-272-03	450054	8681010
356	Serapio Condori Flores	17-TAM/C-OPB-J-276-03	525193	8631155
357	Silvia Apaza Hidalgo	17-TAM/C-OPB-J-285-03	464973	8668997
358	Teodocio Ancalle Llamoca	17-TAM/C-OPB-J-288-03	519639	8649827
359	Blanca Luz Vargas Pashanaste	17-TAM/C-OPB-J-293-03	465958	8658105
360	Inely Mestanza Villaroel	17-TAM/C-OPB-J-297-03	428555	8642028
361	Abel Galindo Izquierdo	17-TAM/C-OPB-J-299-03	453456	8643770
362	Felicitas Ramirez Surco	17-TAM/C-OPB-J-302-03	485043	8657110
363	Nora Esperanza Belluma Huanuire	17-TAM/C-OPB-J-306-03	412323	8661656
364	Jesús Chavez Vargas	17-TAM/C-OPB-J-309-03	486231	8644480
365	Juan Onesimo Ayerbes Ohuichi	17-TAM/C-OPB-J-310-03	495458	8679085

366	Dionisia Ccorahua De Zapana	17-TAM/C-OPB-J-311-03	480857	8644109
367	Hermelinda Argandoña Piña	17-TAM/C-OPB-J-317-03	482009	8676564
368	Julio Hurtado Garay	17-TAM/C-OPB-J-319-03	489520	8656473
369	Hernancia Rodriguez Flores - Transferencia	17-TAM/C-OPB-J-321-03	487781	8676296
370	Miguel Jorge Zevallos Narvaes	17-TAM/C-OPB-J-325-03	464539	8681536
371	Vicencio Yaricahua Nieto/ María Eduvilda	17-TAM/C-OPB-J-331-03	522778	8636245
372	Dionisio Lima Armuto	17-TAM/C-OPB-J-338-03	455867	8671572
373	Ynocencio Bacilio Huaman	17-TAM/C-OPB-J-346-03	486617	8642168
374	Agueda Pachcerres Salazar	17-TAM/C-OPB-J-348-03	488446	8640714
375	Daniel Idme Guetierrez	17-TAM/C-OPB-J-349-03	490315	8671215
376	Pablo Callo Condori	17-TAM/C-OPB-J-353-03	478512	8651669
377	Angel Fuentes Yupanqui	17-TAM/C-OPB-J-382-03	502439	8654280
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380	Lebana Olivia Quispe Sueros	17-TAH/C-OPB-A-037-08	489867	8677227
381	Gabriela Rossana Parillo Quispe	17-TAH/C-OPB-A-050-08	409750	8701500
382	Valentín Parrillo Yerba	17-TAH/C-OPB-A-118-04	453400	8696547
383	Cesar Delgado Andia	17-TAH/C-OPB-J-114-04	464753	8726609
384	Teobaldo Aristides Reategui Trigoso	17-TAM/C-OPB-A-004-08	475131	8667270
385	Maribel Yeni Aparicio Carpio	17-TAM/C-OPB-A-006-08	428209	8673784
386	Hugo Mamani Chavez	17-TAM/C-OPB-A-019-07	493239	8664897
387	Wilder Reategui Camargo	17-TAM/C-OPB-A-032-06	409495	8622441
388	Agapito Pacco Barrientos	17-TAM/C-OPB-A-036-06	437366	8638417
389	Jose Manuel Corahua Quispe	17-TAM/C-OPB-A-040-07	412173	8613865
390	Casimira Huaman De Mishisaka	17-TAM/C-OPB-A-041-06	479519	8662682
391	Alcibiades Canelos Yumbo	17-TAM/C-OPB-A-079-07	424607	8626348
392	Percy Humberto Espirilla Condo	17-TAM/C-OPB-A-121-04	490063	8673820
393	Isabel Tejada Aguirre	17-TAM/C-OPB-A-159-04	469592	8650632
394	Honorato Pacamia Guerra	17-TAM/C-OPB-A-187-04	458488	8670200
395	Facundo Cahuantico Cahuantico	17-TAM/C-OPB-J-022-03	480253	8668066
396	Felix Condori Taina	17-TAM/C-OPB-J-030-02	503482	8677015
397	Maria Cristina Loayza Valeriano	17-TAM/C-OPB-J-035-04	443661	8686685
398	Angel Bustamante Huallpayunca	17-TAM/C-OPB-J-086-03	495896	8644375
399	Juan Emilio Barriga Vissa	17-TAM/C-OPB-J-105-03	444648	8647164
400	Juan Gualberto Condori Sullo	17-TAM/C-OPB-J-137-03	462779	8672008
401	Francisco Vargas Puma	17-TAM/C-OPB-J-208-03	467914	8669162
402	Lucinda Novoa De Romero	17-TAM/C-OPB-J-243-03	477802	8679257
403	Hernan Jimenes Llanos	17-TAM/C-OPB-J-262-03	482323	8656102
404	Juan Reyner Mamani Loayza	GOREMAD-GGR-PRMRFFS- DER-TAH/C-OPB-024-11	444653	8698383
405	Wilder Marave Rodriguez	GOREMAD-GGR-PRMRFFS- DER-TAH/C-OPB-025-11	438415	8711566

Annex 2. Digital Process of Images in the ZEE



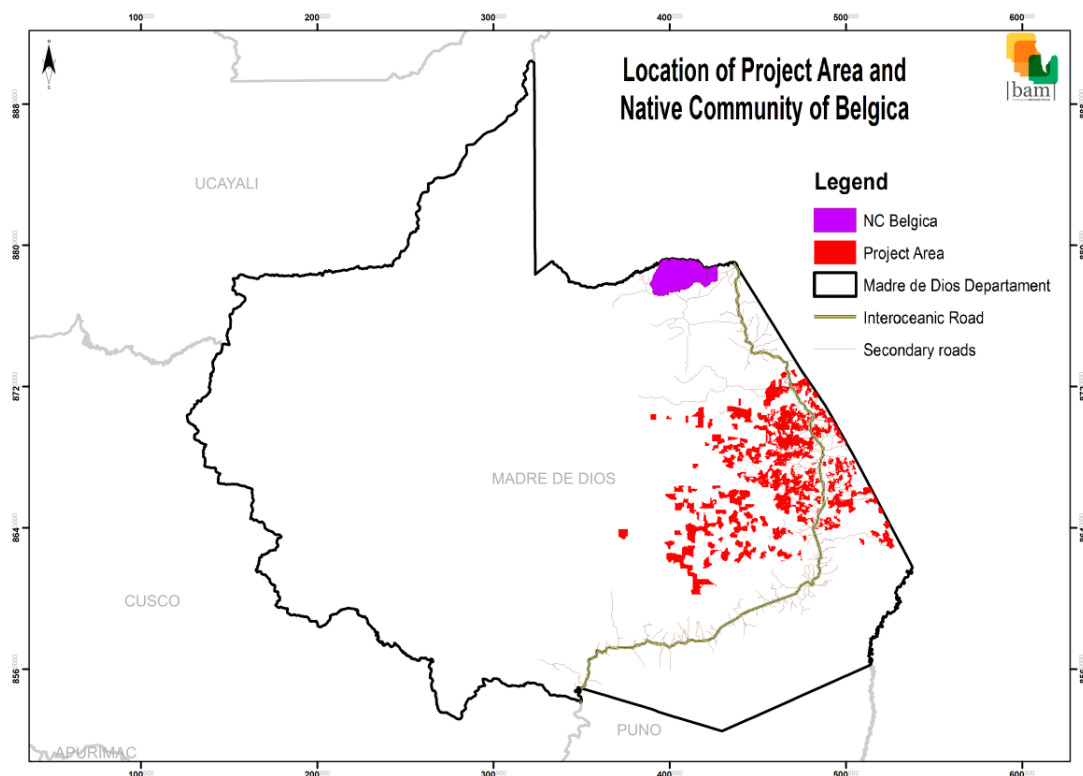
Annex 3. Crammer's Test for the Baseline Scenario (N°2)



Annex 4. Significant Test for the Carbon Inventory Results of Native Community of Belgica

The Native Community of Belgica is located in the northeast part of the Department of Madre de Dios, close to the Project Area (See Map 01).

Map 01: Location of the Project Area and the Native community of Belgica



Source: Compiled by author

The National Environment Fund (FONAM) carried out the Carbon inventory developed in Belgica in 2010, and like us, they used the Forest Map of the Economic Ecological Zoning (ZEE) made by the IIAP as a basis for their area stratification.

In the area of Belgica, 14 forest types were found, and grouped according to their floristic, physiographic and flood criteria into 7 different strata (See table 01).

Table 01: Simplification of forest types units in Native Community of Belgica

Initial Code	ZEE Forest Type	Area (Ha)	Final Code
BPTbi	Low flooded terraces with bamboo (paca) forest	7 104.84	BTI
BTbi	Low flood terrace forest	116.24	
BTm	Mid terrace forest	194.59	BT
BtaS	High terraces forest with <i>Shiringa</i> stands	4 343.53	
BCb	Low hills forest	8 710.14	BCb
BCbS	Low hills forest with <i>Shiringa</i> stands	330.40	

BPTm	Mid terrace with bamboo (paca) forest	145.38	BPT
BPTa	High terrace with bamboo (paca) forest	18 124.52	
BPCb	Low hills with bamboo (paca) forest	71 693.46	BPCb
BPCbS	Low hills with bamboo (paca) forest and <i>Shiringa</i> stands	2 871.96	
Ptbi	Bamboos of low flooded terraces	1 340.32	P
Pta	Bamboos of high terraces	2 162.58	
PCb	Bamboos of low hills	2 433.15	
Ai	Intervened Areas – Deforestation	15 020.10	NB
	Water bodies	456.94	
TOTAL AREA (HA)		135,048.14	

Source: Compiled by author

In the Castañeros REDD Project case, the Forest Map of ZEE was used as well, and the simplified stratification is similar (Table 6, page 18) to the one used in the Belgica native community.

The results from the Carbon Inventory made in the Native Community of Belgica were analyzed to see the significance between the Carbon Pools considered. The Carbon Stock results obtained are shown in the following table.

Table 02. Tones of CO₂ per hectare per carbon pool in the Native Community of Belgica

Forest Strata	Above-ground tree biomass	Below-ground tree biomass	Above-ground non tree biomass	Litter	Dead wood	Area (ha)
BCB	404.3	97	2.5	9.7	1.7	9,040.54
BPCB	397.2	95.3	4	8.1	4.2	74,565.42
BPT	325.2	78	4.9	8.3	1.8	18,269.90
BT	530.2	127.2	3.6	11.4	5	4,538.12
BTI	406.2	97.5	2.9	8.8	2.7	7,221.08
P	393	94.3				5,936.05
Total t CO₂/ha	392.12	94.08	3.74	8.02	3.38	501.33

Source: Compiled by author

Relative contributions of the project decrease of carbon stocks by sources

The relative contributions of the carbon pools were estimated using the equation (IPCC 2003, Eq. 5.4.1):

$$RC_{E_i} = \frac{E_i}{\sum_{i=1}^I E_i}$$

Where:

RC_{E_i} Relative contribution of each source to the sum of project and leakage carbon stocks

E_i Carbon stocks by sources

i Index for individual sources of project and leakage stocks

Table 03. Relative contributions analysis per Carbon pool

Carbon Pools	Relative contribution	RCEi (%)	Rank	Sum of RCEi (%)
Above-ground tree biomass	0.78	78	5	0.78
Below-ground tree biomass	0.19	19	4	0.97
Litter	0.02	2	3	
Above-ground non tree biomass	0.01	1	2	
Dead wood	0.01	1	1	

Source: Compiled by author

The sum of the relative contributions is completed at the Belowground tree biomass pool (with 0.97). The carbon stocks in the last three pools are insignificant (less that 5% of the total carbon stocks) and ought to be excluded according to the REDD-MF and CP-AB modules.

This result is considered relevant to the Castañeros REDD Project, and because of the likeness in both areas, the last three pools were not included in the project's baseline.