REDUCTION OF DEFORESTATION AND DEGRADATION IN TAMBOPATA NATIONAL RESERVE AND BAHUAJA-SONENE NATIONAL PARK WITHIN THE AREA OF MADRE DE DIOS REGION –PERÚ

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Madre de Dios is the Amazon region that registers the highest biodiversity indexes in the country; this characteristic gave it the title of Biodiversity Capital of Peru[1] in 1994. This region is natural habitat for threatened fauna species like black caiman (*Melanosuchus niger*), harpy eagle (*Harpia harpyja*), giant otter (*Pteronura brasiliensis*) and forest species with economic importance like chestnut (*Bertholletia excelsa*). This region, together with high jungle of Cusco and Puno regions, is the best conserved sector in the Peruvian amazon, having 30% of its surface under different protection categories in the National System of Natural Areas (SINANPE), which comprehends, inter alia, Tambopata National Reserve (RNTAMB) and Bahuaja-Sonene National Park (PNBS).

While Madre de Dios has had historically low deforestation levels, significant improvement of accessibility due to South Interoceanic Highway construction (adjacent to RNTAMB Buffer Zone) is increasing migration and therefore land-use change and forest degradation, which can have a huge impact considering the good conservation status of this part of the country. Informal gold mining expansion is added to this scenario (inside and outside Buffer Zone and even inside Natural Protected Areas) - encouraged by the increasing gold price - which mining modality is highly polluting and cause of deforestation in areas adjacent to rivers.

The project will be developed in the area comprised by Tambopata National Reserve and the sector of Bahuaja-Sonene National Park located in Madre de Dios region, corresponding to the partial Administration Contract of RNTAMB and PNBS – Madre de Dios sector, signed by Peruvian State and the Asociación para la Investigación y el Desarrollo Integral – AIDER[2]. Both Natural Protected Areas (NPA) belong politically to Tampopata province, Inambari and Tambopata districts, and have a combined area of 573 299,97 hectares. The project purpose is to conserve forests from both NPAs against deforestation imminent advance.

The project proposes to reduce pressure to change land-use at the NPAs Buffer Zone by promoting sustainable economic activities and establishing conservation agreements at previously identified critical areas. Both actions are looking forward to consolidate a “barrier” against expansion of economic frontier (agricultural and mining activities), with alliance and permanent coordination with institutions that are currently doing conservation activities in the area.

In addition, RNTAMB and PNBS control and surveillance system will be strengthened, even more on conformation and operation of community committees of surveillance with official recognition, as a strategy for local communities to participate in NPAs management.

Finally, we will provide technical support to regional forest authority and National Service of Natural Protected Areas –SERNANP for forest and environmental governance of Madre de Dios region, enhancing State participation on NPAs and optimizing coordination and collaboration between authorities and local population on NPAs management.

With this actions, the project expects to avoid a net emission rate of **457 750,25 tCO_2-e** annually in comparison with baseline scenario projected during the first 10 years, in which due to migration and land occupation that promotes the south interoceanic highway, an average of 1189,31 hectares would be deforested annually.

[1] Law Nº 26311 enacted on May 5, 1994 (www.congreso.gob.pe/ntley/Imagenes/Leyes/26311.pdf)
[2] Granted by Resolution of Intendancy Nº 053-2008-INRENA-IANP

The project comprises benefits for local population and for biodiversity conservation, beyond benefits of GHG emissions reduction. The project has applied the standards of Climate, Community & Biodiversity Association (CCBA) to demonstrate this.

1.2 Sectoral Scope and Project Type

Sectoral scope 14 – Agriculture, Forestry and Other Land Use

AFOLU project category: Reduced Emissions from Deforestation and Degradation (REDD)

Activity type: Avoiding Unplanned Deforestation and Degradation (AUDD)

Project activity type was defined according a decision tree located in the methodology used (REDD-MF, see section 2.1). It is expected that forest land will be converted to non-forest at the "without-project" scenario, with the project area lacking legal authorization for a non-forest conversion.

Project is individual, not grouped.

1.3 Project Proponent

Project proponents are shown in Table 1.

Table 1 Description and responsibilities of Project Stakeholders

Entity	Description	Roles/responsibilities
Asociación para la Investigación y Desarrollo Integral – AIDER Contact: Jaime Nalvarte Armas Address: Av. Jorge Basadre 180 Oficina 6 – San Isidro. Lima, Peru Telephone: (51 1) 421 5835 Email : lima@aider.com.pe	Peruvian NGO leading issues related to REDD and CDM projects, with more than 20 years of experience in forest projects, including forest Management, reforestation and nature conservancy, working with companies, native communities and small rural land-owners promoting Eco businesses.	Executor of Partial Administration Contract on RNTAMB y PNBS. Project design, implementation and monitoring.

1.4 Other Entities Involved in the Project

The National Service of Natural Protected Areas (Servicio Nacional de Áreas Naturales Protegidas - SERNANP) is in charge of conducting the management of the National System of Natural Protected Areas (Sistema Nacional de Áreas Naturales Protegidas por el Estado – SINANPE); the headquarters of the Tambopata National Reserve (RNTAMB) and the Bahuaja-Sonene National Park (PNBS) are part of that System. The role of SERNANP is to bring political support, monitoring and supervision of the signed

agreements for the project's implementation, giving compliance to its responsibilities as the State entity in charge of the Natural Protected Areas management.

Servicio Nacional de Áreas Naturales Protegidas - SERNANP

Contact: Pedro Gamboa Moquillaza

Address: Calle Diecisiete nº 355 - Urb. El Palomar - San Isidro. Lima, Perú

Telephone: (51 1) 225-2803

E-mail: sernanp@sernanp.gob.pe

Private Peruvian Company Bosques Amazónicos S.A.C., which aims to develop projects that promote the potential of the Peruvian Amazon Biodiversity through access to carbon markets and other environmental services payments mechanisms to help restore degraded lands and preserve the nature in a financially sustainable way, is responsible of the REDD project financing and VCUs marketing, in its capacity as AIDER financial partner. Bosques Amazónicos S.A.C.

Contact: Jorge Cantuarias

Address: Calle Monte Rosa 271 office 7B, Santiago de Surco. Lima, Perú

Telephone: (51 1) 715 1380

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The Pontifical Catholic University of Peru - PUCP is an autonomous institution designed to provide higher education, promote research and project to the community in order to contribute with the National Development. In 2008 PUCP and AIDER established a strategic alliance to perform the Partial Operations Management Contract in RNTAMB and PNBS, it was made official on May 8, 2009 by the signing of a cooperation agreement.

PUCP complements AIDER efforts as executor of the Management Contract providing extensive research expertise in RNTAMB, through the participation of professionals in developing academic and research activities. Also advises AIDER in the research management component of the contract, specifically promoting new research and improving conditions for research. An example of this collective effort is the construction and operation of a tower 45 meters high for continuous measurements of CO2 over the forest, into the RNTAMB.

1.5 Project Start Date

Project start date: July 01, 2010

1.6 Project Crediting Period

Project crediting period: 20 years (July 01, 2010 – June 30, 2030).

First period to quantify GHG emission reductions: 10 years (July 01, 2010 – June 30, 2020)

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the scale of the project (project or large project) and the estimated annual GHG emission reductions or removals for the project crediting period.

Project	✓
Large project	

Years	Estimated GHG emission reductions or removals (tCO2e)
2010-2011	165,971.7
2011-2012	224,423.9
2012-2013	305,963.3
2013-2014	355,785.2
2014-2015	409,756.2
2015-2016	534,703.4
2016-2017	565,360.0
2017-2018	568,672.2
2018-2019	711,164.6
2019-2020	735,702.0
Total estimated ERs	4,577,502.5
Total number of crediting years	10
Average annual ERs	457,750.25

1.8 Description of the Project Activity

Avoiding Unplanned Deforestation and Degradation (AUDD)

The Project will achieve to avoid unplanned deforestation and degradation that occur at baseline scenario, by application of the strategy detailed below, and divided in 4 main components:

- **Conservation agreements:** These consist in offering tangible and periodic benefits to local settlers in exchange of real conservation commitments; this component will be used across other components, giving technical support and consultancy to local populations to establish this agreements with SERNANP and Management Committees of NPAs. We will use the methodology developed by Conservation International (CI). CI Peru advises AIDER on conservation issues aimed to strengthen the strategy for reducing deforestation raised by this project. As part of the alliance between AIDER and CI established in 2010 to contribute on a REDD project development in the Alto Mayo Protected Forest (protected natural area in San Martín region), CI Peru will transfer their knowledge in conservation agreements and strengthening environmental institutions at the regional level, based on their experience and lessons learned in San Martin region.

- **Productive activities promotion:** Financial resources, technical and commercial assistance will be assigned for promoting sustainable productive initiatives among families from farmhouses and communities settled at leakage belt; likewise, technologic innovations will be introduced for traditional activities, reducing their environmental impacts. These activities are:

  - Agroforestry
  - Aquaculture
  - Low-impact gold mining
  - Sustainable forest management for timber
  - Processing and marketing of Chestnut
  - Management and conservation of palm trees

  Activities will be promoted at different rural communities according the participatory assessments that are being elaborated for the Buffer Zone, implementing the ones that are adequate to the natural and socioeconomic conditions of each place. In addition, two main criteria will be followed to implement those activities: 1) known and guaranteed markets and 2) initiatives from the producers themselves.

- **Surveillance and control:** Nevertheless the main component of the project strategy will be to generate alternative activities to deforestation between population, the Surveillance and Control component will imply strengthening of this Subprogram of both NPAs that shape the project area, to ensure its integrity, through prevision and mitigation of threats and negative impacts, mainly those that generate forest deforestation. This component will gain greater importance at areas where it is impossible to build consensus (presence of illegal mining, illegal forestry production). It implicates technical support for community surveillance committees, park rangers training, and also improvement of infrastructure and equipment at checkpoints:

  - Infrastructure repairing of checkpoints San Antonio, Briolo, Huisene, Sandoval, Jorge Chávez, La Torre, Malinowski, Azul y Farfán, including, according to needs on each checkpoint: piles, meshes, electric and sanitary facilities, roof change, among others.

  - Implementation of checkpoints Farfán, Malinowski, La Torre, Jorge Chávez, Sandoval, Briolo, Huisene. San Antonio, including, according to needs on each checkpoint: photovoltaic systems, vessel motors, radio communication and radio towers, lightning conductors, sanitation system, building of housing modules, motor pump, beds, mattress and other furniture.

  - Boats purchase and inscription at Port Captaincy.

  - Periodical maintenance and possible reparation of motors for vessels, motorcycles, motor pump, radios, boats.

  - Food and fuel for routine patrols.

- **Forest governance:** This component is addressed to promote agreements between institutions and related to responsibilities that allow a better governance of resources within the project area and leakage belt.

We seek to work together with the different stakeholders: public or private institutions that support the RNTAMB Management Committee so there can be team work on protection, conservation and surveillance of natural protected areas and their buffer zone. The aim is to empower the population on conservation and protection of natural environment.

By implementing altogether this 4 components, pressure for land-use and resources will be reduced over the project area, giving benefits to local families and generating also benefits for biodiversity (benefits for local population and for biodiversity have been developed according Climate, Community & Biodiversity Association).

Main productive activities to be promoted by the project are described below - this does not set asides other sustainable activities to be incorporated during the development of the process of socio-economic assessments, dialogue and agreements with populations from the area of project influence.

a) Agroforestry

"Agroforestry" is a technical word used to describe different ways to associate tree species, including fruit, medicinal, timber and other trees, with short term crops, as components of a sustainable agricultural production system.

Agroforestry systems allow a dynamic and ecological handling of natural resources, by integrating trees to agricultural lands, from small lands to pastures and other scenarios, diversifying and increasing productivity, promoting economic, social and environmental benefits for direct users and population at large, which demonstrates to be also a good alternative to prevent, reduce and revert soil degradation.

The first project task is to do a micro-zoning of each beneficiary land, considering criteria as soil fertility, species of community interest, agricultural techniques (to avoid soil degradation) and other necessary criteria to ensure the activity sustainability.

These systems are expected to provide constant incomes for beneficiary population through production of annual crops, fruit trees, fast growing timber trees and high value timber species.

The table 2 mentions possible species for this activity; previous studies will determine if these ones and their associations are adequate for the specific parcel where this activity is implemented.

Table 2 Technical description – Agroforestry

Species	Inputs / Machinery and equipment /Infrastructure
Coverage crops (beans); fruit trees (critics, copoazú, pineapple, etc.) combined with common annual crops in the region; fast growing trees as "guaba" *Inga sp*., and valuable trees as "mahogany" *Swietenia macrophylla,* "tornillo" *Cedrelinga catenaeformis*, and "chestnut" *Bertholletia excelsa*.	Biol (liquid foliar fertilizer)
	Superphosphate
	Mobile nursery (rustic material)
	Fuel (for relocation , thinning, pruning)
	Effective microorganism use

This activity will progressively incorporate a permaculture approach, pursuing a production with a systemic approach linked to social strengthening and good management of the landscape.

b) Palm trees Management

Within the project area exist forests with palm tree predominance, with "aguaje" (*Mauritia flexuosa*) as the most abundant species, which, together with "ungurahui" (*Oenocarpus sp.*) and other species, forms extensive associations locally known as "aguajales"; these have importance not only for human consumption but also for wildlife, because their fruits are part of the ungulate, rodents and primates diet (Bodmer,1999), being established an palm-animal-human relation, which has to be manage to ensure conservation of the ecosystem and its dynamics. Besides these ecosystems would be providing more storage by carbon capture (Guzmán, 2004).

Referent to the way that this populations are being managed in the project area, it is known that currently inappropriate techniques are being applied at stages of harvest and post-harvest (strong pressure over natural populations by selective logging of female "aguajes"), causing low productivity, low product quality and, therefore, limited conditions to access other markets.

Products obtained from palm tree species growing in the area (edible fruits and leaves) represent a contribution to local economy, since they are abundant at the area, of traditional use and with a natural and continuous demand.

The project proposes to provide technical assistance to rural producers, involving them in control measures of palm trees production, replacing destructive harvesting practices by sustainable practices (to climb palm trees for fruit harvest).

The Table 3 mentions palm tree species within the project area, and necessary inputs to achieve activity goal:

Table 3 Technical description – Palm trees management

Species	Inputs / Machinery and equipment /Infrastructure
Fruit use: aguaje, ungurahui.	Up loaders (homemade harnesses)
	Chainsaw for thinning

c) Aquaculture

Aquaculture is an economic activity that includes a farming system, focusing human intervention on stock reproduction and also on capture (Lockwood, quoted by Gonzáles *et al*, 2004). Compared to fishing, this system makes possible a selective production increase of edible, industry or ornamental species. This is not a new activity, so along the years has demonstrated to have an important role on future production of fish and population food support.

As an Amazon region, Madre de Dios has fish as main protein source in the diet, being rivers Madre de Dios and Tambopata the places with more fishing activity, where the larger floodplains of the region are located. To the moment, 245 fish species have been identified in Madre de Dios basin, grouped in 179 genus, 38 families and 12 orders. From these, just 48 species sustain commercial fishing which main disembark port is located in Puerto Maldonado (Tello, 2002).

The extraction of hydro biological resources has gradually decreased from 1995 when reached 768 tons to reach the lowest point in 1999 with 132 tons, as is observed in Figure 1. Strong pressure of fishing activity, as well as of mining activity that pollutes rivers with mercury, have been diminishing natural populations.

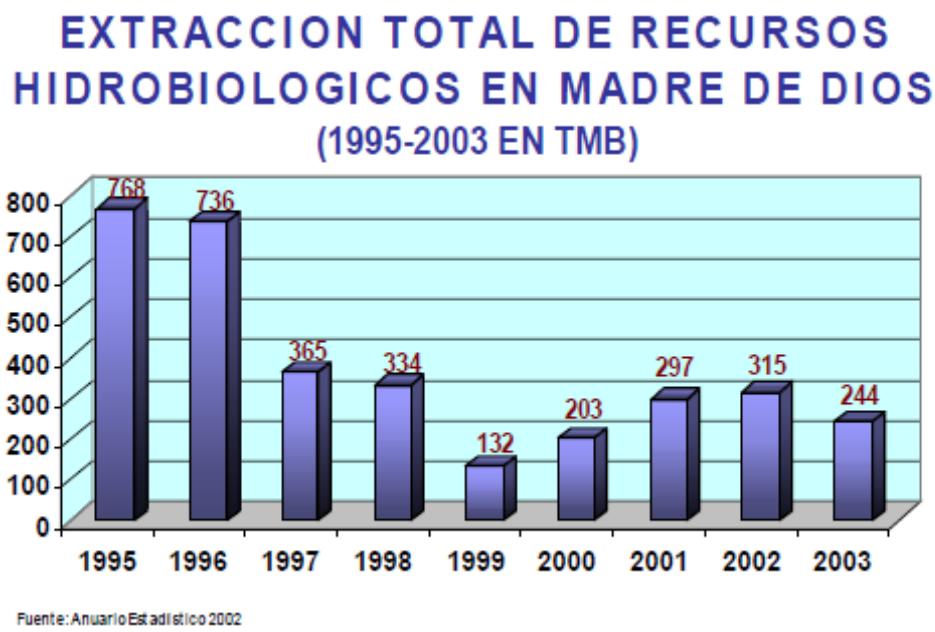


Figure 1 Total extraction of hydro biological resources in Madre de Dios (1995-2003 in GMT)

Source: Statistical yearbook 2002

Species with more demand in Puerto Maldonado market are: doncella, mota, boquichico, dorado and saltón. Furthermore, paiche and tilapia can be used for aquaculture; both species were managed on past experiences, with optimum results.

Aquaculture has advantages over other activities, like agriculture, as it uses smaller areas for infrastructure, allowing installation on deforested land and once operating it becomes a profitable activity. It is important to mention that farm water quality is controlled, so there has to be special care with existing mercury amount, to guarantee mercury-free fish production. Initial investment and necessity of technical training to manage and care young fish are high barriers.

This activity is not occurring in the project area but considering it an economic activity with low environmental impact, sustainable and profitable, it is included in REDD project activities.

Table 4 Technical description – Aquaculture

Species	Inputs / Machinery and equipment /Infrastructure
Edible and ornamental species	Heavy machinery for pool excavation (only for edible species). In the case of permeable soils will be used geomembranes.
	Fish farms will be constructed on pastures, where there are no roots.
	Around pools will be planted tree species for shadow (arazá, guanábana, among others)
	According to the area: for water oxygenation will be used: springs (running natural water), motor pumps.

d) Low-impact gold production

Mining activity in Madre de Dios starts way before NPA creation and the project, as is shown on section 1.10 (Prior conditions). Is a highly profitable economic activity but causes moderately significant impacts to environment, like a consequence of mercury pollution, soil removal, and deforestation, among others. It is an artisanal mining, so election of extraction sites, exploitation techniques and waste disposal are done in a chaotic way, polluting forest water and soil.

From used mercury, 20 % is discharged directly to the river and other 20 % is lost in atmosphere. It is calculated that mercury annual discharge to rivers is between 10 and 30 tons (Gutleb, quoted by Tello, 2002). Metallic mercury is transformed into inorganic mercury (dimethyl and methyl mercury) by aerobic and anaerobic bacteria located on aquatic environment sediments; it is in this stage where mercury is absorbed and accumulated into fish and then transmitted to human beings that eat them.

It has been considered in the project to perform a mining activity friendly with natural and social environment. Initially recycling inputs used for extraction (mercury) will be considered, which will be recuperated by using a "Mercury reactant" (it allows to use mercury up to 3 times); black sand polluted with mercury and same recycled useless mercury must be deposited in trenches (special pits) duly sealed to avoid contact with biophysical environment. In a second stage will be introduced gold extraction technologies without using mercury, and a third stage will consist in initiating the first action to certificate obtained gold.

Since this is an informal activity, there will be constant training to strength their organization and capacities so they can manage their own small or micro business.

Table 5 Technical description – Gold production

Species	Inputs / Machinery and equipment /Infrastructure
None	Use of 1 g of mercury (Hg) per 1 g of extracted gold (Au) (usually is 2 g of mercury per 1 g of gold)
	Raft, with diesel motor 35 hp
	Mercury (Hg) recuperator
	Security equipment
	Construction of cement pits (or with geomembranes) to bury the back sand. With 1m depth x 4 m wide x 4 m long.

e) Sustainable forest management for timber

There is evidence of logging activity at the area belonging to the project leakage belt. Is a small-scale activity, in other words, commercialized volumes are not huge, but doing a selective logging of high commercial value species (cedar, mahogany, "ishpingo", etc.) are generating impacts to forest like seed trees lost, opening roads for timber transportation using skidder, trucks, etc., that compact the soil and pollute water streams, scare away wildlife and eliminate part of undergrowth from areas under extraction.

The project has a proposal to give continuous technical assistance to forest users so they can develop this activity with low environmental impact, that is to say, planning their activities, optimizing their operations and above all managing forest in a sustainable way.

Table 6 Technical description - Management of wood forest resources

Species	Inputs / Machinery and equipment /Infrastructure
To be selected, according to forest type	Forest Management plan and POA (Operational Annual Plan)
	Map of species dispersion and roads
	Security equipment
	Fuels and lubricants
	Tirfor ®, /Winch
	Chainsaw
	Mobile sawmill and/or low impact technologies
	Timber transport equipment (will be defined according terrain and volume to be transported)

f) Management and marketing of Chestnut:

The operational system of chestnut activity is familiar, generating a wide distribution of economic benefits; however, exploitation profitability is relatively low, due to high extraction costs and small exploitation areas. To this is added that migratory agriculture and extensive cattle breeding have been deforesting big extensions of natural “castañales” (chestnut forests), despite the forbidden logging of this specie.

Referent to chestnut use, there are lots of initiatives that comprise ordering and managing “castañales”, and also the post-harvest manage. Nevertheless, a crucial aspect that project will aboard is to strength chestnut farmers organizations, where there is a lot of weaknesses and has caused that processes started by other projects have not had the expected success.

- **Harvesting:**

Chestnut fruit (“cocos”) fall occurs when rain season starts, because at this point fruits are mature and also cause humidity generated on stalk makes them to rot and cause the fruit to drop from the tree.

Therefore, fruit harvest process is simply a collection with a kind of trident made of palo santo or a cane rod with split end (like a flower) known as “pallana”.

At this moment is when there has to be special care to do a fast collection, because once fruits have felled they get contaminated by soil fungus which, according to investigators studies, belong to genus *Aspergillus.* This contamination is facilitated by warm weather and humid weather at the zone. Once fungi get into fruits, is produced one of the most dangerous mycotoxins.

- **Post-harvest handling**

Once fruits are collected, they are accumulated into “piles” on certain places by the side of a path or “estrada”, this is usually done without the right conditioning; at this moment can also happen fungus

infection, provided that several days had passed and fruits are wet by rainwater. At this place is done the process called “chancado” consisting in breaking the hard shells with a machete to remove chestnuts and proceed to bag them, which is known as “embarricado”.

The “barricas” are taken to the campsite and collected into storages called “payoles” which many times do not have adequate conditions like platforms for chestnuts sacks (barricas) built in order to avoid contact with floor producing humidity generating a third time for fungus infection.

Likewise, storages must be well-ventilated, avoiding temperature and humidity conditions inherent to the inside of a natural products storage, that would propitiate develop and multiplication of fungus and saprophyte bacteria.

In regular circumstances, next to payol there is a flat place called “secadero” (on best conditions is covered by cement), where nuts are spread under the sun; if these ones get wet by rain, it generates a fourth time for fungus infection to occur, so this must be monitored at all times to avoid fungus presence.

- **Transport and storage**

Depending on the place where the “castañal” is located, transport will be by boat and/or automotive vehicles; at this stage as well, must be avoided nuts wetting, being this the fifth critical time to create optimal conditions for fungus infection.

Once chestnut is in the processing centre storage, the barricas will be piled high upon a wooden platform to avoid contact with floor, this piles need to be turned by hand regularly and constantly by hand for ventilation; another alternative is to stock them in round, automatically ventilated metal silos.

Figure 2 shows the complete process of harvesting and post-harvest handling.

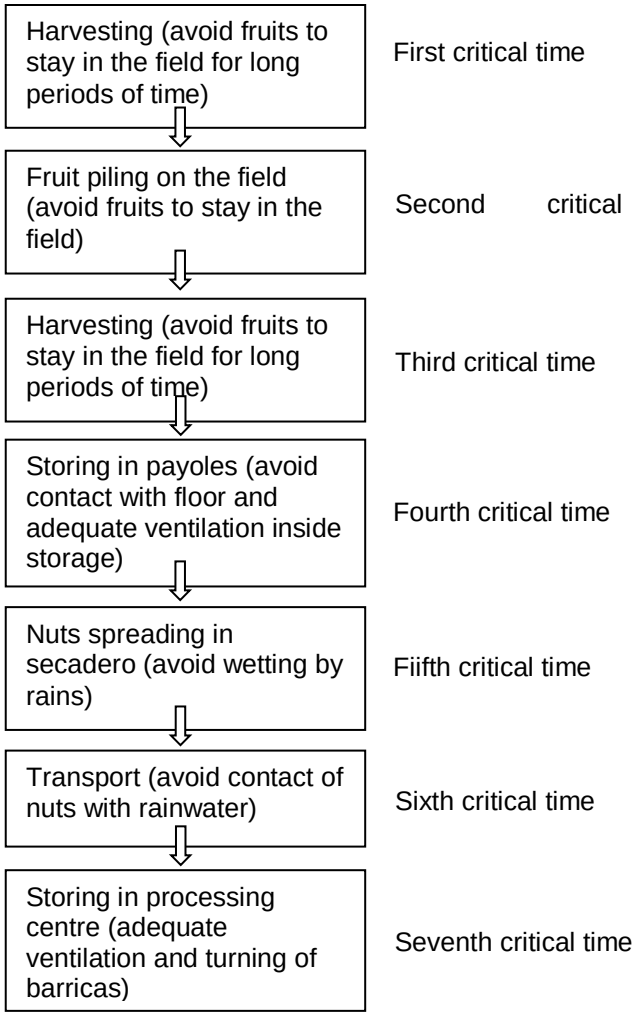


Figure 2 Chestnut production process

Annex 33: list of project activities undertaken during the first year of the project (July 1, 2010-June 30, 2011).

The following table shows the activities during credit period of the project (2009-2029)

Table 7 Project's timetable

	Years																		
	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028	2028-2029	2029-2030
Carbon																				
Starting Date	X																			
Validation			X																	
Registration			X																	
Monitoring		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Re-evaluation of baseline scenario and VCS-PD updating										X										X
Final Date																				
Productive activities																				
Agroforestry	Start	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Palm tree management and conservation	Start	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Aquaculture					Start	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Low mercury gold mining	Start		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chestnut management			Start	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sustainable Forest Management for timber			Start	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Conservation agreements																				
Settlement, tracking compliance, reach agreements with new stakeholders				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Surveillance and control																				
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Forest governance																				
Approaching to institutions, presentations, reach agreements, inter-institutional coordination.	X	X	X	X																
Annual evaluations and adaptation to context changes.					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Partial administration contract RNTAMB and PNBS - Madre de Dios sector.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

1.9 Project Location

Name of the project area: Tambopata National Reserve and Bahuaja-Sonene National Park – Madre de Dios sector.

The project area is politically located in Tambopata and Inambari districts, Tambopata province, department and region of Madre de Dios, Republic of Peru. It takes up south-eastern end of the department, reaching the international border with the Republic of Bolivia. Geographical location map is shown in Figure 3 and with a larger scale in Annex 4. Additionally in figure 4 there is a map of the project area.

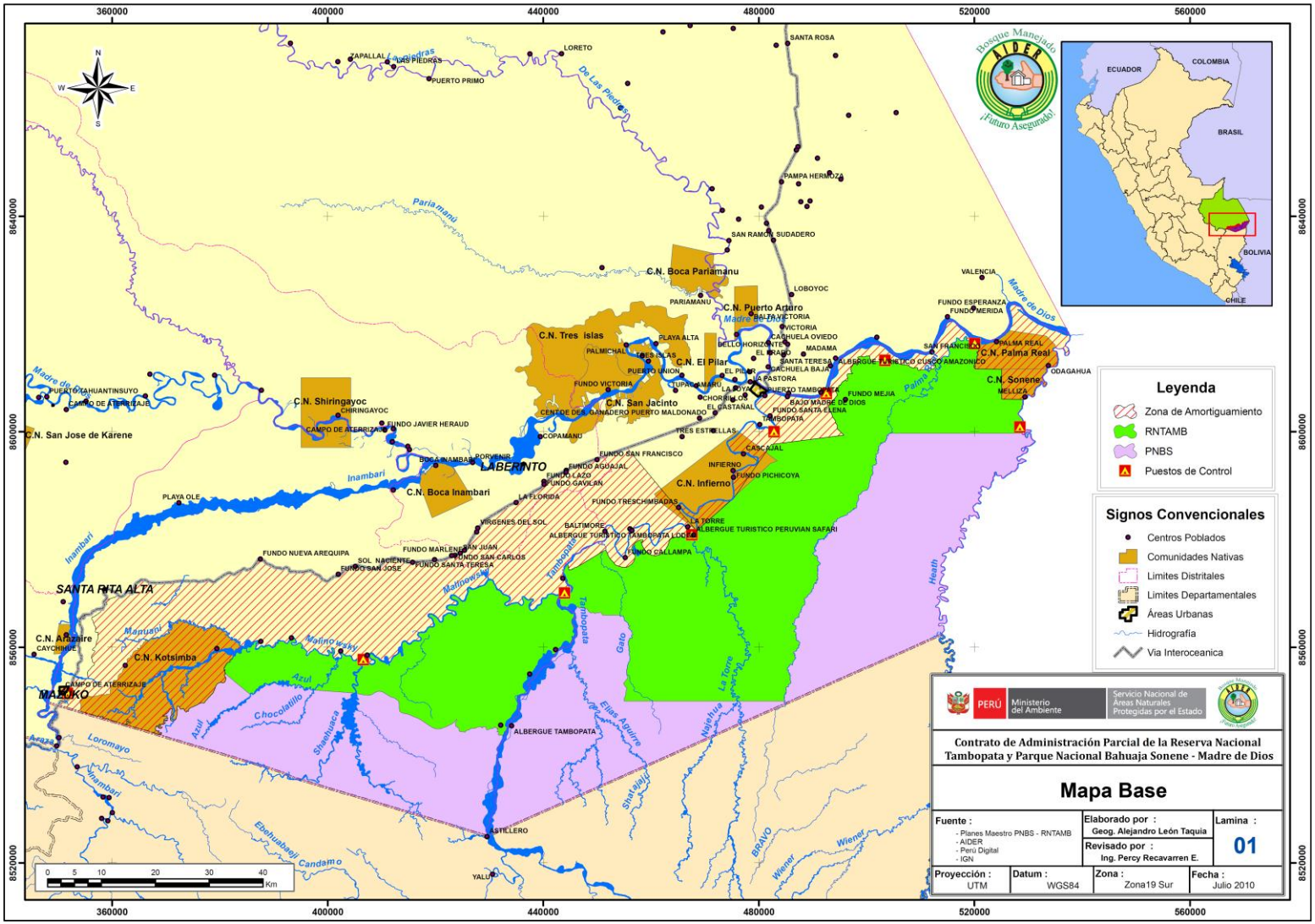


Figure 3 Geographical location map of natural protected areas

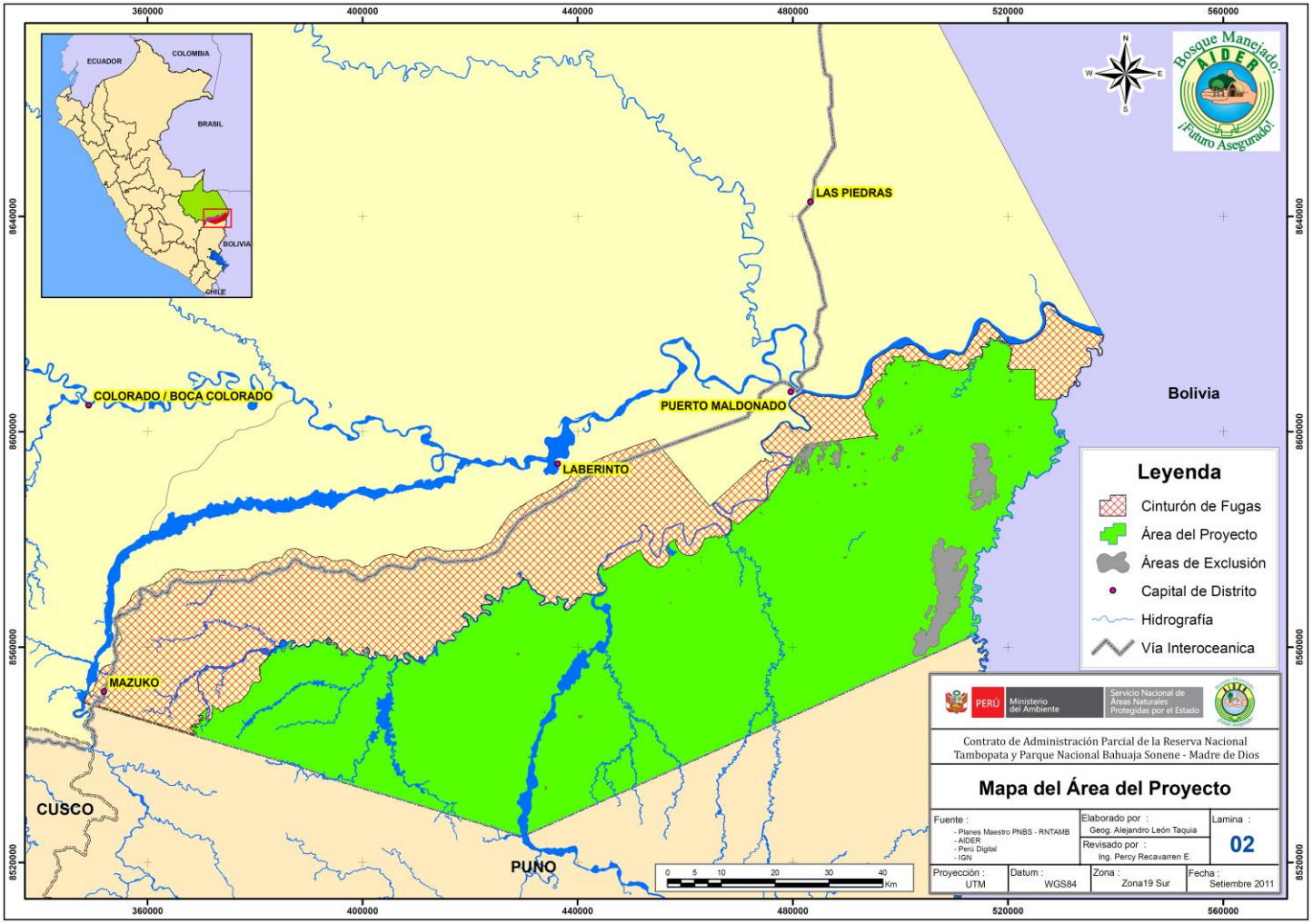


Figure 4 Map of the project area

The total area of the Administration Contract (RNTAMB y PNBS-Madre de Dios) holds 573 299,97 ha, of which 541 620,14 ha have been considered as project area, because they fit, till year 2008, the forest definition in use; the project area, including streams and water bodies (not considered for carbon quantification) holds a total of 556 849,56 ha. Coordinates of the points that delimit the project area are listed in Annex 2 (coordinates of project boundaries) and 3 (Coordinates of exclusion areas within the project).

Placement of project limits was done using Landsat 5 images and GPS Garmin Oregon 550® equipment. The location error of landmarks that delimitate the project area and the exclusion areas are according to standard deviation of residual errors inherent to the satellite images used, which is 4,02 m East and 5,37 m North. GPS equipment error is ± 3 m.

1.10 Conditions Prior to Project Initiation

1.10.1 Biophysical aspects

a) Climate

Climate corresponds to a subtropical humid or very humid forest with an average annual temperature of 26º C (78,80º F), fluctuating between 10º C and 38º C (Rasanen, 1993, quoted by INRENA, 2003b). Low temperatures are associated to cold air masses coming from Antarctica, causing the phenomenon locally known as “friaje” or “surazo”; this is characterized by a temperature decrease, covered skies and persistent rains. The friaje last two or three days although is occasionally longer, mostly in June and July, when it occurs more often. Maximum temperatures reach 38ºC and occur regularly from September to October. Annual precipitation varies between 1600 to 2400 mm (Rasanen, 1993, quoted by INRENA, 2003b) dividing the year in two periods defined by frequency and amount of precipitation: a dry period between April and December and a rain period from January to march, though this time limits vary (INRENA, 2003b).

According to Köppen classification, region climate is AM, that is to say, tropical warm, humid seasonally, characterized by presenting precipitations and a short dry season with no significant influence in vegetation development due to abundance of precipitation during the rest of the year.

b) Hydrography

Tambopata National Reserve, Bahuaja-Sonene National Park and their buffer zones hold part of Tambopata and Heath rivers, formed by large, medium and small gorges that make accessible most of the places during rise of rivers level season.

Tambopata river starts at the heights of Puno department, outside the Bahuaja-Sonene National Park and has as main effluents: Távara river in the same Park, Malinowski river on the right bank; and La Torre (D´Órbigny) river on the left bank, in RNTAMB. Tambopata river nearly does not form meanders and “cochas” (ox-bow lakes) formation is scarce, predominating straight sections bordering river terraces and hills on both riversides. Cochas density from its mouth to the confluence with Malinowski river is four cochas per 100 km (62,14 miles) of river. River width is varying, reaching approximately 250 meters at the lower course of the river, and it can be twice as wide at the middle course, when is over a flat riverbed (Shenck, 1999, quoted by INRENA, 2003b).

Malinowski river starts at Kotsimba native community, out of the Reserve limits, and have as main effluents Pamahuaca, Azul, Malinowsquillo y Agua Negra rivers on the right bank and Manuani river on the left side.

Heath river, from its source in the foothills of the Andes, in Puno department, to its mouth in Madre de Dios river, forms the east boundary of the Reserve and the PNBS, as well as the limit between Peru and Bolivia. The Heath basin limits by the west with the Tambopata basin and by the east with the Alto Madidi basin (in Bolivia); despite being close to the Andes, some parts of the Heath have typical characteristics of a white water river in lowlands. Meander and cochas formation is frequent, with a density of 14,5 cochas pear 100 km of river with an approximately width of 100 meters (Shenck, 1999, quoted by INRENA, 2003b). At the area close to its mouth meanders and cochas are scarce. Main Heath effluents are Bravo and Wiener rivers located in the PNBS (INRENA, 2003b).

Tambopata and Heath waters get to the Brazilian section of the Amazon River through Madre de Dios river. This starts at eastern Andes in Cusco region, flows eastward to Amazon mouth (in Brazil) where it takes the name of Madeira River. Main effluents of Madre de Dios river are Manu, Blanco, Azul, Colorado, Inambari, Tambopata and Heath, on the right bank; and Los Amigos y Las Piedras, on the left bank. There are also smaller effluents inside the Reserve like Palma Real Grande, Palma Real Chico and Briolo gorge (INRENA, 2003b).

c) Physiography and soils

The actual topography of Madre de Dios region is characterized by presenting two big biophysical units: the sub-Andean mountain range and the Madre de Dios valley. These units are different due to their lithological qualities, pedogenetic development, altitude and vegetal coverage types. According with this topography type, major morph-dynamic processes that affect the area are landslides and floods.

Madre de Dios river valley is the most extent and develops to the east of sub-Andean mountain range, between 176 and 500 meters above sea level. It is characterized by a soft and wavy relief, with predomination of floodplains and low hills.

Generally the region soils are poor in nutrients, because the nature of its lithology, a strong chemical weathering (due to high temperature and humidity) and nutrient wash caused by strong rains during most part of the year. With these natural conditions, soil fertility is linked to organic cycle. Abundant vegetal coverage from tropical forest gives a constant supply of organic matter, principally as litter, which after transforms to humus. Due to climate conditions and microorganisms action, organic matter decomposition is so fast that just leaves a thin layer relatively nutrient-rich. It is observed that most of the roots are found in this superficial layer to absorb them.

High terraces soils are generally well drained, have low fertility and can develop toxic aluminum levels. Low terraces soils vary from poorly drained to moderately well drained, depending on how dissected terraces are. They have low to very low fertility and aluminum saturation is very high. At strongly dissected hills and, in less proportion, at high terraces of Madre de Dios river, soils have a loamy texture in the superficial layer and a clay accumulation in the subsoil; consequently, they are very susceptible to erosion. This is aggravated by deforestation, especially in the more strongly dissected units. Soils are moderately well drained, have low fertility and generally high aluminum saturation.

The department soils have very low agricultural potential; those lands that reach this condition (agricultural suitability) have use limitations because their fertility is qualified as “medium low”, with drainage difficulties and flood problems (IIAP, 2001, quoted by INRENA, 2003b).

d) Ecology

According to the Ecological map of Peru (INRENA, 1994), the project area presents the next life zones:

- Bosque pluvial Subtropical bp-S (Subtropical rain forest)
- Bosque húmedo subtropical bh-S (Subtropical humid forest)
- Bosque muy húmedo subtropical (transicional a bp-S) bmh-S/bp-S (very humid Subtropical forest- transitional to bp-S)
- Bosque muy húmedo subtropical bmh-S (very humid Subtropical forest)

Distribution of these life zones within project area can be seen in Annex 8 (ecological map).

According to INRENA forest types map elaborated for master plans of RNTAMB and PNBS, in the project area we find the next types:

- Floodable alluvial forest
- Low terrace forest
- High terrace forest
- Softly dissected terrace forest
- Strongly dissected terrace forest
- Soft steep-low hill forest
- Strong steep-low hill forest
- Soft steep-high hill forest
- Strong steep-high hill forest
- Mountain forest

Distribution of these forest types within project area can be seen in Annex 9 map.

According to the vegetation association map elaborated for master plans of RNTAMB and PNBS, in both protected areas (Madre de Dios sector) we find 12 forest subtypes, considering areas dedicated to agricultural activity as a vegetation association:

- Agricultural activity
- Mining activity
- Swamp with tree vegetation
- Swamp without tree vegetation
- Aguajal (“aguaje”, *Mauritia flexuosa*)
- Forest with aguajal
- Riverine forest
- Pacal(“paca” or bamboo, *Guadua spp.*)
- Forest with paca
- High vigour forest
- Medium vigour forest
- Low vigour forest
- Tropical savannah

Agricultural and mining activity was considered as a vegetation association, because they correspond to land coverage product of human activity. Agriculture match with crop areas and grasslands; mining match with a transformation of original land coverage to bare soil (scale used for analysis doesn’t evidence the totality of bare soils resulting from this activity) (INRENA, 2003b). Distribution of vegetation associations in the project area can be seen on Annex 10.

e) Biological Diversity

Peru is one of top ten biologically diverse countries, with approximately 10% of global diversity; is the fifth country in number of flora species; the first in fish species (10% of world total, near 2000 species of marine and inland waters); second in birds (1 736 species); third in amphibians (332 species); third in mammals (460 species) and fifth in reptiles (365 species) (Estrategia Nacional de la Diversidad Biológica del Peru D.S. 102-2001-PCM, quoted by INRENA, 2003b).

Madre de Dios department, that represents just 7% of national territory, support a considerable portion of country biodiversity, as fauna registries demonstrate: approximately 30% of amphibians, reptiles and inland fish; and 50% or more of mammals and birds reported in Peru (INRENA, 1996 quoted by Conservation International, 1999). The project area in particular presents a high biodiversity, having endemic species and a habitat mosaic with high ecological and sociocultural importance (INRENA, 2003a, INRENA 2003b).

The importance of Tambopata´s natural protected areas, as a part of a representative sample of Peru biodiversity, is established in the light of the information presented at table 8.

Table 8 Wildlife species richness of Protected Areas in the area of the project

Taxonomic group	PNBS Total	% of Peru	RNTAMB Total	% of Peru	Peru Total
Amphibians	74	22,29	103	31,02	332
Birds	607	34,97	632	36,41	1736
Mammals	171	37,17	169	36,74	460
Fish	180	9,00	130	6,50	2000
Reptiles	56	15,34	103	28,22	365
Total	1088	22,24	1137	23,24	4893

Source: INRENA, 2003a, INRENA 2003b

The set of Natural Protected Areas and the actors linked to them (central administration, governmental and non-governmental organizations, grassroots organizations, etc.) represent physical and social components that, besides the relations that link them, form the National System of Natural Areas Protected by the State (SINANPE). The SINANPE has the purpose of contribute to sustainable development of the country through the conservation of a representative sample of biodiversity. Areas incorporated to this system must fulfill biological representativeness criteria, the same that are shown next on Table 9 (RNTAMB) and 10 (PNBS).

Table 9 Biological representativeness of the Reserve

Biological representativeness criteria at site	Tambopata National Reserve
Species Diversity	Investigations carried out in between 1970s and 1980s resulted in records of more than 570 bird , of 1 200 butterflies and many other animal groups. More than 150 types of trees were found in an area of 0,01 km2, becoming one of the world centres for plants diversity identified by IUCN y WWF (TReeS, 1989). Currently, the Reserve has registered 103 amphibian species, 632 bird species, 180 fish species, 16 mammal species and 103 reptile species.
Regions, ecosystems and landscape diversity	Presents the following life zones: very humid Subtropical forest, humid Subtropical forest and the transitional forest between both, as well as vegetation associations like "aguajales" and "pacales".
Endemism	The Reserve is home of endemic fauna known by several localities: amphibians, like *Dendrobates biolat, Scinax icterica, Scinax pedromendinae, Eleutherodactylus toftae*; birds, like *Conioptilon mcilhenyi, Pipra coeruleocapilla, Poecilotriccus albifacies;* and mammals, like *Isothrix bistriata* y *Sciurus sanborni* (CDC-UNALM & WWF, 2000). It protects also wild flora species that are endemic to Peru, like chestnut (*Bertholletia excelsa*).
Rarity	The Reserve also supports species deemed under threat, both by Peruvian law and the UICN categorization.
Migration stop-over sites	Several habitats in the Reserve (beaches, secondary forests and aquatic ecosystems) are stop-over sites for more than 40 bird species like Pa*ndion haliaetus*, *Buteo platypterus*, *Tachycineta leucorrhoa*, among others.
Connectivity	Contributes to continuity of populations and processes supported in the Conservation Corridor Vilcabamba-Amboró, in conjunction with other protected areas in Peru and Bolivia
Size	The Reserve has an extension of 274 690 ha. Being this area adjacent to PNBS, it contributes to the continuity of the ecosystem natural processes, minimum viable populations and genetic diversity of species found in both. The Reserve is the fifteenth protected area as regards extent in SINANPE (the fourteenth among definitive categorization areas) and protects 0,21% of the national territory.
Buffering potential	The complex conformed by Tambopata National Reserve and Bahuaja-Sonene National Park in Peru and the Madidi National Pak in Bolivia, ensures a buffering potential against negative impacts over habitats, species or ecosystems associated to this NPA.

Source: INRENA, 2003b

Table 10 Biological representativeness of the Park

Biological representativeness criteria at site	Bahuaja-Sonene National Park –Madre de Dios sector
Regions, ecosystems and landscape diversity	Representative ecosystems of Bio geographical Provinces: Subtropical Amazonian and Subtropical Yunga. Unique sample of Tropical Wet Savannah in the country.
Species Diversity	High biodiversity area: 74 registered species in 8 amphibian families, 607 registered bird species in 60 families, 171 registered mammal species in 30 families, 56 registered species in 1 reptile family and 180 registered fish species distributed en 30 families (records in whole Park area, Madre de Dios and Puno sectors).
Endemism	Heath plains are a unique habitat in Peru for marsh deer (*Blastocerus dichotomus*), maned wolf (*Chrysocyopn brachyurus*), 02 rodent species and 14 bird ones (Conservation International , 1994). The Park is also home for 05 amphibian species, 02 bird species, and 02 endemic mammal species (a rodent and a marsupial) known by several localities (considering Madre de Dios y Puno sectors) (CDC-UNALM & WWF, 2000). The Park also protects species of wild flora species that are endemic to Peru, like chestnut (*Bertholletia excelsa*).
Rarity	The Park is home for species deemed under threat, both by Peruvian law and the UICN categorization.
Migration stop-over sites	Beaches, secondary forests and aquatic ecosystems are highly important as stop-over sites for transcontinental migratory birds. There are important habitats for at least 20 migratory bird species. (CDC-UNALM & WWF, 2000).
Connectivity	Contributes to continuity of populations and processes supported in the Conservation Corridor Vilcabamba-Amboró, in conjunction with other protected areas in Peru and Bolivia.
Size	The Madre de Dios sector of PNBS has an extension of 294 269,21 ha. In conjunction with PNBS – Puno sector, it contributes to the continuity of the ecosystem natural processes, minimum viable populations and genetic diversity of species found in both.
Buffering potential	The complex conformed by Tambopata National Reserve and Bahuaja-Sonene National Park in Peru and the Madidi National Pak in Bolivia, ensures a buffering potential against negative impacts over habitats, species or ecosystems associated to this NPA.

Source: INRENA, 2003a

- **Flora**

Tambopata National Reserve has a list of 1 255 plants identified in a specie product level, primarily, from investigations made in the surroundings of Explorer's Inn. These investigations contribute to the area to be recognized as one of the world centers for plants diversity identified by IUCN y WWF (TReeS, 1989), quoted by INRENA, 2003b).

Both protected areas are not just characterized by the richness of species that they have, but for supporting species of high commercial value, whose populations endure or endured use pressures exposing them to a certain level of threat, like chestnut (*Bertholletia excelsa*), mahogany (*Swietenia macrophylla*) and shiringa (*Hevea guianensis*) (INRENA, 2003b).

The Heath river sector highlights for the presence of Heath plains, characterized by a very particular vegetation composed by dozens of species of grasses, bushes, basically from Melastomatacea family (*Macairea thyrsiflora*, *Graffenrieda weddellii*, *Bellucia grossularioides*, *Clidemia capitellata*, among others) and trees like *Graffenrieda limbata*, *Matayba guianensis*, *Virola sebifera*, *Xylopia* sp. *Myrcia paivae*, *Hymathantus succuba*, *Remijia firmula* y *Ladenbergia graciliflora* among the most common ones. The palm tree called aguaje (*Mauritia flexuosa)* is found in dense patches at the plain centre and along some of its boundaries (INRENA, 2003a).

The *Ficus insipida* stands, characteristic of meandering successions of upper Amazon river, are underdeveloped at the Heath basin, and even if they are more frequent, they have few leaves, are covered with vines and parasite plants of Loranthaceae and don't have herbaceous undergrowth of large monocotyledons. A predominant specie in this stands is *Acacia loretensis*, which is a support for parasite species of Loranthaceae family; additionally are registries of *Callycophyllum spruceanum, Iriartera deltoidea* y *Alchornea castaniifolia*, which despite being common at the low part of the river, tend to disappear at the high zone. Occasionally is found along the river a bamboo "llorón" which, according to records from RNTAMB staff and info from PACA project, would not correspond to a bamboo, but to a cane from Poaceae family not observed in any other Peruvian river, together with common bamboo or "paca" *Guadua weberbaueri* (INRENA, 2003a).

In Tambopata basin stands out the presence of two bamboo species (*Guadua spp.*) and mature flooded forest, as well as succession series proper of intertwined rivers and stony substrates, but with higher densities of climbing plants and epiphytes associated to the high moisture throughout the year. Amid mountain bamboo, especially along the ravines bottom, we find patches of low hill typical forests. At the base of hills there are occasionally swamp areas composed by aguaje (*Mauritia flexuosa* y *Lueheopsis sp*.), constituting the northern limit of what is a frequent association in many Bolivian swamp forests.

Table 11 Main endangered species of flora in the project area

Scientific name	Common name	Threat status (UICN 2010 - I)	Peru category (D.S. 034-2004-AG)	CITES (appendices)
Cedrela odorata	Cedar	Vulnerable (VU)	Vulnerable (VU)	III
Swietenia macrophylla	Mahogany	Vulnerable (VU)	Vulnerable (VU)	II
Bertholletia excelsa	Chestnut	Vulnerable (VU)	Doesn´t specify	
Dipteryx alata	Shihuahuaco	Vulnerable (VU)	Doesn´t specify	
Cedrela fissilis	Cedar	Endangered (EN)	Vulnerable (VU)	
Caryocar amygdaliforme	Almond	Endangered (EN)	Doesn´t specify	

Source: Own elaboration

- **Fauna**

The Project area is world-wide known for the richness of species of fauna that it supports. By 1980, the preliminary inventory leaded by Pearson in old Tambopata Reserved Zone (ZRT), in the surroundings where the Tambopata and La Torre rivers meet, reports 80 species of reptiles and amphibians, 533 bird species, 77 mammal sp and important numbers of invertebrates, the main ones being Lepidoptera (112 species of butterflies) and Odonata (151 species) (CDC-UNALM/CI/TreeS, quoted by INRENA, 2003b). Subsequent studies, like the RAP of Tambopata executed by the Rapid Assessment Program of Conservation International (quoted

by INRENA 2003b) and inventories carried out in the surroundings of tourist lodges (Explorer's Inn, Tambopata Research Center), confirm the importance of the project area in terms of specie richness (INRENA, 2003b).

In the year 2000, the Conservation Data Centre (CDC-UNALM)-and the World Wildlife Fund (WWF-OPP), compile and systematize the list of available species at that time producing the biodiversity database of Bahuaja-Sonene N.P. and Tambopata N.R. From the analysis of these database, of information handled by the Reserve headquarters, of fish evaluation by Chang and of Ascorra and Mitchell investigations (forthcoming document) and Doan and Arizabal (INRENA, 2003B), have resulted the identification of 103 amphibian species , 632 bird species, 169 mammal species, 103 reptile species and 205 fish species for the Reserve (INRENA, 2003b).

The fauna for the project area not only highlights because its richness in species, but also for having species considered exposed to high levels of danger, both by national legislation (D.S. 034-2004-AG) and by Red List of Endangered Species created by International Union for Conservation of Nature (IUCN, 2010); among them stand out the ones presented on Table 12:

Table12 Main species of endangered fauna in the project area

Scientific name	Common name	Threat status (UICN 2010 - I)	Peru category (D.S. 034-2004-AG)	CITES (appendix)
Ateles chamek	Spider monkey	Endangered (EN)	Vulnerable (VU)	
Pteronura brasiliensis	Giant river otter	Endangered (EN)	Endangered (EN)	I
Pauxi unicornis	Unicorn curassow	Endangered (EN)	Doesn´t specify	
Tapirus terrestris	Amazonian tapir	Vulnerable (VU)	Vulnerable (VU)	II
Primolius couloni	Blue macaw	Vulnerable (VU)	Doesn´t specify	I
Coryphaspiza melanosis	Masked finch	Vulnerable (VU)	Vulnerable (VU)	
Podocnemis unifilis	Taricaya turtle	Vulnerable (VU)	Vulnerable (VU)	
Priodontes maximus	Giant armadillo	Vulnerable (VU)	Vulnerable (VU)	I
Geochelone denticulata	Motelo turtle	Vulnerable (VU)	Doesn´t specify	
Ara militaris	Green macaw	Vulnerable (VU)	Vulnerable (VU)	I
Tinamus osgoodi	Black tinamou	Vulnerable (VU)	Vulnerable (VU)	
Blastocerus dichotomus	Marsh deer	Vulnerable (VU)	Vulnerable (VU)	I
Vampyressa melissa	Yellow ears bat	Vulnerable (VU)	Vulnerable (VU)	
Lagothrix lagotricha	Small Woolly monkey	Vulnerable (VU)	Vulnerable (VU)	
Dinomys branickii	“Picuro mama / pacarana”	Vulnerable (VU)	Endangered (EN)	
Tayassu pecari	White-lipped pecary	Near threatened (NT)	Doesn´t specify	II
Agamia agami	Agami Heron	Least concern (LC)	Doesn´t specify	
Neochen jubata	Orinoco goose	Near threatened (NT)	Doesn´t specify	
Chrysocyon brachyurus	Maned wolf	Near threatened (NT)	No se especifica	II
Panthera onca	Jaguar	Near threatened (NT)	Near threatened (NT)	I
Harpia harpyja	Harpy eagle	Near threatened (NT)	Vulnerable (VU)	
Ara couloni	Light blue-headed green macaw	Vulnerable (VU)	Vulnerable (VU)	
Ara macao	Red macaw	Least concern (LC)	Vulnerable (VU)	I
Ara chloroptera	Red and green macaw	Least concern (LC)	Vulnerable (VU)	
Ajaia ajaja	Roseate Spoonbills	Least concern (LC)	Endangered (EN)	

Source: Own elaboration

The project area offers healthy habitats to recover and shelter populations of big mammals (INRENA, 2003b). Among them are species that during decades, especially in the 1950s, were object of intense hunting due to the high value of their skins/furs, until exposing them to high levels of threat. This is the case of the otter, giant river otter and jaguar, as well as felines *Leopardus pardalis* y *Leopardus wiedii*. Despite currently this hunting has diminished considerably, they are still under threat, mainly because habitat loss. Furthermore, has been found that in the protected area live large populations of species that are rarely found elsewhere in the Amazon jungle because excessive poaching, specially tapirs and spider monkeys, but also jaguars, white-lipped peccaries, medium-sized and large monkeys and caimans (Walsh, 2007).

The presence of species on which exist little information about their population status, like bush dogs *Atelocynus microtis* y *Speothus venaticus,* or endemic species like *Dendrobates biolat, Scinax icterica, Scinax pedromendinae, Eleutherodactylus toftae* (anfibios), *Conioptilon mcilhenyi, Pipra coeruleocapilla, Poecilotriccus albifacies (aves), Isothrix bistriata y Sciurus sanborni* (mammals), among others, is relevant for the role of the area in the project in terms of constructing a representative sample of the country biodiversity (INRENA, 2003b).

The project area outstands for achieving registers of new species for science. On year 2002, Conservation International publish the reports of biological evaluation of Heath Plains, carried out in 1996 at three localities: Juliaca, Las Pampas (both evaluated for a second time) and Enahuipa in the Heath river sector and also in Quebrada Palma Real Grande, where there were obtained 19 new records of amphibians, 16 of birds, 4 of mammals and 25 of reptiles (INRENA, 2003a).

Ascorra and Mitchell investigations report 4 mammal species new for Peru: *Lutreolina crassicaudata*, *Eumops* maurus, *Holochilus* sp., y *Pseudoryzomys simples* (1 marsupial, 1 bat and 2 rodants, respectively), all situated in the Heath river sector (including Las Pampas) (INRENA, 2003a).

1.10.2 Socio-economic aspects

a) Human occupation in Madre de Dios

Madre de Dios department has been historically the most isolated region of Peru. Although since the fifteenth century some Inca expeditions entered, and lately Spaniards ones, is only at the end of the nineteenth century that occurs an important migratory flow, when the rubber "barons" move indigenous population from other Amazonian regions to the nowadays Madre de Dios territory to work in as slaves.

Successive entrance of missionaries and colonizers looking for different natural resources (Cascarilla tree, rubber, chestnut, gold, wood) caused that original native communities were forced to migrate to less accessible zones, changing their grouping patterns and in general, affecting their populations.

When rubber tappers get into Madre de Dios they take with them workers from the coast, sierra and Indians from central and northern jungle, dispersing and inclusively exterminating the original native communities of the department, which see themselves obligated to abandon their ancestral territories or to retire to less appropriate areas for their lifestyle. This continuous dispersion and internal mobility of Indians diminished significantly only in the 1970s with the law of creation of native communities (INRENA, 2003b).

During the first decades of the twentieth century, the government stimulated colonization, being south Andean dwellers the first migrants; then began to arrive small groups from Loreto, San Martín and Ucayali departments, as well as foreign colonizers, many of which ventured into

agriculture, wood or chestnut extraction at small scale, and in some cases in mining, while rubber was losing hegemony as main economic activity (INRENA, 2003b).

During the 1940s starts again a gold interest and arrive more population groups from south Andes. With the opening of the highway to Cusco, in 1960s, volume of migration from Cusco increases gradually till getting over migration from Puno prevalent before, until becoming massive from 1980s, when "gold fever" reactivates (INRENA, 2003b); is in this decade that is constructed the first dirt road between Puerto Maldonado and the Brazilian border (Dourojeanni, 2006).

In 1990, over an extension of de 1 478 942,45 ha, the Ministerial Resolution N° 032-90-AG/DGFF created the Reserved Zone Tambopata-Candamo, occupying part of Madre de Dios (Tambopata province) and Puno territories. In 1996, via Supreme Decree N° 012-96-AG, part of its surface is annexed to Pampas de Heath Natural Sanctuary to conform the Bahuaja-Sonene National Park; the area left was open for further categorization. On year 2000, the Supreme Decree N° 048-2000-AG allocates part of this territory for Bahuaja-Sonene National Park expansion and another one to create the Tambopata National Reserve, resting 262 315 ha excluded to form part of the buffer zone for both natural protected areas. Local population (indigenous, chestnut extractors, farmers), tourism sector and union organizations have been linked, directly or indirectly, with categorization and management processes of both natural protected areas (RNTAMB y PNBS) (INRENA, 2003b).

b) Demography

By 1993, 45.1 % of Madre de Dios population were foreigners and on 2003, near 50% was born in any other department of Peru or in overseas, and most of people born in that department were descendent of migrant families (INRENA, 2003b).

The 2007 census reports a total of 109 555 inhabitants in Madre de Dios, making it the less populated department of Peru. RNTAMB and PNBS are neighboring the most populated Madre de Dios territories: Tambopata province holds 71, 67% of departmental population.

Watching the behaviour of departmental-level censed population from 1993 and 2007 census, major increase is in Madre de Dios region, with a population volume rise of 63,5%, growing with an annual average rate of 3,5%, which is equivalent to 3039 habitants per year. When analyzing population density behaviour between 1940 and 2007 census in terms of number of times, is observed that two jungle departments: Ucayali and Madre de Dios, are the ones with more rate-of-rise of population density, with 21,0 and 13,0 times respectively; the current density of Madre de Dios is 1,3 habitants/km2. The males proportion (54,3 %) is the most elevated in Peru, due to migrant condition and to the most common jobs (INEI, 2008).

Table 13 Census population in Madre de Dios, 1940 – 2007

1940	1961	1972	1981	1993	2007
4 950	14 890	21 304	33 007	67 008	109 555

Source: INEI, 2008

Table 14 Average annual growth rate of census population in Madre de Dios, 1940 – 2007 (Percentage)

1940-1961	1961-1972	1972-1981	1981-1993	1993-2007
5,4	3,3	4,9	6,1	3,5

Source: INEI, 2008

Net migratory balance shows the population gain or loss in the departments, is the difference between immigrants and emigrants, thus, on year 2007, Madre de Dios presents a positive balance of 33 747 (INEI, 2008).

Table 15 Distribution of migrant population by department

	Immigrants				Emigrants			
	1988-1993	**% of national total**	**2002-2007**	**% of national total**	**1988-1993**	**% of national total**	**2002-2007**	**% of national total**
Madre de Dios	29 355	0,6	44 985	0,8	9 287	0,2	11 238	0,2

Source: INEI, 2008

Most part of immigrant people is generally absorbed in urban centres, even if their work activity is at countryside (double residence system is much extended in the different settlements at the buffer zone as well as both situated in the Reserve). Puerto Maldonado, department capital, is the city with highest urban expansion and where is observed the increase and diversification of services, principally tourism related ones. Other cities moderately populated are Laberinto and Mazuko (INRENA, 2003b).

The larger concentration of population is in the Puerto Maldonado-Mazuko road, mostly farmers, and eventually timber producers or traders, representing 61% of the population at the buffer zone (BZ) by 2003, likewise the smaller concentration is in the axis Bajo Madre de Dios, which most numerous group corresponds to native communities from Palma Real and Sonene, what means 6, 1% of settled population in the ZA for that year. The two left axis have similar numbers of population: in Tambopata river, 1975 inhabitants (17, 4%), mainly farmers, chestnut extractors and Infierno Native Community members; in Malinowski river axis, basically miners in disperse settlements and residents in Kotsimba N.C. with 1770 inhabitants (15, 5%) (INRENA, 2003b). The urban population of Madre de Dios has at the moment 80 309 habitants, representing 73, 3% of total department population (INEI, 2008).

Regarding native population, population and housing census of 1993 provided the quantity of 5349 habitants which represent 8% of regional population. Considering natural growth rate projected by INEI, we could calculate approximately 6500 native for 2003 without considering migration. However, 2007 census totalized native population in 4005 habitants.

Table 16 Native population in Madre de Dios

Year of census	**1993**	**2007**
Total Native Population	5349	4005

Source: INEI, 2007

Master Plan of RNTAMB 2204-2008 registers 2 settlements inside the Reserve: Nueva America, in the gorge of the same name, with 150 habitants, approximately, and Sandoval, by the Shore of Sandoval Lake, with an estimate of 50 habitants. At the same time is indicated the existence of parcels from other settlements that overlap the Reserve territory, as Loero case. The Reserve buffer zone, for its part, had 50 settlements, estimating in them a total of 11 369 habitants, which would represent 53,8% of population from the three involved districts, excluding population from Puerto Maldonado. Comparing the population numbers of 1993 census against the ones obtained for the buffer zone in 2003, would result a demographic growth in 10 years equal to 64, 3%, being growth from Malinowski axis population the most significant one with 134,4% and growth from Bajo Madre the smaller one with 17% (INRENA, 2003b).

c) Economic activities and land use

Actual productive base of Madre de Dios is dominated by extracting activities and services disconnected between them, highlighting among them mining and nature tourism, followed by agricultural production not correspondent to the productive capacity of the soil, neither to local demand volume; it counts with an incipient industrial sector, principally micro and small business with a significant growth rate, that basically qualifies the construction sector (INRENA, 2003b).

In Madre de Dios, the economic activity that contributes more significantly to the regional GDP is gold mining. In between 1999 and 2001, mining represented between 40,4% and 35% of regional GDP, following in importance agriculture (8,4 %), manufactured goods (7,3 %), governmental services (7,1 %), other services (6,6 %), trading (5,1 %), hotels and restaurants (4,1 %), construction (2,2 %), electricity and water (22,2 %) y transports and communications (1,8 %) (Mosquera *et al*, 2009).

Mining in Madre de Dios is confined to, fundamentally, the extraction of alluvial gold. Production volumes have been increasing remarkably along time: 500 kg in July 1990, rises to 9 600 kg in 1995 and to 10 832 in 2001 (INEI-ODEI, 2002, quoted by INRENA, 2003b). It is estimated that production reached 15 223 kg in 2008 (MINEM, 2008).

Most of the department mining activity started and continued for a great while being held by small-scale miners, who operated in scarce and dispersed places using completely artisanal techniques. In 1970s decade, the State established an incentive to gold mining, impelling migration towards Madre de Dios; from 1980s the internal migrations increased throughout the country, due to the economic crisis and political violence, which added to an increase of international gold prices, produced a massive migration of peasant from south of the country towards Madre de Dios, who settled at riversides and gorges looking for gold (INRENA, 2003b).

Nowadays there are in the Department a large number of small miners, mostly illegal, operating with highly polluting artisan technology as it uses mercury, whose waste is disposed in the main rivers as Jayabe, Malinowski and Huacamayo. The vast majority of mining operations started just having submitted the permit application (mining right request), assuming it gives them the right to property and permission to start up, even when they have knowledge of the mining regulations and administrative procedures required.

Mining operations occur even within the project area due to the proximity of major roads, such as Inter-Oceanic Highway. In the buffer zone and the National Reserve, these illegal activities are conducted principally in the Malinowski River basin, and to a lesser extent, in the rivers Tambopata and Madre de Dios (DGAAMEM, 1997, cited by INRENA, 2003b). Unusually, overlap occurs between the mining rights in the region and Madre De Dios' Protected Areas, and their buffer zones. The main goal of Protected Natural Areas is the preservation of representative samples of the national biodiversity, therefore the extraction of nonrenewable resources that require the removal of all vegetation cover is not permitted in this area (Mosquera et al., 2009)[3].

In Tambopata National Reserve there are 27 concessions with title and 58 concessions mining claims pending. Similarly, the buffer zones (ZA) are not respected: ZA in Tambopata National Reserve and Bahuaja-Sonene have 38 concessions with title, and out of 168 pending

[3] According to Natural Protected Areas Law, art. 22, National Parks protect intangibly the ecological integrity of the ecosystem (including biological, ecological, landscape and cultural characteristics). While National and Communal Reserves may establish areas where commercial use is allowed under resource management plans, approved, monitored and controlled by the national competent authority. However, the Master Plan of the area ANP disapproves gold mining.

concessions, mainly along the river Malinowski, only 3 of them were entitled ordered before the creation of these protected areas, the vast majority of the filings date from the last years (Mosquera et al., 2009).

Agriculture has been practiced in Madre de Dios from times previous to colonizer waves described before. The original native communities developed a small-scale migratory culture (slash-and-burn), which in a certain way, despite having changes, is maintained among most of actual producers, either being members of native communities or from the different migratory waves. In general, all those who live in rural settlements practice agriculture to a greater or lesser extent; most of the cases it is for own consumption, being those who settle along the road who more frequently produce for the local market (INRENA, 2003b). Main crops are yucca, banana, rice and hard yellow corn; there's also produced, in smaller volumes, papaya, bean, and soy (MINAG-OGPA, 2002, quoted by INRENA, 2003b).

The regional agriculture is predominantly traditional, with the following characteristics: migratory system, common seeds use, restricted hand-operated harvesting, inadequate application of external inputs and weather dependent. All this results in its very low productivity and yield (MINAG-OGPA, 2002, quoted by INRENA, 2003b).

In relation with cattle farming, animal breeding is generally made in a family manner and extensively, is practiced together with agriculture and in many cases, complements other activities (mining, wood extraction, chestnut extraction, service provision). Vaccine stockbreeding, where is predominant a zebu type, registers 38 060 heads on 2002, happening , in areas close to Puerto Maldonado, numerous cases of farmers that practice pastures management and care the genetic improvement of their cattle by artificial insemination. By 2002 were accounted also 5 520 ovine heads, most of them localized by the Puerto Maldonado-Mazuko road (INRENA, 2003b).

Law Nº27308, Forest and Wild Fauna Law enacted in 2000, creates the Permanent Production Forests (BPP), with the aim to order forestry in the Amazon jungle. Madre de Dios was the department where initiated the process of forest concessions having place the first public concourse in 2002.

Madre de Dios is the only department of Peru with important concentrations of chestnut forest (*Bertholletia excelsa*) which cover an approximate extension of 2 500 000 hectares, from which and important percentage is harnessed, generally by forest concessions also established by the Forestry law. This resource is concentrates mainly in Tambopata, Laberinto and Las Piedras districts, in Tambopata province and Tahuamanu district, in Tahuamanu province; around 100 000 ha (4%) are in between RNTAMB and PNBS, in lesser amount at PNBS (INRENA, 2003b). Inside RNTAMB exist 85 concessions and, inside PNBS, 13 concessions (GPAN, 2008). Chestnut is harnessed with a certain commercial orientation since 1930s, having, nowadays, an increasingly important contribution to departmental GDP, a more technical production and a relatively more ordered exploitation.
In relation with the internal structure of regional GDP, agriculture, hunting and silviculture sector contributes in 1995 with 32, 1%. However, the 2002 strategic plan of agricultural sector indicates that this participation lowered at the end of 1990s to 13, 7% despite the wood "boom" in year 1999 (INRENA, 2003b).

Tambopata has been a touristic destiny since 1975, when two businessmen founded the first lodges, the Explorer´s Inn and Cusco Amazónico, located by Tambopata and Madre de Dios riverbanks, respectively. From then the touristic industry has grown enormously, especially during 1990s, thanks to a control of political violence, the creation of Tambopata-Candamo Reserved Zone and the renown gained by the area thanks to scientific studies that placed in evidence its high biodiversity. In 1989, there were only 3 touristic establishments normally functioning in the area and annual touristic flow through Puerto Maldonado was just 3000 visitors. In 2002 were 24 establishments and touristic flow through Puerto Maldonado exceeded

18 000 visitors per year. The touristic annual flow that makes use of RNTAMB and PNBS is estimated in 12 800 persons (Kirkby, 2002). Despite a decrease between 1998 and 2001, in absolute numbers the foreign tourism grows 128, 4% between 1990 and 2001 8INRENA, 2003b). In 2008, the RNTAMB registered the entrance of 33 617 visitors (32 458 foreigners and 1 159 national) (MINCETUR, 2009).

According to 2007 census, most part of Madre de Dios labour force dedicates to non-qualified jobs, followed by those who dedicate to personal services and trade and market salespersons. Just 2, 8% of population is unemployed as shown on table 17.

Table 17 Labour force aged 15 and over in the Department of Madre de Dios

Main occupation	Total	Occupation category						
		Employee	Laborer	Independent worker	Employer or patrón	Unpaid family worker	Household worker	Unemployed
Executive and legislative power members, public administration	129	115	-	-	14	-	-	-
Teachers, scientific and intellectuals	3 234	2 754	-	409	60	11	-	-
Middle level technicians and similar workers	2 929	1 789	-	842	275	22	1	-
Chiefs and office employees	2 019	1 989	-	2	-	28	-	-
Personal service workers and trade and market salespersons	8 279	2 700	210	4 380	272	716	1	-
Agricultures, agriculture/livestock and fishing qualified workers	5 152	11	6	4 380	272	716	1	-
Laborers and workers of mines, quarries, manufacturing industry and others	5 530	-	2 622	2 430	389	89	-	-
Workers of construction, clothing, paper, industries	7 020	838	2 488	3 514	123	57	-	-
Non-qualified workers, services, farm worker, sales person, peddler and similar	12 358	1 530	6 800	1 882	40	1 136	970	-
Others	405	405	-	-	-	-	-	-
Unspecified occupation	1 890	597	537	575	51	130	-	-
Unemployed	1 404	-	-	-	-	-	-	1404
Total	**50 349**	**12 728**	**12 663**	**18 878**	**1 515**	**2 189**	**972**	**1404**

Source: INEI, 2007

d) Life conditions, services and health

Madre de Dios department and Tambopata province are not considered among the poorest places of the country. The potentialities map of Peru, elaborated by UNDP, locates Madre de

Dios region in place Nº7 among the 24 Peru regions and to Tambopata province in Nº20. Basic services concentrate in the capital city or in district capitals (INRENA, 2003b).

Health coverage in the department presents many deficiencies, because 69, 7% of population doesn't count with any type of health insurance, while 35, 8% is affiliated to a State Insurance and the rest to a private insurance, as is observed on table 18.

Table 18 Total population, classified by affiliation to some type of health insurance

(Department, province, district, urban and rural area, gender and age group)

POBLACIÓN TOTAL, POR AFILIACIÓN A ALGÚN TIPO DE SEGURO DE SALUD

DEPARTAMENTO, PROVINCIA, DISTRITO, ÁREA URBANA Y RURAL, SEXO Y GRUPOS DE EDAD	TOTAL	AFILIADO A ALGÚN SEGURO DE SALUD			
		SIS (SEGURO INTEGRAL DE SALUD)	ESSALUD	OTRO SEGURO DE SALUD	NINGUNO
Dpto. de MADRE DE DIOS	**109,555**	**17,827**	**18,018**	**4,242**	**69,721**
Menos de 1 año	2,489	1,075	323	61	1,033
De 1 a 14 años	31,934	11,035	4,778	893	15,283
De 15 a 29 años	34,671	3,450	4,003	1,304	25,954
De 30 a 44 años	24,380	1,334	5,347	1,098	16,705
De 45 a 64 años	13,178	694	3,083	745	8,702
De 65 y mas años	2,903	239	484	141	2,044

Source: INEI 2007

e) Education

According to 2007 census, in Madre de Dios department are identified seven different mother tongues, prevailing Spanish, Quechua and native languages. 9, 17% of population doesn't have any education, while 36, 7% get to finish secondary school. In the buffer zone of Tambopata NR, 42 from the 50 human settlements registered till year 2003 had primary school (84, 9%), most of them with a single teacher; likewise, five of populated centers in that area had secondary school (INRENA 2003a, INRENA 2003b).

Table 19 Population aged 3 and over, according to educational attainment in Madre de Dios

Language through which people learned to speak	Total	Educational attainment							
		No level	Initial ed.	Primary	Secondary	Tertiary Incomplete non-university education (college)	Tertiary Complete non-university Education (college)	Tertiary Incomplete university education	Tertiary complete university education
Quechua	16 830	1 612	95	5 936	6 220	877	811	550	729
Aymara	991	69	3	265	410	62	83	36	63
Asháninka	30	4	2	10	11	1	-	2	1
Other native language	2 095	507	69	826	511	73	52	32	25
Spanish	81 427	7 058	2 708	20 625	30 160	5 156	5 213	5 082	5 425
Foreign language	309	37	8	49	42	13	10	12	138
Is deaf-mute	106	51	6	24	10	7	1	1	6
Total	**101 788**	**9 338**	**2 890**	**27 735**	**37 364**	**6 189**	**6 170**	**5 715**	**6 387**

Source: INEI, 2007

f) Transport infrastructure and its implications for the region

For native population and a great majority of rural settler, river transport continues being the most used one.

Ground transport settles on a set of vehicular transit roads and numerous footpaths. The most important road is the one that connect Puerto Maldonado with Cusco city (constructed from 1963) that is used for passengers' regular transport and also for fuel and various heavy loads. Regular aerial transport at the department starts in 1943 communicating by this way Puerto Maldonado with the rest of the country (INRENA, 2003b).

The road that connects Puerto Maldonado with Cusco was lacking compacting and was generally in bad shape because frequent rains, making the travel between both cities to take, in the best case, approximately two days, and in the worst, until two weeks.

In 2006 starts the construction of South Interoceanic Highway, which is framed within the work of the Regional Integration of Infrastructure in South America Initiative (IIRSA), launched in 2000 by 12 by the governments of the region with support of the Inter-American Development Bank (IDB), of the Andean Development Corporation (CAF)and of the Financial Fund for the Development of the River Plate Basin (Fonplata). IIRSA includes promotion of 10 integration axis that link paths, roads, rivers and ports that exist in South America (MTC, 2009). The South Interoceanic Highway consists of 3 existing highways that have to be asphalted or improved, which link Ilo, Matarani and San Juan de Marcona ports, in the southern coast of Peru, with Acre state, in Brasil. The highway will connect with motorways BR-317 and BR-364 in Brasil, which will join the Peruvian highways with Brazilian cities Rio Branco and Cuiaba, as well as the commercial ports of the country Atlantic coast. The Brazilian side (BR-317 and 364)of the interoceanic highway has been already partially constructed (Spang 2005). In figure 5 and Annex 12 is found the map of highway's complete layout in Peru.

Figure 5 South Interoceanic Highway
Source: Own elaboration

With the asphalting of the highway, travelling time has decreased considerably: The Puerto Maldonado-Cusco route takes approximately 12 hours and Puerto Maldonado – Iñapari (border with Brazil) near 5 hours. Thanks to a better accessibility, and therefore a costs and transport problems reduction, the mobility of people and goods is increasing progressively.

Till the moment, the main impacts have been negative. Social and environmental problems at the South Interoceanic Highway influence area are due to intensification of four accelerated processes by the road project: (a) alluvial gold mining (stimulated by the high prices of this metal); (b) wood extraction; (c) Andean highlands citizens migration to the jungle (stimulated also by high poverty rate in the southern Andes); and (d) migrant population concentration in the city of Puerto Maldonado.

These processes are in turn time increasing:

1. Slash-and-burn deforestation for agricultural purpose;
2. Frequency and severity of forest fires;
3. Invasion of the natural protected areas, principally Tambopata National Reserve, Bahuaja-Sonene National Park and Amarakaeri Community Reserve;
4. Commercial illegal hunting;
5. Illegal extraction and correspondent degradation of forest resources;
6. Reduction of landscape natural beauty and touristic value in the high jungle and jungle brow zones.
7. Air and water pollution with urban waste and tailings water generated by mining activity.
8. Biodiversity loss (by deforestation, hunting, fishing and pollution).
9. Reduction of the region potential to provide environmental services like carbon fixation and clean water flow;
10. Dissemination of vector and sexually transmitted infections;
11. Invasion of territories belonging to the last indigenous peoples in voluntary isolation.

12. Mining invasion of fragile basins, native communities territories and protected areas;
13. Land use and land ownership conflicts, both in the city and in the country.
14. Common delinquency;
15. Precarious settlements formation (misery villages) at urban zones;
16. Forced and slave work in mining and illegal logging;
17. Prostitution and sexual traffic of underage people, mainly at mining camps (Felipa y Raez Luna, 2007).

At the reference region of the project, starting from the interoceanic highway or from the main navigable rivers, it exist numerous highways or transversal motorized roads, in some cases constructed more than 20 years ago and in their majority on the last 10 years (hydrographical and regional highway net maps are found in Annex 7 and 13, respectively).

This highways and roads had as an excuse to open lands for agriculture, but their real purpose was to access hardwood forest or, in between Puerto Maldonado y Puente Inambari, to facilitate gold mining. Many of these lines cover distances of more than 50 km and from their ends they were continued by small-scale wood extractors and miners (Dourojeanni, 2006).

The roads start especially from populated centres Primavera Alta, Unión Progreso, Las Mercedes, Vírgenes del Sol, were nowadays forestry tractors are being used.

Local, regional and national public opinion, traditionally in favour of highway construction and improvement, considers almost unanimously that the work will bring economic benefits and doesn't evaluate environmental and social impacts.

g) Regional conservation initiatives

The natural protected areas form, together with the territory that surrounds them, a land-uses mosaic which connect natural forests fragments through landscape, constitute the so- called conservation corridors (Conservation International, 2000, quoted by INRENA, 2003b). Conservation corridors are a proposal for managing vast territories towards a sustainable development in the frame of the land-use planning that integrates protected areas and allow them to contribute to local and regional development, beside accomplishing their conservation goals (INRENA, 2003b),

The Vilcabamba-Amboró Conservation Corridor (CCVA) is a vast territory that includes natural protected areas from Bolivia and from south of Peru, located within one of the most important zones for biodiversity conservation in the world: the Tropical Andes. The approximate area of CCVA is 30 million hectares, from the Vilcabamba Mountain Range in Peru to the Amboró National Park in Bolivia, forming a network of 19 protected areas, 11 in Peru and 8 in Bolivia (Conservation International, 2007).

The Corridor core is the complex of natural protected area formed by Tambopata National Reserve and Bahuaja-Sonene National Park, in Peru, and Madidi National Park, in Bolivia. There have been coordination between the three of them, as part of a bi-national management construction (Peru-Bolivia); successful results have been obtained that contribute to the NPA zoning process and to the creation of agreements to move forward in the development of bi-national strategies for tourism that benefit native communities Ese'éja and Tacana, among the most important aspects (INRENA, 2003b).

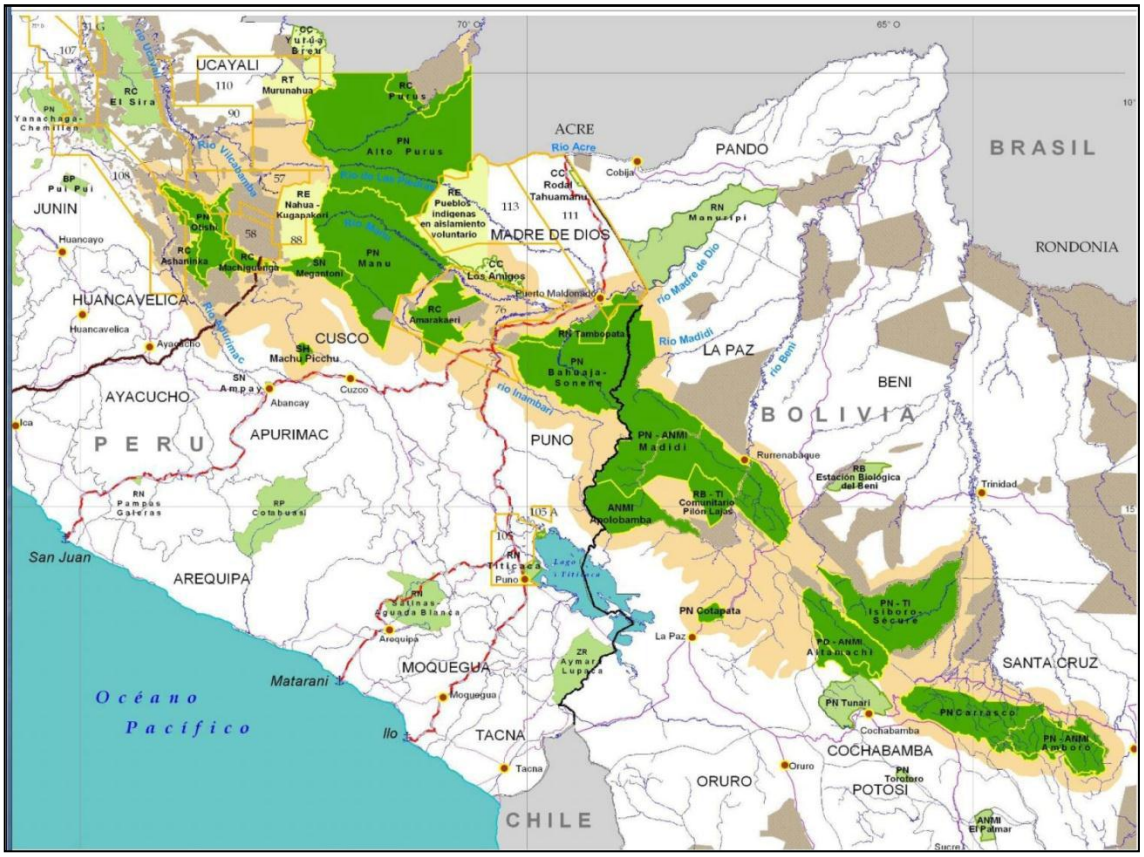


Figure 6 Vilcabamba-Amboró Conservation Corridor
Source: Conservation International, 2007

Through the corridor and Bahuaja-Sonene National Park area corresponding to Puno department, the project area is related to the Tropical Andes hotspot, which is considered the richest and more biological diverse in the world, with the higher number of species and endemic species of birds and mammals, as well as 10% of vascular plants species. This hotspot has an extension of 1 542 644 km^2 and comprises part of Colombia, Ecuador, Peru, Bolivia, Venezuela, Chile y Argentina. Despite the Tropical Andes hotspot occupies just the sixth place in terms of extension; it is considered to have the higher number of endemic species of the planet (Conservation International, 2007).

The project activity is to reduce emissions produced by deforestation and forest degradation (REDD), which are produced because of historical-social processes described above, without mediating action or influence from the project proponent; therefore, the project will not be implemented with the aim of generating GHG emissions to reduce them after.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

During the past decade, at the beginning of the project, laws and regulations conducive to the establishment of compensation mechanisms for environmental services have passed, but these are limited to express general purposes of the State, which have not been put into practice. This is the case of Law No. 28611, General Environmental Law, which states that the State establishes mechanisms to value, reward and retain the provision of environmental services (among which considers mitigating emissions of greenhouse gases), seeking to ensure the conservation of ecosystems, biodiversity and other natural resources. The Act stipulates that the Ministry of Environment (MINAM), in his capacity as National Environmental Authority,

promotes the creation of financing mechanisms, payment and monitoring of environmental services.

Additionally, **Law Nº 27308, Forest and Wild Fauna Law,** which has ruled forestry sector since year 2000, points on its Article nº35 – Compensation for forest environmental services, that "the State will implement from year 2005 compensation mechanisms for pollution damages produced by fossil fuels consume, which will be destined to finance activities of conservation, natural areas rehabilitation and forest and wildlife research". Nevertheless these mechanisms were not implemented. The recently promulgated **Law Nº 29763, Forest and Wild Fauna Law** (July 21st, 20011) will be effective when its rules of procedure are approved, according to the law's sixth final complementary disposition; in the meanwhile Law 27308, Forest and Wild Fauna Law, and its rules of procedure, are applied. Law 29763 will be regulated within a period of not more than one year counting from its publication in the official newspaper El Peruano, according to its seventh final transitory disposition.

Furthermore, the **National Environmental Policy** (approved by **Supreme Decree No. 012-2009-MINAM**) states, within their policy guidelines concerning the use of natural resources, promote the design and implementation of economic and financial instruments, systems compensation, remuneration policies and distribution environmental services. Furthermore, the policy guidelines regarding priority forests include full use of forest resources, supporting initiatives in respect of timber and non-timber resources, wildlife and environmental services.

Thus, the project activity is in accordance with the purposes expressed by these regulatory frameworks regarding the establishment of mechanisms for payments for environmental services.

Currently, at the Congress there is a pre-project of environmental services law approved by the respective Commission and waiting for its discussion in a plenary session. This proposal has been elaborated having a MINAM previous proposal as a basis.

Law No. 26834, Natural Protected Areas Law, states that the natural condition of these areas must be maintained in perpetuity and may allow the regulated use of the area and the use of resources, or determined the restriction of direct use; the project meets to maintain the natural condition of the NPAs that comprise the project area. This Act provides two categories of protected areas, in which are allowed or restricted certain activities, project activities are in accordance with established permitted uses for each of the categories of NPA, as follow:

a. Areas of indirect use, those who allow non-invasive scientific research, recreation and tourism, in appropriately designated and managed zones; in these areas it is not allowed to extract natural resources, neither to modify nor transform the natural environment. Inside this category are the National Parks.

b. Areas of direct use, those who allow resource harnessing or extraction, giving priority to local populations, in the zones and places and for those resources, defined by the area management plan; any other uses and activities to be developed must be compatible with the area objectives. Inside this category are the National Reserves, on which is allowed the commercial exploitation of natural resources only under management plans being approved, supervised and controlled by the relevant national authority.

The figure of the Administration Contract is contemplated in the NPA Law, where is specified that the State recognizes and promotes the private participation in the Natural Protected Areas management. The granting of rights to privates obligates them to follow the policies, plans and rules that the Relevant National Authority, in this case the SERNANP, determines for the protected areas. The **Chief Resolution N° 155-2002-INRENA** approved the list of natural protected areas that can or cannot be entrusted to a third party by administration contracts,

being among the top ones the RNTAMB and the PNBS. Likewise, through **Chief Resolution Nº 270-2001-INRENA** were approved the Complimentary Dispositions to the Rules of Procedure of the Natural Protected Areas Law for awarding of Administration Contracts.

Here are, in rank order, laws and regulations governing the activities permitted within protected natural areas and their buffer zones, provided the activities proposed by the project (see 1.8) with those requirements.

According the **Rules of procedure of the Natural Protected Areas Law (approved by DS Nº 038-2001-AG)** the activities done in Buffering Zones cannot put at risk the accomplishment of the Natural Protected Areas goals; in these Zones agroforestry systems development will be promoted (one of the activities selected by the project), among other several activities. The Master Plan of each NPA establishes the criteria to implement these activities, giving priority to those proposals that contemplate participation of peasant or native communities and local population in general in their development.

AIDER has been conducting Participatory Rural Appraisals in populations of the buffer zone, through which identifies the most appropriate activities according to reality, expectations and proposals of each population, this process has been documented according to the requirements standard of Climate, Community and Biodiversity (CCB).

According to the Law Rules of Procedures, in the Natural Protected Areas of indirect use it is not allowed the natural resources extraction as well as changes and transformations of natural environment, except those useful for their administration or those necessary for maintaining or recovering of the same; exceptionally, and under modalities allowed by respective law, Director Plan, Rules of procedure, Master Plan and Management Plan, it can be done an exploitation of renewable natural resources or products derived from them, provided that this activity is considered in the Master Plan and zones are specifically identified for that. In the natural protected areas of direct use, in the cases established by the Master Plan, within the allowed zones and according to correspondent specific management plans, it can be done an exploitation of non-wood forest resources for self-consumption or commercialization, giving priority to local population. In the indirect use areas the exploitation of non-wood forests resources is only allowed at a small scale, by traditional populations that live within the area, for subsistence purposes. These is fulfilled in the cases of RNTAMB and PNBS, in which Director Plans the chestnuts contracts partially or totally within their areas, awarded by the relevant authority, are considered.

The Rules of Procedure also indicates that the chief of the Natural Protected Area or, if appropriate, the executor of the Administration Contract, will promote the signing of agreements with registered local settlers, Peasant or Native Communities, to develop minor activities, consisting in small scale economic services provision or exploitation of natural resources.

The **SINANPE Director Plan** indicates that Buffer Zones (BZ) are established with the main purpose of minimize negative impact of human activities on NPA values and facilitate their connectivity; their design and planning must be oriented to improve the unique interactions that exist between each NPA and its BZ. To make these interactions explicit, to construct and consolidate alliances for conservation, as to help to project the NPA sustainable development goals and the good government principles towards the surrounding landscape, NPA and BZ must take into account, among others, the next guidelines:

- To identify all critical interactions that link the NPA with the local populations and surrounding landscape, paying special attention to those that lead to direct conflict situations.

- To understand the values and functions that local populations attribute to the NPA and the surrounding landscape.

- To inform local populations about the international, national, regional and local importance of the NPA, trying to generate a proud and appreciation sense for the NPA values.

- To determine strategies that can assure a balance between populations' immediate needs with long-term objectives of the NPA. To promote environmentally friendly practices.

- To provide and alternative resources base, especially for livelihoods, that minimizes gradually the BZ population dependence to NPA resources.

- To explore and apply mechanisms to provide benefits that compensate the opportunity costs that the NPA could impose to local populations through, for example, adopting good practices that in a short term would generate an income decrease due to productivity decrease of production systems.

- Reinforce the participation of all groups interested in the planning processes associated with the NPA.

- To determine responsibilities, authorities and compromises of the different interested groups facing the planning results, particularly those correspondent to the buffer zone and larger contest.

- To establish and consolidate participation opportunities/spaces and mechanisms to assess the evolution of the different interactions and compromises.

- To inform populations and local authorities on the benefits of applying a landscape scope in the development planning to improve the levels of social and environmental welfare.

The **Master Plan of the RNTAMB 2004-2008** establishes, in the general guidelines for the Buffer Zone that activities carried out in the BZ cannot put at risk the accomplishing of the RNTAMB goals; in this regard they must promote alliances with local populations settled in there and with the different public and private sectors. Furthermore, it established as a priority the renewable resources harnessing against the non-renewable resources exploitation, besides the need to recognize and legally formalize the existent rights at the BZ with the aim of stabilizing the populations and to be able to regulate the natural resources use in a better way.

In the frame of current regulations in the buffer zone it is encouraged the establishing of:

a) Regional, municipal and private conservation areas establishment
b) Ecotourism
c) Manage or recuperation of flora and fauna populations
d) Environmental services concessions
e) Research
f) Habitat recovering
g) Agroforestry systems development

In the frame of the forest management (under Law Nº27308, current Forest and Wild Fauna Law) in the buffer zone can be established:

a) Forests in reserve production, where rights for harvesting non-wood products and wild fauna can be awarded.

b) Forests for future use: Forest plantations, secondary forests and degraded forests for restoration.

c) Forests on protection land, where ecotourism, endangered flora and fauna restoration and non-wood products harvesting can be operated.

d) Local forests, where wood and non-wood products harvesting can be operated, with authorizations and permits.

In lands with agricultural capacity within the buffer zone a minimum of 30% of forest mass and a strip no less than 50 meters from riverbeds, bodies of water and other similar has to be reserved (according to current Forest and Wild Fauna Law).

Every activity, project or work done in the buffer zone, requires and environmental impact evaluation (according to Rules of Procedure of Natural Protected Areas Law). Evaluation of this impact can be done by Environmental Impact Studies (EIS), Environmental Impact Declarations ("DIA"), Environmental Compliance and Management Program ("PAMA") or can be considered in a renewable resources management plan; this will depend of the activity type operated and requirements of each sector.

Mining titles obtained in the buffer zone, considering the special treatment of it, shall present their environmental impact studies.

In the buffer zone of RNTAMB the relevant authority must promote the following activities:

a) Reforestation with production, protection and environmental services purposes in lands with forestry prime use, without or with scarce vegetal cover, by means of concessions (according to Forest and Wild Fauna Law).

b) Harnessing of non-wood forest resources in primary natural forests, under the next modalities (according to Forest and Wild Fauna Law):

- Concessions for other forest products (chestnut, aguaje, palmito, vines, resins, rubbers, medicinal plants, stockbreeding in the animal natural habitat).
- Concessions for ecotourism.
- Concessions for conservation.
- Concessions for environmental services.

c) Forest timber harvesting in secondary forests and forest plantations by means of authorizations and permits (according to Forest and Wild Fauna Law).

d) Forest timber and non-timber harvesting in local forests, which can be established in residual primary forests, secondary forests or forests in protection lands and are awarded to rural settlements and populated towns (according to Forest and Wild Fauna Law and its Rules of Procedure).

e) Management and harnessing of wild fauna with commercial purposes through areas of wild fauna management in land properties of public domain (according to Forest and Wild Fauna Law).

f) Development of Agroforestry systems in land of agricultural capacity (according to Forest and Wild Fauna Law), in local forests and native and peasant communities forest.

g) Regional, municipal and private conservation areas.

h) Management of flora and fauna populations.

i) Fishing.

j) Habitat recuperation (ecological restoration).

k) Research.

1.12 Ownership and Other Programs

1.12.1 Right of use

The project area is constituted by 2 Natural Protected Areas, which, according to NPA Law, is part of the Heritage of the Nation and cannot be awarded in property to privates.

The lands are property of Peruvian State – National Service of Natural Protected Areas (SERNANP). The numbers of property titles can be seen next.

Table 20 State property titles over the NPA of the project area

Natural Protected Area	Nº of Title	Surface area (ha)
Tambopata National Reserve	0621200000003075	254 358,00
Bahuaja-Sonene National Park	2009-00004814	323 569,77

The certificates of registration of property are in Annex 27.

As mentioned, the State has awarded its consent for the project execution through the signing of the Administration Contract subscribed by AIDER.

1.12.2 Emissions Trading Programs and Other Binding Limits

The Project is not included in an Emissions Trading Program; this program does not exist in Peru up to date. Likewise, Peru does not have commitments to limit GHG emissions.

1.12.3 Participation under Other GHG Programs

The project has not been registered or rejected by any other GHG program, nor is seeking that registration.

1.12.4 Other Forms of Environmental Credit

N/A

1.12.5 Projects Rejected by Other GHG Programs

N/A

1.13 Additional Information Relevant to the Project

Eligibility Criteria

N/A (this is not a grouped project).

Leakage Management

It is considered that the Project will generate a leakage by activity shifting (see Annex 24). The next components of the project strategy: "Conservation agreements" and "Productive activities promotion" are directed to mitigate the risk of leakage (see section 1.8).

The potential market leakage effects have been considered not significant, according to the calculations found in Annex 31 and spread sheet - Significance (T-SIG).

Commercially Sensitive Information

Project cash flow

Further Information

The area of the partial Administration Contract of RNTAMB and PNBS –Madre de Dios sector is nowadays mostly covered by subtropical humid primary forest, presenting a little percentage of non-forest areas (tropical savannah and deforested zones). The Administration Contract area holds 573 299,97 ha, from which have been excluded the surfaces categorized by the project as "non-forest" (i – deforested areas, ii - tropical savannah, and iii – agricultural activity mosaic and secondary forests patches). Therefore, the project area holds 556 849,56 ha, from which 541 620,14 ha correspond to primary forest and 15 229,42 ha are bodies of water. The surfaces detail is observed in Table 21.

Table 21 Area surface of the project and exclusion areas regarding the area of the partial Administration Contract of RNTAMB and PNBS – Madre de Dios sector

Area Category		Surface area (ha)
Area of the partial Administration Contract of RNTAMB and PNBS – Madre de Dios sector		573 299,97
Project Area	**Project Area (forest)**	**541 620,14**
	Bodies of water	15 229,42
	Total	**556 849,56**
Exclusion areas	Agricultural activity/secondary forest	500,66
	Deforestation	3 010,32
	Tropical Savannah (Pampas del Heath)	12 939,43

For the elaboration of the Master Plans of Tambopata National Reserve and Bahuaja-Sonene National Park, the INRENA (2003a, 2003b) determined, based on its physiographic-floristic criteria, the existence of several forest types in both NPA. These forest types were used as an information source for the area stratification, previous to the quantification of carbon stored in it (see Annex 21); during field inventory, conducted by AIDER on year 2009, validation of this classification precision was done on each sample plot. The information obtained by the inventory on each forest type shows, among most representative species[4], primary forest tree species, some of them with commercial value, which in the case of a disturbed forest, are the

[4] The most representative species were determined based on abundance and dominance, evaluating individuals found in plots with 16 m radius (here were evaluated Diameters at Breast Height of 20-50cm) and 30 m radius (here were evaluated Diameters at Breast Height >50cm)

first ones to disappear so they would be absent. From this we can deduce that the project area has a low degree of human intervention.

The project area is considered "forest" according to the national definition. Peru has opted for the following parameters for its forest definition as agreed by the UNFCCC in 2001:

- A minimum canopy cover of 30 per cent;
- A minimum land surface of 0,5 hectares (1,24 acres), and
- A minimum tree height of 5 meters (16,4 feet).

In 1996, INRENA defined priority zones for Peru's biodiversity conservation, including the area called Tambopata-Heath, which was covered with the definitive categorization of the Tambopata-Candamo reserved zone, same that has been described in section 1.10.

Despite the legal protection status that these NPA hold, they are vulnerable to the establishing of activities incompatible with their creation objectives. To difficulties inherent in monitoring and patrolling extent and difficult access areas, it has to be added the scarce budget assigned by the Peruvian State to the successive organizations entrusted for their management (Forestry and Hunting General Direction, Natural Protected Areas Intendancy, SERNANP), which is traduced in huge limitations for the area headquarters and management committees at the time of enforcing the protected area objectives and plans. In the practice, they are continuously under pressure of forest degradation agents (mainly high valued timber species selective extraction), and also deforestation advance in their buffer zones and, in the last years, within the areas, product of population increase and better access.

The REDD mechanism will allow the financing of biological monitoring and investigation; actions of control, surveillance and monitoring of human activity impacts, as well as promotion of sustainable economic activities in the buffer zone, which allow local population to improve their standard of living without generating considerable impacts on the environment.

By signing Administration Contracts, the State seeks to improve the natural protected areas management and to face the problem of its little presence and institutional limitations, through participation of non-profit entities. The current partial Administration Contract of RNTAMB and PNBS – Madre de Dios sector proposes the financing of the contract activities by mean of VCUs sale, also seeking to promote an adequate inter-institutional coordination in the region.

The indirect environmental impacts of highway improvement or construction in Amazonian conditions are very serious; an emblematic case is precisely the BR-364 that forms the Interoceanic highway in Brazilian territory. The paving of this highway in the 1980s, which dirt road was opened in the 1970s, caused what was considered an environmental and social disaster in the northern Mato Grosso, in Rondonia and in Acre (Dourojeanni, 2006). In the case of Peru, the construction of highways towards the Amazon jungle has occasioned also serious environmental and social impacts. This is because both countries have historically considered the Amazon as a region to be incorporated to national economy, being, during last century, a constant in the State policies the construction of these roads, the foment of colonization and the landscape modification to install traditional economic activities (agriculture, livestock breeding, mining), as a means to relieve social tensions in other country regions. The improvement of these highways increases at the same time these activities profitability, raising their opportunity cost with regard to standing woodland[5].

It has been documented the Marginal highway paving impact in the Huallaga river valley: in 1986 disturbed area covered only 14,8% of the valley, but until 2001 disturbed area (without forest vegetation or with secondary forest vegetation) was already reaching 31,1% of area wide

[5] See Moore, Thomas: State of the natives against gold mining in Madre de Dios. EORI - 1992

(CDC-UNALM, quoted by Dourojeanni, 2006). Similar results have been obtained in the case of other highways indirect influence area, like the highway Huánuco-Pucallpa. It is considered - based in conservative models analysis - which 40% of Amazon forest will have disappeared in the middle of 21st century, including two thirds of the 6 main basins (Silveira Soares Filho, quoted by Dourojeanni, 2006).

The experience has been, in all Amazonian asphalted highways, that neighbouring protected areas have been degraded in a much greater speed and intensity than before the highway improve. That is why in all terrestrial transport projects of Brazil and other countries are included obligatory compensatory measures in favour of the affected protected areas (Dourojeanni, 2006).

In April 2009, an intention memorandum between Peru and Brazil governments is signed, one of which 6 points foresee the construction of 6 hydroelectric plants in Peruvian territory. First of these projects to be execute is the Inambari hydroelectric, situated between Cusco, Puno and Madre de Dios departments. The reservoir will flood 41 000 ha, covering even a 4,6% of the PNBS buffer zone in Puno department. According to the construction company, the area to be flooded area has a population of 3261 inhabitants (Constructora OAS Ltd, 2009), although news media sources say that is almost 8000 people distributed in 30 localities (Luna and Vela, 2009). This population contingent will be forced to move towards other areas; while the construction company assures that they will be moved to planned new settlements (OAS, 2009), it can't be guaranteed that all involved people will participate of this ordered relocation process. Another important impact that this plant would cause is the flooding of approximately 106 km of the Interoceanic highway (Luna and Vela, 2009), obligating to relocate affected stretch (OAS, 2009). Currently it isn't known which would be the new highway route, but it is possible to suppose that would be closer to PNBS, inside its buffer zone. If the hydroelectric plant construction takes place, would represent a potential threat to integrity of forests within the project area, due to population displacement that it would lead to

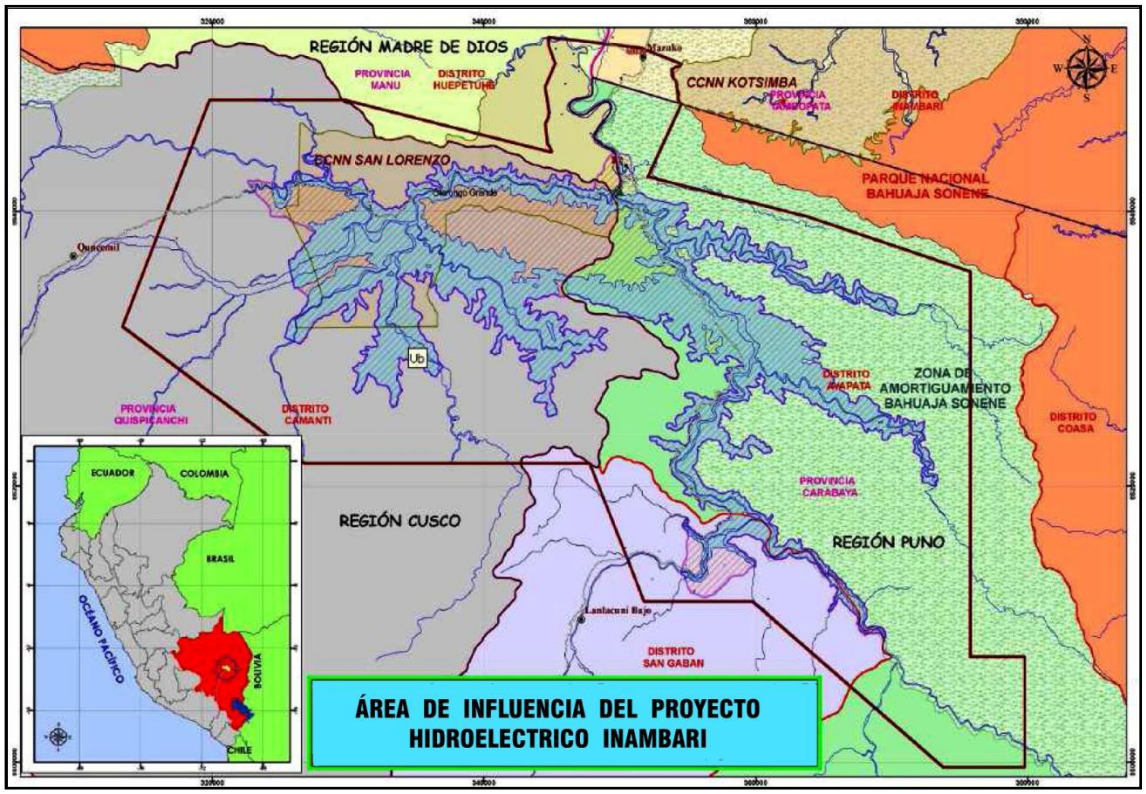


Figure 7 Reservoir and influence area of Inambari hydroelectric project
Source: *Engineers Association of Peru, 2009*

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Approved VCS Methodology VM0007, REDD Methodological Modules (REDD-MF) version 1.1, developed by Avoided Deforestation Partners.

The utilized modules are numbered next; selection of carbon pools and emission sources that determined the election of these modules is described in 2.3.

- Module VCS VMD0001 **"**Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools" **(CP-AB) version 1.0**

- Module VCS VMD0007 "Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation" **(BL-UP)** version 2.0

- Module VCS VMD0010 "Estimation of emissions from activity shifting for avoided unplanned deforestation" **(LK-ASU) version 1.0**

- Module VCS VMD0013 "Estimation of greenhouse gas emissions from biomass burning" **(E-BB) version 1.0**, it will be used for *ex-post* assessment of non-CO_2 GHG emitted from biomass burning.

- Module VCS VMD0015 “Methods for monitoring of greenhouse gas emissions and removals” **(M-MON)** version 2.0

- Module VCS VMD0016 “Methods for stratification of the project area” **(X-STR) version 1.0**

- Module VCS VMD0017 **“**Estimation of uncertainty for REDD project activities” **(X-UNC) version 1.0**

Additionally to the methodological modules, the next tools:

- VCS Tool VT0001 “Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities”.

- AFOLU Non-Permanence Risk Tool version 3.0.
- "Tool for testing significance of GHG emissions in project activities A / R CDM" version 01 (T-SIG).

2.2 Applicability of Methodology

Without the Project, population increase and, therefore, the establishment of agricultural and illegal mining activities, which start mainly from the interoceanic highway, will cause a continuous process of deforestation and degradation, getting inclusively to transform soils to a status in which forest cannot regenerate, situation that is observed in other zones of the department with high presence of illegal miners. The project activity is therefore AUDD (Avoiding unplanned deforestation and degradation).

The methodology is constructed using modules from REDD Methodology more appropriate to the project conditions: quantification of carbon stocks in the above- and belowground biomass (excluding the other pools, as is explained on section 2.3), use of the baseline scenario modules, and leakage with unplanned deforestation.

There is compliance with the conditions for the applicability of the methodology (REDD-MF):

- The project area is currently covered by primary subtropical wet forest (the land in the project area has been qualified as forest for at least 10 years before the project start date), according to satellite image analysis carried out for the stratification of the project area, which is developed in Annex 21. A mosaic of Landsat 5, which you can check this statement is in the file Geodatabase_Shapefiles.mdb.

- The project area may include forested wetlands, as long as they do not grow on peat. Peat is defined as organic soils with at least 65% organic material and a minimum thickness of 50 cm. The project area includes a forest type that meets the conditions of forested wetland (forests that are inundated or saturated by surface water or soil in such frequency and duration that under natural conditions there are organisms that are adapted to poorly aerated soils or saturated), which is the mixed swamp, the same as shown in Table 01 and Figure 06 of Annex 22 (quantification of carbon stock), but this has not been excluded from the project area, since it does not grow on peat. The soil evaluation in Annex 32 shows that there are not peat soils.

- The project area is under AIDER administration, by virtue of the contract subscribed with the Peruvian State, which is owner of the carbon rights (project proponents must be able to show control over the project area and property over the carbon rights for the project area at the time of verification).

- Baseline deforestation and degradation in the project area fit into the category of Unplanned Deforestation (VCS category AUDD)

- There aren't areas of land registered under the CDM or other carbon trading scheme. The Framework Convention on Climate Change United Nations (The United Nations Framework Convention Climate Change - UNFCCC), on its website, which publishes all the projects under the Kyoto Protocol (Clean Development Mechanism - CDM), in Peru's case, three projects have been recorded on agriculture, afforestation and reforestation, which are:

    - Reforestation, sustainable production and carbon sequestration project in Ignacio Tavara´s dry forest, Piura, Peru

    - Palmas del Espino – Biogas recovery and heat generation from Palm Oil Mill Effluent (POME) ponds, Peru

    - La Calera Bio digesters Project Peru

These projects are for Piura's Departments, San Martin and Ica therefore to January 2012 the UNFCCC does not record any project for the Department of Madre de Dios, so the project does not overlap any CDM contrasts.

- The land is being converted to an alternative use and it is common that there is no forest regeneration (see deforestation numbers in Annex 23).

- The activities to avoid leakage do not include: agricultural lands that are flooded to increase production (e.g. paddy rice) neither intensifying livestock production through use of "feed-lots" and/or manure lagoons.

- Deforestation agents in the baseline scenario: (i) Remove coverage for settlements, agricultural or cattle production, without reaching the size of large-scale industrial agricultural activities (each owner/ landholder/ occupant has a maximum of 60 ha)[6]; (ii) are lacking documented and uncontested legal rights to deforest land for these purposes; and (iii) are resident in the reference region or immigrants.

- The use of post-deforestation land does not constitute reforestation, but farming activities and illegal gold extraction.

REDD-MF Framework states that, if the degradation is caused by legal or illegal extraction of wood, the Framework will not be used. In the project area, the cause of forest degradation in the study identified "Estimation of forest degradation by human activities in the Tambopata National Reserve and Bahuaja Sonene, sector Madre de Dios" (Recavarren and Castro, 2012) is precisely, the illegal logging, which is the most recognized cause of forest degradation in the Amazon Plain in Peru. This degradation has been omitted from the calculations conservatively emission baseline and therefore not claim credit for avoiding it; however, will be monitored and any emission produced will be subtracted from the benefits of the project.

Module CP-AB is applicable for all forest types and ages classes; inclusion of the aboveground tree biomass pool as part of the project boundary is mandatory

Module BL-UP is applicable for estimating baseline emissions from unplanned deforestation (conversion of forest land to non-forest land in the baseline case). The module is applied to all project activities where the baseline agents of deforestation have got the characteristics

[6] These conditions are met in Madre de Dios, adding the presence of mining.

mentioned above (clear the land for settlements and small-scale crop production, have no legal rights to deforest the land, are either residents in the region or immigrants).

LK-ASU: the module is applicable for estimating carbon stock changes and greenhouse gas emissions related to the displacement of activities that cause deforestation of lands outside the project area due to the avoided unplanned deforestation in the project area. Activities subject of potential displacement are: conversion of forest land to grazing lands, crop lands, and other land uses. The module is obligatory if BL-UP has been used to define the baseline and the applicability criteria in BL-UP must be complied with in full.

E-BB: The use of this module is mandatory. If fire is used to clear the land or constitutes a cause of forest degradation, this results in GHG emissions. Its inclusion in the baseline is always optional; in this case, it was not considered; nonetheless, the module will be used to estimate emissions in the case that *ex post* burnings occur.

M-MON: The module is always mandatory.

X-STR: Any module referencing strata *i* will be used in combination with this module.

X-UNC: The module is mandatory. It is applicable for estimating the uncertainty of estimates of emissions of CO_2-e generated from REDD project activities.

Module VMD0008 "Estimation of baseline emissions of forest degradation caused by fuel wood extraction" (BL-DFW) was not used. According to REDD-MF, this module is mandatory when this degradation by extraction of firewood and charcoal. The condition of applicability of BL-DFW says collecting firewood and charcoal production should be "non-renewable" in the baseline period. Coal production in Madre de Dios is done with activity waste wood from sawmills mainly of Permanent Production Forests, delivered to individuals through concessions, according to the Forest Act and Wildlife in effect, by which does not involve a decrease in carbon stocks in the project area, in particular dead wood, litter and soil organic carbon.

By contrast, the degradation in the project area is caused by illegal logging (Recavarren and Castro, 2012), which will be monitored according to the procedures of the module M-MON (see monitoring plan in Section 4).

2.3 Project Boundary

The project will measure and monitor the carbon stock in aboveground and belowground biomass, both for baseline scenario and the project case. Likewise, it will measure the GHG emissions different from CO_2 that would produce *ex post* as a consequence of biomass burning.

The methodological framework (REDD-MF) considered mandatory to use the "Tool for testing significance of GHG emissions in project activities A/R CDM". In this case, we have considered the criteria first VCS AFOLU Requirements document, as well as those of the methodological framework to include reservoirs and sources of emissions within the project boundary. To rule out the significance of the reservoir of wood products were used steps 1 and 2 of that tool (see Worksheet – Linea base y caso del proyecto.xls and Spreadsheet - Significacion (T-SIG).xls), and it was considered as not significant for not reaching the 5% of the total project benefits.

In Table 22 are observed the mandatory, optional and not significant carbon reservoirs for VCS REDD projects; likewise, in Table 23 are presented the elected reservoirs according to the criteria contained in the document Agriculture, forestry and other land use (AFOLU) requirements (VCS, 2011), as well as in the methodological framework REDD (REDD-MF). Table 24 shows the emissions sources and GHG considered.

Table 22 Mandatory, optional and not significant carbon pools for VCS REDD projects

		Above-ground tree* biomass	Above-ground non tree* biomass	Below-ground biomass	Litter	Dead wood	Soil	Wood products
REDD	Planned or unplanned deforestation/degradation (APD or AUDD) with annual crop as the land cover in the baseline scenario	Y	O	O	N	O	O	S
	Planned or unplanned deforestation/degradation (APD or AUDD) with pasture grass as the land cover in the baseline scenario	Y	O	O	N	O	N	S
	Planned or unplanned deforestation/degradation (APD or AUDD) with perennial tree crop as the land cover in the baseline scenario	Y	Y	O	N	O	N	S

Y: Carbon pool shall be included in the project boundary.
S: Carbon pool shall be included where project activities may significantly reduce the pool, and may be included where baseline activities may significantly reduce the pool, as set out in Sections 4.3.7 to 4.3.20. The methodology shall justify the exclusion or inclusion of the pool in the project boundary.
N: Carbon pool does not have to be included, because it is not subject to significant changes or potential changes are transient in nature. The pool may be included in the project boundary because of positive impacts to reducing or removing emissions. Where the carbon pool is included in the project boundary, methodologies shall establish criteria and procedures to set out when a project proponent may include the pool.
O: Carbon pool is optional and may be excluded from the project boundary. Where the pool is included in the methodology, the methodology shall establish criteria and procedures to set out when a project proponent shall or may include the pool.

Source: VCS AFOLU requirements

Table 23 Selection of carbon pools examined in the baseline scenario and for the project case

Carbon pools	Included Yes / No	Justification / Explanation of the Choice
Above-ground biomass	Yes	Mandatory pool for REDD projects, according to VCS AFOLU requirements and to the methodology used (REDD-MF)
Below-ground biomass	Yes	According VCS AFOLU requirements, it can be mandatory or optional, depending on the type of land use change that would occur in the without-project scenario. According to methodology used (REDD-MF), it must be included every time it is significant. Since there is enough scientific knowledge to do the assessment of carbon stocks in this pool, the project proponent will consider it.
Litter	No	It is not necessary to include this carbon pool, according to VCS AFOLU requirements, since it is no subject of significant changes. According to methodology used (REDD-MF), this pool is not significant. On this basis the project proponent is allowed to omit it conservatively.
Soil organic carbon	No	According to VCS AFOLU requirements, it is not necessary to include this carbon pool, since it is not subject to significant changes. The pool could be included because positive impacts on emissions reduction. Despite the fact that in the project area the conversion to annual crops is a common practice, which could cause a huge decrease of carbon soil stocks, this pool will be omitted in a conservative way. According to used methodology (REDD-MF), the exclusion is always conservative.
Harvested wood products	No	According to VCS AFOLU requirements, this pool must be included when project activities can significantly reduce the pool, and could be included when baseline scenario activities can significantly reduce the pool. According to used methodology (REDD-MF), this pool will be included if it is greater in the baseline scenario than project scenario and significant, otherwise it can be omitted conservatively; it is mandatory when deforestation process involves timber harvesting for commercial markets. Deforestation occurring at the project area and leakage belt does not include immediate previous extraction of long-lived wood products. In the Project area legal timber harvesting with commercial markets destination is not occurring, since the project area is composed by natural protected areas. The amount of timber illegally harvested from the project area and which ends up in long-lived wood products can be considered not significant, due to the high percentage of wood loss that produces sawmill practiced by illegal harvesters (chainsaw use) and because of the low density of commercial trees per hectare. The pool has been considered not significant according to the calculations found in Annex 31 - Significance of reservoirs and sources of leaks, and the Spreadsheet - Significacion (T-SIG).xls.

Table 24 Sources of emissions and associated greenhouse gases for project activity

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass burning	CO_2	No	According to methodology used (E-BB), its inclusion in the baseline scenario is always optional.
		CH_4	No	According to methodology used (REDD-MF), non-CO_2 gases emitted from woody biomass burning will be excluded in a conservative way from baseline scenario accounting.
		N_2O	No	
		Other	No	
Project	Use of fertilizers	CO_2	No	According to methodology used (REDD-MF), potential emissions are negligible small.
		CH_4	No	According to methodology used (REDD-MF), potential emissions are negligible small.
		N_2O	No	According to VCS AFOLU requirements, N_2O emissions from project activities that apply nitrogen containing soil amendments and N_2O emissions caused by microbial decomposition of plant materials that fix nitrogen may be deemed minimal and do not need to be accounted. According to methodology used (REDD-MF), can be neglected if excluded from baseline accounting except in the situation where fertilizer use is enhanced as a leakage avoidance mechanism. Module E-NA (Estimation of direct N_2O emissions from nitrogen application) is mandatory when leakage prevention activities include increases in the use of fertilizers. Although technology level chosen by the Project to prevent leakage will promote avoidance of N_2O emissions, and therefore the project could have a positive impact, this GHG will be omitted in a conservative way.
		Other	No	
	Fossil fuels combustion	CO_2	No	According to VCS AFOLU requirements, emissions produced by fossil fuel combustion from transport and machinery use in project activities may be deemed minimal and do not need to be accounted. According to methodology used (REDD-MF), it can be neglected if excluded from baseline accounting.
		CH_4	No	According to VCS AFOLU requirements, emissions produced by fossil fuel combustion from transport and machinery use in project activities may be deemed minimal and do not need to be accounted. According to methodology used (REDD-MF), potential emissions are negligibly small.

Source		Gas	Included?	Justification/Explanation
		N_2O	No	According to VCS AFOLU requirements, emissions produced by fossil fuel combustion from transport and machinery use in project activities may be deemed minimal and do not need to be accounted. According to methodology used (REDD-MF), potential emissions are negligibly small.
	Biomass burning	CO_2	No	According to methodology used (E-BB), in case biomass burning occurs during the project, shall be monitored *ex post*. The carbon dioxide can be omitted in the accounting if the fire is used during deforestation (carbon stock decreases due to burning); hence CO_2 emissions are accounted as a carbon stock change.
		CH_4	Yes	According to methodology used (REDD-MF), non-CO_2 gases emitted from woody biomass burning must be included in accounting of *ex-post* emissions where fire occurs.
		N_2O	Yes	
		Other	No	

According to VCS AFOLU requirements for REDD activities, GHG emissions from the removal or burning of herbaceous vegetation and collection of non-renewable wood sources for fencing of the project area may be deemed minimal and need not to be accounted for.

Although, as indicated in VCS AFOLU requirements, reductions of N_2O and/or CH_4 emissions are eligible for crediting if in the baseline scenario the project area would have been subject to livestock grazing, burning and/or nitrogen fertilization, these emission will be conservatively neglected.

According to methodology used (REDD-MEF), leakage prevention activities could lead to an increase of fossil fuels burning; however, any emissions increase is considered insignificant.

2.4 Baseline Scenario

The identification of the most probable baseline scenario for the project area was done following the procedure of VCS VT0001- Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities, which is developed on section 2.5. It concludes that the most probable scenario involves, mainly, pre-project land use continuation.

In the without-project scenario is identified a tendency of unplanned frontier deforestation and degradation, which starting principally from the Interoceanic highway, is moving gradually towards the project area.

Thanks to recent access facilities, people and goods movement is increasing progressively, as costs and transport difficulties are reduced. In this way, an increment of activities that cause land-use change is generated, and consequent pressure over natural resources already exhausted in other zones (high valued timber species, hunting fauna, non-wood forest products, gold).

Despite migration is mainly internal and especially from Puno and Cusco highlands, there is also a registered external migration, mostly of large commercial ranchers from neighbouring Brazilian State of Acre.

The arrival of immigrants looking for terrains to settle has generated a significant increase of the region properties average value, both in urban and rural zones.

This search of non-occupied areas is starting to exert pressure over already occupied areas, as agriculture properties (many of which still have an important portion of forest cover), timber forest concessions, and chestnut concessions, among others. New human settlements are being created (like San Bernardo, Vírgenes del Sol, Alto Libertad) at the side of the road that is inside the RNTAMB buffer zone and towards Malinowski river; their inhabitants cut down forest to install agricultural activities. In the buffer zone is common, in the last years, the sale and resale of areas with forest cover, even when there is no property rights over them (radio and paper news mention the “sale of chestnut concessions, forest concessions” among others, which are awarded temporarily and cannot be offered for sale).

Even with most of the population settled in urban and mining areas, this population growth implies a greater demand for farming products, which, added to lower transportation costs, would lead to increase farming profitability. Areas that in the past were unprofitable for agriculture and stockbreeding would be now at risk of being deforested; likewise, abandoned areas could be recuperated for farming production, preventing their natural regeneration.

As natural resources (high valued timber species, hunting fauna, and non-wood forest products, gold) are exhausted, is highly probable that they will be searched for within the project area.

All this described above forms an extremely complex scenario which is favourable for deforestation and forest degradation. Without a substantial profitability improvement of activities associated to forest conservation, family unit decision (local and immigrant) will prioritize activities associated to land-use change and unsustainable uses of the forest. These causalities are illustrated in Figure 10.

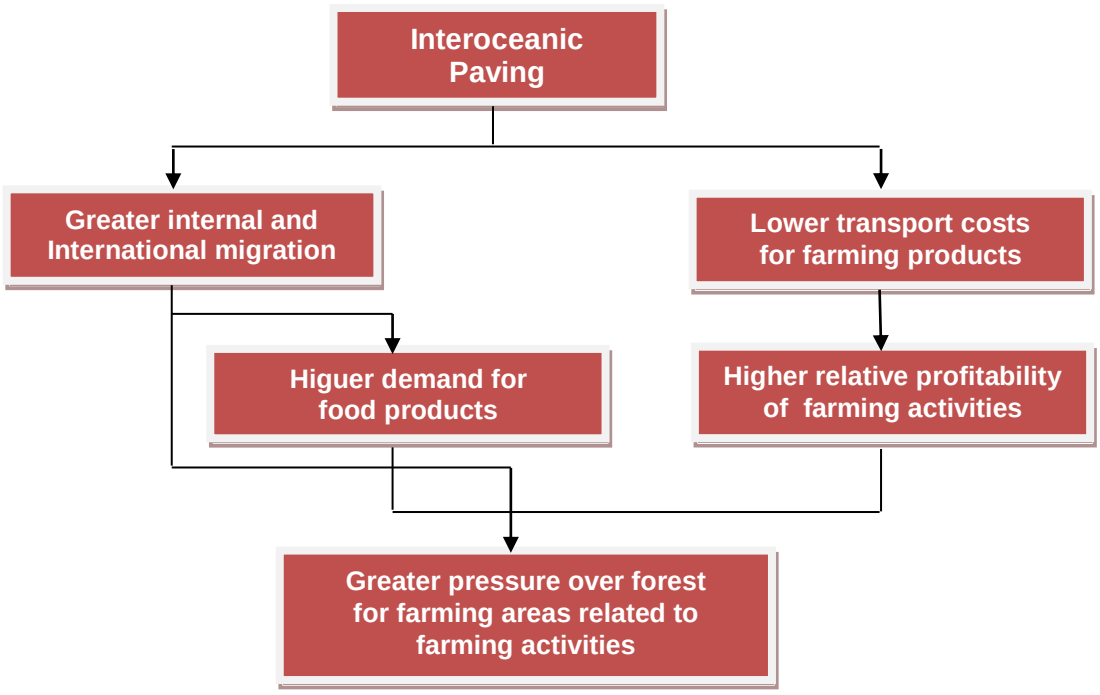


Figure 10 Cause-effect relations that stimulate deforestation

As deforestation and forest degradation expands, vulnerability to fire increases. The project area and its leakage belt have fire probabilities according studies carried out by Conservation International (CI) in the *"Forest fires prevention and mitigation plan for section 3 of the south interoceanic highway"*. The map of burnings probability, which is shown in Figure 11, presents medium to high values for the project area and its leakage belt.

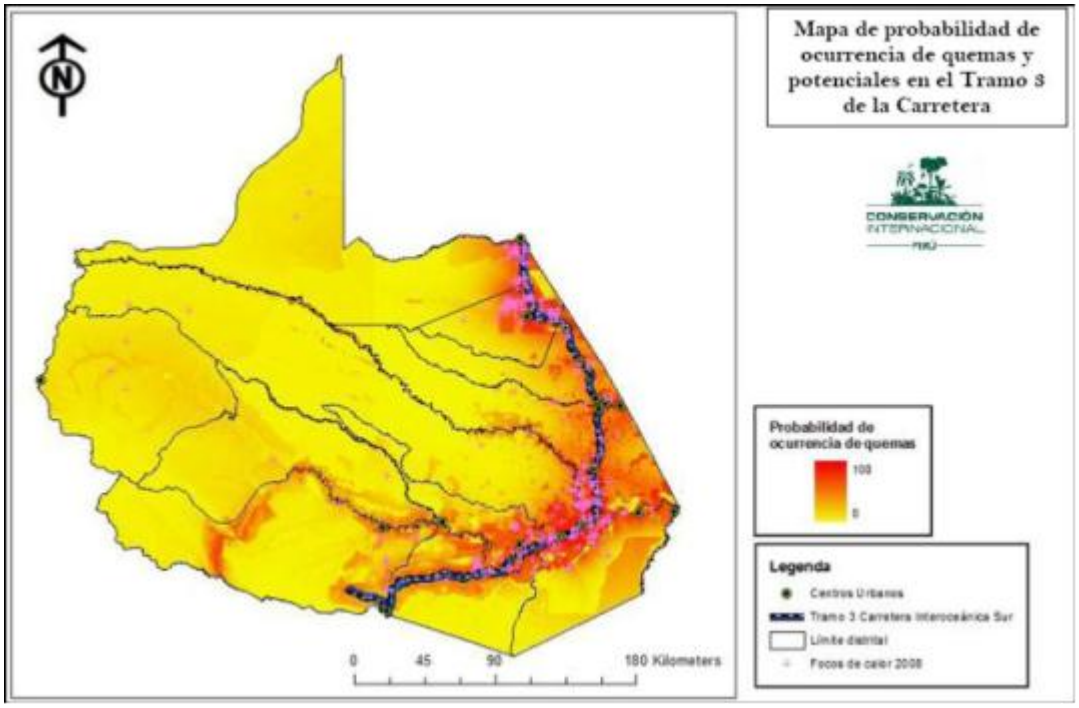


Figure 11 Map of burnings probability, occurrences and potential in section 3

In the without-project scenario it is highly probable to repeat, at different locations, what happened on Huepetue district, adjacent to west side of leakage belt, where illegal gold mining, besides devastating the forest cover and polluting streams, has left soils in a status where forest cannot regenerate. This situation is already developing in other department zones with high presence of illegal miners.

To carry out the area stratification and calculate the current carbon stocks, it was followed the procedure defined in the Approved methodology VCS VM0007 Version 1.1, REDD Methodological Modules. Modules used are:

- Methodological Module "REDD Methodology Framework" (REDD-MF)
- Module VCS VMD0016 "Methods for stratifying the project area" (X-STR)

- Module VCS VMD0001 ""Estimation of carbon stocks and changes in carbon stocks in the above- and below-ground biomass (trees and non-trees) carbon pool" (CP-AB)

The carbon pools subject of measurement was the above-ground biomass carbon pool and the below-ground biomass carbon pool. Justification of inclusion and exclusion of carbon pools is detailed in section 2.3.

The inventory carried out to determinate carbon stocks was of an exploratory type, using a merge of forest inventory methodologies used by AIDER and the standard operating procedures for measuring land carbon developed by Winrock International. This merge includes the experience that AIDER has acquired in forest inventory implementation at Ucayali region on years 2000 till 2002, applying Malleux (1982) methodology; this experience incorporated the procedures of Winrock Int. (Walker *et al.*, 2007) that establish nested circular sampling plots.

Methodology of inventory done in the project area was of an exploratory type, with a sampling design optimal stratified, with samples distributed at random in the vegetation types identified in the project area.

Before doing field work it was done the interpretation of Landsat 5 satellite images, to determine the project area stratification, according to module X-STR mentioned above (developed procedure is found in Annex 21). This allowed to identify 12 units, 2 of them considered as non-forest and therefore excluded from carbon quantification (tropical savannah and farming activity /secondary forest):

- Mixed aguajal
- Floodable alluvial
- Strong steep-high hill
- Soft steep-high hill
- Strong steep-low hill
- Soft steep-low hill
- High terrace
- Low terrace
- Strongly dissected terrace
- Softly dissected terrace
- Farming activity /secondary forest
- Tropical savannah

Predominant strata in the project area were Floodable alluvial, Low terrace and Softly dissected terrace, which conform more than 60%. Distribution of strata can be seen in Annex 20 Map.

It was done a measurement of all types of woody vegetation with diameter at chest height equal or more than 5 cm (broadleaf species, palm trees, vines, ceticos, others).

The sampling consisted in a network of points that were distributed equidistantly (500 m X 500 m) over all the evaluation area, from which were randomly selected a number of points that corresponded respectively to the sampling plots.

The collection of 108 samples was effected, proportionally distributed on each forest type; it was considered a minimum number of samples for the smaller stratum.

Likewise, another 11 plots were evaluated to verify the existence of tree vegetation in the tropical savannah stratum (known as Pampas del Heath). This evaluation was also developed with parameters described in methodology.

Sample unit consisted in temporary plots with a circular nested shape of 5, 16 and 30 meters of ratio. The maximum sampling error planned was of 10%, with regard to the average of total carbon stock per hectare of all evaluated biomass.

Optimum stratified sampling allows a sample distribution proportional to stratum size and to its standard deviation (variance), according to formula:

$$n = \frac{t^2 \left(\sum_i^M Pj\, s_j\right)^2}{E^2}$$ (Total sample size)

$$n_i = \frac{n\ Pj\ s_j}{\sum_i^M Pj\ s_j}$$ (Total sample size for each strata)

Were:

n = Total sample size
nj = Total sample size for each strata
Sj = Standard deviation of strata j
Pj = Portion of strata j
T = t-student value
M = Strata quantity

With this formula an adjusted value of n and nj was got, that in all cases will result a sample size smaller than conventional.

It has been mentioned that, through a variance analysis, it is possible to split the population total variance in 2 variation sources:

- Variance between strata, and
- Variance inside strata.

$$\sigma^2 = \sigma_y^2 + \sigma_\beta^2$$

Where:

σ^2 = Total variance
σ_y^2 = Variance between strata
σ_β^2 = Variance inside strata, or, variance due to stratification.

For extra certainty of not exceed the prefixed sampling error of 10%, a 10% of plots was added (Malleux, 1982).

Besides the characterization data of each plot, were registered the following information:

- Steep
- Diameter at Breast Height (DBH)
- Shaft height (trees)
- Total height (palm trees and other type of vegetation)
- Common name
- Physiography
- Vegetation type

Also was considered data from special measurements for soil evaluation, non-wood products, fauna and tourist attractions. On each plot, non-wood products and soil were evaluated, using the Malleux (1982) format. Tourist attractions and fauna data were evaluated as its presence was detected during movements to evaluate inventory plots, using for this the MINCETUR (2008) formats and another one elaborated based on CIMA (2002) and Kirkby (2004), respectively. These formats are in Annex 22.

For biomass calculation formulas from different literature were compiled, which the following are particularly worth mentioning: Cairns *et al* (1997, quoted by Pasa, 2008), Frangi and Luyo (1985, quoted by Brown, 1997), Brown and Schroeder (1999, quoted by Pearson *et al*, 2005), Putz (1983, quoted by Pearson *et al*, 2005) and Pearson *et al* (2005).

Formulas used for calculation of above-ground biomass are:

a) Allometric equation to estimate above-ground tree biomass:

$$Y = \exp[-2{,}289 + 2{,}649 * \ln(DAP) - 0{,}021 * (\ln(DAP))^2]$$

Where:

Y = Dry weight of total above-ground biomass, Kg $(tree)^{-1}$
DBH = diameter at breast height, cm
Ln = natural logarithm
DBH range: 5 – 148 cm

Source: Brown, 1997, quoted by Pearson *et al*, 2005

Established for tropical humid forests (precipitations of 1500-4000 mm)

b) Allometric equation to estimate above-ground tree biomass of species "cetico" (*Cecropia sp*.)

$$Y = 12.764 + 0.2588 * (DAP)^{2.0515}$$

Where:

Y = Dry weight of total above-ground biomass, Kg $(tree)^{-1}$
DBH = diameter at breast height, cm
DBH range: 5 – 40 cm

Source: Pearson *et al*, 2005

c) Allometric equation to estimate above-ground palm tree biomass of species "ungurahui" (*Oenocarpus bataua*)

$$Y = 23.487 + 41.851 * (\ln(Ht))^2$$

Where:

Y = Dry weight of total above-ground biomass, Kg $(tree)^{-1}$
Ht = total height in (m)

Source: Pearson *et al,* 2005

d) Allometric equation to estimate above-ground palm tree biomass of species "huasaí" (*Euterpe precatoria*)

$$Y = 6.666 + 12.826 * H\ 0.5 * \ln(Ht)$$

Where:
Y = Dry weight of total above-ground biomass, Kg $(tree)^{-1}$
Ht = total height in (m), established only until 33 m

Source: Pearson *et al,* 2005

e) Allometric equation to estimate above-ground palm tree biomass

$$Y = 10.0 + 6.4 * Ht$$

Where:

Y = Dry weight of total above-ground biomass, Kg $(tree)^{-1}$
Ht = total height in (m)
Source: Frangi and Luyo, 1985, quoted by Brown, 1997, and Pasa, 2008.

f) Allometric equation to estimate above-ground vines biomass

$$Biomass = \exp(0.12 + 0.91 * \log(BA \text{ at dbh}))$$

Where:

BA at dbh= basal area at DBH
dhb= diameter at breast height, is established up to 12 cm.

Source: Putz, 1983, quoted by Pearson *et al*, 2005

g) Allometric equation to calculate stored carbon in "aguaje" (*Mauritia flexuosa)*

$$Y = 0.00006*(Ht)^3+0.0046*(Ht)^2-0.043*(Ht)+0.1259$$

Where:

Y = Aguaje Biomass, tons (t)
Ht= total height de aguaje (m)
Source: Freitas *et al.* 2006

Each one of the allometric equations were applied to the species group and the carbon fraction to the above-ground biomass of the same group, determining the carbon stock in the above-ground biomass for each plot and forest stratum (see Annex 22, Document of carbon stock quantification).

To estimate carbon stock in the below-ground tree biomass, allometric equations were applied with information obtained from above-ground biomass. Procedure established in module CP-AB was applied:

Fixed area plots with root to shoot ratio

A step sequence is established in order to apply this methodology:

Step 1. Carbon stock in belowground biomass was estimated from aboveground biomass using an allometric equation for each specie group developed; in this case was used a specific equation for broadleaf species and "ceticos" (*Cecropia sp.*). Regarding palm trees, it was considered the belowground / aboveground biomass ratio equal to 0.37 for tropical rainforest, established by IPCC (2006) guidelines for national GHG inventories.

The equations used are:

a) Allometric equation to estimate belowground biomass of tree species:

$$Y=\exp[-1{,}0587+0{,}8836*\ln(BSS)]$$

Where:

Y= Root biomass in Mg ha^{-1} of dry matter
ln = natural logarithm
BSS = aboveground biomass in Mg ha^{-1} of dry matter

Source: Cairns *et al*, 1997, quoted by IPCC (2003).

This equation was applied for broadleaf species and Cecropia gender.

Step 2. The equation was applied and the mean belowground tree biomass carbon stock was established for each plot and stratum; to see the entire procedure, see Annex 22.

The equations were validated with the "Limited measurements" method established by CP-AB module; the entire procedure is found in Annex 22 (Document of carbon stock quantification).

- **"Paca" destructive sampling**

As part of present study, an additional methodology of paca or bamboo destructive sampling was developed to create an aboveground biomass equation, which allows quantifying carbon of paca existing in the project area. This methodology is found in Annex 22 (Document of carbon stock quantification).

With the compiled information, it was possible to realize the field data collection according to what each formula required; this helped data to be precise.

To validate visual stratification (by satellite images) of the project area, it was necessary a field sampling of random points to determine the classification precision. Because logistic issues, this procedure was done parallel to data collection of biomass inventory plots.

The formats given to inventory squads had a given space to describe the forest type found on each plot they were evaluating. Obtained data was processed and used to determine the percentage with which the previous map had to be adjusted. Results gave reliability higher than 95%, hence areas identified in desk remained the same.

They are presented in Table 25, and also in Annex 22.

Table 25 Area of project area strata

Stratum	Area (ha)
Mixed aguajal	29 405,04
Floodable alluvial	150 428,17
Strong steep-high hill	24 792,88
Soft steep-high hill	17 146,44
Strong steep-low hill	7 302,52
Soft steep-low hill	6 707,01
High terrace	45 126,19
Low terrace	124 892,37
Strongly dissected terrace	24 123.65
Softly dissected terrace	111 695,87
TOTAL	**541,620.14**

Source: Annex 21 – Project Area Stratification

Distribution of each stratum can be seen in Annex 20 Map. Predominant strata in the project area are Floodable alluvial, Low terrace and Softly dissected terrace, which altogether conform more than 60%.

Table 26 Carbon stock in project area strata

Strata	Area (ha)	Aboveground biomass stock (tC/ha)	Belowground biomass stock (tC/ha)	Total biomass (tnC/ha)	Carbon stock (tCO_2-e/ha)	Total carbon stock (tCO_2-e)
Mixed aguajal	29,405.04	56.71	16.27	72.98	267.59	7,868,567.92
Floodable alluvial	150,428.17	85.45	24.02	109.46	401.37	60,376,716.92
Strong steep-high hill	24,792.88	117.14	30.59	147.73	541.69	13,430,044.88
Soft steep-high hill	17,146.44	102.38	27.06	129.45	474.63	8,138,271.52
Strong steep-low hill	7,302.52	136.62	34.77	171.39	628.41	4,588,998.42
Soft steep-low hill	6,707.01	176.27	42.89	219.16	803.60	5,389,770.97
High terrace	45,126.19	102.75	26.77	129.53	474.93	21,431,767.76
Low terrace	124,892.37	114.92	30.08	145.01	531.69	66,404,033.34
Strongly dissected terrace	24,123.65	114.69	30.46	145.14	532.20	12,838,560.00
Softly dissected terrace	111,695.87	90.81	24.42	115.23	422.51	47,192,364.74
Total	**541,620.14**					**247,659,096.47**

Source: Annex 22 - Estimation of forest biomass carbon stocks within the project area

Eligible area for REDD project has stored 53 260 873,81 carbon tons in the *aboveground biomass* pool and 14 282 516,14 carbon tons in the *belowground biomass* pool, having a total of 67 543 389,95 carbon tons, equivalent to **247 659096,47 CO_2 –e tons.**

In order to determine the amount of hectares that would be deforested within the next years if there would be no project, as well as to determine the zones under higher deforestation risk, Module VCS VMD0007 “Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation” (BL-UP) was used. It was achieved with help of Dinamica EGO Software. The entire procedure is on Annex 23.

The projection of deforestation is based on an opportunity costs analysis, both for deforestation rates assessment and location of new road destinations, which methodological construction, inputs and validation are detailed on Annex 23.

Tendency and most probable spatial distribution were evaluated, for which, firstly, characteristics of each deforestation agent and number of people of each one of them were determined. Subsequently, the current and predictable future development of population size for the reference region agents group was estimated.

In this way, estimation of annual areas under unplanned deforestation at the baseline scenario in the project area and leakage belt was done.

Table 27 Deforested areas in the project area and leakage belt for the first baseline period

Period	Project area		Leakage belt	
	Annual (ha)	Accumulated (ha)	Annual (ha)	Accumulated (ha)
2010-2011	436.07	436.07	9,294.73	9,294.73
2011-2012	577.92	1,013.99	9,373.23	18,667.97
2012-2013	792.52	1,806.51	9,298.67	27,966.64
2013-2014	912.94	2,719.46	9,323.39	37,290.03
2014-2015	1,068.89	3,788.35	8,414.37	45,704.40
2015-2016	1,397.53	5,185.88	8,108.00	53,812.40
2016-2017	1,461.45	6,647.32	7,445.61	61,258.01
2017-2018	1,471.72	8,119.04	7,360.60	68,618.62
2018-2019	1,850.50	9,969.55	7,232.46.	75,851.08
2019-2020	1,923.54	11,893.09	6,792.11	82,643.18

Obtained results from modeling for the present project are shown in the following figures for some of the worked years, like 2010, 2015 and 2020.

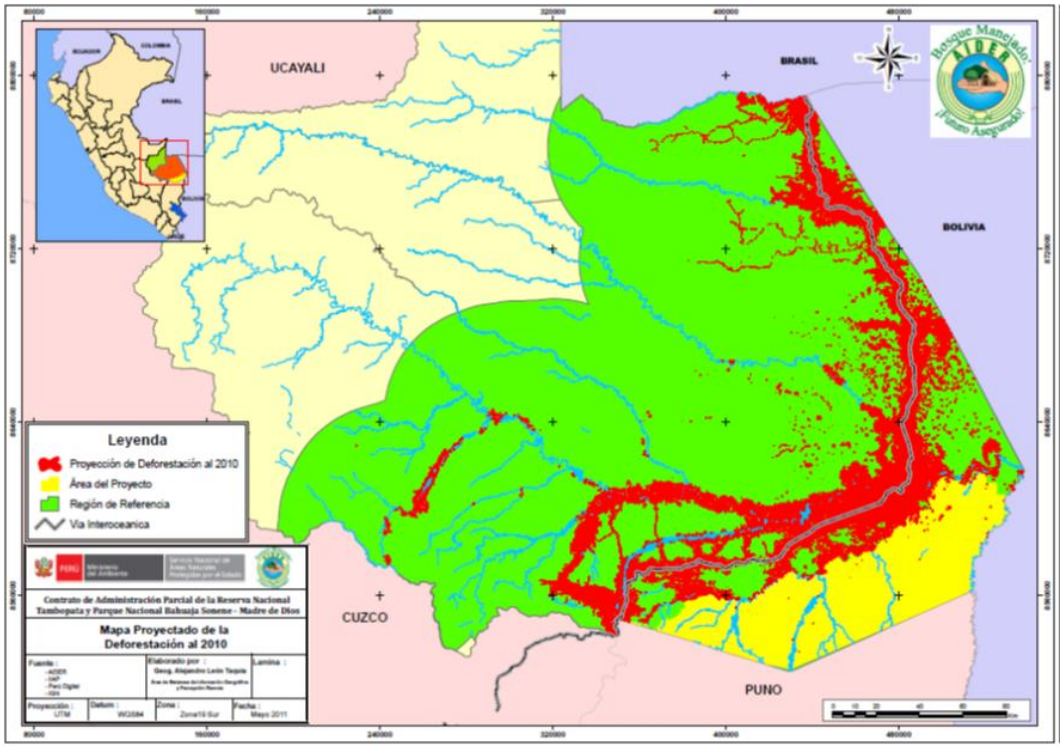


Figure 10 Map of projected deforestation to the year 2010

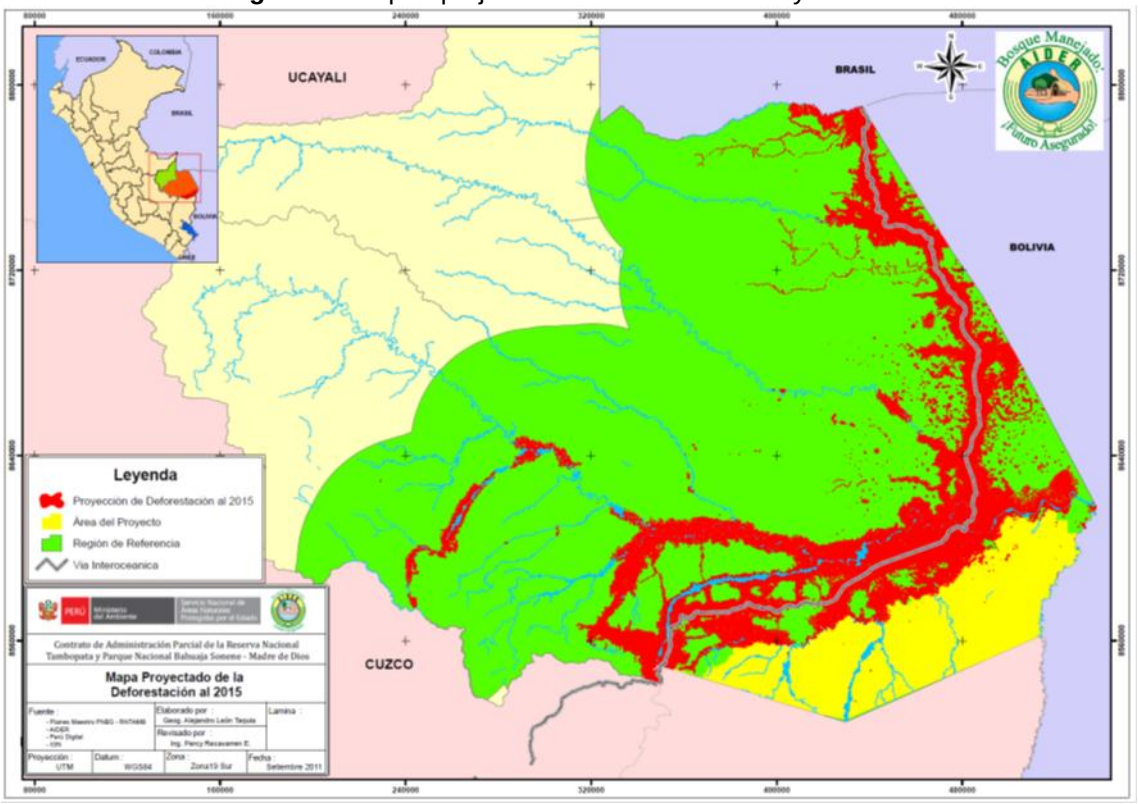


Figure 11 Map of projected deforestation to the year 2015

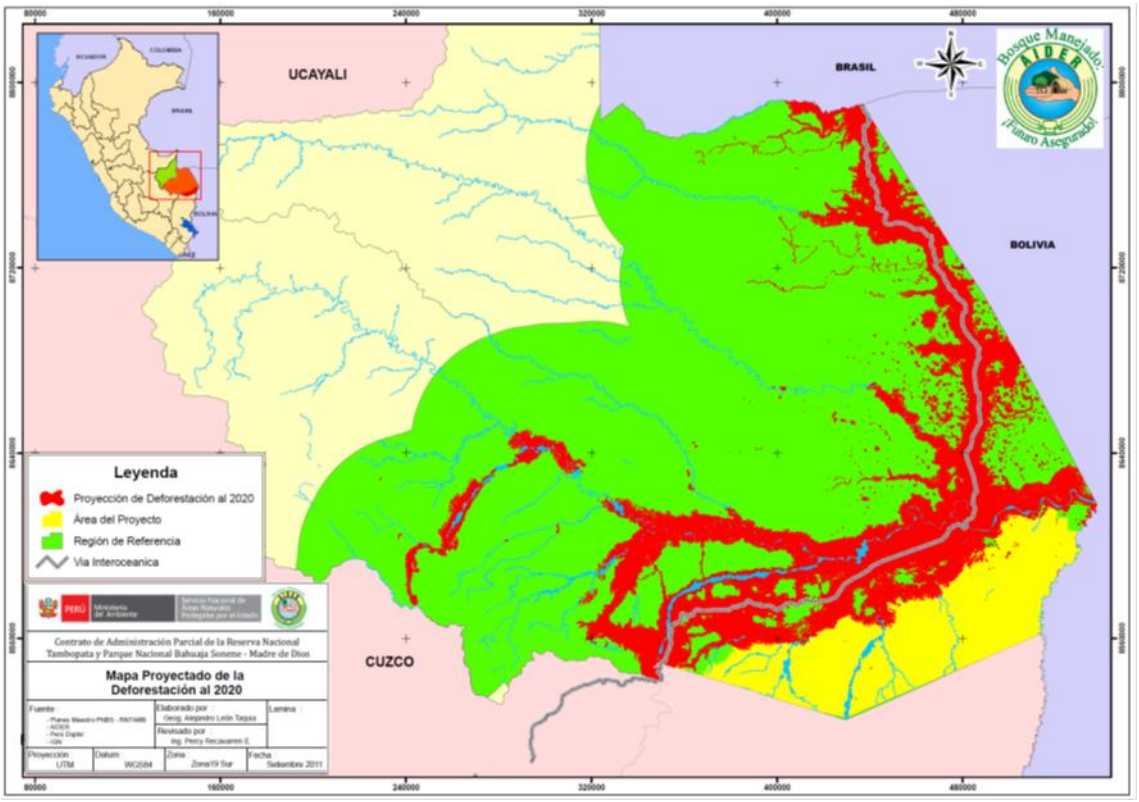


Figure 12 Map of projected deforestation to the year 2020

2.5 Additionality

Demonstration of project activity additionality was carried out by using VCS VT0001- Tool for the demonstration and assessment of additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) project activities, which is an adaptation of the" Tool for the demonstration and assessment of additionality in A/R CDM project activities" (Version 02). By means of this tool credible land use scenarios for the project area were identified, evaluated and determined, as is required in the REDD-MF module.

According to the mentioned tool, the following steps were taken:

STEP 1. Identification of alternative land use scenarios to the project activity

Sub-step 1a. Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity

Next are described the realistic and credible land-use scenarios that would have occurred on the land within the proposed project boundary:

i. Continuation of the pre-project land use:

The land use prior to the implementation of the project consists of agriculture (mostly immigration), mainly extensive livestock and illegal gold mining, the establishment of which is necessary for the continuous removal of forest cover[7], soil removal and riverbeds, also, there is

pressure on forest resources (selective extraction of commercial timber, harvesting forest products not tech than wood) and wildlife, causing a continuous forest degradation[7]. It is reasonable to consider, among the possible baseline scenarios, continuing change scenario typical land use in Madre de Dios, because of increasing population pressure on the land of Madre de Dios, according to population data that have been presented in Section 1.10. In the study "Quantification of deforestation in Madre de Dios: an analysis from the impact of mining" (Recavarren and Angulo, 2012) which has been prepared by AIDER and is close to its publication, is no proven correlation between population growth and deforestation caused by illegal gold mining. It took the deforested area caused by mining, as the dependent variable and the independent variable or explanatory, the population of Madre de Dios. We obtained the following equation:

DEFO = -20235.49 + 0.301413*POB

Where:

DEFO: Deforested area caused by mining activity
POB: Madre de Dios population

According to the coefficient of determination, 71,93 % of variations in the dependent variable (deforestation) are explained by the model.

Figure 13 shows the linear regression obtained by comparing the area deforested in the population.

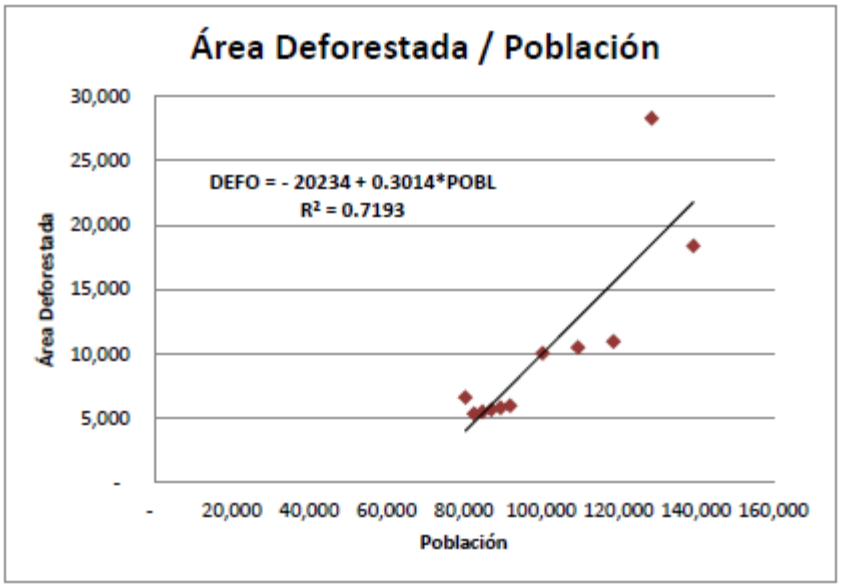


Figure 13: Linear regression of deforested areas with population
Source: Recavarren and Angulo, 2012

The evolution of the gold price, which is shown in Figure 14, represents an incentive for migration to Madre de Dios.

[7] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Forest Engineer Marioldy Sanchez

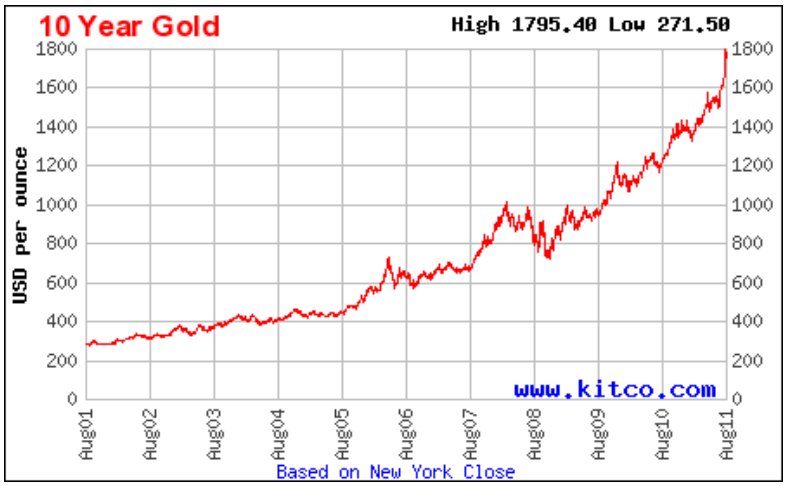


Figure 14 Gold ounce price to 10 years in US$
Source: Kitco Metals Inc. 2011[8]

Table 28 shows the evolution of the gold price, population and area deforested between 2000 and 2010.

Table 28 Gold price, population and deforested area from 2000 to 2010

Year	Gold price (USD)	Population	Deforested area (ha)
2000	271.5	80,452	6,602
2001	278.1	82,644	5,355
2002	347.5	84,895	5,501
2003	415.2	87,208	5,652
2004	437.1	89,584	5,807
2005	516.6	92,024	5,966
2006	634.3	100,408	10,042
2007	883.3	109,555	10,493
2008	881.1	118,725	10,964
2009	1096.5	128,662	28,292
2010	1421.6	139,431	17,632

Source: Recavarren and Angulo, 2012[9]

There is a correlation between the increase in livestock production (beef) and the increase in population and between deforestation and increased beef production. It is inferred that there is a unidirectional causality between meat production (cause) and the deforested area (caused), since in order to keep up this activity, it is necessary having fields of treeless grassland, which forces farmers to deforest to achieve such conditions to conduct livestock activities.

Below is the link between meat production (cause) and deforestation (caused). Consider the following information in Madre de Dios on meat production (tonnes) and deforestation (hectares) from 2004 to 2010:

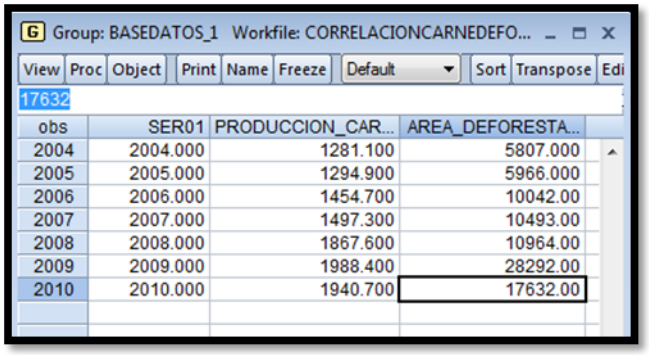
[8] http://www.kitco.com/charts/livegold.html
[9] Recavarren, P, Angulo, MA. 2012. Quantification of deforestation in Madre de Dios: the impact of mining analysis. AIDER.

Table 29 Development of meat production and deforested areas in Madre de Dios, period 2004-2010

Year	Meat Production (tonnes) (*)	Deforested Area (ha) (**)
2004	1281.1	5,807
2005	1294.9	5,966
2006	1454.7	10,042
2007	1497.3	10,493
2008	1867.6	10,964
2009	1988.4	28,292
2010	1940.7	17,632

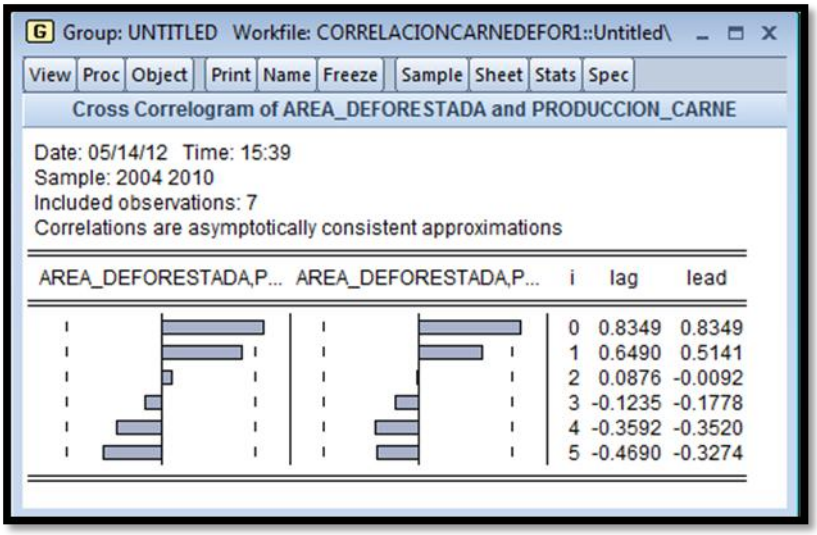
(*) Source: Madre de Dios Regional Agrarian Direction[8]
(**) Source: Recavarren and Angulo, 2012
Own Elaboration

From this series, a correlation analysis was performed to verify the relationship between them. To enable such verifications, E-views7, a statistical program, is used. The series were entered in the program as follows:



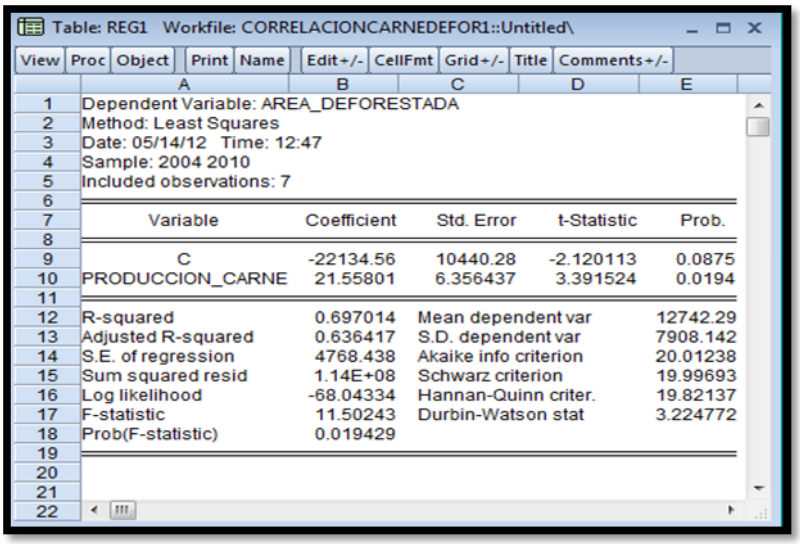
Once entered in the program, to find out the correlation analysis, click in View/Cross correlation. The program produced the following results:

[8] See digital file folder "Livestock Production 2004-2011 MD"



Correlation analysis of the deforested area and meat production indicate that it has a value of 0.8349, since the value is close to 1, is evidence that it is a direct correlation and high (perfect considering a coefficient of 1). Unlike the autocorrelation, cross-correlations are not necessarily symmetric about the lag 0 (i 0). Correlations are asymptotically consistent approximations, meaning that as you increase the value of the sample, the estimates are closer and closer to the value of the parameters.

Regarding the regression analysis between the two variables (deforestation: And Meat: X), starting from our database, you click Quick / Estimate Equation / and determines the dependent variable, constant and independent, separate for each space. Results from the program are presented below:



Regression analysis yields a coefficient of determination of 69.70%, this indicates how the model explains the dependent variable (AREA_DEFORESTADA) also PRODUCCION_CARNE variable is significant for the model because it has a prob value <0.05 (Prob = 0019), whereas only one is working with a limited number of observations (7) corresponding to the number of years you have information for both variables.

We do not analyze the Durbin Watson coefficient, since this requires a minimum sample of 15 observations for reliable results.

In summary, the interpretation of the regression analysis indicates that for every ton of meat, would increase by 21,558 the number of hectares deforested, which complements the conclusion regarding the correlation analysis noted above.

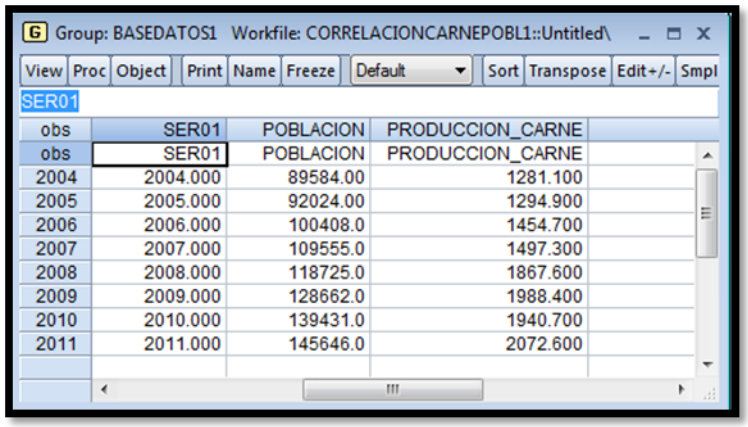
Regarding the relationship between meat production (in tonnes) and the population (number of people), you have the following information to the Madre de Dios to the period covered from 2004 to 2011:

Table 30 Evolution of the population and meat production in Madre de Dios, 2004-2010

Year	Population (N° of people) (*)	Meat Production (tonnes) (**)
2004	89584	1281.1
2005	92024	1294.9
2006	100408	1454.7
2007	109555	1497.3
2008	118725	1867.6
2009	128662	1988.4
2010	139431	1940.7
2011	145646	2072.6

(*) Source: www.inei.gob.pe
(**) Source: Madre de Dios Regional Agrarian Direction[9]
Own elaboration

With these series, we performed a correlation analysis to verify the relationship between the two variables. For this purpose we used the statistical program E-views7. These series are entered the program as follows:



[9] See digital file folder "Livestock Production 2004-2011 MD"

Once admitted to the program, to find the correlation analysis is clicked View / Cross correlation. The program produced the following results:

Table: CORREL1 Workfile: CORRELACIONCARNEPOBL1::Untitled\

View | Proc | Object | Print | Name | Edit+/- | CellFmt | Grid+/- | Title | Comments+/-

Cross Correlogram of PRODUCCION_CARNE and POBLACION

Date: 05/14/12 Time: 18:02
Sample: 2004 2011
Included observations: 8
Correlations are asymptotically consistent approximations

PRODUCCION_CARNE,...	PRODUCCION_CARNE,...	i	lag	lead
		0	0.9627	0.9627
		1	0.6315	0.6977
		2	0.2309	0.3973
		3	-0.1027	-0.0042
		4	-0.3873	-0.3486
		5	-0.4211	-0.4316
		6	-0.3355	-0.4310

The results of the correlation analysis between meat production and population indicate that it has a value of 0.9627, since the value is close to 1, is evidence that there is a direct correlation and almost perfect (perfect considering a value of coefficient of 1). Unlike the autocorrelation, cross-correlations are not necessarily symmetrical around the lag 0 (i 0). Correlations are asymptotically consistent approximations, this means that as you increase the value of the sample, the estimates are closer and closer to the value of the parameters.

Regarding the regression analysis between the two variables (Meat: And Population: X), starting from our database, you click Quick / Estimate Equation / and determines the dependent variable, constant and independent, separate for each space. Results from the program are presented below:

Table: REG1 Workfile: CORRELACIONCARNEPOBL1::Untitled\

View | Proc | Object | Print | Name | Edit+/- | CellFmt | Grid+/- | Title | Comments+/-

Dependent Variable: PRODUCCION_CARNE
Method: Least Squares
Date: 05/14/12 Time: 18:15
Sample: 2004 2011
Included observations: 8

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-33.65770	198.9286	-0.169195	0.8712
POBLACION	0.014790	0.001697	8.713451	0.0001

R-squared	0.926762	Mean dependent var	1674.663
Adjusted R-squared	0.914555	S.D. dependent var	325.9575
S.E. of regression	95.28047	Akaike info criterion	12.16384
Sum squared resid	54470.21	Schwarz criterion	12.18371
Log likelihood	-46.65538	Hannan-Quinn criter.	12.02989
F-statistic	75.92422	Durbin-Watson stat	2.029785
Prob(F-statistic)	0.000126		

Regression analysis yields a coefficient of determination of 92.67%, this indicates how the model explains the dependent variable (PRODUCCION_CARNE) also, the population variable is significant for the model because it has a prob value <0.05 (Prob = 0.0001), whereas only one is working with a limited number of observations (8) that corresponds to the number of years you have information for both variables.

We do not analyze the Durbin Watson coefficient, since it requires a minimum sample of 15 observations for reliable results.

In summary, the interpretation of the regression analysis indicates that for every person who joins the population will increase by 0.014790 tons of meat, which complements the conclusion regarding the correlation analysis noted above.

On this pre-project land use scenario, forest degradation can be aggravated within the project area, considering the depletion of forest resources and wild fauna in the leakage belt forests and in other forests zones outside it, being the natural protected areas a strong attractor because of having these resources in abundance. In this scenario, the Reserve Headquarters will continue its efforts for maintaining the NPA integrity and supervising adequately the allowed uses inside them, among which there is the ancestral rights of use of indigenous populations. Nevertheless, as is detailed in Step 3 (barrier analysis), the Headquarters is facing serious difficulties to carry out its task adequately.

It is reasonable to include in this scenario a continued growth of touristic operations within the project area and leakage belt, using existent resources (landscapes, high biodiversity); however, it is predictable that a conflict will develop between this activity and land uses described above.

Slash-and-burn agriculture, livestock and gold mining coexist with the implementation of some initiatives of sustainable land use in the buffer zone of the Tambopata National Reserve, promoted by diverse NGOs and financed by international cooperation. These projects are specific and focused mainly on promoting agroforestry and management of chestnut (Bertholletia excelsa), with a maximum duration of two years and budgets of U.S. $ 20,000 to U.S. $ 100,000, should be noted that the process to obtain these funds is slow (the formulating and implementing process of these funds take approximately one year).

The conditions listed have prevented the development projects implemented in the buffer zone are formed in a structured, articulated and coordinated across sectors, being insufficient to reduce activities that cause deforestation, which is why the pre-project land use scenario is predominantly deforestation and forest degradation.

ii. Project activity on the land within the project boundary performed without being registered as the VCS AFOLU project:

AIDER, in the framework of the partial Administration Contract of operations of the biological monitoring and research components of RNTAMB and PNBS- Madre de Dios sector, has already launched some of the activities proposed by the project[i10][10], despite the difficulties to access financial sources. However, the mentioned Contract, subscribed with the Peruvian State, specifies that the environmental services component (development of a REDD scheme and VCUs sale) will finance operations of the biological monitoring and research components; finding another financial source with the required magnitude and for the Administration Contract

[10] Promotion of sustainable productive activities (agroforestry, forest management, artisanal mining with social and environmental responsibility); recovery of degraded areas; control and surveillance support to RNTAMB Headquarters; support for forest Governance.

period (20 years) would be unlikely. From this, the high risk of the project not being sustainable in case VCUs sale is not achieved is deducted.

Initiatives for sustainable land use are developed in the area under the leadership of NGOs but none of them raises the performance of the proposed activities coordinated by the project. It is necessary to add that Madre de Dios is a region that, for several reasons (among them the historical difficulty of accessibility) has a high cost of living and comparatively higher than most of the regions of the country, which makes more expensive the labor force, inputs and, in general, the projects costs[11].

iii. Activities similar to the proposed project activity on at least part of the land within the project boundary

The project proposes the deployment of activities articulated in a strategy of reducing deforestation in the long term that is characterized by integrating the institutional strengthening environmental governance and development work in the field with local populations. Similar activities can hardly be developed in the area, or at least part of the area, there is no history of such initiatives that have been designed or implemented in Madre de Dios and on the other hand, the budget they demand is significantly higher compared to the funds usually financed by the international cooperation.

Sub-step 1b: Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

The Law Nº 27308, Forest and Wild Fauna Law currently in force, while stipulates measures for using the Amazon forests, establishes the conditions where is justified to change the land use; nonetheless, these measurements are extremely weak because they are not supported by sanctions for deforestation and degradation, and it doesn't exist any efficient control system.

The regulatory framework promotes some of the activities that the project will launch to avoid deforestation, without getting to have a practical application in a desirable dimension.

According to the Regulation of the Natural Protected Areas Law (approved by Supreme Decree No. 038-2001-AG), the activities in the buffer areas should not jeopardize the achievement of the purposes of the Natural Protected Area that is systematically violated in Protected Areas nationwide.

According the Rules of Procedure of the Forest and Wild Fauna Law, the Ministry of Agriculture in coordination with the INRENA (now Forest and Wild Fauna General Direction –DGFF), through its regional and local offices, promotes and gives technical support for the establishment of agroforestry systems, in jungle lands classified by their greater use capacity as agricultural, oriented to the socioeconomic development of local settler and the region's environmental sustainability. Likewise, Ministry of Agriculture promotes through the INRENA (now DGFF), the establishment of forest plantations and/or agroforestry systems aimed at industrial use, either timber or non-wood products, as well as for environmental services. The stipulations of this Rules of Procedure have had a scarce practical application.

In 2006 the Law Nº 28852, Law of private investment promotion in reforestation and agroforestry, was approved declaring of national interest these activities, and also the environmental services; this law have not been regulated, for which does not have real effects.

[11] For further references, see Mosquera et al, 2009

The artisanal mining legislation does not contemplate the mercury use reduction in gold mining, and does not include the group of physical, chemical and/or physic-chemical processes that artisanal miners use to extract and concentrate the valuable parts of an aggregate of minerals and/or to purify, smelt and refine metals. Nevertheless, it is required the preparation of Environmental Impact Statements signed by a competent professional in matter of gold extraction and recuperation, to obtain the Environmental Certification referred in Law Nº27446, National System of Environmental Impact Evaluation, otherwise, any services or commerce activity could not be initiated. Still, illegal mining reality is other, as explained in section 1.10.

The project is not mandatory in the national or local legal framework, since there is not a governmental program of deforestation and degradation emissions reduction. Despite of this situation, as detailed in section 1.11, different laws establish the State responsibility in the creation of compensation mechanisms for primary forests environmental impacts, these have not been created up to date.

According to the used tool, any land use scenarios which are not in compliance with applicable mandatory laws and regulations must be removed from the land use scenarios identified in the sub-step 1a, unless it can be shown these land use scenarios result from systematic lack of enforcement of applicable laws and regulations. In the case of scenario i), it is product of the failure to comply with applicable mandatory legislation, even by the same State organizations, which is common practice in Madre de Dios region, as described in Step 3- Institutional barriers. For this reason, this scenario is not removed.

From this sub-step it is deducted that, according to legal requirements, the three proposed scenarios are valid.

Sub-step 1c. Selection of the baseline scenario:

According to the tool used to evaluate additionality, it is required that the baseline methodology (REDD Methodology Modules, BL-UP specifically) provides a stepwise approach justifying the selection and determination of the most plausible baseline scenario. Nevertheless, this baseline methodology lacks that procedure.

Scenario i) is considered the most plausible scenario, discarding scenario ii) because of the financial limitations it faces and scenario iii) due to the absence of articulated proposals with inter-sectoral coordination which could reduce deforestation effectively.

STEP 2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios

Sub-step 2a. Determine appropriate analysis method

The investment comparison analysis was used because the project will generate benefits derived from other different sources than VCS related income, which excludes the simple cost analysis. In the same direction, the benchmark analysis was rejected for not having examples of similar projects.

Sub-step 2b. Investment comparison analysis

In order to demonstrate the profitability and sustainability of the project, most representative financial indicators were calculated for the project analysis: the Investment Rate of Return (IRR), Net Present Value (NPV) and cost benefit ratio.

Sub-step 2c. Calculation and comparison of financial indicators

The following were considered:

- The project works with a discount rate of 10%, having as a reference the social discount rate proposed by Public Investment National System (SNIP) for projects[14].

- In addition, the cash flow, conservatively, assumes an annual growth of carbon credits price equal to 6%, that is to say, year 1 will have a price equal to US$ 6.00 (six American dollars) getting by year 10 to an approximate price of US$ 10.00 (ten American dollars).

- Although the project life cycle is 20 years, the cash flow has been projected to 10 years (first baseline period), since according to the VCS Methodology VM0007 v1.1, can only be projecting and estimating deforestation carbon credits for a period of 10 years.

- The costs that are incurred for the VCUs are higher in the first year of development and presented implementation costs, infrastructure and equipment to enable their activity.

- It has secured funding from SAC BAM for a period of seven years (although it is true that before the year 7 already have benefits under the cash flow obtained, it is also true that being a projected cash flow may not fully reflect the reality, for that occasion will be a sensitivity analysis on the Su-step 2d).

- Differentiation is made between revenue and funding. The revenues earned by the project are from the sale of their products, in this case, refers to the sale of VCUs, there is also an additional income by PROFONANPE for a period of two years, thus flow reflect this income housing project. On the other hand, funding are disbursements of financial resources to cover the investment, in this way, what the cash flow will reflect are the amounts of income, investment and project costs. Thus SAC BAM contributions are not reflected in the cash flow because they are part of a secured financing with which the project counts and cannot be considered as income, because if do so, there would be a conceptual mistake in the cash flow preparation.

Considering the possibility that the project performs its activity without incomes from VCUs sale, that is to say, to remove the main source of income, financial indicators were calculated, which are presented next:

Table 31 Financial indicators of the project activity without incomes from VCUs

Discount Rate	10.00 %
NPV (10%)	**- US$ 10,407,023.32**
IRR	-
Discounted incomes	US$ 0.00
Discounted expenses	US$ 10,407,023.32
B/C	-

As is observed in the table above, financial indicators show that the scenario without incomes from VCUs sale is not cost- effective: Net Present Value is negative, discounted expenses are more than discounted incomes, there are no benefits and Investment Rate of Return cannot be calculated because just losses are generated.

Significantly, the economic indicators obtained show a scenario where (productive activities, conservation agreements, control and surveillance and forest governance: see 1.8), without a permanent income, as if given the stage of the sale of VCUs, which ensures the economic viability and sustainability of the project.

[14] Annex Nº10 SNIP

In this scenario without a steady income, it is true that one could obtain financing for the activities, however, we must distinguish the viability of the project and for a project to be economically viable, and its income must cover their costs, so this scenario obtained indicators showing the impossibility to implement the project in a sustainable manner over time. We show that these activities without selling VCUs, would not be sustainable, because without adequate income would not cover the costs involved in the development of the project activities and it will be stopped for not meeting their goals. It should be noted that funding disbursements are financial resources to cover the investment and cannot be considered as income, since income is the amount of money obtained from the sale of a good or service and in this case, since it does not consider the sale of carbon credits, is not reflected in the indicators project revenues.

For the project scenario (if the sale is achieved VCUs) gives the indicators shown in Table 32.

Table 32 Financial indicators of the project

Discount Rate	10.00 %
NPV (10%)	US$ 8,315,569.86
IRR	35.69 %
Discounted income	US$ 18,722,593.18
Discounted expenses	US$ 10,407,023.32
B/C	1.80

- Net Present Value (NPV)

With a discount rate of 10%, an “income present value” (expected future net incomes discounted to their present value) of US$ 18,722,593.18 (eighteen million, seven hundred and twenty-two thousand five hundred and ninety three American dollars and eighteen cents) and an “expenses present value” (expected future net expenses discounted to their present value) of US$ 10´407,023.32 (ten million, four hundred and seven thousand, twenty-three American dollars and thirty-two cents) are obtained, Therefore, a Net Present Value of US$ 8,315,569.86 (eight million, three hundred and fifteen thousand, five hundred and sixty-nine American dollars and eighty six cents) is obtained, which indicates that the project is quite profitable, where it is possible to recoup the investment and to generate profits.

- Investment Rate of Return (IRR)

The investment rate of return value for the project is 35.69%, which indicates that the project performance is greater than investments cost, confirming the project economic viability.

- Cost Benefit Ratio

The ratio benefit to cost is 1,80 and shows the expected return for each Nuevo Sol expended, with which is resolved that the project is profitable.

Sub-step 2d. Sensitivity analysis

When performing any economic analysis projected to future, there is always an element of uncertainty associated with the alternatives studied and is precisely this lack of certainty that makes hard to take decisions. In order to facilitate investment decisions process, a sensitivity analysis has been done.

It should be noted that the sensitivity analysis is a term used very frequently in the financial analysis when it comes to taking investment decisions, which consist in calculating the new cash flows and obtaining its main indicators, in this case: **NPV, IRR, incomes present value (discounted incomes), expenses presents value (discounted expenses) and Cost-Benefit ratio,** to determine when a solution is still optimal, given some changes in the problem environment, data precision or the same project financing.

In this way, the project behavior can be observed, taking into account the different scenarios that would appear in the case that different variables change or unforeseen event occurs that cannot be controlled.

The base to apply this method is to identify possible scenarios of the investment project, which classify as follows:

Pessimist: Is the scenario where variables are not as favorable as were hoped.
Probable: This would be the more probable result that we would suppose in the investment analysis, must be objective and based in as much information as possible. That is to say, this is the scenario that the project uses.
Optimist: There is always a possibility to achieve more than is projected, the scenario where benefits are more than expected.

In this case, we performed the analysis of three cases:

a. **Price Variation:** First column shows the expected financial indicators under a normal circumstance (most feasible scenario based on the project information). In Table 33, first column shows the project financial indicators, second column shows their values, in the next 4 columns are shown financial indicators variations if carbon credit prices decrease in 5 %, 10 %, 15 % and 20 %, respectively. Likewise, in Table 34, the last 4 columns show financial indicators variations if carbon credit prices increase in 5 %, 10 %, 15 % and 20 %, respectively.

Table 33 Financial Indicators with percentage decrease of carbon price

Financial indicators calculated with a discount rate of 10%	Regular price of tCO_2	Price decreased in 5% of tCO_2	Price decreased in 10% of tCO_2	Price decreased in 15% of tCO_2	Price decreased in 20% of tCO_2
NPV	$8,315,569.86	$7,430,603.55	$6,545,637.24	$5,660,670.93	$4,775,704.63
IRR	35.69%	33.37%	30.99%	28.54%	26.00%
Incomes Present Value	$18,722,593.18	$17,837,626.87	$16,952,660.56	$16,067,694.26	$15,182,727.95
Expenses Present Value	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32
Benefit / Cost	1.80	1.71	1.63	1.54	1.46

(*) According to the National Public Investment System - SNIP

Table 34 Financial indicators with percentage increase of carbon price

Financial indicators calculated with a discount rate of 10%	Regular price of tCO_2	Price increased in 5% of tCO_2	Price increased in 10% of tCO_2	Price increased in 15% of tCO_2	Price increased in 20% of tCO_2
NPV	$8,315,569.86	$9,200,536.17	$10,085,502.47	$10,970,468.78	$11,855,435.09
IRR	35.69%	37.96%	40.17%	42.35%	44.49%
Incomes Present Value	$18,722,593.18	$19,607,559.49	$20,492,525.79	$21,377,492.10	$22,262,458.41
Expenses Present Value	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32
Benefit / Cost	1.80	1.88	1.97	2.05	2.14

(*) According to the National Public Investment System - SNIP

b. **Costs Variation:** In a similar way as carbon credits price, in Table 35 is presented, in the first column, the financial indicators that the project uses to observe its profitability, second column shows their obtained values and in the next 4 columns are shown financial indicators variations if project costs decrease in 5 %, 10 %, 15 % and 20 %, respectively. Likewise, in Table 3, the last 4 columns show financial indicators variations if project costs increase in 5%, 10 %, 15 % and 20 %, respectively.

Table 35 Financial indicators with percentage decreased of project costs

Financial indicators calculated with a discount rate of 10% (Source: SNIP)	Indicators calculated with projected costs	Project costs decreased in 5%	Project costs decreased in 10%	Project costs decreased in 15%	Project costs decreased in 20%
NPV	$8,315,569.86	$8,835,921.02	$9,356,272.19	$9,876,623.36	$10,396,974.52
IRR	35.69%	38.42%	41.44%	44.78%	48.53%
Incomes Present Value	$18,722,593.18	$18,722,593.18	$18,722,593.18	$18,722,593.18	$18,722,593.18
Expenses Present Value	$10,407,023.32	$9,886,672.16	$9,366,320.99	$8,845,969.82	$8,325,618.66
Benefit / Cost	1.80	1.89	2.00	2.12	2.25

(*) According to the National Public Investment System - SNIP

Table 36 Financial indicators with percentage increase of project costs

Financial indicators calculated with a discount rate of 10%	Indicators calculated with projected costs	Project costs increased in 5%	Project costs increased in 10%	Project costs increased in 15%	Project costs increased in 20%
NPV	$8,315,569.86	$7,795,218.69	$7,274,867.53	$6,754,516.36	$6,234,165.19
IRR	35.69%	33.19%	30.89%	28.76%	26.78%
Incomes Present Value	$18,722,593.18	$18,722,593.18	$18,722,593.18	$18,722,593.18	$18,722,593.18
Expenses Present Value	$10,407,023.32	$10,927,374.49	$11,447,725.65	$11,968,076.82	$12,488,427.99
Benefit / Cost	1.80	1.71	1.64	1.56	1.50

(*) According to the National Public Investment System – SNIP

c. Project Prices Variation and Costs simultaneously: Similar to the analysis of the two previous variables, now will work, with changes in prices and costs of the project simultaneously. Thus, shown in Table 37, in the first column economic indicators used to observe the project performance, in the second column are the values obtained and 4 columns show the following variations economic indicators if prices of carbon credits and reduce project costs increase by 5%, 10%, 15% and 20%, respectively. Similarly, in Table 38 the last four columns show the variations of economic indicators if the price of carbon credits increase and the project costs decrease by 5%, 10%, 15% and 20%, respectively.

Table 37 Financial indicators with percentage decrease in carbon prices and percentage increase in project costs

Financial indicators calculated with a discount rate of 10% (*)	Project Indicators	Reduced Prices and Increased Costs by 5%	Reduced Prices and Increased Costs by 10%	Reduced Prices and Increased Costs by 15%	Reduced Prices and Increased Costs by 20%
NPV	$8,315,569.86	$7,430,603.55	$6,545,637.24	$5,660,670.93	$4,775,704.63
IRR	35.69%	33.37%	30.99%	28.54%	26.00%
Income Present Value	$18,722,593.18	$17,837,626.87	$16,952,660.56	$16,067,694.26	$15,182,727.95
Expenses Present Value	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32
Benefit / Cost	1.80	1.71	1.63	1.54	1.46

(*) According to the National Public Investment System - SNIP

Table 38 Financial indicators with percentage increase in carbon prices and percentage decrease in project costs

Financial indicators calculated with a discount rate of 10% (*)	Project Indicators	Increased Prices and Reduced Costs by 5%	Increased Prices and Reduced Costs by 10%	Increased Prices and Reduced Costs by 15%	Increased Prices and Reduced Costs by 20%
NPV	$8,315,569.86	$9,200,536.17	$10,085,502.47	$10,970,468.78	$11,855,435.09
IRR	35.69%	37.96%	40.17%	42.35%	44.49%
Income Present Value	$18,722,593.18	$19,607,559.49	$20,492,525.79	$21,377,492.10	$22,262,458.41
Expenses Present Value	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32	$10,407,023.32
Benefit / Cost	1.80	1.88	1.97	2.05	2.14

(*) According to the National Public Investment System - SNIP

Thus, one can conclude that the project is not very risky, because even considering the more conservative and pessimistic scenario, where the price decreases by 20% and costs are increased by 20%, the project remains profitable and economically attractive thus, it follows the same economic viability.

Additionally, we performed an analysis of the change in economic indicators, if the project life cycle be adversely affected by some external factor (the current cash flow of the project 10 years for this purpose shows variations for cases the project is affected for some reason and the cash flow is only 9, 8 or 7 years).

Table 39 Financial indicators with project life cycle decrease

Financial indicators calculated with a discount rate of 10% (*)	Calculated with a project life cycle of 10 years	Calculated with a project life cycle of 9 years	Calculated with a project life cycle of 8 years	Calculated with a project life cycle of 7 years
NPV	$8,315,569.86	$6,207,468.70	$4,138,056.46	$2,531,807.80
IRR	35.69%	33.27%	29.58%	24.99%
Income Present Value	$18,722,593.18	$16,221,105.63	$13,711,801.10	$11,629,554.90
Expenses Present Value	$10,407,023.32	$10,013,636.92	$9,573,744.64	$9,097,747.10
Benefit / Cost	1.80	1.62	1.43	1.28

It is found that the project, despite these variations, remains economically attractive for its profitability and sustainability over time.

STEP 3. Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of the type of proposed project activity

- **Investment barriers**

The most visible barrier that project is facing is the financial one, due to economical shortages that natural protected areas face to their right management.

The budget of the National System of Natural Protected Areas (SINANPE) is made up of the budget from National Service of Natural Protected Areas (SERNANP), the resources assigned annually by National Fund for Natural Protected Areas (PROFONANPE) from the patrimonial (fiduciary) funds that it administrates in perpetuity, and the resources from projects entrusted to this entity, contributions that are not consolidated in any of both budgets like the projects executed by entities with NPA administration contracts, projects executed in the buffer zone, regional governments counterpart contributions to projects, and resources from local governments and from population by their participation in the NPA and that have not been registered or valorized; these last ones change from one NPA to another (SERNANP, 2009).

On the whole, SINANPE budget for year 2009 was approximately US$ 18 million (without valorizing the totality of some private and local interventions that could raise it to 20 million) (SERNANP, 2009); from this amount, SERNANP budget was of US$ 1 468 198,47, which corresponded to 0,018 % of the Republic General Budget for that year (SERNANP, 2009).

From total SERNANP budget, the central offices at Lima absorb the 15,4% and the NPAs the 76,1%. From the NPA total, a third part corresponds to Machu Picchu Historic Sanctuary, which is the larger fundraiser and holds the totality of resources that it raises (SERNANP, 2009)..

Hence, from SERNANP budget, U$ 1 780 000 correspond to the left 66 NPA in the System, which means an average of US$ 26 700 annually for each one of them.

Considering the financial sources of the SINANPE global budget, from the US$ 18 million, 11,7% corresponds to ordinary resources (RO), 12% to directly raised resources (RDR), 8,2% to patrimonial or fiduciary funds (FF) and 68,1% to international cooperation (CI), as is seen in Figure 18.

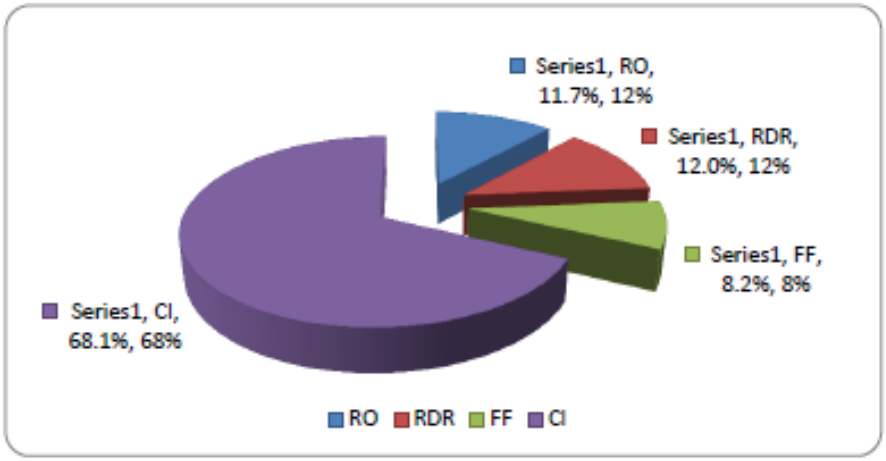


Figure 18 SINANPE financial sources
Source: SERNANP, 2009

To preserve the most representative part of national biodiversity it is needed an important increment of the State financial contribution. If that assignment was at least 0,20% of public budget, it would balance the current budgetary structure, characterized for a high dependence of external resources (León, 2007).

The financial lacks dramatically demonstrate in limitations that has NPA control and surveillance system. A system like the current one in RNTAMB and PNBS does not show an adequate operating capacity, as both represent a very extended area and because of the development of several activities like tourism control, hunting and fishing, as well as threats from felling and mining[12].

The surveillance system RNTAMB PNBS-sector Madre de Dios, made in the field by 09 checkpoints (08 in the Reserve and 01 in the Park) and 23 rangers, being this understaffed: covering an area of 563 608, 94 ha, which means about 24 504.73 ha has to be monitored for each ranger. Also, since working in the regime of 22 working days with 08 days off, checkpoints often present the following situations.

a) Checkpoints that have 3 working people show 3 periods of staff permanence and activities:

- Period 1: of 8 days a month with just one person working, who does surveillance from the checkpoint, without being able to do patrols, interventions and others; besides, if there would occur an urgency for infringement, he could not take action because would have to

[12] AIDER. FONDAM-PROFONAMPE-PNBS: Project "Strengthening the management and sustainability of Bahuaja Sonene National Park" 2010. Reports and ledgers from the Management Agreement of RNTAMB and PNBS-field Madre de Dios

leave the checkpoint alone, without considering the case that occurs an emergency for sickness, which would be critical;

- Period 2: of 8 days with two people present, which easies the activities at the checkpoint, but not the patrols or interventions on which is required a minimum of 2 people to proceed on the field;

- Period 3: of 14 days and counting with 3 people at the checkpoint, who can develop activities in a more operative manner, because they can attend users and do extension or control activities out of the checkpoint.

b) Checkpoint that have 2 working people show 2 periods of staff permanence and activities:

- Period 1: of 16 days a month with just one person working, who does surveillance from the checkpoint, without being able to do patrols, interventions and others; besides, if there would occur an urgency for infringement, he could not take action because would have to leave the checkpoint alone, without considering the case that occurs an emergency for sickness, which would be critical;

- Period 2: of 14 days with two people present, which easies the activities at the checkpoint, but not the patrols or interventions on which is required a minimum of 2 people to proceed on the field.

In the hypothetical case that the NPA checkpoints have 3 people working, they would show 3 periods of staff permanency and activities, being much more effective but not yet 100% operative.

- Period 1: of 16 days with two people present, which easies the activities at the checkpoint, but not the patrols or interventions on which is required a minimum of 2 people to proceed on the field.

- Period 2: of 14 days and counting with 4 people at the checkpoint, which can develop activities in a more operative manner, because they can attend users and do extension or control activities out of the checkpoint.

This lack of staff is mitigated with some measurements taken to improve operational capacity, like having a communication system from checkpoints and integrating, in some seasons of the year when is required more control and surveillance, voluntary staff that contributes to do multiple activities.

A latent problem in the NPA is also the historical insecurity in disbursement of budget allocations, which during last year has shown a tendency to stabilize, due to the creation of the Ministry of Environment (MINAM); nonetheless, a deficit in the amount of money assigned to operational capacity of checkpoints remains, where equipment, general maintenance, food supplies and fuels are always insufficient[13].

This scenario shows some of the activities that would continue being done in a deficient manner in the mentioned NPAs, meaning deficient not related to the staff activity, which shows dedication and commitment in conservation work, but to the requirements in park rangers staff

[13] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Biol Deyvis Huaman

number necessary for an effective control and expenses involved in checkpoints operations, without mentioning the fees issue which requires also immediate attention[14].

Some of the activities proposed by the project have been launched in a small scale, as is the case of agroforestry. Its impact will be explained in the common practice analysis.

The access to agricultural credit in Peru, especially for small and medium-scale operations, is in general a source of debate and conflict, being continuously part of voting platforms of different political groups, especially the creation, rescue or extension of the scope of the Agrarian Bank (public)[15]. Up to date, the access to credit is still limited, especially due to excessive land fragmentation, frequent lack of property titles among small producers[16] and low profitability of small and medium scale agriculture, which makes it less attractive to banking sector[20]. To this is added the Financial institutions and State assistance attention are focused on agricultural land of Peruvian cost, where highly profitable and larger scale-crops are produced, both traditional (rice, cotton) and non-traditional (asparagus)[17].

This scene gets more critical for forests activities. These are not eligible for credit to the financial institutions[18] [19], as in their case do not exist property titles that can be used as endorsement by producers (forest, according to law, are handed over just through concessions)[20].

- **Institutional barriers:**

The Peruvian State characterizes by huge deficiencies in its institutional structure. The most visible expression of this weakness is the scarce or no control that the State exerts over the areas under its jurisdiction or property; for this reason, it is a common fact that a natural protected area is encroached to install activities incompatible with its creation goals. The scarce presence of the State in remoter areas of national territory also means a lack of control over inputs and products, as well as deficient supervision of economic activities. Another consequence of this historical absence is the fact that for an Amazonian rural settler the public land encroachment is not a crime, since there has never been a real demonstration of that ownership; about land tenure, the “in practice” sense predominates over the “right of” one[21].

The State institutional weakness also means historically incoherent policies, a lack of coordination between institutions and even open intersectoral conflicts[22]. Added to this, within the political and regulatory framework Peruvian tradition of trying to improve the poverty situation in the Peruvian Amazon through the promotion of activities that violate forest ecosystems, such as agriculture and livestock, this tradition has over 150 years old (Figallo, quoted by Capella and Sandoval, 2010). A clear example of these policies were the so called “Proyectos Especiales de Selva” (Jungle Special Projects) carried out in the second half of

[14] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Biol Deyvis Huaman
[15] http://cepesrural.lamula.pe/category/credito-agrario
[16] http://cepesrural.lamula.pe/2011/04/13/conveagro-critica-rebaja-arancelaria-a-productos-agrarios/cepesrural
[20] http://cepesrural.lamula.pe/category/credito-agrario
[17] http://cepesrural.lamula.pe/category/credito-agrario
[18] http://www.cdlima.org.pe/documents/capitulos/forestal/noticias/191.html
[19] http://www.cepes.org.pe/notiagro/node/7249
[20] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Forest Engineer Marioldy Sanchez
[21] See Mosquera et al., 2009
[22] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Johhny Anthropologist Davila.

twentieth century, which mainly fomented the agricultural development in the Amazon jungle, even on lands where its use capacity was different from this; the different activities of those projects have generated, among rural settlers, a vision that considers deforestation as a synonym of progress[23]. The trend rules of laws and regulations that favor deforestation continues, since there are rules in the country that support this form of ill-use Amazonian forests and lands, including Legislative Decree 667, Act Rural Estate Registry , and Legislative Decree 653, Law on Investment Promotion in the Agricultural Sector, which encouraged the practice of granting owned forests of the Amazon as a "reward" for making illegal use change through the inappropriate use of the call "swidden" (Figallo, quoted by Capella and Sandoval, 2010).

Nowadays, the government incentives for large infrastructure and investment projects is often against the economic activities that are technically, ecologically and socially more appropriate for a certain Amazon zone; this is the case of Madre de Dios, where its more promissory, recognized and technically feasible activities (forestry, tourism) face threats derived from the Interoceanic Highway construction[24].

In 2005, as indicated in section 1.10, the South Interoceanic Highway works were offered in concession. These were exonerated, by a supreme decree, from the Public Investment National System (SNIP), a filter created to improve the State investments quality by means of the adequate studies. The work was approved, financed and started without having a complete Environmental Impact Study (EIA), going against the Law in force (Law Nº28611, Environment General Law, from October 2005, and also the one that preceded it). The feasibility study was considered enough by the Peruvian government (Transports and Communications Ministry - MTC, Economy and Finance Ministry - MEF, governmental agency of promotion of private investments - Proinversion) to approve the project and to tender the work. This study has an extent environmental chapter, despite of which it cannot be qualified as environmental impact assessment (it is essentially a compilation of available information not always updated; besides, it refers almost exclusively to probable direct impacts) (Dourojeanni, 2006).

The absence of an EIA to approve the work was a cause for considerable criticism, but was not the only reason for that. The economic justifications given at the feasibility study express that the agriculture expansion is one of the project objectives; the proposals of intensive crops installations, promoted by the State itself, include sugar cane and soja (Dourojeanni, 2006). It was assumed as a benefit that Madre de Dios would have from 12 000 ha with agriculture (in 2005 this corresponded to 0,6% of national total) to 196 000 ha (10,2% of national total) by the third year after finishing the work. Assumes also the introduction of 370 000 livestock units, having as a result that 55% of the highway net benefits come from agrarian projects (Zegarra, 2005). Some critics have considered that these benefits have been oversized, arguing that Madre de Dios reality does not match with data used in the agricultural-land availability study and that, also, has been exaggerated the crops economic profitability (Zegarra, 2005; Olcese, quoted by Dourojeanni 2006). The Ministry of Transport and Communications also includes among its benefits “to foster the poor high-Andean population to migrate to the Amazonian plain, which has more development possibilities” (Palacios Lanfranco, quoted by Dourojeanni, 2006). Others consider that the work responds essentially to geopolitical Brazilian interest (Roburg, quoted by Dourojeanni, 2006), which looks for a strategic exit for its products towards the Pacific Ocean and hence to Asian markets.

This agricultural development projections did not specify where would be established the new productive areas. In 2002, most of areas adjacent to the highway (where is more probable that crops and pastures will be installed) were designated as Permanent Production Forests (BPP), as is observed in Figure 19. The Government argues that land occupation situation in Madre de

[23] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Johhny Anthropologist Davila.
[24] See Dourojeanni *et al.* 2009.

Dios is consolidated by the existence of natural protected areas, titled indigenous lands and the forest concessions system (of several types) already awarded. It is also elaborating an ecological-economical zoning and development plans.

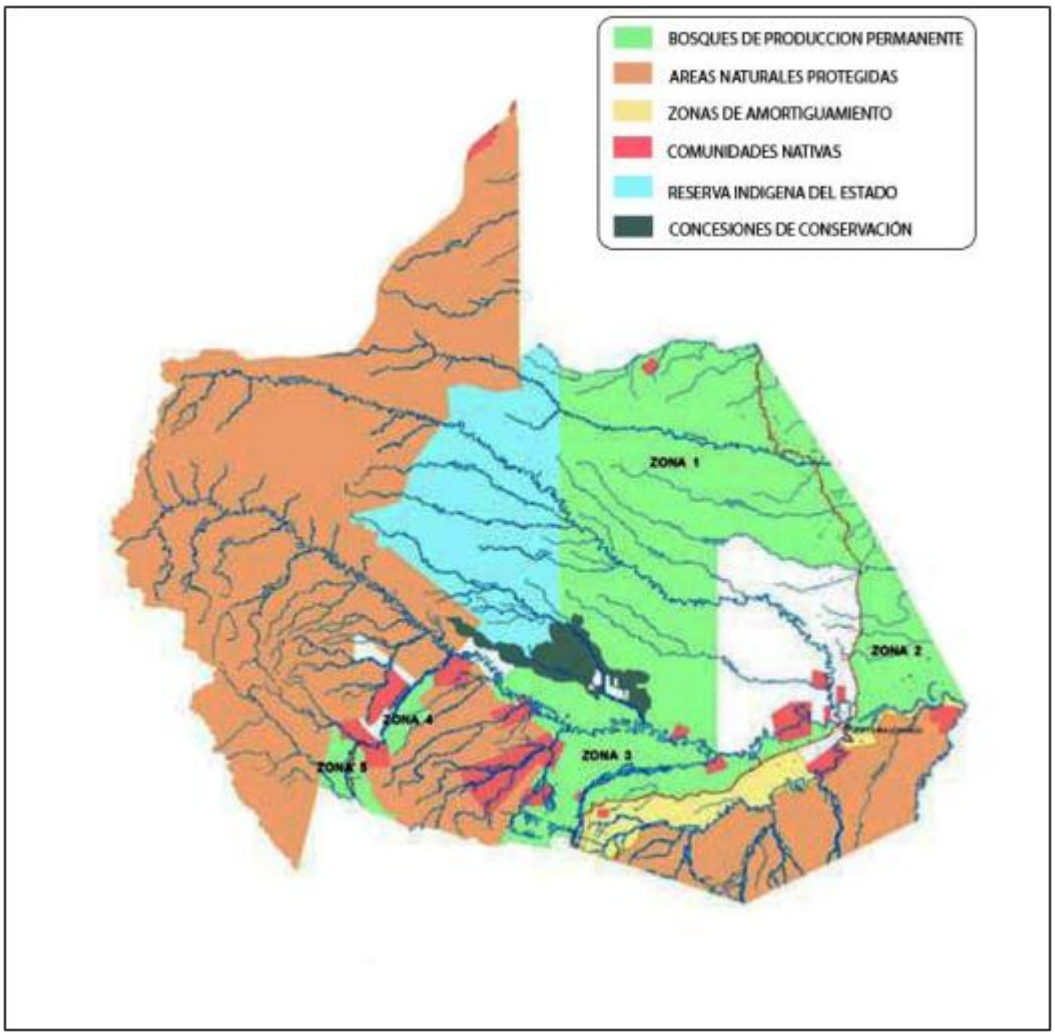


Figure 19 Delimitation of Permanent Production Forests in Madre de Dios
Source: INRENA, 2003c

Reality shows that the supposed land occupancy stabilization is very fragile. In first place, there is no capacity to avoid encroachments and the deficient work of the Land Titling and Rural Cadastre Project (PETT), instead of avoiding conflicts, has multiplied them. In second place, the probability of plans to be implemented is extremely remote, given its high cost and the low management capacity of the regional government (Dourojeanni, 2006).

The regional land tenure situation is chaotic, existing a high degree of informality of rural property in the axis road (it is estimated that 500 000 individual lands have a lack of property titles or adequately geo-referenced boundaries, happening also in Native Communities). Because of this, land conflicts are expected to be aggravated in the future due to the appearance of new people interested in occupying land and/or use natural resources. This situation is supported by the weak presence and institutional structure of the State at a national,

regional and local level; example of this situation are confusions fomented by the State itself through its mechanisms for awarding land with agricultural purposes, forest, mining and oil concessions, usually without consulting with other sectors and without field checking. Land market is now extremely active along the Interoceanic highway and prices have duplicated and even triplicated, being mostly foreign buyers (Dourojeanni, 2006).

After the work's tender, partial environmental impact studies, referred to the sections by which the work was started (2 and 3), were conducted. Nevertheless, they are studies based on second-hand information or referred essentially to the work's direct impacts that do not have a complete analysis, neither the essential complement of public information and consultation. The claim of partial or sectional environmental impact studies to be altogether equivalent to a complete environmental assessment is not technically acceptable and, anyway, would be approved too late to be able to apply the range of measurements that the exercise presupposes (Dourojeanni, 2006).

Trying to rectify this situation, the Andean Development Corporation (CAF) pressed the Peruvian government to accept a program of environmental and social management in the highway-affected area (Programa INRENA/CAF) (Dourojeanni, 2006). Nonetheless, the Program manages a notably disproportionate budget in relation with the paving cost (US$ 892 million against 17, 5 million, less than 2 %) and the threats magnitude that it pretends to solve (Bank Information Center, cited by Balvin 2008).

- **Technological barriers:**

The technological barriers are relating to the financial ones, having the protected areas a lack of necessary and sufficient resources to acquire and maintain equipment, as well as appropriate monitoring and surveillance systems.

Thus, for example, Amazonian natural protected areas of Peru should count with a deforestation monitoring system that makes use of remote sensors; however, its high cost has made it impossible to the present date. Another example is the use that could be given to equipment such as camera traps to conduct biological monitoring, which are being used only in punctual investigation projects.

Related to economic activities carried out by population adjacent to the project area, in the case of gold mining, proposed technology would not be implemented if the project would not exist, due to its high cost.

- **Barriers related to local tradition:**

Colonizers, who settle in Amazonian plains, coming from the Andes, implement their farming practices without taking into account climate and soil different conditions from the ones at their home regions. This results in low productivity, an increase of deforestation and abandonment and degradation of soils. To this, the mentioned view of deforestation as "land improvement", that is to say, progress, is added[25]. The project activity, failing to achieve the VCS registry, hardly could deal with the constant immigrant flow towards Madre de Dios, due to investment barriers described above.

- **Barriers due to local ecological conditions:**

In Madre de Dios, areas that were deforested to implement grasslands and then abandoned have been frequently invaded by grass of Brachiaria genus (alien species), which is

[25] See Huertas - Garcia "Indigenous People of Madre de Dios: History, Ethnography and Business Cycles" 2003

characterized by being an aggressive competitor and can inhibit the forest natural regeneration; this results in a continuous process of soil degradation caused by climate conditions. Uncontrolled fires also influence on soil degradation and interruption of natural succession[26].

Degraded soils from gold illegal extraction are rendered useless for other land uses, neither for forest natural regeneration (see Annex 29).

- **Barriers due to social conditions and land-use practices:**

Description of plausible without-project scenarios (continuation of pre-project land use) includes statistics of population increment occurred between years 2000 and 2010, related to a sustained raise in gold price.

Weak institutions, as mentioned, result in a great number of illegal activities (deforestation, timber and non-wood products extraction, unauthorized mining exploitation, etc.).

Furthermore, lack of training causes permanence of land-use practices not compatible with forest cover conservation, soil productive capacity and forest resources restoration[27].

The greatest conflict of interest in the region is the overlapping between mining operations (either authorized or illegal) and other activities, being these agricultural, forestry, touristic and conservation, as well as with Native Communities rights. Since mining is the economic activity that contributes the most to regional GDP, mobilizes a large proportion of the population, generating conflicts with other economic activities, especially those compatible with conservation[28].

The relation between indigenous populations and miners has been friendly during a long time, without major conflicts for territory. However, the situation turns conflictive after the land titling of Native Communities, between 1984 and 1994, and –principally- after being declared the Tambopata-Candamo Reserved Zone in 1990 (Mosquera *et al.*, 2009). The indigenous populations have maintained a relation with the miners characterized by tension, confrontations and the exigency of a payment for exploiting the mineral in community territories, as concept of “royalties”. Likewise, conflicts have been generated inside the Native Communities, between the ones that promote a community collection of royalties and the ones that promote an individual collection. In 2009, there was an overlap of 29 mining rights on the territory of the Native Community Kotsimba and one on the Native Community Infierno, it should be noted that these figures do not include illegal mining (Mosquera et al. 2009).

In the social dimension, there have been differentiated two actors: the strictly miner one and the so called “population” or civil society. Miners have configured a body of social relations based on a sense of belonging and identity around mining and on ideas such as “work hardness”, “not to be able to obtain profits from their work but the trader and middle men (mineral collector) do”, “the poverty conditions in which they live”, “having created their own job” and “being just passing through”. In the miners’ perception, population or civil society, just requires money without noticing their true condition, neither recognizing that if there was no mining then there would not be commerce or population. In the same way the civil society has elaborated its social world of representations, its belonging and identity sense, based on recognizing themselves as a non-miner social group, who live from the commerce, have as representative institutions the local governments or State institutions, and that identify themselves as poor.

[26] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Gil Flores Asvin-Agronomist.
[27] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Gil Flores Asvin-Agronomist.
[28] See Mosquera *et al.*, 2009

About miners they indicate that they are rich, spend their money in pubs, nightclubs and discos, are ignorant and have to pay a royalty for working in their territory (Mosquera *et al.*, 2009).

Conflicts have become more and more frequent in the process of mining activities development and development of local populations that emerge and hinge around this activity (Mosquera *et al.*, 2009).

- **Lack of organization of local communities**

In Peru exist different political- administrative categories and are recognized different ways for population to organize themselves; this happens in Madre de Dios as well. In the reference region the next ones are identified:

- Populated town: political-administrative category that comprise also settlements with more than 350 families. It has a small municipality which maximum authority is the mayor and his council members, made up of 6 people; includes also a lieutenant governor (Teniente Gobernador) as political authority. It has a lack of defined budget (FONCOMUN); it only depends from the municipality of the district they belong to.

- Sector: Is the gathering of a small number of families, being this part of another bigger political-administrative area. It is comparable to "neighborhood" and does not have authorities of higher level, just representatives of the group.

- Producers association: group of people organized around the development of a certain productive activity, occupying a common land (with private ownerships of the occupied lands, both titled or not) where they develop their productive activities, install their homes and share social and festive activities, conditions that tighten more their family and neighborhood bonds. They count with a recognized representation, the Management Board (Junta Directiva) that is responsible for ensuring the welfare of association members, but mainly regarding what their unifying productive activity implicates.

- Native Community: legal figure created in 1974 and sanctioned in the Political Constitution of Peru enacted in 1979 (and its successor of 1993) to recognize the property rights of indigenous people.

The organization level of local populations is heterogeneous: thus, we find populations with strong organizations, as is the case of Virgen de la Candelaria, and others with an extremely weak organizational structure, as is the case of Loero sector and San Bernardo producers association. Several factors contribute to organizational weakness of many populations, as rural land registry deficiencies, lack of clear delimitation between neighboring sectors that grow without planning, ownership informality, double residence regime (between town/sector and Puerto Maldonado city), presence of "watchers" hired by the land owners, internal conflicts, scarce participation, non-compliance with agreements, among others. To this, a constant creation of migrant settlements is added, principally those dedicated to illegal gold mining, being this the population segment with more organizational weakness[29].

On the other hand, there are consolidated organizations, like the Native Federation of Madre de Dios river and affluent (FENAMAD). Even so, it cannot be ignored that the existence of organizational weakness in different groups represents an important barrier for articulated establishing of activities that involve an effective reduction of current deforestation and forest degradation tendencies[30].

[29] See Mosquera *et al.*, 2009
[30] See Huertas - Garcia "Indigenous People of Madre de Dios: History, Ethnography and Business Cycles" 2003

- **Barriers relating to land tenure, ownership, and property rights:**

According to Law Nº 26821, Organic Law for the Sustainable Use of Natural Resources, the natural resources maintained in their source, being these renewable or not, are Heritage of the Nation. The fruits and products from natural resources, obtained in the way this Law establishes, are property of holders of the rights awarded over them. The forests are part of the Forest and wild fauna Nation's Heritage, according to Law Nº29763, Forest and Wild Fauna Law. Hence property rights over natural forests lands cannot be awarded. Currently, The Organism of Formalization of Informal Property (COFOPRI) gives titles only in extents of worked land (were forest have been cleared), which increases the deforestation process of the zone (MINAM, 2009). This has already been mentioned in the institutional barriers.

If the project is done without selling VCUs, will not achieve the objective of reducing deforestation and degradation, since most of the leakage belt population will continue its current practice of land use.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternative land use scenarios (except the proposed project activity):

The identified barriers would not prevent the continued use scenario pre-project land, indeed, contribute to its aggravation.

STEP 4. Common practice analysis

The previous existence of initiatives from different institutions that have had as a goal to promote sustainable productive activities is recognized, some of them similar to the proposed ones in the present project to reduce deforestation; this involves the need to evaluate barriers found by each one of them, if there was any.

Previous projects have promoted agroforestry, characterized for its self-consume orientation, without generating incomes to farmers (what is different from the project proposal), hence they considered agroforestry as a complimentary activity to the traditional slash-and-burn agriculture. The interventions where short-termed (2-3 years), involving farmers training and installation of agroforestry systems, but not their monitoring, so they did not result sustainable and, on the other hand, have generated distrust among beneficiaries for not having results traduced in an improvement of their economic conditions. The real success degree of those programs has not been evaluated. The proposed project activity adds the permaculture scope, not considered in the previous initiatives[31].

In relation to palm trees management, there have been harvest pilot trials, with a lack of continuity[32]; besides, the project pretends to incorporate the marketing chain of obtained products.

Regarding chestnut harnessing, there are numerous initiatives that comprise the ordering and management of castañales, as well as the post-harvest management. Nevertheless, a crucial aspect that the project will address is the organization of producers (castañeros), which is weak; this weakness has occasioned that processes started by other projects did not have the necessary continuity[33].

[31] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Agronomist Asvin Gil Flores, Forest Engineer Mariolidy Sanchez.
[32] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Aldo Ramirez Agronomist
[33] AIDER. FONDAM-PROFONAMPE-PNBS: Project "Strengthening the management and sustainability of Bahuaja Sonene" 2010. See Annex 30 - Internal Workshop multidisciplinary analysis of the

Aquaculture has been practiced in the Puerto Maldonado-Iñapari road, were the Peruvian Amazon Research Institute (IIAP) is implementing this activity with good results up to date[34].

In the region, any project involving artisanal gold mining have not existed until the present date, being this project the first initiative that seeks to incorporate to this activity, new technologies that reduce mercury use[35].

Finally, the selective and illegal extraction of timber species is common practice; except one forest concession, the sustainable forest management in settlements and Native Communities adjacent to the protected areas is still non-existent[36].

We can observe that a common barrier to all initiatives existent up to date is their short life cycle, if compared with the necessary time to consolidate them technically and financially. This will be surpassed thanks to the long-term existence of the REDD project[37].

2.6 Methodology Deviations

The Region of reference for the projection of the rate of deforestation - RRD (BL-UP 1.1.1.1) was defined including the project area and leakage belt, its size and limits were defined matching the reference region to project the deforestation location - RRL (BL-UP 1.1.1.2).

According to the specifications in the BL-UP module (1.1.1), the reference region is representative of the general patterns of unplanned deforestation that are influencing the project area and leakage belt. As Madre de Dios is a region apart from the rest of the Peruvian Amazon for their ecological and socio-economic characteristics (see section 1.10), it is considered that both the rate and location of deforestation should be evaluated within the scope of that region and also taking into account social and economic factors at the regional level.

Madre de Dios has the only portion of subtropical Amazon of Peru, as a result, has species such as paca (Guadua sp.), which is important for the classification of forest types, and chestnut (Bertholletia excelsa), whose economic importance determines the existence of social actors involved in its use.

Madre de Dios consists of a closed basin (bounded by the headwaters of the Manu, Tahuamanu and Piedras, the Andes mountain range and borders with the Republics of Brazil and Bolivia), so it has no fluvial connection with the rest of the Peruvian Amazon, also, the only land that connects Madre de Dios with the rest of the country is the inter-oceanic highway, recently paved, (see sections 1.10.2 and 2.5), which leads to the Andean region of Cusco. The historical isolation (and, therefore, low population) and the recent interconnection with the rest of the country by a national road paved in its entirety is a fundamental difference with the rest of the Peruvian Amazon. Through this pathway there is an intense migration from the southern Andes, where the most economically depressed areas of the country, the farming culture of

characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Forest Engineer Marioldy Sanchez

[34] "Natural Resources and Aquaculture" MDD 2006. See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Gil Flores Asvin -Agronomist.

[35] AIDER: Artisanal mining project with social and environmental responsibility in the buffer zone of the Tambopata National Reserve, Madre de Dios: APAYLOM experience. FONDAM finances.

[36] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Anthropologist Johnny Davila.

[37] See Annex 30 - Internal Workshop multidisciplinary analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD / March 2010 - Gil Flores Asvin-Agronomist.

these migrants[38] and the presence of alluvial gold deposits[39], added by the increase in international prices of the metal, encourage deforestation, which, by the above conditions, follows patterns unique to the region.

Having established that DRR must lie within Madre de Dios, there is the inconvenience that it does not cover the project area and leakage belt, as specified in the module BL-UP. If DRR is limited to an area within the Madre de Dios that excludes the project area and leakage belt (for example, the northeast portion of the Madre de Dios, consisting of the districts of Iñapari, Iberia, Tahuamanu and Las Piedras, which are also crossed by the southern inter-oceanic highway), the deforestation model accuracy would be severely affected by excluding key areas for most variables that were used in the modeling: Opportunity cost (which is lower in Southern Madre de Dios), native communities (which are mostly concentrated in the south of Madre de Dios), mining concessions (grouped around the project area and leakage belt), Protected Natural Areas (in southeast and southwest of Madre de Dios), Quaternary Holocene (also concentrated in the south), navigable rivers (navigable rivers higher flow and regularity are south) for details on the variables used in the modeling, see step 3.1 of Annex 23.

In order to have an accurately projecting rate of deforestation, it is necessary to include the project area and leakage belt in DRR.

- The **leakage belt area** (BL-UP 1.1.3) corresponds to 48.66% of the project area, since it is not possible to achieve the requirements of the methodology (at least 90% of the project area) without affecting the 4.6.1 criteria of the AFOLU Requirements, which states "Leakage is defined as any increase in GHG emissions that occurs outside the project boundary (but within the same country), and is measurable and **attributable to the project activities"**.

The leakage belt is bounded on the north-east, by the low Madre de Dios river whose characteristics and river dynamics determine the physiographic environment and settlement patterns of populations whose deforestation agents do not cross from one bank to another, but they form the border of deforestation from the bank on which it is located; expanding the leakage belt toward the opposite bank of the river would have cast doubt on the attribution of deforestation made it to the activities of the project[40].

The north central limit leakage belt, meanwhile, coincides with the highest concentration of accumulated deforestation in Madre de Dios (see Annex 18), so that forests cannot be found in this sector.

Finally, beyond the northwestern boundary leakage belt forests themselves are similar. However, they have not been included because they were among the southern oceanic highway and river Inambari, in this area, crossed by secondary roads that connect the river with the road axis, are populations (for example, Sarayacu Alto Huacamayo, etc.[41].) which, despite being linked to deforestation, mining predominantly[42] do not imply a direct threat to the project area; include produce more serious distortion in the principle of conferral of leakage, since that deforestation mining progresses in this area regardless of the project activity.

[38] The regional culture is more related to Amazonian Andean patterns due to migration and the severe alteration of native indigenous population produced during the period of the rubber. This affects the application of unsuitable agricultural practices to regional ecological reality. See section 1.10.2 and 2.5 – Barriers Analysis.
[39] In the Peruvian Amazon plain, the essential gold zone is Madre de Dios. See http://www.minem.gob.pe/minem/archivos/file/Mineria/PUBLICACIONES/MAPAS/2012/MAPAORO.pdf
[40] To determine this, we performed the Participatory Workshop "Analysis of the mobility of agents of deforestation in the buffer zone of the Tambopata National Reserve adjoining the river Madre de Dios"
[41] See Geodatabase_Shapefiles COBERTURA_BASE Centros_Poblados_2010
[42] See Mosquera *et al.* 2009

In sum, the leakage belt has been delimited using the maximum possible area considering the principle of conferral of leaks to the project activity.

Reduced the total national forest area available for unplanned deforestation - TOTFOR (LK-ASU 4a) the scope of the Madre de Dios region, due to the particular scenario that occurs within the boundaries of the region, as found lines described above in methodological deviation concerning the reference region: the special conditions of accessibility make it highly unlikely the immigration agents displacement of deforestation from Madre de Dios to other forested areas outside the region and confirmation of the presence of gold mining illegal distinctive case in Peruvian Amazon plain (see footnote 43) and the increase in the international price of gold invigorate the regional economy, representing a powerful incentive to migration to the Madre de Dios. See Exhibit 24, step 4a.

To monitor forest degradation will not be made participatory rural appraisal methodology required by the (M-MON 2.2.1) to determine if there is potential for forest degradation by logging, since it will be used for reports rangers of Protected Areas on this illegal activity. Be used as supporting information area potentially impacted by degradation processes, calculated from satellite images using software geographic information systems, following the procedure contained in the document "Estimation of forest degradation by human activities in the Tambopata National Reserve and Bahuaja Sonene, sector Madre de Dios "(Recavarren and Castro, 2012).

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

For quantification of emissions in the project area only emissions from above and below-ground biomass loss caused by elimination of forest cover have been considered. Other reservoirs as dead wood, litter, soil organic carbon and harvested wood products, have not been included according to justification presented in section 2.3.

Carbon stock is shown in Table 40.

Table 40 Carbon stock in strata of the project area

Strata	Area (ha)	tCO2-e/ha	tCO2-e
Mixed aguajal	29,405.04	267.59	7,868,567.92
Floodable alluvial	150,428.17	401.37	60,376,716.92
Strong steep-high hill	24,792.88	541.69	13,430,044.88
Soft steep-high hill	17,146.44	474.63	8,138,271.52
Strong steep-low hill	7,302.52	628.41	4,588,998.42
Soft steep-low hill	6,707.01	803.60	5,389,770.97
High terrace	45,126.19	474.93	21,431,767.76
Low terrace	124,892.37	531.69	66,404,033.34
Strongly dissected terrace	24,123.65	532.20	12,838,560.00
Softly dissected terrace	111,695.87	422.51	47,192,364.74
Total	**541,620.14**		**247,659,096.47**

In Table 41 the deforested surfaces and emissions produced by deforestation for each stratum are shown, in the 10 years of the baseline scenario. Likewise, in Table 42 are shown emissions for each carbon pool selected (above-ground biomass and below-ground biomass) during the same period.

Table 41 Deforested surface and emissions per stratum in the project area for the first period of the baseline scenario (10 years)

N°	Projected Years	Mixed Aguajal		Floodable Alluvial		High Terrace		Low Terrace		Strongly dissected terrace		Softly dissected terrace		Total	
		Area (ha)	tCO_2-e	Area (ha)	tCO_2-e	Area (ha)	tCO_2-e	Area (ha)	tCO_2-e	Area (ha)	tCO_2-e	Area (ha)	tCO_2-e	Area (ha)	tCO_2-e
1	2010-2011	13	3,416	72	28,937	12	5,804	299	158,790	0	0	40	17,044	436	213,990
2	2011-2012	4	1,181	103	41,157	7	3,483	429	227,986	2	1,202	33	13,764	578	288,773
3	2012-2013	12	3,189	163	65,543	21	10,011	574	305,376	5	2,707	17	7,095	793	393,921
4	2013-2014	8	2,145	161	64,516	13	5,955	694	369,074	1	522	37	15,426	913	457,638
5	2014-2015	12	3,192	250	100,398	25	11,712	745	396,261	7	3,782	30	12,579	1,069	527,924
6	2015-2016	25	6,808	312	125,306	52	24,776	967	514,222	7	3,798	33	14,127	1,398	689,037
7	2016-2017	6	1,540	307	123,327	16	7,383	1,062	564,572	8	4,397	63	26,521	1,461	727,741
8	2017-2018	3	933	335	134,299	27	12,651	1,057	561,844	10	5,434	40	16,927	1,472	732,089
9	2018-2019	22	5,793	426	171,117	33	15,877	1,315	699,079	11	5,975	43	18,185	1,851	916,024
10	2019-2020	16	4,317	497	199,544	20	9,434	1,326	704,826	18	9,702	45	19,153	1,922	946,976

Table 42 Carbon stock changes in the selected pools for the first period of the baseline scenario (10 years)

Years	Changes in carbon stock					
	Above-ground biomass pool		Below-ground biomass pool		Total	
	Annual (tCO_2-e)	Accumulated (tCO_2-e)	Annual (tCO_2-e)	Accumulated (tCO_2-e)	Annual (tCO_2-e)	Accumulated (tCO_2-e)
2010-2011	169,125.0	169,125.0	44,864.6	44,864.6	213,989.64	213,989.64
2011-2012	228,291.8	397,416.8	60,481.0	105,345.6	288,772.73	502,762.37
2012-2013	311,334.2	708,750.9	82,586.8	187,932.4	393,920.97	896,683.35
2013-2014	361,826.0	1,070,577.0	95,812.4	283,744.8	457,638.40	1,354,321.75
2014-2015	417,094.5	1,487,671.5	110,829.3	394,574.1	527,923.82	1,882,245.56
2015-2016	544,432.4	2,032,103.9	144,604.9	539,179.0	689,037.36	2,571,282.92
2016-2017	575,141.8	2,607,245.8	152,599.0	691,778.0	727,740.86	3,299,023.77
2017-2018	578,510.3	3,185,756.0	153,578.6	845,356.7	732,088.92	4,031,112.70
2018-2019	723,766.3	3,909,522.3	192,257.8	1,037,614.5	916,024.07	4,947,136.77
2019-2020	748,731.2	4,658,253.5	199,200.8	1,236,815.3	947,932.03	5,895,068.80

In Table 43 the estimation of carbon stock in post deforestation stratum is shown. Besides, in Table 44 the net changes in carbon stock in the Project area during the first baseline period are shown.

Table 43 Estimate of carbon stock in post deforestation stratum

Years	Net annual deforestation (ha)	tCO_2	Agricultural activity			Mining activity			Urban areas			Roads			Post deforestation			
			Annual (ha)	Above-ground biomass (tCO_2)	Below-ground biomass (tCO_2)	Annual (ha)	Above-ground biomass (tCO_2)	Below-ground biomass (tCO_2)	Annual (ha)	Above-ground biomass (tCO_2)	Below-ground biomass (tCO_2)	Annual (ha)	Above-ground biomass (tCO_2)	Below-ground biomass (tCO_2)	**ha (annual)**	**Above-ground biomass (tCO2)**	**Below-ground biomass (tCO2)**	**Total Biomass (tCO2)**
			0.948	**31.2**	**13.8**	**0.034**	**0**	**0**	**0.009**	**0**	**0**	**0.00826**	**0**	**0**				
2010-2011	436	213,989.6	414	12,901	5,703	15	-	-	4	-	-	4	-	-	436	12,901	5,703	18,604
2011-2012	578	288,772.7	548	17,097	7,558	20	-	-	5	-	-	5	-	-	578	17,097	7,558	24,656
2012-2013	793	393,921.0	752	23,446	10,365	27	-	-	7	-	-	7	-	-	793	23,446	10,365	33,811
2013-2014	913	457,638.4	866	27,008	11,940	31	-	-	8	-	-	8	-	-	913	27,008	11,940	38,948
2014-2015	1,069	527,923.8	1,014	31,622	13,980	37	-	-	10	-	-	9	-	-	1,069	31,622	13,980	45,602
2015-2016	1,398	689,037.4	1,326	41,344	18,278	48	-	-	13	-	-	12	-	-	1,398	41,344	18,278	59,622
2016-2017	1,461	727,740.9	1,386	43,235	19,114	50	-	-	13	-	-	12	-	-	1,461	43,235	19,114	62,349
2017-2018	1,472	732,088.9	1,396	43,539	19,248	50	-	-	13	-	-	12	-	-	1,472	43,539	19,248	62,787
2018-2019	1,851	916,024.1	1,755	54,745	24,202	63	-	-	17	-	-	15	-	-	1,851	54,745	24,202	78,947
2019-2020	1,924	947,932.0	1,824	56,906	25,157	66	-	-	17	-	-	16	-	-	1,924	56,906	25,157	82,063

Table 44 Net carbon stock changes in the Project area for the first baseline period (10 years)

N°	Years	Carbon stock in pre-deforestation stratum (tCO_2-e) C_{BSL}	Carbon stock in post-deforestation stratum (tCO_2-e) C_{post}	C_{wp}	Net emissions (tCO_2-e) $\Delta C_{TOT,PA}$
1	2010-2011	213,989.6	18,603.9	0	195,385.7
2	2011-2012	288,772.7	24,655.5	0	264,117.2
3	2012-2013	393,921.0	33,811.2	0	360,109.8
4	2013-2014	457,638.4	38,948.4	0	418,690.0
5	2014-2015	527,923.8	45,601.8	0	482,322.1
6	2015-2016	689,037.4	59,622.2	0	629,415.2
7	2016-2017	727,740.9	62,349.1	0	665,391.7
8	2017-2018	732,088.9	62,787.3	0	669,301.6
9	2018-2019	916,024.1	78,947.3	0	837,076.8
10	2019-2020	947,932.0	82,063.4	0	865,868.7

3.2 Project Emissions

Emissions produced by the project activity have been considered insignificant, according to justification given in section 2.3.

3.3 Leakage

Emissions estimated to be produced due to leakage in the project case are shown in Table 45.

Table 45 Emissions produced due to leakage in the case of the project

Projected years	Leakage from activity shifting (tCO_2-e)	
	Annual (tCO_2-e)	Accumulated (tCO_2-e)
2010-2011	29,414.0	29,414.0
2011-2012	39,693.3	69,107.3
2012-2013	54,146.5	123,253.8
2013-2014	62,904.8	186,158.5
2014-2015	72,565.9	258,724.4
2015-2016	94,711.8	353,436.2
2016-2017	100,031.7	453,467.9
2017-2018	100,629.4	554,097.3
2018-2019	125,912.3	680,009.6
2019-2020	130,166.7	810,176.3

3.4 Summary of GHG Emission Reductions and Removals

Total net reductions of GHG emissions REDD project are calculated as follows, according to the procedure of the methodology used (REDD-MF):

$$C_{REDD,t} = \Delta C_{BSL} - \Delta C_P - \Delta C_{LK}$$

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 tCO_2-e
ΔC_{LK}	Net greenhouse gas emissions due to leakage; t CO_2-e

The project does not allow selective logging, which is considered to REDD as project emissions. As shown in Table 24 (see 2.3), Among the possible sources of project emissions are only considered different CO2 gases from the burning of biomass, which will be calculated ex-post, the same way, it is considered that 100% of the estimated emissions for the baseline within the project area will be avoided. In Table 46, the net GHG balance of the project emissions are zero.

$$\Delta C_{LK} = \Delta C_{LK-AS,planned} + \Delta C_{LK-AS,unplanned} + \Delta C_{LK-AS,degrad-FW/C} + \Delta C_{LK-ME}$$

Where:

ΔC_{LK}	Net greenhouse gas emissions due to leakage; t CO_2-e
$\Delta C_{LK-AS,planned}$	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation; t CO_2-e (from LK-ASP)
$\Delta C_{LK-AS,unplanned}$	Net greenhouse gas emissions due to activity shifting leakage for projects preventing unplanned deforestation; t CO_2-e (from LK-ASU)
ΔC_{LK-ME}	Net greenhouse gas emissions due to market-effects leakage; t CO_2-e (from LK-ME)

$\Delta C_{LK-AS,degrad-FW/C}$ Net greenhouse gas emissions due to activity shifting leakage for degradation caused by extraction of wood for fuel; t CO_2-e (from LK-DFW)

The project does not allow selective logging, which is considered to REDD as project emissions. As shown in Table 24 (see 2.3), Among the possible sources of project emissions are only considered different CO2 gases from the burning of biomass, which will be calculated ex-post, the same way, it is considered that 100% of the estimated emissions for the baseline within the project area will be avoided. Thus, in Table 46, where the net GHG balance of the project, the project emissions are zero.

Table 46 Net CO_2 flow for the project

Years	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2010-2011	186,242.2	0	29,414.0	165,971.7
2011-2012	251,999.3	0	39,693.3	224,423.9
2012-2013	343,492.1	0	54,146.5	305,963.3
2013-2014	399,547.4	0	62,904.8	355,785.2
2014-2015	459,909.5	0	72,565.9	409,756.2
2015-2016	600,111.7	0	94,711.8	534,703.4
2016-2017	634,748.0	0	100,031.7	565,360.0
2017-2018	638,442.6	0	100,629.4	568,672.2
2018-2019	798,275.4	0	125,912.3	711,164.6
2019-2020	825,535.7	0	130,166.7	735,702.0
Total	**5,138,304.0**	**0**	**810,176.3**	**4,577,502.5**

The number of Voluntary Carbon Units (VCUs) is shown in Table 47; to do this calculation, the 13% from the annual net GHG emission reductions was subtracted, which is the VCS non-permanence risk buffer, calculated according to the AFOLU Non-Permanence Risk Tool (VCS Version 3); the development of the tool and reserve calculation is found in Annex 29.

Table 47 Voluntary Carbon Units

Periodo	**Net GHG emission reductions (tCO_2-e)**	**AFOLU pooled buffer account (13 %)**	**Voluntary Carbon Units**
2010-2011	165,971.7	21,576.3	144,395.4
2011-2012	224,423.9	29,175.1	195,248.8
2012-2013	305,963.3	39,775.2	266,188.1
2013-2014	355,785.2	46,252.1	309,533.2
2014-2015	409,756.2	53,268.3	356,487.9
2015-2016	534,703.4	69,511.4	465,192.0
2016-2017	565,360.0	73,496.8	491,863.2
2017-2018	568,672.2	73,927.4	494,744.8
2018-2019	711,164.6	92,451.4	618,713.2
2019-2020	735,702.0	95,641.3	640,060.7

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	**Regional forest cover/ non-forest cover Benchmark Map**
Data unit:	-
Description:	Map showing location of forest land within the reference region, the project area and the leakage belt at the beginning of crediting period.
Source of data:	Landsat 5 imagery. Points collected with GPS in the case of field verifying.
Value applied:	-
Justification of choice of data or description of measurement methods and procedures applied:	Imagery interpretation by using ENVI 4.7 and Arc Gis 9.3 software. Minimum map accuracy should be 90 %, according to the specified in M-MON Module. Validation of deforestation map through a non-linear systematic sampling, and calculation of accuracy and errors of commission and omission through a confusion matrix.
Any comment:	-

This parameter will be subject to monitoring for baseline renewal.

4.2 Data and Parameters Monitored

In the following tables are presented the data and parameters that will be subject to monitoring on each monitoring period.

Data Unit / Parameter:	**Project forest cover monitoring map**
Data unit:	-
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, comparison with benchmark map must show the deforested areas at each monitoring event.
Source of data:	Landsat 5 imagery. Points collected with GPS in the case of field verifying.
Description of measurement methods and procedures to be applied:	Imagery interpretation by using software of geographical information system. Minimum map accuracy should be 90 %, according to the specified in M-MON Module.
Frequency of monitoring/recording:	Annual
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Softwares ENVI 4.7 and Arc GIS 9.3 GPS Garmin Oregon600
QA/QC procedures to be applied:	Validation of deforestation map through a non-linear systematic sampling, and calculation of accuracy and errors of commission and omission through a confusion matrix
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	**Project forest cover monitoring map**
Data unit:	-
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, comparison with benchmark map must show the deforested areas at each monitoring event.
Source of data:	Landsat 5 imagery. Points collected with GPS in the case of field verifying.
Description of measurement methods and procedures to be applied:	Imagery interpretation by using software of geographical information system. Minimum map accuracy should be 90 %, according to the specified in M-MON Module.
Frequency of monitoring/recording:	Annual
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory.

	Softwares ENVI 4.7 and Arc GIS 9.3 GPS Garmin Oregon600
QA/QC procedures to be applied:	Validation of deforestation map through a non-linear systematic sampling, and calculation of accuracy and errors of commission and omission through a confusion matrix
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	**Project forest cover monitoring map**
Data unit:	-
Description:	Map showing the location of forest land within the project area at the beginning of each monitoring period. If within the Project Area some forest land is cleared, comparison with benchmark map must show the deforested areas at each monitoring event.
Source of data:	Landsat 5 imagery. Points collected with GPS in the case of field verifying.
Description of measurement methods and procedures to be applied:	Imagery interpretation by using software of geographical information system. Minimum map accuracy should be 90 %, according to the specified in M-MON Module.
Frequency of monitoring/recording:	Annual
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Softwares ENVI 4.7 and Arc GIS 9.3 GPS Garmin Oregon600
QA/QC procedures to be applied:	Validation of deforestation map through a non-linear systematic sampling, and calculation of accuracy and errors of commission and omission through a confusion matrix
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	**Leakage belt forest cover monitoring map**
Data unit:	-
Description:	Map showing the location of forest land within the leakage belt area at the beginning of each monitoring period.
Source of data:	Landsat 5 imagery. Points collected with GPS in the case of field verifying.
Description of measurement methods and procedures to be applied:	Images interpretation by using software of geographical information system. Minimum map accuracy should be 90 %, according to the specified in M-MON Module.
Frequency of monitoring/recording:	Annual
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Softwares ENVI 4.7 and Arc GIS 9.3 GPS Garmin Oregon600
QA/QC procedures to be applied:	Validation of deforestation map through a non-linear systematic sampling, and calculation of accuracy and errors of commission and omission through a confusion matrix.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	**Degradation study**
Data unit:	-
Description:	-
Source of data:	-
Description of measurement methods and procedures to be applied:	Sampling to verify evidence of illegal timber extraction according to procedures specified in M-MON Module.
Frequency of monitoring/recording:	Annual
Value applied:	-
Monitoring equipment:	GPS Garmin Oregon 600
QA/QC procedures to be applied:	Elaboration of SOP (standard operational procedures) to establish these procedures.
Calculation method:	
Any comment:	-

Data Unit / Parameter:	**Fires of importance for project activity**
Data unit:	UTM
Description:	Location of fires in areas with priority to develop project activities
Source of data:	Fire Information for Resource Management System – FIRMS, de la Universidad de Maryland, EEUU. http://maps.geog.umd.edu/firms/shapes.htm#southamerica
Description of measurement methods and procedures to be applied:	Fires will be located in the project area and leakage belt with software of geographical information system.
Frequency of monitoring/recording:	Monthly
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Softwares ENVI 4.7 and Arc GIS 9.3 GPS Garmin Oregon600
QA/QC procedures to be applied:	Verification in-situ of damage degree that fire caused to the project activity. Elaboration of SOP to establish these procedures.
Calculation method:	-
Any comment:	There will be especial emphasis when monitoring areas with historical fires/ burns (e.g. Pampas del Heath)

Data Unit / Parameter:	**Deforested area in the project area**
Data unit:	hectares
Description:	Deforested area registered for the project in strata *i* during the monitoring period.
Source of data:	Landsat 5 Imagery
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	Annual
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Software Arc GIS 9.3 GPS Garmin Oregon600
QA/QC procedures to be applied:	
Calculation method:	Over processed imagery, areas will be calculated through Software Arc GIS 9.3 with function Calculate Geometry from the attribute table for each entity.
Any comment:	-

Data Unit / Parameter:	**Deforested area in leakage belt**
Data unit:	hectares
Description:	Deforested area registered for the leakage belt in strata *i* during the monitoring period.
Source of data:	Landsat 5 imagery
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	Annual
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Softwares Arc GIS 9.3
QA/QC procedures to be applied:	
Calculation method:	Over processed imagery, areas will be calculated through Software Arc GIS 9.3 with function Calculate Geometry from the attribute table for each entity.
Any comment:	*Ex - ante*, an estimation of deforestation in the leakage belt in the project scenario will be done, according to procedures established in M-MON Module.

Data Unit / Parameter:	**Area under forest degradation**
Data unit:	hectares
Description:	Area potentially impacted by degradation processes in stratum *i*
Source of data:	Park Rangers reports about illegal timber extraction. Landsat 5 imagery.
Description of measurement methods and procedures to be applied:	Digital processing of Landsat 5 Images.
Frequency of monitoring/recording:	annual
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Software Arc GIS 9.3, ENVI 4.7, and Claslite 2.1
QA/QC procedures to be applied:	
Calculation method:	Comparison of satellite imagery of the project area from 2 different points in time, using software ENVI 4.7, and Claslite 2.1 (methodology included in the document "Estimación de la degradación forestal por actividades antrópicas en la Reserva Nacional Tambopata y el Parque Nacional Bahuaja- Sonene, sector Madre de

	Dios", Recavarren and Castro, 2012) Over processed images, areas will be calculated with Software Arc GIS 9.3 with function Calculate Geometry from the attribute table for each entity.
Any comment:	-

Data Unit / Parameter:	**Forest area at reference region**
Data unit:	hectares
Description:	Forest remaining area in the reference region.
Source of data:	Images Landsat 5.
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	Every 5 years
Value applied:	-
Monitoring equipment:	Computer (desktop/portable) with processor i7 and 4 GB of RAM memory Software Arc GIS 9.3
QA/QC procedures to be applied:	
Calculation method:	Over processed images, areas will be calculated with Software Arc GIS 9.3 with function Calculate Geometry from the attribute table for each entity.
Any comment:	-

Data Unit / Parameter:	**Area of degradation sample plots**
Data unit:	hectares
Description:	Total area of degradation sample plots in stratum *i*
Source of data:	Field measurements
Description of measurement methods and procedures to be applied:	Randomly systematic sampling, covering at least 3 % of area potentially subject to degradation.
Frequency of monitoring/recording:	annual
Value applied:	-
Monitoring equipment:	GPS Garmin Oregon600 Computer (desktop/portable) with processor i7 and 4 GB of RAM memory. Software Arc GIS 9.3
QA/QC procedures to be applied:	
Calculation method:	Processing on desk the information collected on filed, using software of geographic information systems.
Any comment:	-

Data Unit / Parameter:	**CO_2 emissions produced from forest degradation in the project area**
Data unit:	t CO_2-e
Description:	Carbon of tree biomass cut and removed through degradation process in stratum *i* at the monitoring period.
Source of data:	Field measurements. Park Rangers reports about illegal timber extraction.
Description of measurement methods and procedures to be applied:	Field measurements according to procedure described in Module M-MON.
Frequency of monitoring/recording:	annual
Value applied:	-
Monitoring equipment:	Tree calliper
QA/QC procedures to be applied:	
Calculation method:	Equation 7 of M-MON, allometric equations used to calculate biomass.
Any comment:	-

4.3 Description of the Monitoring Plan

The purpose of monitoring is to obtain information that allows estimating the amount of avoided emissions during the crediting period. Monitoring activities include the use of remote sensors and also inspections in-situ. Combining both sources, calculations and estimations required to know if the project is being developed in conformity with VCS-PD and the management plans will be done, as well as to determine leakages.

In order to do the monitoring of areas under deforestation and forest degradation and the associated emissions, Module VCS VMD0015 “Methods for monitoring of greenhouse gas emissions and removals” (M-MON) will be used; likewise, the report of leakage from activity shifting caused by the project will be done according to Module VCS VMD0010 “Estimation of emissions from activity shifting for avoided unplanned deforestation” (LK-ASU). About estimation of non-CO_2 GHG emitted from biomass burning, Module VCS VMD0013 “Estimation of greenhouse gas emissions from biomass burning” (E-BB) will be used.

It will be considered conservatively that the carbon stock in the aboveground and belowground biomass remains constant; hence it will not be monitored. Furthermore, the secondary forest growth (carbon enhancement) will be omitted in a conservative way, considering instead, the mosaic of agriculture/livestock grazing and secondary forest as a single category; this is due to the complications that imply to differentiate between secondary forests and areas under agricultural management (because they have similar visual and spectral characteristics) with the pixel value of the imagery that will be used. It is necessary to indicate that, in many occasions, forest regeneration is stopped (as it is the case of areas affected by mining or those invaded by aggressive-competitors alien grass species).

Monitoring of land-use change, based on Landsat 5 imagery, will be conducted annually, involving all the changes in forest coverage. Deforested area will be calculated (in hectares) within the project area and the leakage belt. Likewise, once generated the deforestation map, it will be validated through a systematic non-linear sampling on the field.

Moreover, every month there will be a monitoring of fires that could affect the project activities, through the online information system provided by Maryland University, U.S.A.

The spatial information that can be provided by governmental entities will be actualized annually.

Monitoring will be performed by a professional Monitoring team, which will have its headquarters in the city of Puerto Maldonado, coordinating with the park rangers from the protected areas covered by the project area. The Monitoring team reports to the AIDER Coordinator in Madre de Dios Headquarter.

The monitoring *in-situ*, run by the professional monitoring team, will be eventually supported by the park rangers from the protected areas covered by the project area, which will receive additional training to accomplish this work.

All the monitoring activities will be implemented using Standard Operating Procedures (SOPs) that will be elaborated by the project team. The staff will be trained permanently to assure the data quality.

Monitoring data will be stored and processed in Puerto Maldonado and Lima cities.

- **Baseline revision**

The baseline scenario will be revised every 10 years. The deforestation rate for the reference region, project area and leakage belt will be updated, as well as the deforestation drivers; likewise, carbon stock information will be verified, evaluating 10% of surveyed plots on each stratum to determine the baseline scenario. Using this updated information, the deforestation model will be adapted in the baseline scenario for the project area and leakage belt, projecting again the deforested areas and the calculation of carbon emissions in the baseline scenario for the next period.

- **Monitoring of the effective changes in carbon stock and GHG emissions:**

It will be performed using geographical software to process and interpret satellite imagery, complementing this with field data; the parameters subject to monitoring are found in section 4.2. Procedure is described next, as stipulated by module M-MON.

STEP 1. Selection and analysis of sources of land-use and land-cover (LU/LC) change data

Spatial data from Landsat 5 sensor will be used, since it has a medium resolution (30m x 30m resolution).

The collected and analyzed data will completely cover:

- The reference region: data will be available for the year of baseline renovation or no more distant in the past than one year before baseline renovation.

- The project area: data will be available for the year in which monitoring and verification are being conducted.

- The leakage belt: data will be available for the year in which monitoring and verification are being conducted.

1.1 Processing LU/LC Change Data

Processing of satellite imagery will involve geometric correction (ortho rectifying).

1.2 Post –processing and accuracy assessment

Post-processing is required to:

a. Map area change detected in the imagery

b. Calculate area changed to "non-forest" category within the project area and the leakage belt. For periodical baseline revision, this will be done also for the reference region.

For the calculation of each category of change:

a. At the end of each monitoring period:

- The area of categories "forest" and "non-forest" within the project area and leakage belt will be calculated.
- Forest Cover Maps for the project area and leakage belt will be updated.
- The remaining forest area in the reference region will be updated.

b. At the time of baseline revision:

- The area of categories "forest" and "non-forest" within the reference region, project area and leakage belt will be calculated.
- Forest Cover Benchmark Maps for the reference region, project area and leakage belt will be updated.
- Total area deforested during the historical reference period in the reference region will be estimated.

c. Land-use and land-cover (LU/LC) change data in areas obscured by clouds will be estimated. As described in module BL-UP (Part 2, section 2.2.3) imagery from multiple dates will be used to reduce cloud cover to no more than 10% of any image. If the areas with 10% of cloud cover in any date in question do not exactly overlap, then the rate should come from areas free of clouds in both dates. This should be estimated in % per year. Then, a map of the maximum possible forest cover for the most recent period of time should be created. The historical rate in % should be multiplied by the maximum area of forest cover at the beginning of the period to estimate the total deforested area during the period.

The overall accuracy of classification of the result from previous steps shall be 90% or more.

STEP 2. Interpretation and analysis

2.1 Monitoring deforestation

This step will produce an estimation of emissions resulting from any deforestation that occurs within the project area and leakage belt.

The methodology used for satellite imagery interpretation will be the one described in the works of Emilio Chuvieco (2008, 2009) [43] to estimate any deforestation that could occur in the project area and leakage belt.

[43] Chuvieco, E. 2009. Fundamentos de teledetección espacial. 2ª Ed.

Net carbon stock change resulting from deforestation is equal to the deforested area multiplied by emissions per area unit.

2.2 Monitoring Forest degradation

2.2.1 Monitoring degradation through extraction of trees for illegal timber

Monitoring of degradation will be determined by Natural Protected Areas park rangers' reports about illegal timber extraction. The area potentially impacted by degradation processes will be used as support information, calculated from satellite imagery following the procedure included in document "Estimation of forest degradation by human activities in Tambopata NR and Bahuaja- Sonene NP, Madre de Dios sector", (Recavarren and Castro, 2012).

Where there is potential for degradation activities, a limited sampling in the field will be conducted. First, it is needed to delineate the potentially degraded area. Relying on park rangers' information about illegal timber extraction, an access buffer from all access points to the project area will be delineated, as highways, rivers or previously-cleared areas, with a width equal to the distance of degradation penetration (estimated as well from park rangers' data). Definition of areas potentially subject to degradation will rely, likewise, in the methodology included in the document "Estimation of forest degradation by human activities in Tambopata NR and Bahuaja- Sonene NP, Madre de Dios sector" (Recavarren and Castro, 2012)

Several transects of known - length and width shall be surveyed across the access-buffer area (equal in area to at least 1% of area potentially subject to degradation*)* to check whether new tree stumps are evident or not. If there is little or no evidence that trees are being harvested (see next paragraph on how to estimate emissions using tool T-SIG to determine if significant or not) then degradation can be assumed to be zero and no monitoring is needed.

If the limited sampling does provide evidence that trees are being removed in the buffer area, then a more systematic sampling will be implemented. The sampling plan will be designed using plots systematically placed over the buffer zone so that they sample at least 3% of the area of the buffer zone (*ADeg,i)*. The diameter of all tree stumps will be measured and conservatively assumed to be the same as the DBH. If the stump is a large buttress, several individuals of the same species nearby will be identified and a ratio of the diameter at DBH to the diameter of buttress at the same height aboveground as the measured stumps will be determined. This ratio will be applied to the measured stumps to estimate the likely DBH of the cut tree. The above- and belowground carbon stock of each harvested tree will be estimated using the same allometric regression equation and root to shoot ratio used in the module for estimating the carbon pool in trees (CP-AB) in the baseline scenario. The mean above- and belowground carbon stock of the harvested trees is conservatively estimated to be the total emissions and to all enter the atmosphere. This sampling procedure shall be repeated every 5 years and the results annualized by dividing the total emissions by five.

2.2.2 Monitoring degradation due to selective logging of forest management areas possessing a FSC certificate

It does not apply, due to the absence of FSC forest management areas within the project area, since these operations are incompatible with the objectives of the Natural Protected Areas that conform the Project Area.

Chuvieco, E. 2008. Teledetección Ambiental. 3ª edición revisada.

2.3 Monitoring areas undergoing natural disturbance

In Peru there is a system for natural disasters management. Law N° 29664 creates the Disaster Risk National System (SINAGERD). Article 9 of this law mentions that the National Institute for Civil Defense (INDECI) is integral part of that system. The same law mentions, in Article 13, INDECI functions to develop, coordinate and facilitate the formulation and implementation of the Disaster Risk Management National Plan.

In the Regulation of the Organization and Functions of the National Institute for Civil Defense – INDECI, SUPREME DECREE Nº 059-2001-PCM, is stipulated in its formation the creation and functioning of the statistics and telematics office inside INDECI. Article 9 of that regulation sets out this office functions highlighting in paragraphs b) To make timely and reliable statistic report, c) To centralize and publish statistics related with disasters mitigation and prevention, g) To develop and maintain INDECI´s web page and intranet network updated.

Taking into account this legal basis, INDECI' data will be gathered to obtain the occurrence of events (natural or human-induced) on each district of Madre de Dios department, for the monitoring period; this data will be gathered by each Emergency Operations Centre COE (that works to a municipality level) and systemized in the National Information System for Response and Rehabilitation - SINPAD

From this database, information for districts in which is located the project area (Tambopata and Inambari districts) will be selected for the monitoring period. Then, a map showing the allocation of these events will be prepared, in order to establish if they occurred inside the project area. If events resulting in degradation of carbon stocks (landslide, earthquake, volcano, pests, disease) occurred inside the project area, the disturbed area and the area of post-disturbance strata will be calculated using the procedure set in Step 1; next, the emissions resulting from natural disturbance will be estimated.

Depending on the type of natural disturbance, it will be decided if it is conservatively assumed that the post-disturbance life- and dead-vegetation stock is set equal to zero, or it is preferable to measure the post-disturbance carbon stock. The resulting emissions from natural disturbances will be omitted if they are considered *de minimis* using toll T-SIG.

Although SINAGERD is the only trustable and official source of natural disasters data, it is addressed that it can have information limitations and gaps. For this reason, we will put emphasis on mapping all land cover changes (due to anthropogenic or natural causes) through deforestation mapping procedures (Step 1 and Step 2.1); what is more, we will add to monitoring procedures new software to measure small-scale disturbances in forest cover when it is available.

The emissions produced by fires will be considered as project emissions.

2.4 Monitoring areas under carbon stock enhancement

Carbon stock enhancement due to forest re-growth has been omitted in a conservative way as specified on the Project description.

2.5 Monitoring Project emissions7

Where fires are present *ex-post* in the project area, the area burned shall be delineated. The delineated area burned will be used to calculate non-CO_2 GHG emissions using E-BB.

STEP 3. Documentation

The methodological procedures used in steps 1-2 above will be documented. The following information will be provided:

a. Data sources and pre-processing: Type, resolution, source and acquisition date of the remotely sensed data (and other data) used; corrections performed (geometric, radiometric); projection and parameters used to geo-reference the images; error estimate of the geometric correction; software and software version used to perform tasks; etc.

b. Data classification: Definition of the classes and categories; classification approach and classification algorithms; coordinates and description of the ground-truth data collected for training purposes; ancillary data used in the classification, if any; software and software version used to perform the classification; additional spatial data and analysis used for post-classification analysis, including class subdivisions using non-spectral criteria, if any; etc.

c. Classification accuracy assessment: accuracy assessment technique used; coordinates and description of the ground-truth data collected for classification accuracy assessment; and final classification accuracy assessment.

d. Changes in data sources and pre-processing / data classification (if this is determined by the technical team): If in subsequent periods changes will be made to the original data or use of data:

   - Each change and its justification will be explained and recorded; and

   - When data from new satellites are used documentation will follow “a” to “c” above.

- **Monitoring of changes in carbon stock and GHG emissions caused by leakage**

Relevant parameters for monitoring of leakage by activity shifting are found in section 3.2. Deforested areas at leakage belt will be monitored, trying, as much as possible, to cross information from ground-truth data with information of social monitoring at the different populations (according to Climate, Community & Biodiversity Association standards), to confirm that leakages are, effectively, attributable to the project activity.

- **Monitoring of measurements to avoid deforestation and reduce risks of leakage**

The development of actions promoted by AIDER to achieve an effective reduction of emissions from deforestation and degradation within the project area, which altogether conform the project strategy, will be monitored.

The project strategy is divided in 4 components, as exposed in section 1.8:

(i) *Promotion of sustainable economic activities:* technical and financial support to local populations to develop initiatives like agroforestry, sustainable forest management for timber, among others.

(ii) *Strengthening of control and surveillance system*: improvement of existent checkpoints, construction of new checkpoints, technical support to community surveillance committees, park rangers training.

(iii) Promotion of conservation agreements: technical assistance and consultancy for local populations to establish conservation agreements with SERNANP and Management Committees.

(iv) Support for forest governance: consultancy for SERNANP, Management committees, regional forest authority and local governments to fulfill their duties of promotion and supervision of sustainable forest management.

For each component, AIDER will design a specific monitoring plan with participation of directly involved stakeholders, being each plan in function of the definitive field activities and each activity's scope in terms of surface area, number of involved families, among others. In these plans the indicators to be measured according to expected results in a short, medium and long term, will be identified, as well as procedures of data collection and processing, frequencies, report mechanisms and feedback.

In a general way, in Table 48 is proposed the scheme for monitoring project activities, which will be conducted annually.

Table 48 Scheme of annual monitoring for Project activities

REDD Strategy Component	Monitoring Tasks	Indicators proposed	Involved actors
PROMOTION OF SUSTAINABLE ECONOMIC ACTIVITIES	-Geo-referencing and registering characteristics of disturbed areas -Apply surveys to families supported by the project in developing sustainable economic activities. -Register on the field productivity/profitability of promoted activities.	-Number of families involved in new sustainable economic initiatives -Number of hectares under sustainable use -Increment in land profitability. -Increment of families´ economic incomes.	Local populations Management committees Extension workers and social promoters project team
PROMOTION OF CONSERVATION AGREEMENTS	- Georeference and register characteristics of areas under conservation agreements. -Interview families that have conservation agreements. - Register productive activities performed by families with conservation agreements.	-Number of hectares under conservation agreements. -Number of forest hectares hold per family. -Opportunity costs per hectare.	Local populations Management committees Extension workers and social promoters project team SERNANP Conservation International - CI

SURVEILLANCE AND CONTROL	-Apply surveys to park rangers and community surveillance committees. -Apply interviews to community Leaders -Process records of checkpoints -Process events reports of checkpoints	-Number of checkpoints adequately implemented -Number of performed patrolling -Number of alerts from checkpoints -Number of operations performed (confiscation, interventions) -Number of populated centers involved in community surveillance actions -Number of community park rangers	SERNANP Specialists from RNTAMB and PNBS Official and volunteer park rangers Community surveillance committees Management committees
SUPPORT FOR LOCAL GOVERNANCE	-Apply surveys/interviews to local and regional authorities -Collect information from official reports of SERNANP and regional forest authority -Apply surveys/ interviews to community leaders -Revision legal regulations issued (municipal by-laws, directives, legal provisions)	-Number of regulations in favor of forest conservation. -Number of environmental events organized by local and regional authorities. -Number of field inspections conducted by SERNANP and regional forest authority. -Number of trainings organized by SERNANP and regional forest authority.	SERNANP Regional forest authority Tambopata District Municipality Tambopata Province Municipality Community surveillance committees Management committees

The monitoring actions will be conducted permanently and reports by component will be issued once a year.

Annually a report about monitoring of deforestation and degradation reduction strategy will be elaborated and an assessment of achieved results will be performed, with the purpose of overcome limitations and potentiate the obtained successes.

The emissions that could produce the project activity are considered insignificant, due to the technology level selected (see section 1.8) and to the sources of emissions selected (see section 2.3).

- **Estimation of net ex-post changes in carbon stocks and GHG emissions**

The estimation of net ex-post changes in carbon stocks will be conducted according methodology REDD-MF.

5 ENVIRONMENTAL IMPACT

The possible impacts that would generate the different activities proposed by the project were evaluated and qualified: agroforestry, gold mining, forest management, chestnut management. The main study conclusions are presented next; the complete assessment is on Annex 26.

All economic activities have, within their intervention area, positive and negative impacts over the environment. The gold production is the activity with the most negative impact; this is mainly due to the use of mercury in amalgamation. The second activity with larger negative impact is the forest management for timber; nevertheless, it does not get to a higher qualification than *moderately significant*, this is due to the construction of roads and areas for storage, which will be properly mitigated. In the case of processing and marketing of chestnut, there are no large impacts positive or negative, since it is an activity that has been done from years ago and does not have a large influence area or technological development. Finally, agroforestry is the activity with larger positive impacts, as it restores degraded forest areas (using native species) and providing local people with agricultural valued crops of agricultural for their consume (food security).

In conclusion, the activities that the project will develop do not have much effect over the natural environment; however, there will be taken measures of mitigation in the development of each activity, and occurrence of unforeseen impacts will be monitored for its prompt mitigation.

6 STAKEHOLDER COMMENTS

The Studies of scenario analysis and social context, performed by Non-Governmental Organizations and public institutions, partially involve settlements of interest for the project. In such a way, the existent data has been complemented with socio-economic assessments in the Buffer Zone of Tambopata National Reserve, conducted in August 2009, involving quantitative and qualitative variables, which provides the stakeholders characteristics, geographical distribution, problems and conflicts, main economic activities and their impacts, being a first general document of primary information.

The Management Committee of Tambopata National Reserve, entity that represents the civil population, Non-Governmental Organizations and public institutions, about the NPA use, has been bringing together almost all settlements that are in the Buffer Zone of RNTAMB, which delegates attend to the zone assemblies that have place every 3 months. In this space was done the project´s initial presentation in August 2009; a consultation and dialogue regarding their current needs and problems was conducted, having as a result an initial document of the stakeholders accounting their relation with the forest and their needs of use, economy and conflicts.

Given the complexity and dynamic of settlements that corresponds to the adaptation and reality of scenarios and geographic spaces 53 human settlements in the buffer zone area have been visited.

From the identification of Native Communities and populated towns in the project ´s influence area, a direct communication process was started with field visits, first with the authorities, leaders and after with the settlers, their leaders and authorities, which meant the development of workshops of Participatory Rural Appraisal. These workshops were developed with characteristics of information and consult workshops simultaneously, because we did not proceed just to give and receive information, but also they were asked to express their opinion about the possible positive and/or negative impacts of the project and to explain their specific proposals about what activities would be more suitable to their conditions and

expectations. In this way, the secondary information was complemented and the components of the REDD strategy were specified. The data registered by questionnaire and interviews were applied in the elaboration of socio-economic assessments; up to date these have been conducted in 9 settlements.

These approaches to population carry more openness to dialogue and the creation of an environment of trust and respect with the producer families to channel consensual work agreements to avoid deforestation.

The socio-economic assessments allow to formulate strategies for resources use and to carry out, together with the populations, action plans for better management, emphasizing the sustainable harnessing.

Efforts have been made to do consultations in a way that the coordination with social networks that cross the families, their representative board of directors, as well as regional indigenous organizations (Federación Nativa del rio Madre de Dios y Afluentes - FENAMAD), and agriculturalists' guild organizations (Federación Agraria de Madre de Dios - FADEMAD) are assured.

The discussion that has been occurring in different spaces, promoted by public entities, as well as by private institutions and NGOs, is allowing to dialogue with communities, which are increasingly willing to listen and dialogue about REDD.

In this way, Native Communities have an interest in REDD as this mechanism allow them to improve their life quality. We have been informing and coordinating with Asociación Forestal Indígena de Madre de Dios – AFIMAD, which is recognized and is political part of FENAMAD, and is in charge of productive activities of Native Communities. The REDD consultation process is slow when it is carried out within regional organizations of Native Communities, not being the case of individual communities, in which case is faster.

The project proposal has been presented to populations of the project's area of influence since 2009, conducting meetings with the Management Committee of the RNTAMB and the Quick Participatory Assessment with the populations. In such a way, the productive proposals have been developing step by step, which execution is launched based on knowledge and acceptance of involved population and their authorities.

The Management Committee, having the representation of 2 delegates per settlement, expressed its interest for promoting environment-friendly economic activities; something that characterizes the delegates is the degree of consciousness that they have develop about the need to conserve the forest, considering that in this way they will ensure their children's welfare; therefore, they are waiting with a lot of expectation the launch of economic activities that the project will promote.

On its side, the leadership of the Federación Nativa del rio Madre de Dios y Afluentes (FENAMAD) has as a priority to include and start revaluating the issue of the ancestral territory of Ese´eja ethnic group, considering that its participation in management of RNTAMB is still scarce. They show conscience of the problem that represents the global climate change. The project will allow then to strength their capacities to provide environmental services in other indigenous communities, for which they show interest in coordinating and supporting the process of the project.

The Federación Agraria de Madre de Dios (FADEMAD) is interested in developing the environmental services offer as an economic opportunity for the forest. Additionally, the "Agroforestry Plan" promoted by the Federation and communicated to the producers along the Interoceanic highway, is being positively received, and also implemented by some NGOs. They consider that the project activities are a complement to strength the good practices specified in the plan. Likewise, they consider that the techniques proposed by the project will allow putting order in the forest in a way according to the new exigencies of social life and climate change.

The beneficiary families are different from each other because of their historical reality and ways of occupying forest. The beneficiary of the Interoceanic highway show more interest for the project; predisposition to give information and to know about carbon capture issues are due to the promotion of the carbon market by timber companies or intermediary agents, who have been spreading and taking advantage of this issue to operate their profit-oriented activities. The well promoted activities among the beneficiary are the agroforestry, fruit trees succession, agro ecological soil management, etc.; they manifest that the project will strength more these practices, besides they plan to organize themselves in the future to work issues of environmental services.

For families at the fluvial axis, both the low section of Tambopata river and the low Madre de Dios river, while the project theme and the concepts “environmental services” and “carbon sequestration” are totally unknown; they consider that their activities in the forest are not different from the project interests. The beneficiary families, for being close or adjacent to the Reserve, know about it and opine that they have always collaborated to conserve the environment; because of this, activities performed by them are of a lesser scale, like small parcels for agriculture or agroforestry, as well as chestnut collection. They plan also, in the future, to develop ecotourism or to be a part of the touristic corridors.

Relating to the families of Native Communities that are adjacent to the Reserve, the economic activities that they do are, mostly, collection and extraction of forest resources; few families have initiatives of farm openings, maintaining a certain balance with the environment. Numerous community members maintain in their historical memory the remembrance of their ancestral territories, which in their opinion have been snatched to create the Natural Protected Areas. The project is innovative and they relate it with coverage maintenance that they have practiced traditionally, but the skepticism lies in the benefits property, manifesting that they must receive the carbon certificates given that the ancestral territory belongs to them and not to the Peruvian State. The internal colonization and the relationship between the Peruvian State and the indigenous people, which has been characterizing by constant social-environmental conflicts, must be also remembered. They have the expectation that the activities run by the project will improve their traditional activities as well as their incomes.

For all these reasons, it is necessary to implement a Plan of communication and information to populations of the project influence area that takes into account the principles of Prior, Free and Informed consultation process.

The Field Technical Team (ETO) of the Administration Contract is conformed to tackle the intercultural processes of the different stakeholders and thus get to know their demands and cultural perceptions clearly, and be able to articulate these local experiences with the technical training of professionals; this team will carry out a critical accompaniment of project activities leading by the local populations. In addition, the Management Committee of the RNTAMB will represent a dialogue space among stakeholders and will contribute to solve possible conflicts.

The project has elaborated a Project Design Document following the Climate, Community & Biodiversity Association (CCBA) standards, containing the plans and process of consultation to local populations.

Literature

Balvín, D., P. Pattern 2008. South Inter-Oceanic Highway: Considerations for sustainable use. Civil Labor Association. Peru. 130 p.

Bank Information Center. 2005. Proyectos IIRSA: datos sobre la carretera interoceánica. Disponible en http://www.bicusa.org/en/Article.2227.aspx

_____. 2007. Programa CAF/INRENA, de la Interoceánica Sur, Perú. Disponible en http://www.bicusa.org/es/Article.10386.aspx

Bodmer, RE. 1999. Game animals, palms and people of the flooded forests: management, considerations for the Pacaya - Samiria National Reserve, Peru. *In*: Várzea, diversity, development, and conservation of Amazonas whitewater floodplains. Padoch, C., Ayres J. M.; Pinedo - Vasquez, M.; e Hendersc, A. (Ed). The New York Botanical Garden. 407 p.

Capella, JL, Sandoval, M. 2010. REDD in Peru: Legal considerations for implementation. SPDA. 101 p.

CITES (Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres). 2009. Apéndices I, II y III de la CITES. Disponible en www.cites.org/esp/app/index.shtml

CIMA (Center for Conservation and Research Natural Areas Management). 2002. Basic Training Course and Handbook for rangers. Lima. 153 p.

Chuvieco, E. 2008. Environmental Remote Sensing: Observing the Earth from space. 3 ed. Barcelona, Spain. 162 p.

Chuvieco, E. 2009. Fundamentals of remote sensing. 2nd Ed, Spain.

Conservación Internacional. 2005. Estrategias de conservación: hotspots terrestres. Disponible en http://www.conservation.org.pe/ci/hotspots/andestropicales.html

_____. 2007. Biodiversity hotspots: tropical Andes. Disponible en http://www.biodiversityhotspots.org/xp/hotspots/andes/Pages/default.aspx

_____. 2007. Corredor de conservación Vilcabamba-Amboró. Disponible en http://www.conservation.org.pe/ambitos/vilca_amboro.html

Conservación Internacional; Fundación Peruana para la Conservación de la Naturaleza -Pronaturaleza. 2007. Interoceánica sur. Lima.

Constructora OAS Ltd. 2009. C.H. Inambari: presentación para evento de interconexiones. Lima.

Dourojeanni, M. 2006. Estudio de caso sobre la carretera Interoceánica en la Amazonía sur del Perú. Asociación Civil Labor, BIC, Conservación Internacional, DAR, Racimos de Ungurahui. Lima. 85 p.

Felipa, S; Ráez Luna, E. 2007. Interoceánica Sur. Conservación Internacional - Fundación Peruana para la Conservación de la Naturaleza-PRONATURALEZA. 4 p.

Freitas, L.; Otárola, E.; Del Castillo, D.; Linares, C.; Martínez, C.; Malca, G. 2006. Servicios Ambientales de Almacenamiento y Secuestro de Carbon del Ecosistema Aguajal en la Reserva Nacional Pacaya Samiria – Loreto. Documento Técnico Nº 29. Instituto de Investigación de la Amazonía Peruana – IIAP. Iquitos, Perú. 65p.

Gonzáles, F; Lupin, H; Bretón de la Cal, J. 2004. Acuicultura: producción, comercio y trazabilidad. 1ra ed. España.

GPAN (Proyecto Gestión Participativa de Áreas Naturales Protegidas). 2008. Plan de manejo de *Bertholletia excelsa* H.B.K. en la Reserva Nacional Tambopata y el Parque Nacional Bahuaja-Sonene.

Guzmán, C. M. 2004. Valoración económica de beneficios ambientales en el manejo sostenible de humedales: estudio de caso del manejo sostenible "aguajal" en la comunidad de Parinari, Reserva Nacional Pacaya-Samiria (Región de Loreto, Perú). IIAP/ Proyecto BIOFOR (INRENA/ USAID). 71 p.

IPCC (Intergovernmental Panel on Climate Change, JP). 2003. Guía de buenas prácticas para el uso de la tierra, uso de la tierra y silvicultura: Capítulo 4 Métodos complementarios y orientación las buenas prácticas que emanan del Protocolo de Kyoto. (en línea). Kanagawa, Japón. s.p.Disponible en http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf/spanish/ch4.pdf

_____. 2006. Directrices del IPPC del 2006 para los inventarios nacionales de gases de efecto invernadero. Volumen 4: Agricultura, silvicultura y otros usos de la tierra. Capítulo 4: Tierras forestales. Programa de inventarios nacionales de gases de efecto invernadero. Hayama, Japón. 93 p.

INEI (Instituto Nacional de Estadística e Informática). 2007. Censos nacionales de población y vivienda. Lima.

_____. 2011. Compendio estadístico 2011 del departamento de Madre de Dios.

INEI; UNFPA (Fondo de Población las Naciones Unidas); PNUD (Programa de las Naciones Unidas para el Desarrollo). 2008. Perfil sociodemográfico del Perú. 2da ed. Lima.

INRENA (Instituto Nacional de Recursos Naturales, PE). 1994. Mapa Ecológico del Perú. Lima, Perú. Esc. 1/ 100 000. Color.

_____. 2003a. Parque Nacional Bahuaja-Sonene. Plan Maestro 2003-2008.

_____. 2003b. Reserva Nacional Tambopata. Plan Maestro 2004-2008.

_____. 2003c. Mapificación y evaluación forestal del Bosque de Producción Permanente de Madre de Dios. 59 p.

Kirkby, C. 2002. Estándares Ecoturísticos para la Reserva Nacional Tambopata, el Parque Nacional Bahuaja Sonene y sus Zonas de Amortiguamiento, Madre de Dios, Perú. WWF - Oficina del Programa de Perú.

Kirkby, C. 2004. Manual metodológico para el monitoreo ambiental y socioeconómico de la Reserva de la Biósfera del Manu. Edición Industria Gráfica Pantigozo E.I.R.L. Cusco, PE. 130 p.

León, F. 2007. El aporte de las Áreas Naturales Protegidas a la economía nacional. INRENA. Lima. 140 p.

Luna, N; Vela, G. 2009. Sumergidos por la propuesta. Diario El Comercio. Lima. Set. 20. p. a10.

Malleux, J. 1982. Inventarios forestales en bosques tropicales. Universidad Nacional Agraria La Molina. Lima, Peru. pp. 272-276

MINCETUR (Ministerio de Comercio Exterior y Turismo). 2009. Ingreso de nacionales y extranjeros a las Áreas Naturales Protegidas por el Estado años 2004-2008. Disponible en http://www.mincetur.gob.pe/newweb/Portals/0/turismo/sitios%20turisticos/Peru_Visit_ANP_Ing_Prom_Mes_Mayor_1000.pdf

MINAM (Ministerio del Ambiente). 2009. Mapa de deforestación de la Amazonía peruana – 2000.

MINEM (Ministerio de Energía y Minas). 2008. Perú 2008: Anuario minero. Disponible en http://www.minem.gob.pe/publicacion.php?idSector=1&idPublicacion=6

Mosquera, C; Chávez, ML; Pachas, VH; Moschella; P. 2009. Estudio diagnóstico de la actividad minera artesanal en Madre de Dios. CooperAcción, Cáritas Madre de Dios, Conservación Internacional.

MTC (Ministerio de Transportes y Comunicaciones). 2009. Carretera interoceánica. Disponible en http://www.mtc.gob.pe/portal/especiales/promesa.htm

Pasa, A. 2008. Smallholders' contribution on climate change mitigation and water quality: the case of the CBFM Project in midwestern Leyte, Philippines. 11th International River Symposium.

Recavarren, P; Angulo, MA.2012. Cuantificación de la deforestación en Madre de Dios: un análisis frente al impacto de la minería. AIDER.

Recavarren, P; Castro, A. 2012. Estimación de la degradación forestal por causa antrópica en la Reserva Nacional Tambopata y el Parque Nacional Bahuaja Sonene, sector Madre de Dios. AIDER.

Rodríguez, L. (ed.). 1996. Diversidad biológica del Perú. Zonas prioritarias para su conservación. FANPE GTZ – INRENA. Lima. 191 p.

SERNANP (Servicio Nacional de Áreas Naturales Protegidas por el Estado). 2009. Plan financiero del SINANPE. Lima.

SINANPE (Servicio Nacional de Áreas Naturales Protegidas por el Estado, PE). 2009. Plan Director de las Áreas Naturales Protegidas (Estrategia Nacional). Lima, Perú. 132 p.

Tello, S. 2002. Situación actual de la pesca y la acuicultura en Madre de Dios. IIAP-Programa de Ecosistemas Acuáticos. Disponible en www.iiap.org.pe/Upload/Publicacion/PescaMDD.pdf

UICN (Unión Internacional para la Conservación de la Naturaleza). 2010. The IUCN Red List for Threatened Species. Disponible en www.iucnredlist.org

Walker, S; Pearson, T; Harris, N; Macdicken, K; Brown, S. 2007. Procedimientos operativos estándares para la medición de carbono terrestre. Winrock Internacional. EE UU.

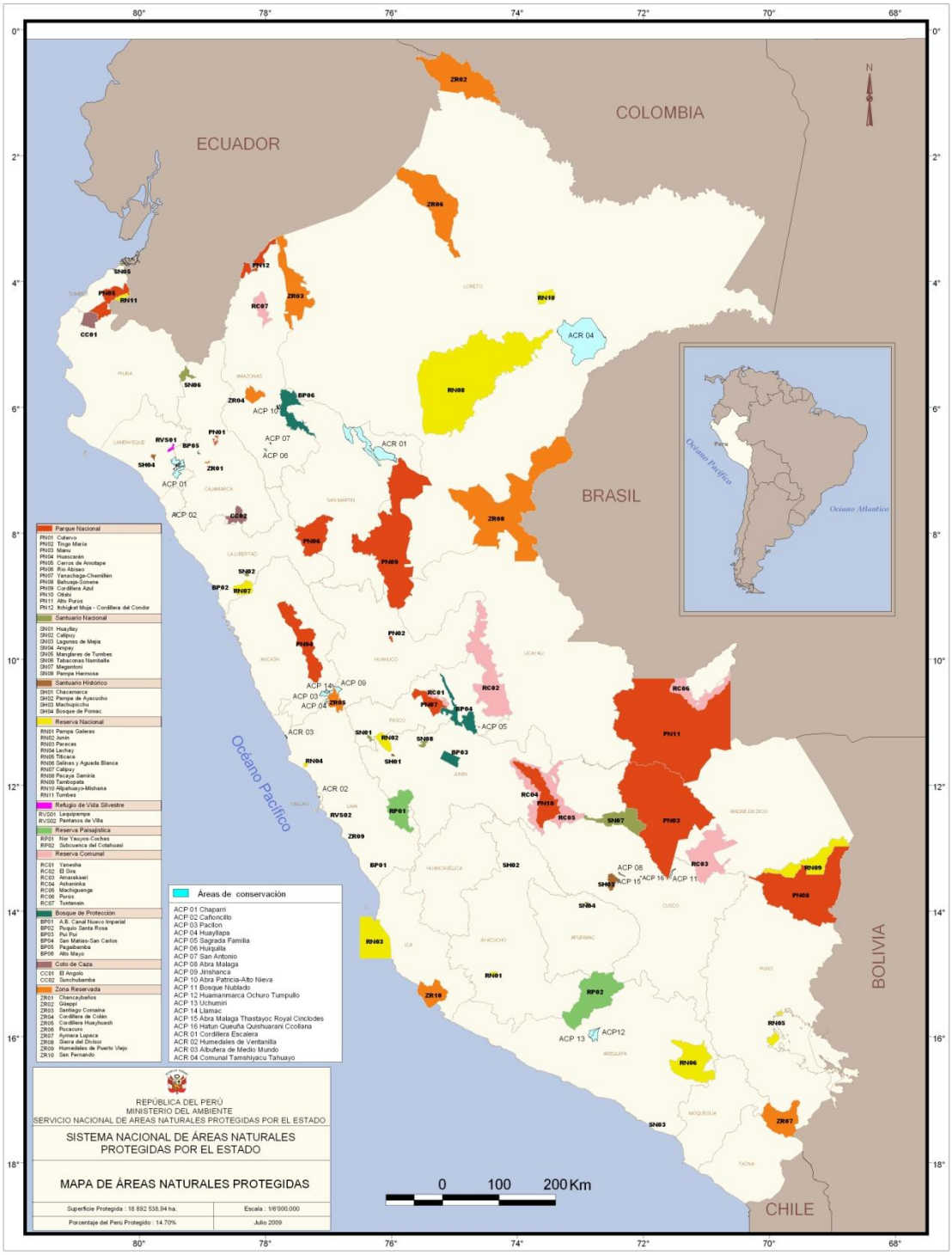
WALSH. 2007. Interconexión vial Iñapari-Puerto Marítimo del Sur – Tramo II (Etapa I)

Zegarra, E. 2005. Dudosos beneficios de la Interoceánica. Diario Perú.21. Lima. Jun 30.

ANNEX

ANNEX 1

Map of National System of Natural Protected Areas - SINANPE



ANNEX 2

List of coordinates of project area limits

ANNEX 3

List of coordinates of limits of exclusion areas within project area

ANNEX 4

Base map

ANNEX 5

Map of project area and of leakage belt

ANNEX 6

Hypsographic map

ANNEX 7

Hydrography map

ANNEX 8

Ecological map

ANNEX 9

Forest types map

ANNEX 10

Vegetation associations map

ANNEX 11

Map of natural protected areas zoning

ANNEX 12

Map of south interoceanic highway

ANNEX 13

Map of road network at reference region

ANNEX 14

Map of resources use

ANNEX 15

Mapa of critical areas

ANNEX 16

Map of accumulated deforestation interpretation to year 2000

ANNEX 17

Map of accumulated deforestation interpretation to year 2006

ANNEX 18

Map of accumulated deforestation interpretation to year 2008

ANNEX 19

Map of projected deforestation from 2008 to 2020

ANNEX 20

Map of project area stratification

ANNEX 21

Project area stratification

ANNEX 22

Estimation of forest biomass carbon stocks within the project area

ANNEX 23

Estimation of changes in carbon stocks and GHG emissions produced by unplanned deforestation at the baseline scenario

ANNEX 24

Estimation of leakage due to activity shifting

ANNEX 25

Estimation of leakage due to market effects

ANNEX 26

Estimation of uncertainty

ANNEX 27

Environmental impact of productive activities proposed by the project

ANNEX 28

Property registration certificates of Natural Protected Areas (NPA)

Oficina Registral Regional
Región Inka

1036180056

FICHA : 3426
RIMDD—

OFICINA DE MADRE DE DIOS	ANTECEDENTE DOMINIAL		PRESENTACION DIARIO				DERECHOS : S/.00
FICHA Nº: 3426	PRIMERA DE DOMINIO	DIA	MES	AÑO	HORA	TITULO	RECIBO : 4944
		17	07	1997	08:04	2297	LIBRO : PIM-2029

010926/001

B.- DESCRIPCION DEL INMUEBLE

01.- PREDIO RUSTICO.-Denominado PARQUE NACIONAL BAHUAJA SONENE,creado por Decreto Supremo Nº012-96-AG,ubicado en el distrito y provincia de Tambopata,departamento de Madre de Dios,Región INKA,y, en el distrito de San Juan del Oro,provincia de Sándia,departamento de Puno,comprensión de la Región José Carlos Mariátegui. AREA:323,569.77 Has. (TRESCIENTOS VEINTITRES MIL QUINIENTOS SESENTINUEVE HECTAREAS CON SIETE MIL SETECIENTOS METROS CUADRADOS). PERIMETRO:386,770 M.L. LINDEROS: NOROESTE Y NORTE: Apartir de la intersección del Thalweg del rio Tambopata con el límite Noroeste del Lote 78 del Mapa del Perú con áreas de contratos para operaciones petrolíferas de PETROPERU S.A. de lotización para las concesiones de Exploración y Explotación de Hidrocarburos,denominado HITO Nº 1,el límite está constituido por el Thalweg del rio Tambopata aguas abajo hasta la desembocadura de la Quebrada"Ocho Gallinas" HITO Nº2,cuyas coordenadas UTM son 444,450 m E y 8'567,400 m N,ubicado en la margen derecha del rio Tambopata a la altura de la unión de sus brazos que bordean el islote "Ocho Gallinas" ; de este punto continua por el thalweg de la quebrada "Ocho Gallinas",aguas arriba,surcándola aproximadamente 6 Km.hasta llegar al punto denominado HITO Nº 3 con coordenadas UTM 451,000 m E y 8'566,00 m N;de este punto continúa por una línea recta de 3.25 Km.que marcha con rumbo 90°E hasta llegar a un punto en que dicha línea corta el curso de la quebrada "Gato" o "Hamainetiti",ubicado en coordenadas UTM 454,250 m E y 8'566,000 m N,denominado HITO Nº4, De allí sigue la margen derecha de la mencionada quebrada aguas arriba hasta el punto denominado HITO Nº 5 con coordenadas UTM 455,130 m E y 8'550,000 m N. Del Hito Nº 5 sigue una linea recta con rumbo 90°E y distancia de 30.2 Km.aproximadamente,esta línea pasa por el punto donde se unen los rios Hasiaja y Alto la Torre (D'Orbigny) o Kuishokmi y continua hasta el punto que denominamos HITO Nº6,donde dicha línea se intersecta con la margen izquierda del rio Plasma Real Grande que a la vez es el punto suroeste del SANTUARIO NACIONAL PAMPAS DEL HEATH siendo las coordenadas UTM 485,300 m.E y 8'550,000 m.N;del cual,el límite del PARQUE NACIONAL propuesto,bordea el área del referido SANTUARIO NACIONAL PAMPAS DEL HEATH en sus límites oeste,norte y este;es así que sigue el rio Palma Real Grande aguas abajo de dirección Noreste,hasta llegar al punto denominado HITO Nº7 que es el punto noroeste del actual SANTUARIO NACIONAL cuyas coordenadas geográficas son UTM 504,000 m.E y 8'599,720 m.N. Desde el HITO Nº7,continúa a lo largo del paralelo 12°40'00'' por una linea recta de distancia proximada en 25 km. hasta llegar al punto de intersección con la margen izquierda del rio Heath o Sonene,límite internacional con Bolivia denominado HITO Nº8,que es el punto noreste del Santuario Nacional. POR EL ESTE:del punto anterior,el límite del PARQUE NACIONAL BAHUAJA-SONENE,lo constituye el límite internacional Perú-Bolivia,hasta su intersección con el límite noreste del Lote 78,denominado HITO Nº.9,quedando así incorporado el SANTUARIO NACIONAL PAMPAS DEL HEATH al ámbito del PARQUE NACIONAL. POR EL SUROESTE: Del punto anterior el límite del PARQUE NACIONAL BAHUAJA-SONENE,está constituido por el límite noreste del Lote 78 hasta su intersección con el thalweg del rio Tambopata,punto de inicio de la presente descripción. Excluyendo parte del area descrita anteriormente,se encuentra la que corresponde a la jurisdicción del Departamento de Madre de Dios,esto es; 180,228.36 Has (CIENTO OCHENTA MIL DOSCIENTOS VEINTIOCHO HECTAREAS CON TRES MIL SEISCIENTOS METROS CUADRADOS) ,con un perímetro de 306,070 M.L. y cuyos linderos son los siguientes :por el NORTE:colinda con la ZONA RESERVADA TAMBOPATA-CANDAMO,con una longitud de 137,870 m.l.,que van desde el HITO Nº2 hasta el HITO Nº3;por el SUR:colinda con el departamento de Puno,con una longitud de 59,200 m.l.,que van desde la intersección entre el límite internacional Perú-Bolivia y el límite departamental Madre de Dios-Puno,hasta la intersección del referido límite departamental y el límite suroeste del Parque Nacional;por el ESTE:margen izquierda del rio Heath,límite internacional con Bolivia,con una longitud de 60,300 m.l.,que van desde el HITO Nº 8 hasta el punto de intersección entre el límite internacional Perú-Bolivia con el límite departamental Madre de Dios-Puno;por el OESTE:colinda con el lote 78 y la ZONA RESERVADA TAMBOPATA-CANDAMO,con una longitud de 50,800 m.l.,que van desde el punto de intersección entre el límite departamental Madre de Dios-Puno y el punto suroeste del Parque Nacional,hasta el HITO Nº2.- Puerto Maldonado, 17 de julio de 1997.—

Abog. ADOLFO E. CORNEJO POLANCO
REGISTRADOR PUBLICO

010926/002

C.- TITULOS DE DOMINIO

01.- EL ESTADO PERUANO,a través del MINISTERIO DE AGRICULTURA-MADRE DE DIOS,es propietario de 180,228.36 Has del predio descrito en el rubro anterior de ésta Ficha,area ubicada dentro de la jurisdicción del departamento de Madre de Dios,en mérito a la Resolución Directoral Nº264-97-MA-DERA-MD-RI,de fecha 11 de julio de 1997,suscrita por el Ing. Palmer Pastor Velasquez,Director Sub-Regional de Agricultura de Madre de Dios.-Adjunta Plano de Ubicación y Perimétrico,Memoria Descriptiva y Decreto Supremo de Creación.- Puerto Maldonado,17 de julio de 1997.-

Abog. ADOLFO E. CORNEJO POLANCO
REGISTRADOR PUBLICO

ZONA REGISTRAL Nº X SEDE CUSCO
Oficina Registral Madre de Dios

L. INGRID MEZA BECERRA
ABOGADA CERTIFICADORA
Oficina Registral Madre de Dios
Zona Registral Nº X - Sede Cusco

CONTINUA AL DORSO

08 JUN 2011

Partida Nº 05005750

Oficina Registral Regional
Región Inka

FICHA : 3426
RIMDD—

ACTO :OTROS ACTOS NO DETERMINADOS
C.I. :010926

2-B.- MODIFICACION DE LINDEROS Y AREA.- Mediante Decreto Supremo Nº 048-2000-AG, de fecha, 04 de Setiembre del 2,000. DECRETA: ARTICULO 2º.- Ampliese el Parque Nacional Bahuaja Sonene, a una superficie total de un millón noventa y un mil cuatrocientos dieciseis hectareás (1 091 416 hás), ubicado en los departamentos de Madre de Dios y Puno, provincia de Tambopata, Carabaya y Sandia, respectivamente, ARTICULO 3º.- La superficie de doscientos sesenta y dos mil trescientos quince hectáreas (262 315 hás), excluida de la Zona Reserva de Tambopata Candamo formará parte de la zona de Amortiguamiento de la Reserva Nacional Tambopata y el Parque Nacional Bahuaja Sonene. ARTICULO 4º.- Derógase el Decreto Supremo Nº 012-96-AG, y las demas disposiciones legales que se opongan a lo dispuesto por el presente Decreto Supremo. MEMORIA DESCRIPTIVA.- POR EL NORTE: Se parte del Hito Nº 1 de coordenadas 354 795E y 8547 609 N desde este punto , se continúa con dirección Este, por el límite sur de la Comunidad Nativa de Kotsimba; y luego, se continúa por el límite sur dicha Comunidad Nativa hasta el Hito Nº 2 ubicado en la quebrada Farfán cuyas coordenadas son 380 957E y 8555 146G, de allí se continúa por una linea recta en dirección Sureste hasta el hito Nº 3 que es desembocadura de una quebrada tributaria sin nombre en el río Azul en su margen izquierda, continúa por el thalweg de dicho río, aguas abajo hasta el Hito Nº 4, ubicado en la confluencia del río Azul con el río Chocolatillo, continúa por una línea recta de dirección Este hasta el Hito Nº 5, ubicado en las confluencias de los ríos Shaehuaca y Malinousquillo; a partir de este último punto se continúa en dirección Este por divisoria de aguas de dos quebradas sin nombre tributarias del río Malinousquillo por su margen derecha, pasando por la cota de las 320 m, continúando por la divisoria de aguas de los ríos Agua Negra y Sabaluyo con dirección al cerro Bishoaniji hasta las nacientes de la Quebrada Segunda, se continúa por dicha quebrada hasta su confluencia con el río Tambopata. Se sigue por el thalweg del río Tambopata aguas abajo hasta la Isla Ocho Gallinas, hasta llegar a la desembocadura de la Quebrada Ocho Gallinas , se continúa por esta Quebrada aguas arriba, hasta el Hito Nº 6 ubicado en la misma quebrada con coordenadas UTM 451 000E y 8 566 000N deste este punto se continúa por una linea recta de dirección este hasta el Hito Nº 7 que corta el curso del río Gato en las coordenadas UTM 454 250E y 8 566 000N; desde este punto se continúa por el curso del río Gato aguas arriba, que luego toma el nombre de Quebrada Mamoinetiji hasta el Hito Nº 8 de coordenadas UTM 455 150E y 8 550 000N; desde este punto sigue una línea recta de dirección Este hasta el Hito Nº 9 en coordenadas 485 000E y 8 550 000N que encuentra en la confluencia del río Palma Real grande y una quebrada tributaria sin nombre ubicada en su margen derecha, desde este punto, continúa por el río Palma real grande hasta el Hito Nº 9 de coordenadas UTM 504 000E y 8 599 720N; desde este punto, se continúa por una linea recta de dirección Este que pasa por el paralelo 8 599 720N intersectándose con la margen izquierda del río Heath, límite internacional con Bolivia que constituye el Hito Nº 10. ESTE:- A partir del último punto se continúa en dirección sur por el límite internacional Perú Bolivia hasta la confluencia del río Colorado y el río Tambopata. SUR:- Desde este último punto, se continúa por la divisoria de aguas del río Intipampa y el río Quita Calzón, hasta alcanzar las cotas 1554, 1578, 1640, ubicadas en el cerro Collque Orco, continuando por las cotas 1320, 1804 ubicada en el cerro Azata Pata, continúando por divisoria de aguas de los ríos Azatá y Arequipa pasando por las cotas 1725, 1948, 2010, punto desde el cual se continúa con dirección sur hasta la cota de 1520, para luego llegar a la confluencia del río Azata con dos quebradas sin nombre, continúando por la quebrada mas meridional hasta las nacientes de dos tributarias a dicha quebrada, punto desde el cual continúa por divisoria de aguas hasta el Hito Nº 11 de coordenadas 478 663E y 8 458N, punto desde el cual se continúa con dirección Noroeste por divisoria de aguas de los ríos Huari Huari y Azata, Guacamayo y Huari Huari; Cuatro y Huari Huari, Chiveni y Guacamayo, Inambari y Azulmayo, Yahuarmayo y Ebehuabaeji, Chaspa y Azul, Inambari y Malinouski hasta el Hito Nº 1 inicio de la presente descripción. Así consta del referido Decreto Supremo, públicado en el Diario el Peruano en fecha, 05 de setiembre del 2,000. Adjunta Oficio Nº 138-2000-INRENA-DGANPFS-J-PNBS-RNT, de fecha 19 de octubre del 2,000, firmado por Ingº Jacqueline R. Ramirez Chávez, plano y memoria descriptiva.Puerto Maldonado, 26 de octubre del 2,000.
FUNCIONARIO: ALBERTO FUJIMORI FUJIMORI PRESENTADO EL DIA DIECINUEVE DE Septiembre DEL DOS MIL A HORAS 13:36:16
CON NUMERO DE TITULO 0621200000003076 Y LEGAJO NRO: 06212000PIN00112 DERECHOS: S/.0.00 RECIBO NRO. 0621200000024972
MADRE DE DIOS 26 DE Octubre DEL DOS MIL *DOOCAR*

Abog. H. Carlos Valencia Pilares
REGISTRADOR PUBLICO

CONTINUA A LA FICHA Nº 3426-A. . .

ZONA REGISTRAL Nº X SEDE CUSCO
Oficina Registral Madre de Dios

L. INGRID MEZA BECERRA
ABOGADA CERTIFICADORA
Oficina Registral Madre de Dios
Zona Registral Nº X - Sede Cusco
08 JUN 2011

OFICINA REGISTRAL INKA

1036180057

Ficha de Continuación
INMUEBLES

FICHA : 3426_A

RI –

OFICINA DE CUSCO
Ficha 3426-A
3-B.- ACLARACION DE INSCRIPCION DEL ASIENTO Nº 2-B.- Se procede a aclarar el As. 2-B, de la presente ficha, por cuanto solo corresponde a la Jurisdicción de Madre de Dios lo siguiente: NORTE: Se parte el punto Nº 1, ubicado en el límite Sur de la Comunidad Nativa Kotsimba cuya coordenada UTM es 368 200E y 8 543 700N, el cual coresponde a la intersección entre la Cota de 400 m y la línea Departamental imaginaria entre los Departamentos de Madre de Dios y Puno. Desde este punto, se continua con dirección Este por el límite Sur de la Comunidad Nativa Kotsimba, hasta llegar al HITO Nº 2 ubicado en la quebrada Farfán cuyas coordenadas son 380 957E y 8 555 146N, de allí se continúa por una línea recta en dirección Sureste hasta el HITO Nº 3 que es una desembocadura de una quebrada Tributaria sin nombre en el río Azul en su margen izquierda, continúa por el thalweg de dicho río, aguas abajo hasta el HITO Nº 4, ubicado en la confluencia del río Azul con el río Chocolatillo, continúa por una línea recta de dirección Este hasta el HITO Nº5, ubicado en la confluencia de los ríos Shaehuaca y Malinousquillo; a partir de este último punto se continúa en dirección Este por divisoria de aguas de dos quebradas sin nombres tributarias del rio Malinuosquillo por su margen derecha pasando por Cota de 320 m. continuando por la divisoria de aguas de los ríos agua Negra y Sabaluyo con dirección al cerro Bishoaniji hasta las nacientes de la quebrada segunda, se continua por dicha quebrada hasta su confluencia con el río Tambopata. Se sigue por el Thalweg del río Tambopata aguas abajo hasta la Isla Ocho Gallinas bordeando inclusive la isla hasta llegar a la desembocadura de la Quebrada Ocho Gallinas, se continua por esta quebrada aguas arriba hasta el HITO Nº6 ubicado en la misma quebrada con coordenadas UTM 451 000E y 8 566 000N; desde este punto se continua por una linea recta de dirección Este hasta el HITO Nº7 que corta el curso del río Gato en las coordenadas UTM 454 250E y 8 566 000N; desde este punto se continua por el curso del río Gato aguas arriba, que luego toma el nombre de quebrada Mamoinetije hasta el HITO Nº8 de coordenadas UTM 455 130E y 8 550 000N; desde este punto sigue una línea recta de dirección Este hasta el HITO Nº9 de coordenadas 485 000E y 8 550 000N que se encuentra en la confluencia del río Palma Real Grande y una quebrada Tributaria sin nombre ubicada en su margen derecha; desde este punto, continua por el río Palma Real Grande aguas abajo hasta el HITO Nº 10 de coordenadas UTM 504 000E y 8 599 720N; desde este punto se continua por una línea recta de dirección Este que pasa por el paralelo 8 599 720N intersectándose con la margen izquierda del río Heath, límite internacional con Bolivia que constituye el HITO Nº11. SUR: A partir del último punto, se continua en dirección Sur por el límite internacional Perú-Bolivia hasta el punto de intersección con la línea del límite Departamental entre Madre de Dios y Puno. A partir de este punto se sigue la línea Departamental en línea recta en dirección Suroeste. OESTE:-Continuando por este tramo se llega a un punto de quiebre para continuar en línea recta en dirección Noroeste de la misma línea del límite Departamental hasta finalmente llegar al punto Nº1. AREA: 313,937 HA 28.76%. ubicado en los Distritos de Tambopata e Inambari, Provincia de Tambopata, Departamento de Madre de Dios. Así consta de la memoria descriptiva,autorizado por el Ministerio de Agricultura Instituto Nacional de Recursos Naturales Parque Nacional Bahuaja Sonene Reserva Nacional Tambopata Ing. Jaquelin Ramirez Chávez – JEFE.- Adjunto plano. Puerto Maldonado, 27 de octubre del 2,000.-

Abog. H. Carlos Valencia Piñeiros
REGISTRADOR PUBLICO

ZONA REGISTRAL Nº X SEDE CUSCO
Oficina Registral Madre de Dios

L. INGRID MEZA BECERRA
ABOGADA CERTIFICADORA
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Zona Registral Nº X - Sede Cusco

08 JUN 2011

Partida Nº 05005750

0066493

Partida Nº 05005750

ZONA REGISTRAL Nº X SEDE CUSCO Oficina Registral Madre de Dios

INGRID NEZA BECERRA
ABOGADA CERTIFICADORA
Oficina Registral Madre de Dios
Zona Registral Nº X - Sede Cusco

SUNARP

ZONA REGISTRAL Nº X SEDE CUSCO
OFICINA REGISTRAL CUSCO
Nº Partida: 05005750

INSCRIPCION DE SECCION ESPECIAL DE PREDIOS RURALES
PREDIO RURAL UBIC.RUR. PARQUE NACIONAL BAHUAJA SONENE AREA Ha. 323 569.77
TAMBOPATA

VIENE DE LA FICHA Nº 3426-A ASIENTO 3-B

REGISTRO DE PROPIEDAD INMUEBLE
RUBRO : TITULOS DE DOMINIO

C00004.- CAMBIO DE DENOMINACION: EL ESTADO - INSTITUTO NACIONAL DE RESURSOS NATURALES - INRENA, ha pasado a ser propietario del predio descrito en esta partida registral, a mérito del Decreto Supremo N° 038-2001-AG de fecha 22 de junio del 2001. Asi consta de la solicitud de fecha 20 de mayo de 2009, firmado por Luis Alfaro Lozano, Jefe Servicio Nacional de Areas Naturales Protegidas por el Estado.
El título fue presentado el 02/06/2009 a las 12:57:50 PM horas, bajo el N° 2009-00004814 del TomoDiario 0060.Derechos S/.76.00 con Recibo(s) Número(s) 00005830-01 00007823-01.-TAMBOPATA, 30 de Julio de 2009.

Julio C. Eduardo Samaniego Montes
REGISTRADOR PUBLICO
Zona Registral N°X - Ofic. Madre de Dios

Partida Nº 05005750

ZONA REGISTRAL Nº X SEDE CUSCO Oficina Registral Madre de Dios

INGRID MEZA BECERRA
ABOGADA CERTIFICADORA
Oficina Registral Madre de Dios
Zona Registral Nº X - Sede Cusco

SUNARP

ZONA REGISTRAL Nº X SEDE CUSCO
OFICINA REGISTRAL CUSCO
Nº Partida: 05005750

INSCRIPCION DE SECCION ESPECIAL DE PREDIOS RURALES
PREDIO RURAL UBIC.RUR. PARQUE NACIONAL BAHUAJA SONENE AREA Ha. 323 569.77
TAMBOPATA

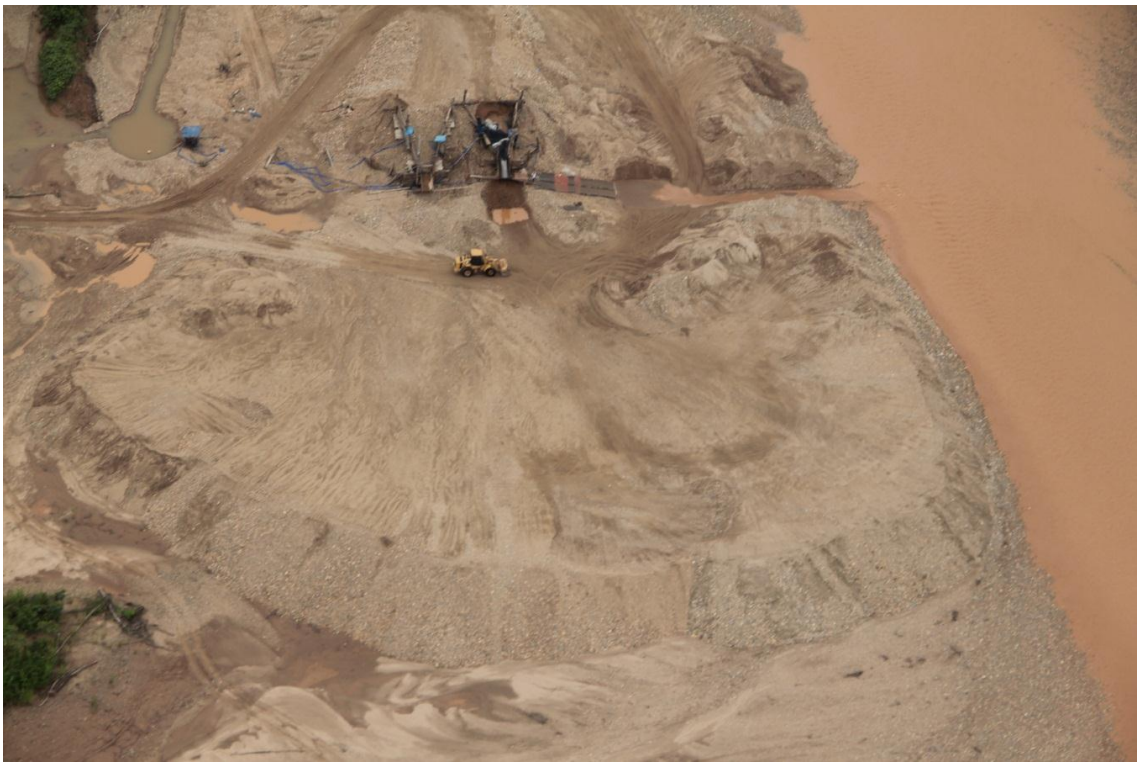
REGISTRO DE PREDIOS
RUBRO : TITULOS DE DOMINIO

C00005.- CAMBIO DE TITULAR POR FUSIÓN: EL ESTADO - SERVICIO NACIONAL DE AREAS NATURALES PROTEGIDAS POR EL ESTADO - SERNANP, ha pasado a ser propietario del predio descrito en esta partida registral, a mérito de la fusión de la Intendencia de Areas Naturales Protegidas del INRENA con el Servicio Nacional de Areas Protegidas del Ministerio del Ambiente, siendo éste último el ente incorporante conforme lo dispuesto por la Tercera Disposición Complementaria final.- FUSIONES del Decreto Legislativo N°1013 Asi consta de la solicitud presentada por Luis alfaro Lozano Jefe del Servicio Nacional de Areas Naturales Protegidas por el Estado, de fecha 20 de mayo de 2009.
El título fue presentado el 02/06/2009 a las 12:57:50 PM horas, bajo el Nº 2009-00004814 del TomoDiario 0060 Derechos S/.76.00 con Recibo(s) Numero(s) 00005830-01 00007823-01.-TAMBOPATA, 30 de julio de 2009.

Julio C. Ricardo Santander Moreno
REGISTRADOR PUBLICO
Zona Registral Nº X - Sede Madre de Dios

ANNEX 29

Over flight photographs of areas affected by gold mining in Madre de Dios (December 2010)



ANNEX 29

VCS non-permanence risk report

ANNEX 30

Multidisciplinary internal workshop on analysis of the characteristics of the Madre de Dios region as REDD project background AIDER MDD

ANNEX 31

Significance of pools and emission sources

ANNEX 32

Mixed Aguajal stratum soil Analysis

ANNEX 33

Project activities during the period 2010-2011

The following are the actions taken by AIDER for the first time emissions monitoring (July 1, 2010 - June 30, 2011), and until December 2011 inclusive, which are framed within the 04 components of the project's strategy for reducing emissions from deforestation and degradation (see section 1.8 of the PD). The shares have been described according to priority sectors, as well as those developed under the Administration Agreement partial operations RTAMB PNBS-sector and Madre de Dios, executed by AIDER. In digital file folder "Project Activities 2010-2011_Anexos" are scanned documents attesting to the completion of the activities listed below.

• INFIERNO SECTOR

This sector has established an Interagency Coordinating specific agreement between the Native Community Ese'eja of Infierno and Asociación para la Investigación y Desarrollo Integral - AIDER, dated March 3, 2010[44]. As part of the commitments made in this agreement, have taken steps to implement the project "Sustainable Forest Management and Utilization of Forest Ecosystem Services administered by the Native Community of Infierno Ese`Eja "by agreement between AIDER and the International Tropical Timber[45].

October 21, 2010. Participatory meeting with the leaders of Infierno for identifying critical points on the map of the community to characterize threats on the use of resources[46].

November 12, 2010. Participatory community meeting for expository presentation on topics of ecosystem services[47].

November 23, 2010. Meeting for the presentation communal participatory exhibition on women and men participating in sustainable development, gender empowerment induction and reinforce notions of REDD[48].

February 13, 2011. Workshop focus group loggers; conducted to gather information on the process for the extraction of timber, species that exploit the characteristics in the development, for together with these stakeholders to discuss the best way to do this activity without posing a threat to the resource[49].

March 31, 2011. Community meeting to gather information on the activities of the community, the location and identification of its forest resources to further develops strategies and action plans designed to benefit the population[50].
April 14, 2011. Participatory community meeting diagnostic use of resources in the native community of Infierno[51].

[44] Annex I. Interagency Coordination Specific Agreement between Asociación para la Investigación y Desarrollo Integral-AIDER Ese'eja Native Community of Infierno. 03/03/2010.
[45] Annex II. International Organization for Tropical Timber Agreement Thematic Programme project RED-PD 018/09 Rev.1 (F)
[46] Annex III. Document Memory: Participatory meeting with the leaders of the community of Infierno. 10/21/2010
[47] Annex IV. Document Memory: Fourth participatory community meeting. 11/12/2010
[48] Annex V. Document Memory: Fifth participatory community meeting. 11/23/2010
[49] Annex VI. Document Memory: Fourth workshop focus group loggers. 13/02/2011
[50] Annex VII. Document Memory: Ninth village meeting. 31/03/2011

June 21, 2011. Participatory meeting for socialization and communal validation document "Diagnostic use, impact and actors involved with the management of natural resources Infierno", to be used as input for the development of strategies for the use of community resources[52].

• APAYLOM SECTOR (Malinowski River)
This sector has established a partnership agreement between the Association of Agricultural Producers and Golden Handcrafted Washers Malinowski - APAYLOM and AIDER, dated May 20, 2010[53], which seeks to develop APAYLOM low-impact activities in their areas to ensure the proper management of the ecosystem in harmony with the conservation and management of the Tambopata National Reserve. Based on this agreement, it has established a non-refundable Financing Agreement between the Fund of the Americas (FONDAM) and AIDER for project implementation "Artisanal with social and environmental responsibility in the buffer zone of the Tambopata National Reserve Madre de Dios - Experiencing APAYLOM" since January 2011[54]. Actions taken:

June 3, 2010. Making an informational workshop regarding legal regulations partners APAYLOM artisanal miners[55].

August 13, 2010. Conducting a training workshop to holders APAYLOM miners to enhance their knowledge concerning the legal standards for formalization[56].

February 28, 2011. Consulting to develop a participatory APAYLOM mining operations[57].

March 16, 2011. Management support on the formalization of artisanal alluvial sub sector Malinowski River Basin, based on the Law of Natural Protected Areas System[58].

August 24, 2011. Implementation with clean technologies for the recovery of gold without using mercury[59].

• SECTOR Loero, JORGE CHAVEZ AND NEW AMERICA
For the development of sustainable economic activities in these three populations (which make up the sector most immediate threat of deforestation in the project area) has established a Reimbursable Agreement between Co-Financing FONDAM PROFONANPE and AIDER for project implementation "Participative management and promotion of sustainable production

[51] Annex VIII. Document Memory: Tenth meeting participatory community. 14/04/2011
[52] Annex IX. Document Memory: Eleventh communal participatory meeting. 21/06/2011.
[53] Annex X. Collaboration Agreement between Asociación para la Investigación y Desarrollo Integral-AIDER and Association of agricultural producers and artisanal gold washers-APAYLOM Malinowski. 20/05/2010
[54] Annex XI. Non Reimbursable Financing Agreement of the Americas Fund and AIDER for project implementation "Artisanal with social and environmental responsibility in the buffer zone of the Tambopata National Reserve, Madre de Dios - Experience with APAYLOM. January 2011.
[55] Annex XII. Informational Workshop Legal Regulations Concerning the partners APAYLOM artisanal miners. 03/06/2010
[56] Annex XIII. Roll Call Training Workshop holders APAYLOM miners. 08/13/2010
[57] Annex XIV. External consulting contract .28.02.2011
[58] Annex XV: Copy of Letter. 16/03/2011
[59] Annex XVI: deed of assignment in use. 08/24/2011

systems as an alternative to reduce deforestation in the Tambopata National Reserve (New America) and its buffer zone (Loero and Jorge Chavez), since October 2010[60].
Actions taken:

April 2, 2011. Workshop on organizational strengthening Jorge Chavez[61].

April 6, 2011. Workshop on sustainable harvesting of palm Jorge Chavez, included training in palm harvesting techniques without the need to clear[62].

April 17, 2011. Conducting workshop on organic composting - biol, targeting agroforestry farmers Jorge Chavez[63].

April 24, 2011. Training workshop for volunteer rangers Jorge Chavez on issues such as policing, responsibility, importance of being a volunteer ranger, in order to motivate members of the Association[64].

May 7, 2011. Training workshop for volunteers rangers annual activity program of community policing and prioritizing areas for control and community policing in the Tambopata National Reserve[65].

May 7, 2011. Workshop II ranger training to volunteers in Jorge Chavez on issues such as policing, responsibility, importance of being a volunteer ranger, in order to motivate members of the Association[66].

May 21, 2011. Internship exchange of experiences between producers in order to achieve that in plain language and with practical field experiences exchange products producer[67].

June 22, 2011. Public delivery of equipment and tools, as transfer of use for the production of organic fertilizers and implementation of agroforestry plots[68].

June 25, 2011. Conducting workshop on good forestry practices in palms, harvesting, propagation and associativity[69].

July 2011. Training in management practice pruning in agroforestry systems in order to strengthen capacities of rural producers and art concepts with emphasis on agroforestry pruning

[60] Annex XVII: Non Reimbursable Co-Financing Agreement between FONDAM, AIDER and PROFONANPE to implement the project "Participatory management and promotion of sustainable production systems as an alternative to reduce deforestation in the Tambopata National Reserve (New America) and its area of buffer (Loero and Jorge Chavez). October 2010.
[61] Annex XVIII. Document Memory: Strengthening Workshop Organization Jorge Chavez. 02/04/2011.
[62] Annex XIX. Document Memory: Workshop on Sustainable palm harvesting Jorge Chavez. 06/04/2011
[63] Annex XX. Report of workshop on organic composting – 17/04/2011 Biol.
[64] Annex XXI. Ranger Training Workshop volunteers Jorge Chavez. 24/04/2011.
[65] Annex XXII. II Training Workshop for volunteer rangers. 07/05/2011.
[66] Annex XXIII. Document Memory: II Training Workshop for volunteer rangers. Jorge Chavez. 07/05/2011.
[67] Annex XXIV. Internship Report: Exchange of experiences between agroforestry producers. 21/05/2011.
[68] Annex XXV. Delivery of equipment and tools Act 22/06/2011
[69] Annex XXVI. Document Memory Course II Workshop Sustainable harvesting palm forestry - Propagation and associativity. 25/06/2011

with rural extension methods in line with the changes and new demands of sustainable rural development[70].

August 13, 2011. Delivery of radio equipment to the Tambopata National Reserve to strengthen monitoring and surveillance activities[71].

• MANAGEMENT AGREEMENT

June 3, 2010. PRA in the native community Sonene, performed for the purpose of promoting a process of recognition of the Community and its forest resources, indicating the potential for exploitation of resources on which they depend, in turn confirms the participants to reflect the misuse of resources implies deterioration in the household economy, is more poverty means. It is an element that is taken as a basis for activities that help reduce deforestation[72].

June 19, 2010. PRA Sector in Philadelphia, made with the same purpose as that of the native community Sonene[73].

June 26, 2010. PRA Sector Virgen de la Candelaria[74].

July 3, 2010. PRA in the Las Mercedes[75].

July 3, 2010. PRA in the San Bernardo[76].

20 August to 05 September 2010. Voluntary support the checkpoint Naturalists San Antonio, for the control and surveillance of the Tambopata National Reserve[77].

22 August to 06 September 2010. Ranger Volunteers support the checkpoint Sandoval, control and surveillance of the Tambopata National Reserve[78].

November 2010. Training rangers checkpoints and surveillance Tambopata National Reserve, patrolling trails georeferencing check points and forest degradation[79].

May 5, 2011. Delivery of communication equipment to the Management Committee of the Tambopata National Reserve to strengthen control and surveillance in the buffer zone of the protected area[80].

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[70] Annex XXVII. Workshop Report "Managing pruning in agroforestry systems." July 2011.
[71] Annex XXVIII. Deed of Assignment in Use 13/08/2011
[72] Annex XXIX. Sonene Participatory dialogue to better opportunities and proposal of our community development 03/06/2010
[73] Annex XXX. Philadelphia Participatory dialogue to better opportunities and proposal of our community development 19/06/2010
[74] Annex XXXI. Virgen de la Candelaria Participatory dialogue to better opportunities and proposal of our community development 26/06/2010
[75] Annex XXXII. Productores Agropecuarios de las Mercedes Participatory dialogue to better opportunities and proposal of our community development 03/07/2010
[76] Annex XXXIII. San Bernardo Participatory dialogue to better opportunities and proposal of our community development 03/07/2010
[77] Annex XXXIV. Report Nº001-2010-CA-AIDER-GVN/VOLUNTARIA 04/09/2010
[78] Annex XXXV. Report Nº001-2010-IDER-GVN/LBR. 04/10/2010
[79] Annex XXXVI. Report Out: Training checkpoints and surveillance in the Tambopata National Reserve. November 2010

May 7, 2011. Delivery of communication equipment to APAYLOM Association to strengthen control and supervision in the buffer zone of the Tambopata National Reserve[81].

July 1, 2011. Delivery of food to volunteer rangers, to be used in control operations and community policing Tambopata National Reserve[82].

July 14, 2011. Preparation of training plan for community volunteer rangers in order to encourage the participation of the communities that are settled within and in the buffer zone of the Tambopata National Reserve's approach to concrete actions to address the immediate needs of short and medium term, in order to mitigate the direct and indirect impacts[83].

September 01, 2011. Meeting with members of the Management Committee, rangers, community members, to identify threats to Bahuaja Sonene, and succeeded in identifying threats such as illegal logging, agricultural expansion and informal mining, managing to take agreements to minimize them[84].

October-December 2011. Making communication actions in order to contribute to the generation of reporting mechanisms for identifying publics to PNBS presence, expanding sustainability processes both wild areas and the quality of life of the population[85].

December 2, 2011. Castañeros technical training for developing their annual work plans and publicizing administrative disciplinary proceedings and covenant violations Management Plan Chestnut[86].

December 15, 2011. Delivery of materials and equipment for the implementation of the community policing plan Bahuaja Sonene[87].

December 15, 2011. Delivery of materials and equipment to implement the High Malinowski checkpoint, which will enhance the monitoring and surveillance activities undertaken by rangers Bahuaja Sonene[88].

December 2011. Report of joint activities with the checkpoint guards and surveillance Loero - Jorge Chavez[89].

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[80] Annex XXXVII. Deed of assignment in use - Receiving radio-communication equipment. 05/05/2011.
[81] Annex XXXVIII. Deed of assignment in use - Receiving radio-communication equipment. 05/05/2011.
[82] Annex XXXIX. Delivery Act - receiving supplies 01/07/2011
[83] Annex XXXX. Report Nº039-2011-SERNANP-RNTAMB/EFG
[84] Annex XXXXI. Meeting Minutes Decentralized Management Committee Bahuaja Sonene - SERNANP. 01/09/2011.
[85] Annex XXXXII. Progress report, Actions Campaign communication "Knowing my Bahuaja Sonene".
[86] Annex XXXXIII. Memory training workshop to castañeros Tambopata National Reserve and Bahuaja Sonene for submission of the annual operating plan and annual harvest 2011. 12/02/2011.
[87] Annex XXXXIV. Deed of assignment in use, Receiving materials and equipment for the implementation of the community surveillance plan. 12/15/2011.
[88] Annex XXXXV. Deed of assignment in use, Receiving materials and equipment for the implementation of the checkpoint High Malinowski. 12/15/2011.
[89] Annex XXXXVI. Report Nº023-2011-SERNANP-RNTAMB-PC-LOERO J.CH. – GP.RGP