

PROJECT MONITORING REPORT FOREST MANAGEMENT TO REDUCE DEFORESTATION AND DEGRADATION IN SHIPIBO CONIBO AND CACATAIBO INDIGENOUS COMMUNITIES OF UCAYALI REGION

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project is developed in 07 native communities belonging to the ethnic Cacataibo and Shibipo Conibo, comprising an area of 127,004.0 hectares. The purpose of the project is to conserve the forests of these communities front to the advance of deforestation and degradation. It is proposed to reduce the pressure to change the land use in the project area with 4 components: i) proper use of communal land, ii) capacity building for the management of natural resources, iii) project finance and market linkages and iv) finally strategic alliances. These actions are oriented to prevent the advance of deforestation.

In the first period of monitoring and verification (01 July, 2010 to 30 June 2013) have been developed the following activities: promotion of community forest management (timber and non-timber), strengthening indigenous organizations to understand REDD+ and Compensation for Ecosystem Services, promoting local forest governance in 07 native communities for the proper management of natural resources, increased organizational and administrative capacities of authorities and community in the management of natural resources.

With the development of activities has been obtained certification forest voluntary under the standard Council Forest Stewardship (FSC), also establishment and management of fast-growing forest plantations, development of handicrafts by women of native communities and capacities in the administration and management of natural resources.

The verification period, comprising from 01 July 2010 to 30 June 2013, managed to avoid a total of 471,649 tCO₂-e.

1.2 Sectoral Scope and Project Type

Sectoral Scope 14 - Agriculture, Forestry and Other Land Use.

AFOLU project category: Reducing Emissions from Deforestation and forest Degradation (REDD+).

Type of activity: Avoiding Unplanned Deforestation and Degradation (AUDD)

1.3 Project Proponent

The project proponents are the 7 Native Communities and AIDER. The 07 native communities are the responsible for the implementation of the REDD+ strategy and owners of the VCUs generated by the project and his marketing. AIDER, is the technical manager of Monitoring, Reporting and Verification (MRV) of the project and the technical adviser for the implementation of the REDD+ strategy.

Table 1. Description of the project proponents

Organization name	Calleria Native Community
Contact person	Carolina Barbarán Reategui
Title	Village head
Address	Callerio River
Telephone	(+51 61) 81-1495
Email	-

Organization name	Curiaca Native Community
Contact person	Jorge Vásquez Barbarán
Title	Village head
Address	Ucayali River - Caco Brook
Telephone	(+51 61) 811497 / 813875
Email	-

Organization name	Sinchi Roca Native Community
Contact person	Javier Panduro Mera
Title	Village head
Address	San Alejandro River
Telephone	-
Email	-

Organization name	Pueblo Nuevo Native Community
Contact person	Coquito Elmer Silvano Linares
Title	Village head
Address	Ucayali River - Quebrada Caco
Telephone	(51 61) 84-0004
Email	-

Organization name	Puerto Nuevo Native Community
Contact person	Merino Agreda Torres
Title	Village head
Address	San Alejandro River
Telephone	-
Email	-

Organization name	Flor de Ucayali Native Community
Contact person	Daniel Lomas Guimaraes
Title	Village head
Address	Ucayali River
Telephone	(+51 61) 968 170 451
Email	-

Organization name	Roya Native Community
Contact person	Gilder Fachin López
Title	Village head
Address	Ucayali River
Telephone	-
Email	-

Organization name	Asociación para la Investigación y Desarrollo Integral - AIDER
Contact person	Jaime Nalvarte Armas
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Address	Dirección: Av. Jorge Basadre 180 Oficina 6 – San Isidro. Lima, Perú
Telephone	Teléfono: (51 1) 421 5835
Email	lima@aider.com.pe

1.4 Other Entities Involved in the Project

In the case of this project only AIDER and 7 Native Communities of the Department of Ucayali, are the only institutions involved.

1.5 Project Start Date

The project start date is July 1, 2010, date on which the activity of community forest management starts, activity corresponding to component "Appropriate environmental use of communal land" of the REDD + project strategy.

1.6 Project Crediting Period

Project crediting period: July 1, 2010 to June 30, 2030, a total of 20 years.

The first reduction period quantified GHG emissions will be 10 years (beginning July 1, 2010 to June 30, 2020).

1.7 Project Location

The project area is politically located in the districts Irazola, Masisea, Calleria, Iparia, in the provinces of Padre Abad y Coronel Portillo in the department and region of Ucayali and also in the districts of Codo de Pozuzo, Puerto Inca, Tornavista, in the Province of Puerto Inca in the department and region of Huanuco. Covers an area of 127,004.0 ha of forests in 7 Native Communities.

The location of the boundaries of the project was conducted using Landsat 5 TM images and GPS Garmin Oregon 550 equipment. The GPS equipment error is ± 3 m.

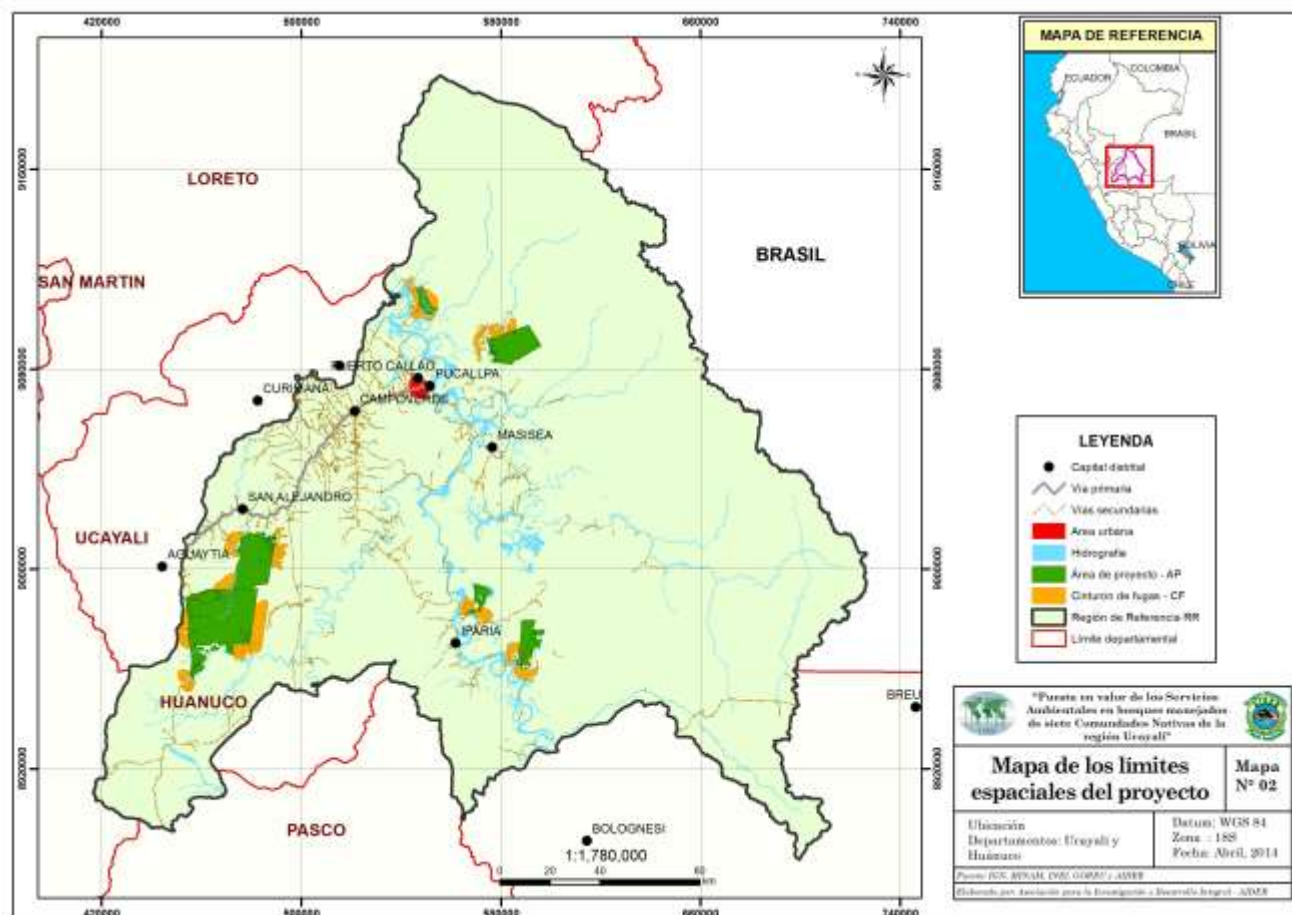


Figure 1. Map of the project boundary

1.8 Title and Reference of Methodology

The methodology used in the project was "Methodology for avoided unplanned deforestation VM0015, version 1.1", approved by the VCS on December 3, 2012. It has been developed each of the steps and established sections by the methodology of a transparent manner. As such, the project proponent has documented the application of the methodology to the project as a separate methodological appendix.

Besides the methodological document, the following tools were used:

- VT0001 "Tool for the demonstration and assessment of additionality for activities of the VCS project in Agriculture, Forestry and other land uses (AFOLU), version 3.0".
- AFOLU Non-Permanence Risk Tool: VCS version 3.2 aprobed by VCS.
- Tool for testing significance of GHG emissions in A/R CMD project activities" version 01.

1.9 Other Programs

The project is not included in an emissions trading scheme; this program does not exist in Peru to date, has not participated in any environmental accreditation program for the elimination of GHG emissions. Also the project is not intended to generate any other type of credit environment related to GHG emissions than not be through the VCS Program environment. The project has not been registered by another GHG program.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The activities of the project "Forest Management to Reduce Deforestation and Degradation in Shipibo Conibo and Cacataibo Indigenous Communities of Ucayali Region", were developed in order to curb the causes of deforestation within the project area. The project considers that to achieve reductions in GHG emissions, is important the compliance of the activities set out in the REDD + strategy. Project activities are composed of four components: *i)* Proper use of communal land, *ii)* Capacity building for the management of natural resources, *iii)* Project financing and *iv)* Market linkages and technical assistance and control in Native Communities by State

During the first period of monitoring and verification of the project the following activities were conducted:

✓ Proper use of communal land

This component consists of 7 activities aimed at avoiding deforestation and forest degradation. One activity that has worked on this verification period 2010-2013, is the promotion of community forest management (timber and non-timber). Starting that 4 of the 7 native communities that are part of the project, has Voluntary Forest Certification (Pueblo Nuevo, Curiaca, Calleria y Roya). In the case of the 3 communities that do not have this certificate, the training that has been given in this topic are helping to realize how important it is to develop good forest management.

According to the potential of each of the member communities of the project has been prioritized resource use. In the case of the native communities of Pueblo Nuevo and Sinchi Roca has promoted the use of latex shiringa (*Hebea brasiliensis*), through the project "Starting shiringa value forests for the production of rubber with rural hamlets and native communities in the Ucayali region". In the case of indigenous communities Calleria, Curiaca, "Pueblo nuevo" has promoted the timber Forestry, by voluntary forest certification of the Forest Stewardship Council (FSC) as shown by the certificate GFA-FM/COC-001288 and SCS-FM/COC-004384.

In the native community of Roya, form the reforestation committee, composed of 22 commoners. This committee is geared to work in the establishment and management of forest plantations of rapid growth.

The craft activity is mainly carried out by women of the communities, becoming somehow in the activity with which women bring to the economy of their homes, in the reporting period was supported with training to artisans and craftsmen of the native communities Calleria, Curiaca and Pueblo Nuevo through the project "Strengthening the handicraft in Shipibo Conibo communities in the Ucayali region."

✓ **Capacity building for the management of natural resources:**

In the period being monitored, was strengthened communities in the following activities as part of this component, among them are:

- Strengthen indigenous organizations to understand REDD+ and WPS.
- Promotion of forestry governance and local in the 07 native communities for the proper administration of natural resources.
- Increased organizational and administrative capacity of authorities and community members in the management of natural resources.

The strengthening was through workshops

✓ **Technical assistance and control in Native Communities by State:**

- Train the community through the intervention of representatives of the state.

Annex 1. Found the list of project activities.

For the leakage monitoring

Activity shifting leakage in the leakage belt will be monitored by tracking forest cover change in the leakage belt, using classified satellite imagery produced following the same procedures in section 3.3 (task 1.1.2), referencing the 2010 forest cover benchmark map for the leakage belt. All changes in forest cover detected for the monitoring interval will be analyzed (to produce estimates of ha for each year) by dividing the area by the number of years in the period the verification.

Non-Permanence

Concerning to Monitoring and management of non-permanence risk factors, the next risk factors will be subject to monitoring:

• **Internal Risks**

Project management

- The institutional monitoring of AIDER - Pucallpa and representatives of each community, will be in charge of maintaining a multidisciplinary team that includes individuals with all the necessary capabilities for the implementation of the project activities.

- Every 5 years, the risk of invasion of external agents threatening more than 50% of the carbon stocks that have previously issued credits will be monitored.
- Natural Risks
 - Fire: fires are annually monitored using the procedure described in Plan for prevention and control of forest fires.
The project proponent has experience in fire control in reforestation projects in the Ucayali region.
 - Pests and diseases: information from Servicio Nacional de Sanidad Agraria - SENASA (por sus siglas en español), of project area, is collected annually.
 - Extreme weather: information from the National Service for Meteorology and Hydrology - SENAMHI is collected annually.

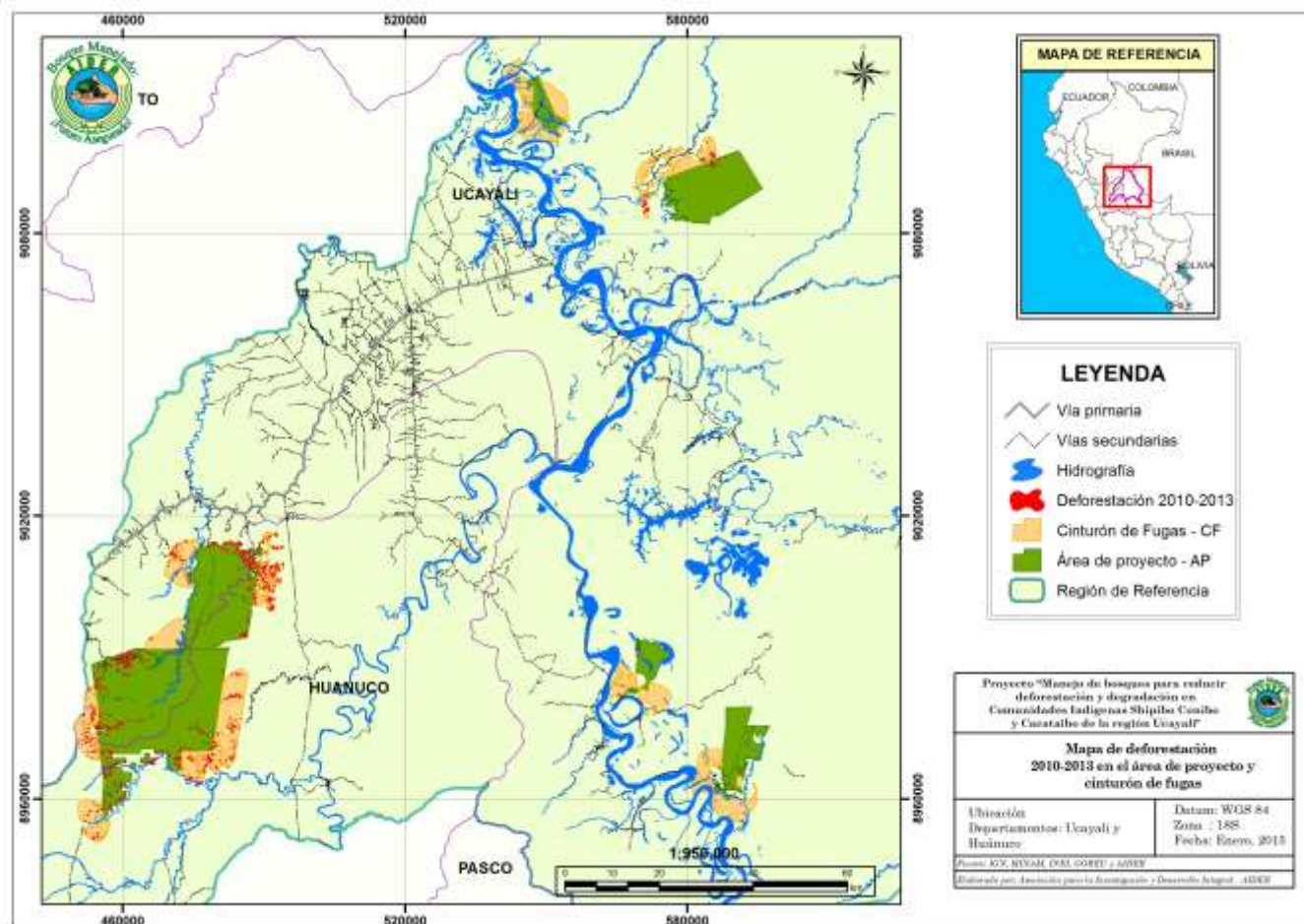


Figure 2. Map of deforestation (2010-2013) in the project area and leakage belt

2.2 Deviations

2.2.1 Methodology Deviations

Any deviation to the methodology of the monitoring plan was performed during the monitoring period.

2.2.2 Project Description Deviations

N/A.

2.3 Grouped Project

N/A (This is not a grouped project)

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	Map of forest cover / no forest cover in the reference region 2010
Data unit	ha
Description	Map showing the location of forest land within the reference region, project area and leakage belt at the start of the crediting period.
Source of data	Landsat 5 TM images 2000, 2005 and 2010
Value applied:	1 ha of forest patch as minimum threshold
Justification of the choice of data or description of measurement methods and procedures applied	Interpretation of Landsat 5TM using ENVI 5.1 and ArcGIS 10.2 software. Map an accuracy of 90%, according to the specifications in the methodology was considered to avoid unplanned deforestation, VM0015 version 1.1. The validation of deforestation map was made by verifying field points were distributed randomly, allowing calculate the precision and errors of commission and omission by a confusion matrix.
Purpose of Data	Determination of baseline scenario
Comments	-

Data / Parameter	Leakage belt
Data unit	Ha
Description	Boundary map leakage belt.
Source of data	Map database (population centers, primary roads, secondary roads and distance to forest edge)
Value applied:	1 ha of forest patch as minimum threshold
Justification of the choice of data or description of measurement methods and procedures applied	Analysis of mobility through a multi-criteria evaluation, for which factors maps based on fuzzy analysis and data collected through a participatory workshop were used
Purpose of Data	Determination of baseline scenario
Comments	-

Data / Parameter	Map of projected deforestation (2011-2020)
Data unit	ha
Description	Analysis of the projected for each stratum of reference region, the project area and leakage belt at baseline deforestation.
Source of data	Map database
Value applied:	1 ha of forest patch as minimum threshold
Justification of the choice of data or description of measurement methods and procedures applied	To determine the projected deforestation based on historical analysis of deforestation in the area of interest and maps factor model was used.
Purpose of Data	Determination of baseline scenario
Comments	-

Data / Parameter	$ABSLRR_t$
Data unit	ha
Description	Annual area of baseline deforestation in the reference region at year t
Source of data	Processing GIS
Value applied:	The values applied are in the annex I of Project Document-PD, 30a table.
Justification of the choice of data or description of measurement methods and procedures applied	Results of the projected distribution within the reference region using spatial modeling deforestation. Appendix I. Methodology VM0015 version 1.1, section 4.2 projection of

	the location of future deforestation
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$ABSLPA_{i,t}$
Data unit	ha
Description	Annual area of baseline deforestation in stratum i within the project area at year t
Source of data	Processing GIS
Value applied:	The values applied are in the annex I of Project Document-PD, 30b table.
Justification of the choice of data or description of measurement methods and procedures applied	Results of the projected distribution within the reference region using spatial modeling deforestation.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$ABSLPA_{ct,t}$
Data unit	ha
Description	Area of category ct deforested at time t within the project area in the baseline case
Source of data	Field measurements
Value applied:	The values applied are in the annex I of Project Document-PD, 49 table.
Justification of the choice of data or description of measurement methods and procedures applied	Information obtained through field measurements and Results of the projected distribution within the reference region using spatial modeling deforestation.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$ABSLLi_{i,t}$
Data unit	ha

Description	Annual area of baseline deforestation in stratum i within the leakage belt at year t
Source of data	Processing GIS
Value applied:	The values applied are in the annex I of Project Document-PD, 30c table.
Justification of the choice of data or description of measurement methods and procedures applied	Results of the deforestation projected distribution within the reference region using spatial modeling.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$C_{tot_{cl}}$
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in all accounted carbon pools of LU/LC class cl
Source of data	The information will be obtained through field measurements.
Value applied:	The values applied are in the annex I of Project Document-PD, 36 table.
Justification of the choice of data or description of measurement methods and procedures applied	The inventory made for the carbon stock determination was exploratory type with temporary sample plots. As a base was used the stratification and variability of each stratum, which is the principle design of the optimal fixation. The sample plots were circular and concentrically nested. The quantification of the existent carbon was through allometric equations and root/shoot ratio. In Annex 9, is indicated in detail the whole process.
Purpose of data	Calculation of baseline emissions
Comments	-

Data / Parameter	$C_{tot_{fcl,t}}$
Data unit	tCO ₂ e ha ⁻¹
Description	Average carbon stock of all accounted carbon pools in non-forest class fcl at time t
Source of data	Bibliographic references J. Alegre and L. Arevalo. Carbon Stocks according to land

	use at two sites in the Peruvian Amazon.
Value applied:	The values applied are in the annex I of Project Document-PD, 42 table.
Justification of the choice of data or description of measurement methods and procedures applied	Information from secondary sources for land converted to young secondary forest 3-10 years, pastures and burned areas. Information held in the region of Ucayali.
Purpose of Data	Calculation of baseline emissions
Comments	-

3.2 Data and Parameters Monitored

Data / Parameter	Forestry cover map (July 2010 – June 2020)
Data unit	ha
Description	Map showing the location of forest cover in the project area and leakage belt in each verification period.
Source of data	Landsat 8 images.
Description of measurement methods and procedures to be applied	Interpretation of Landsat 8TM using ENVI 5.1 and ArcGIS 10.2 software. The validation of deforestation map will be made by checking field points to be distributed randomly, allowing calculate the precision and errors of commission and omission by a confusion matrix.
Frequency of monitoring/recording	In each verification period
Value monitored:	1 ha per forest patch as minimum threshold
Monitoring equipment	Computer (desktop / laptop) i7 processor and 6 GB of RAM. ENVI 5.0 and Arc GIS 9.3.1 Softwares GPS Garmin Oregon600
QA/QC procedures to be applied	The minimum map accuracy is 90%, according to the specifications in the methodology to avoid unplanned deforestation, VM0015 version 1.1. The mapping will be according to the Standard Operating Procedures developed for this purpose.
Purpose of data	Calculation of project emissions Calculation of leakage

Calculation method	It will refer to the classified image of the previous year, which will be updated with new areas of "non-forest" generated by the software and knowledge of the area of remote sensing analyst; thus, the area of forest for each monitoring event shall be demarcated. The accuracy of the map is calculated by comparing it with the data field.
Comments	-

Data / Parameter	$ABSLPA_{i,t}$
Data unit	ha
Description	Annual area of baseline deforestation in stratum i within the project area at year t.
Source of data	Processing GIS. Project area boundary in shapefile format.
Description of measurement methods and procedures to be applied	Results overlay map of forest cover within the limits of the project area
Frequency of monitoring/recording	In each verification period
Value monitored:	649.5
Monitoring equipment	Computer (desktop / laptop) i7 processor and 6 GB of RAM. ENVI 5.0 y Arc GIS 9.3.1 Softwares GPS Garmin Oregon600
QA/QC procedures to be applied	The Map of deforestation will be validate in the field through an unaligned systematic sampling, and calculation of accuracy and errors of commission and omission by a confusion matrix. The minimum map accuracy is 90%, according to the specifications in the the methodology to avoid unplanned deforestation, VM0015 version 1.1. The mapping will be according to the Standard Operating Procedures developed for this purpose.
Purpose of data	Calculation of project emissions
Calculation method	The calculation is done using an excel spreadsheet.
Comments	-

Data / Parameter	$ABSLLKL_{i,t}$
Data unit	ha
Description	Annual area of baseline deforestation in stratum i within the leakage belt at year t
Source of data	Processing SIG. Leakage belt boundary in shapefile format.
Description of measurement methods and procedures to be applied	Results overlay map of forest coverage limits leakage belt
Frequency of monitoring/recording	In each verification period
Value applied:	567.6
Monitoring equipment	Computer (desktop / laptop) i7 processor and 6 GB of RAM. ENVI 5.0 y Arc GIS 9.3.1 Softwares GPS Garmin Oregon600
QA/QC procedures to be applied	The Map of deforestation will be validate in the field through an unaligned systematic sampling, and calculation of accuracy and errors of commission and omission by a confusion matrix. The minimum map accuracy is 90%, according to the specifications in the the methodology to avoid unplanned deforestation, VM0015 version 1.1. The mapping will be according to the Standard Operating Procedures developed for this purpose.
Purpose of data	Calculation of leakage
Calculation method	The calculation is done using an excel spreadsheet.
Comments	-

3.3 Monitoring Plan

The purpose of the monitoring plan of greenhouse gases is to obtain the information necessary to estimate the amount of avoided emissions during the crediting period and evaluate the effectiveness of project activities allowing ensure emission reduction of the project.

The monitoring activities include the use of remote sensing as well as in-situ inspections. The combination of both sources have as a result the calculations and estimations required to determine whether the project is being developed in accordance with “the VM0015 1.1 methodology”, approved by the VCS on December 3, 2012.

Technical description of the monitoring tasks

The change of land use monitoring, based on Landsat 8 images, will take place annually, involving all the changes in forest cover. The deforested area (in hectares) within the project area and leakage belt will be calculated. Also, once generated map of deforestation, it will be validated through a systematic sampling unaligned in field.

Description of the information to be collected

The in-situ monitoring will be conducted by the professional monitoring team and will be conducted in coordination and collaboration with the community that are part of the communal monitoring, who will be primarily responsible for data collection in the field, being trained for this purpose and counting with technical advice while performing the assigned activities.

The Institutional Monitoring, Project Monitoring and Quality Control and Assurance are in charge of the monitoring equipment in the city of Lima. The work of monitoring emissions are shared between both headquarters.

Project monitoring will be done by a professional monitoring team, which will be in the cities of Lima and Pucallpa, under the overall coordination of the Ecosystem Services Program of AIDER. To this will be incorporated the communal monitoring team of the communities that are part of the project.

Management data storage

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

The group of Assurance and Quality Control program audit visits to verify compliance of the SOPs; also select random processes to verify the correct implementation of the SOPs.

The monitoring data are stored and processed in the cities of Lima and Pucallpa.

Organization

The responsible organization of the project data managing will be AIDER, with the support of the 7 native communities, according to their responsibility:

- Responsible for the administration of information: AIDER and the management and administration committee of the REDD+ project "Forest management to reduce deforestation and degradation in the Shipibo Conibo and Cacataibo indigenous communities of Ucayali region".
- Data storage and organization: will be the responsibility of the coordinator of GIS AIDER Lima and Pucallpa.
- Processing and GIS data analysis: GIS Specialist headquarters Pucallpa.

Task 1. Monitoring of changes in carbon stocks and GHG emissions for periodic checks**1.1 Monitoring of current changes in carbon stocks and GHG emissions within the project area****1.1.1 Monitoring of project implementation**

The project implementation is being carried out according to plan monitoring set up in the project description.

1.1.2 Monitoring of the change in land use and land cover within the project area

From the date of validation and verification of the project, in Peru there is only a proposal for National Forest Monitoring System, which is not implemented. As such the project proponent was responsible for analyzing the existence of forest and nonforest in the project area and leakage belt. The analysis consisted of determining the areas of forest and non-forest by 2013, and the increase of deforestation for the period 2010-2013 in the region of reference of the project. As input classification Landsat 8 OLI satellite images were used corresponding to 2013 as shown in Table 1. All the methodology of analysis of deforestation is developed in accordance with "the methodology for avoided unplanned deforestation VM0015, version 1.1", approved by the VCS on December 3, 2012.

In Annex 3 "Report of monitoring deforestation", are shows the process developed.

Table 2. Images used for the analysis of deforestation (forest and non-forest)

Vector (Satellite or Aeroplane)	Sensor	Resolution		Coverage (km ²)	Acquisition date (DD/MM/YY)	Scene or identified point	
		Special	Spectral			Path / Latitud	Row / Longitud
Landsat 8	OLI	30m	0.433 - 12.0 µm	233.7 km x 229.5 km	22-Sep-2013	5	66
Landsat 8	OLI	30m	0.433 - 12.0 µm	234 km x 229.5 km	22-Sep-2013	5	67
Landsat 8	OLI	30m	0.433 - 12.0 µm	233.1 km x 228.6 km	27-Jul-2013	6	65
Landsat 8	OLI	30m	0.433 - 12.0 µm	233.1 km x 228.6 km	27-Jul-2013	6	66
Landsat 8	OLI	30m	0.433 - 12.0 µm	233.1 km x 228.6 km	29-Sep-2013	6	67
Landsat 8	OLI	30m	0.433 - 12.0 µm	232.5 km x 228 km	04-Sep-2013	7	66
Landsat 8	OLI	30m	0.433 - 12.0 µm	232.5 km x 228 km	04-Sep-2013	7	67

1.1.3 Monitoring of carbon stock changes and non-CO₂ emissions from forest fires**➤ Monitoring of carbon stock changes**

Inside the project area:

For the project area the estimation of ex-ante carbon stock per classes LU / LC, will

not change during the baseline period. We know that the project area has been carried timber harvesting under a community forest management and this will continue during the baseline period. As such, a conservative estimate of anticipated emissions was done with information that includes the management plans of each native community that is part of the project. These are legal documents and provides all information on the wood volume in m³, to be harvested each year. Most of the management plans have a duration of 20 years. Under this scenario the estimates gave no significant results.

Inside the areas of leakage management:

The leakage management areas is not subject to the reduction of carbon stock in the project baseline according to the ex – ante evaluation, but it is omitting in a conservative way. Therefore, the not carbon stocks will be monitored within the areas of leakage management.

Inside the leakage belt:

Carbon stocks are not subject to monitoring within the leakage belt, as this is optional.

➤ **Monitoring of non-CO₂ emissions from forest fires**

These CO₂ emissions from forest fires were excluded during the design of the project (Project Document-PD.) According to the guidelines established by the methodology.

1.1.4 Monitoring of impacts of natural disturbances and other catastrophic events

The Peru has a system for natural disasters management. The National Disaster Risk System – SINAGERD was created with Law No. 29664. Article 1 mentions that it is an inter-institutional, synergistic, decentralized and participatory system, which aims to identify and reduce hazard associated risks or minimize their effects, as well as prevent the generation of new risks by establishing principles, policy guidelines, components, processes or instruments of the Disaster Risk Management.

This system has a web where was downloaded the occurrence of events (natural or human-induced) on each districts the Ucayali and Huanuco departments, for the period from 2010 to 2013; this data was 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 was selected information for the monitoring period July 1st 2010 to June 30th 2013 for districts in which is located the project area resulting that In this verification period natural disturbances of any kind weren't reported in project area.

1.1.5 Total estimated ex-post actual net of carbon stock changes and GHG emissions in project area

The relevant tables are updated with the new measurements of changes in carbon stocks and GHG emissions in each monitoring period. The results are summarized in Table 29, set by the methodology.

1.2 Monitoring of leaks

1.2.1 Monitoring changes in carbon stocks and GHG emissions associated with leakage prevention activities

No changes are expected in carbon stocks nor in GHG emissions from the established activities for preventing leakage, because the areas where the activities were held, are considered non-forest lands at the beginning of the project. And it is expected that with the implemented activities, the carbon stocks increases in these areas. Therefore, changes in carbon stocks and GHG emissions associated with leakage prevention activities will not be monitored.

1.2.2 Monitor the decrease in carbon stocks and the increase of GHG emissions due to activities of leakage displacement

➤ Monitoring of changes in carbon stock

Deforestation above baseline in the leakage belt areas will be considered as leakage by activity-shifting. Activity data for the leakage belt area will be determinate using the same methods applied for the monitoring of deforestation activity data.

The results of the *ex post* estimations of changes in carbon stocks will be reported using the same format used in the *ex ante* changes in carbon stocks of the baseline in the leakage belt as is detailed in of methodology to avoid unplanned deforestation, VM0015 version 1.1.

Leakage will be calculate as a difference between *ex ante* and *ex post* estimations. Only will be monitored leakage by shifting of *ex ante* activities.

➤ Monitoring of increase in GHG emissions

Emissions from forest fires were not included in the baseline therefore are not monitored.

1.2.3 Total estimated ex-post leak

The results obtained by the estimates ex - post leakage through monitoring will be summarized using the same table format used in the ex-ante evaluation and are presented in Table 35 - Total Estimated ex - post leak.

1.3 Ex - post calculations of reductions of net anthropogenic GHG emissions

The calculation of net reduction emissions in ex-post anthropogenic GHG is similar to the ex-ante calculation with the only difference that the ex-post estimate changes in carbon stocks and GHG emissions should be used in the case of project scenario and leakage.

Ex-post estimated calculations of net anthropogenic GHG emissions and calculations of Verified Carbon Units (Vcut and VBCt), will be reported using the same ex- ante table number 36.

Task 2. Review of baseline projections for future periods established in the baseline

The established baseline for the project "Forest Management to Reduce Deforestation and Degradation in Shipibo Conibo and Cacataibo Indigenous Communities of Ucayali Region" is 10 years and will be revised in 2020. It should indicate if this date is not yet has a baseline of regional, national or jurisdictional developed, the project proponent will revise and update the baseline again. Also be considered in the review of the baseline the following tasks:

- 2.1. Update information of agents, drivers and underlying causes of deforestation.
- 2.2. Adjustment the component of change in land use and land cover baseline.
- 2.3. Adjust the carbon component of the baseline

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The carbon stored in the initial classes of the project area and leakage belt (pre-deforestation), have not changed during the monitoring period, like the carbon stored in non-forest classes (post-deforestation).

The information in the tables 9b and c, 11b and c and 13b and c, comes from the Annex I. Methodology to avoid unplanned deforestation, VM0015 version 1.1, developed by the project proponent for the development of the baseline.

Table 3. Annual areas of baseline deforestation in the project area (Table 9.b methodology VM0015)

Project year t	Stratum i of the reference region in the project area $ABSLPA_{i,t}$ ha	Total	
		annual $ABSLPA_t$ ha	cumulative $ABSLPA$ ha
2010-2011	1,295.9	1,295.9	1,295.9
2011-2012	954.4	954.4	2,250.3
2012-2013	1,135.0	1,135.0	3,385.3

Table 4. Annual areas of baseline deforestation in the leakage belt (Table 9.c methodology VM0015)

Project year t	Stratum i of the reference region in the leakage belt $ABSLLK_{i,t}$ ha	Total	
		<i>annual</i> $ABSLLK_t$ ha	cumulative $ABSLLK$ ha
2010-2011	2,459.0	2,459.0	2,459.0
2011-2012	1,821.3	1,821.3	4,280.3
2012-2013	2,095.9	2,095.9	6,376.2

Table 5. Annual areas deforested per forest class icl within the project area in the baseline case (baseline activity data per forest class- Table 11.b VM0015 Table)

<i>IDicl</i> > Name > Project year t	Areas deforested per forest class icl within the project area						Total baseline deforestation in the project area	
	1	2	3	4	5	6	$ABSLPA_t$ annual ha	$ABSLPA$ cumulative ha
	Low Hill	Average hill	Riverbank complex	High terrace	Low terrace	Average terrace		
	ha	ha	ha	ha	ha	ha	ha	ha
2010-2011	162.7	89.9	85.4	181.5	185.7	590.7	1,295.9	1,295.9
2011-2012	133.9	59.2	84.0	119.2	133.1	424.9	954.4	2,250.3
2012-2013	159.9	79.0	119.2	166.0	129.9	481.0	1,135.0	3,385.3

Table 6. Annual areas deforested per forest class within the leakage belt in the baseline case (baseline activity data per forest class- Table 11.c methodology VM0015)

Areas deforested per forest class <i>icl</i> within the leakage belt area							Total baseline deforestation in the leakage belt area	
<i>IDicl</i> > Name >	1	2	3	4	5	6	<i>ABSLPA_t</i> annual	<i>ABSLPA</i> cumulative
Project year <i>t</i>	ha	ha	ha	ha	ha	ha	ha	ha
2010-2011	492.0	461.1	152.0	366.6	309.8	677.5	2,459.0	2,459.0
2011-2012	308.3	374.8	95.4	275.5	246.8	520.5	1,821.3	4,280.3
2012-2013	388.1	352.3	130.8	349.3	218.1	657.5	2,095.9	6,376.2

Table 7. Annual areas of post-deforestation classes *fcl* within the project area in the baseline case (Table 13.b methodology VM0015)

Area established after deforestation per class <i>fcl</i> within the project area			Total baseline deforestation in the project area	
<i>IDcl</i> Name >	1	2	<i>ABSLRR_t</i> annual	<i>ABSLRR</i> cumulative
Project year <i>t</i>	ha	ha	ha	ha
	97.58%	2.42%		
2010-2011	1,264.5	31.4	1,295.9	1,295.9
2011-2012	931.3	23.1	954.4	2,250.3
2012-2013	1,107.5	27.5	1,135.0	3,385.3

Table 8. Annual areas of post-deforestation classes *fcl* within the leakage belt in the baseline case (Table 13.c methodology VM0015)

Area established after deforestation per class <i>fcl</i> within the leakage belt			Total baseline deforestation in the leakage belt	
<i>ID_{cl}</i> Name >	1	2	<i>ABSLRR_t</i> annual ha	<i>ABSLRR</i> cumulative ha
	Non-forest vegetation	Bare soil		
Project year <i>t</i>	ha	ha	ha	ha
	97.58%	2.42%		
2010-2011	2,400	60	2,459.0	2,459.0
2011-2012	1,777	44	1,821.3	4,280.3
2012-2013	2,045	51	2,095.9	6,376.2

Table 9. Baseline carbon stock changes in initial (pre-deforestation) forest classes in the project area

Project year t	Baseline carbon stock changes in initial (pre-deforestation) forest classes in the project area											
	IDicl=Colina baja			IDicl=Colina media			IDicl=Complejo de orillares			IDicl=Terraza alta		
	ABSLPA _{icl,t}			ABSLPA _{icl,t}			ABSLPA _{icl,t}			ABSLPA _{icl,t}		
	ha	Cabicl	Cbbicl	ha	Cabicl	Cbbicl	ha	Cabicl	Cbbicl	ha	Cabicl	Cbbicl
		t CO ₂ e			t CO ₂ e			t CO ₂ e			t CO ₂ e	
	2010-2011	162.7	70,074.0	1,788.3	89.9	22,569.4	553.0	85.4	24,606.8	644.6	181.5	49,455.2
2011-2012	133.9	57,673.3	3,260.1	59.2	14,864.3	917.2	84.0	24,209.7	1,278.8	119.2	32,481.6	2,805.8
2012-2013	159.9	68,852.0	5,017.2	79.0	19,843.3	1,403.4	119.2	34,335.0	2,178.2	166.0	45,230.4	4,354.7

<i>IDicl=Terraza baja</i> <i>ABSLPA_{icl,t}</i> <i>Cabicl</i> <i>Cbbicl</i> ha <i>t CO₂e</i> <i>IDicl=Terraza media</i> <i>ABSLPA_{icl,t}</i> <i>Cabicl</i> <i>Cbbicl</i> ha <i>t CO₂e</i>						Total baseline carbon stock changes in initial forest classes in the project area	
						<i>annual</i>	<i>cumulative</i>
						<i>CBSLPA_{it}</i>	<i>CBSLPA_{it}</i>
185.7	45,003.4	1,148.7	590.7	254,747.5	6,445.1	478,729.5	478,729.5
133.1	32,272.9	1,972.5	424.9	183,260.1	11,081.6	366,078.0	844,807.6
129.9	31,499.1	2,776.5	481.0	207,433.3	16,329.7	439,252.8	1,284,060.3

Table 10. Baseline carbon stock changes in final (post - deforestation) not-forest classes in the project area

Project year t	Baseline carbon stock changes in final (post - deforestation) not-forest classes in the project area				Total baseline carbon stock changes in final non-forest classes in the project area	
	<i>IDicl=non-forest</i>				<i>annual</i>	<i>cumulative</i>
	Non-forest vegetation	<i>Ctot icl</i>	Bare soil	<i>Ctot icl</i>	$\Delta CBSLPA_{i_t}$	$\Delta CBSLPA_{i_t}$
	ha	t CO ₂ e ha ⁻¹	ha	t CO ₂ e ha ⁻¹	tCO ₂ e	tCO ₂ e
2010-2011	1,265	10.15	31	0	12,828.5	12,828.5
2011-2012	931	10.15	23	0	22,276.9	35,105.4
2012-2013	1,108	10.15	27	0	33,512.9	68,618.3

Table 11. Total baseline carbon stock changes in the project area

Project year t	Total baseline carbon stock changes in initial forest classes		Total baseline carbon stock changes in final non-forest classes		Total baseline carbon stock changes in the project area	
	<i>annual</i>	<i>cumulative</i>	<i>annual</i>	<i>cumulative</i>	<i>annual</i>	<i>cumulative</i>
	$CBSLPA_{i_t}$	$CBSLPA_i$	$CBSLPA_{f_t}$	$CBSLPA_f$	$CBSLPA_t$	$CBSLPA$
	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e
2010-2011	478,729.5	478,729.5	12,828.5	12,828.5	465,901.1	465,901.1
2011-2012	366,078.0	844,807.6	22,276.9	35,105.4	343,801.2	809,702.2
2012-2013	439,252.8	1,284,060.3	33,512.9	68,618.3	405,739.8	1,215,442.0

Table 12. Baseline carbon stock changes in initial (pre-deforestation) forest classes in the leakage belt

Project year t	Baseline carbon stock changes in initial (pre-deforestation) forest classes in the leakage belt											
	<i>IDicl=Colina baja</i>			<i>IDicl=Colina media</i>			<i>IDicl=Complejo de orillares</i>			<i>IDicl=Terraza alta</i>		
	<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>		
	ha	<i>Cabicl</i>	<i>Cbbicl</i>	ha	<i>Cabicl</i>	<i>Cbbicl</i>	ha	<i>Cabicl</i>	<i>Cbbicl</i>	ha	<i>Cabicl</i>	<i>Cbbicl</i>
		t CO ₂ e			t CO ₂ e			t CO ₂ e			t CO ₂ e	
2010-2011	492.0	211,881.4	5,407.2	461.1	115,804.3	2,837.5	152.0	43,790.3	1,147.1	366.6	99,879.8	3,420.2
2011-2012	308.3	132,772.0	8,795.5	374.8	94,127.6	5,143.8	95.4	27,476.4	1,866.9	275.5	75,051.3	5,990.3
2012-2013	388.1	167,136.7	13,060.8	352.3	88,486.5	7,311.9	130.8	37,678.6	2,853.9	349.3	95,153.0	9,248.6

						Total baseline carbon stock changes in initial forest classes in the project area	
<i>IDicl=Terraza baja</i>			<i>IDicl=Terraza media</i>			<i>annual</i>	<i>cumulative</i>
<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>			<i>ΔCBSLPA_{i,t}</i>	<i>ΔCBSLPA_{i,t}</i>
ha	<i>Cabicl</i>	<i>Cbbicl</i>	ha	<i>Cabicl</i>	<i>Cbbicl</i>	tCO ₂ -e	tCO ₂ -e
	t CO ₂ e			t CO ₂ e			
309.8	75,104.7	1,917.0	677.5	292,184.8	7,392.3	860,766.6	860,766.6
246.8	59,833.6	3,444.3	520.5	224,482.5	13,071.7	652,055.8	1,512,822.5
218.1	52,854.7	4,793.4	657.5	283,534.2	20,245.2	782,357.5	2,295,180.0

Table 13. Baseline carbon stock changes in final (post - deforestation) not-forest classes in the leakage belt

Project year t	Baseline carbon stock changes in final (post - deforestation) not-forest classes in the leakage belt				Total baseline carbon stock changes in final non-forest classes in the leakage belt	
	<i>ID_{icl}=non-forest</i>				<i>annual</i>	<i>cumulative</i>
	Vegetación no bosque	<i>C_{tot icl}</i>	Suelo desnudo	<i>C_{tot icl}</i>	$\Delta CBSLPA_{i_t}$	$\Delta CBSLPA_{i_t}$
	ha	t CO ₂ e ha ⁻¹	ha	t CO ₂ e ha ⁻¹	tCO ₂ e	tCO ₂ e
2010-2011	2,399.5	10.1	59.5	0	24,343.0	24,343.0
2011-2012	1,777.2	10.1	44.1	0	42,372.8	66,715.9
2012-2013	2,045.2	10.1	50.7	0	63,121.6	129,837.5

Table 14. Total baseline carbon stock changes in the leakage belt

Project year t	Total baseline carbon stock changes in initial forest classes		Total baseline carbon stock changes in final non-forest classes		Total baseline carbon stock changes in the leakage belt	
	<i>annual</i>	<i>cumulative</i>	<i>annual</i>	<i>cumulative</i>	<i>annual</i>	<i>cumulative</i>
	$CBSLPA_{i_t}$	$CBSLPA_i$	$CBSLPA_{f_t}$	$CBSLPA_f$	$CBSLPA_{i_t}$	$CBSLPA_i$
	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e
2010-2011	860,766.6	860,766.6	24,343.0	24,343.0	836,423.6	836,423.6
2011-2012	652,055.8	1,512,822.5	42,372.8	66,715.9	609,683.0	1,446,106.6
2012-2013	782,357.5	2,295,180.0	63,121.6	129,837.5	719,235.9	2,165,342.5

4.2 Project Emissions

In the following tables, the ex-post calculations of the monitoring period 2010-2013 is shown. The calculations were reported annually according as the baseline was elaborated. The deforestation which occurred in the period 2010-2013, reported in hectares, a division was made (three) to generate number of hectares per year and emissions of CO₂-e.

Table 15. Ex post annual areas of deforestation in the project area (Table 9.b methodology VM0015)

Project year t	Stratum i of the reference region in the project area $ABSLPA_{i,t}$ ha	Total	
		<i>annual</i> $ABSLPA_t$ ha	cumulative $ABSLPA$ ha
2010-2011	649.5	649.5	649.5
2011-2012	649.5	649.5	1,299.1
2012-2013	649.5	649.5	1,948.6

Table 16. Ex post annual areas of deforestation in the leakage belt (Table 9.c methodology VM0015)

Project year t	Stratum i of the reference region in the leakage belt 1 $ABSLK_{i,t}$ ha	Total	
		<i>annual</i> $ABSLK_t$ ha	cumulative $ABSLK$ ha
2010-2011	567.6	567.6	567.6
2011-2012	567.6	567.6	1,135.1
2012-2013	567.6	567.6	1,702.7

Table 17. Ex post annual areas deforested per forest class icl within the project area in the baseline case
(baseline activity data per forest class - Table 11.b methodology VM0015)

IDic> Name > Project year t	Areas deforested per forest class icl within the project area						Total baseline deforestation in the project area	
	1	2	3	4	5	6	$ABSLPA_t$ annual	$ABSLPA$ cumulative
	Low Hill	Average hill	Riverbank complex	High terrace	Low terrace	Average terrace	ha	ha
	ha	ha	ha	ha	ha	ha	ha	ha
2010-2011	188.0	80.7	0.0	92.0	16.3	272.5	649.5	649.5
2011-2012	188.0	80.7	0.0	92.0	16.3	272.5	649.5	1,299.1
2012-2013	188.0	80.7	0.0	92.0	16.3	272.5	649.5	1,948.6

Table 18. Ex post annual areas deforested per forest class within the leakage belt in the baseline case (baseline activity data per forest class VM0015-Table 11.c methodology VM0015)

IDcl> Name > Project year t	Areas deforested per forest class icl within the leakage belt area						Total baseline deforestation in the leakage belt area	
	1	2	3	4	5	6	ABSLPA _t	ABSLPA
	Low Hill	Average hill	Riverbank complex	High terrace	Low terrace	Average terrace	annual	cumulative
	ha	ha	ha	ha	ha	ha	ha	ha
2010-2011	169.0	208.8	5.3	80.4	27.3	76.8	567.6	567.6
2011-2012	169.0	208.8	5.3	80.4	27.3	76.8	567.6	1,135.1
2012-2013	169.0	208.8	5.3	80.4	27.3	76.8	567.6	1,702.7

Table 19. Ex post annual areas of post-deforestation classes fcl within the project area in the baseline case (Table 13.b methodology VM0015)

IDcl Name > Project year t	Area established after deforestation per class fcl within the project area		Total baseline deforestation in the project area	
	1	2	ABSLRR _t	ABSLRR
	Non-forest vegetation	Bare soil	annual	cumulative
	ha	ha	ha	ha
	97.58%	2.42%		
2010-2011	634	16	649.5	649.5
2011-2012	634	16	649.5	1,299.1
2012-2013	634	16	649.5	1,948.6

Table 20. Ex post annual areas of post-deforestation classes fcl within the leakage belt in the baseline case (Table 13.c methodology VM0015)

IDcl Name > Project year t	Area established after deforestation per class fcl within the leakage belt		Total baseline deforestation in the leakage belt	
	1	2	ABSLRR _t	ABSLRR
	Non-forest vegetation	Bare soil	annual	cumulative
	ha	ha	ha	ha
	97.58%	2.42%		
2010-2011	554	14	567.6	567.6
2011-2012	554	14	567.6	1,135.1
2012-2013	554	14	567.6	1,702.7

Table 21. Ex - post actual carbon stock changes in initial (pre-deforestation) forest classes in the project area

Project year t	Ex - post actual carbon stock changes in initial (pre-deforestation) forest classes in the project area											
	<i>IDicl=Colina baja</i>			<i>IDicl=Colina media</i>			<i>IDicl=Complejo de orillares</i>			<i>IDicl=Terraza alta</i>		
	<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>		
	<i>Cabicl</i>	<i>Cbbicl</i>		<i>Cabicl</i>	<i>Cbbicl</i>		<i>Cabicl</i>	<i>Cbbicl</i>		<i>Cabicl</i>	<i>Cbbicl</i>	
	ha	t CO ₂ e		ha	t CO ₂ e		ha	t CO ₂ e		ha	t CO ₂ e	
2010-2011	188.0	80,990.6	2,066.9	80.7	20,260.4	496.4	0.0	6.9	0.2	92.0	25,055.9	858.0
2011-2012	188.0	80,990.6	4,133.7	80.7	20,260.4	992.8	0.0	6.9	0.4	92.0	25,055.9	1,716.0
2012-2013	188.0	80,990.6	6,200.6	80.7	20,260.4	1,489.3	0.0	6.9	0.5	92.0	25,055.9	2,574.0

						Total ex - post carbon stock changes in initial forest classes in the project area	
						<i>annual</i>	<i>cumulative</i>
						$\Delta CBSLPA_{it}$	$\Delta CBSLPA_{it}$
						tCO ₂ -e	tCO ₂ -e
<i>IDicl=Terraza baja</i>			<i>IDicl=Terraza media</i>				
<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>				
<i>Cabicl</i>	<i>Cbbicl</i>		<i>Cabicl</i>	<i>Cbbicl</i>			
ha	t CO ₂ e		ha	t CO ₂ e			
16.3	3,950.2	100.8	272.5	117,535.4	2,973.7	254,295.3	254,295.3
16.3	3,950.2	201.7	272.5	117,535.4	5,947.3	260,791.3	515,086.5
16.3	3,950.2	302.5	272.5	117,535.4	8,921.0	267,287.2	782,373.8

Table 22. Ex - post actual carbon stock changes in final (post - deforestation) not-forest classes in the project area

Project year t	Baseline carbon stock changes in final (post - deforestation) not-forest classes in the project area				Total baseline carbon stock changes in final non-forest classes in the project area	
	$ID_{icl}=non-forest$				annual	cumulative
	Vegetación no bosque	$C_{tot\ icl}$	Suelo desnudo	$C_{tot\ icl}$	$\Delta CBSLPA_{it}$	$\Delta CBSLPA_{it}$
	ha	t CO ₂ e ha ⁻¹	ha	t CO ₂ e ha ⁻¹	tCO ₂ -e	tCO ₂ -e
2010-2011	633.8	10.1	15.7	0	6,430.2	6,430.2
2011-2012	633.8	10.1	15.7	0	12,860.4	19,290.7
2012-2013	633.8	10.1	15.7	0	19,290.7	38,581.3

Table 23. Total ex - post carbon stock changes in the project area

Project year t	Total ex - post carbon stock changes in initial forest classes		Total ex - forest carbon stock changes in final non-forest classes		Total ex - post carbon stock changes in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative
	$CBSLPA_{it}$	$CBSLPA_{it}$	$CBSLPA_{it}$	$CBSLPA_{it}$	$CBSLPA_{it}$	$CBSLPA_{it}$
	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
2010-2011	254,295.3	254,295.3	6,430.2	6,430.2	247,865.1	247,865.1
2011-2012	260,791.3	515,086.5	12,860.4	19,290.7	247,930.8	495,795.9
2012-2013	267,287.2	782,373.8	19,290.7	38,581.3	247,996.6	743,792.5

Table 24. Ex post estimated net carbon stock change in the project area under the project scenario (Table 27 methodology VM0015)

Project year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
2010-2011	0	0	0	0	247,865.1	247,865.1	247,865.1	247,865.1
2011-2012	0	0	0	0	247,930.8	495,795.9	247,930.8	495,795.9
2012-2013	0	0	0	0	247,996.6	743,792.5	247,996.6	743,792.5

Table 25. Total ex post estimated actual net changes in carbon stocks and emissions of GHG gases in the project area (Table 29 methodology VM0015)

Project year <i>t</i>	Total ex post carbon stock decrease due to planned activities		Total ex post carbon stock increase due to planned activities		Total ex post carbon stock decrease due to unavoided unplanned deforestation		Total ex post net carbon stock change		Total ex post estimated actual non-CO ₂ emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	ΔCPA_{dPA_t}	ΔCPA_{dPA}	ΔCPA_{iPA_t}	ΔCPA_{iPA}	ΔCUD_{dPA_t}	ΔCUD_{dPA}	$\Delta CPSPA_t$	$\Delta CPSPA$	$EBBPSPA_t$	$EBBPSPA$
	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
2010-2011	0	0	0	0	247,865.1	247,865.1	247,865.07	247,865.1	0	0
2011-2012	0	0	0	0	247,930.8	495,795.9	247,930.82	495,795.9	0	0
2012-2013	0	0	0	0	247,996.6	743,792.5	247,996.56	743,792.5	0	0

4.3 Leakage

According to the VCS Methodology VM0015, version 1.1, two sources of leakage are potentially subject to monitoring, which are:

- Decrease in carbon stocks and increase in GHG emissions associated with leakage prevention activities

During this monitoring period, leakage prevention actions did not include measures to enhance cropland and/or grazing land areas, thus no reduction in carbon stocks nor an increase in GHG emissions occurred.

No displaced forest fires nor increase in GHG emissions due to activities implemented in the leakage management area, such as emissions from grazing animals, fertilizer, or fuel use, were identified.

- Decrease in carbon stocks and increase in GHG emissions in due to activity displacement leakage

The activities that cause deforestation within the project area in the base line case could be displaced outside the project boundary due to the implementation of the AUD project activity. A greater decrease in carbon stocks within the leakage belt during the current monitoring period than those predicted ex-ante would indicate displacement of deforestation activities due to the project.

Leakage due to displacement activity was monitored by mapping forest cover change in the leakage belt.

In the tables 26 and 27 shows the ex post annual deforestation area within the leakage belt, the carbon stock per hectare for above and below ground biomass of initial forest class icl, change post deforestation and the changes in carbon stock.

Table 26. Ex - post carbon stock changes in initial (pre-deforestation) forest classes in the leakage belt

Project year t	Ex - post carbon stock changes in initial (pre-deforestation) forest classes in the leakage belt											
	<i>IDicl=Colina baja</i>			<i>IDicl=Colina media</i>			<i>IDicl=Complejo de orillares</i>			<i>IDicl=Terraza alta</i>		
	<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>			<i>ABSLPA_{icl,t}</i>		
	<i>Cabicl</i>		<i>Cbbicl</i>	<i>Cabicl</i>		<i>Cbbicl</i>	<i>Cabicl</i>		<i>Cbbicl</i>	<i>Cabicl</i>		<i>Cbbicl</i>
	ha	t CO ₂ e		ha	t CO ₂ e		ha	t CO ₂ e		ha	t CO ₂ e	
2010-2011	168.97	72,775.71	1,857.23	208.82	52,446.84	1,285.06	5.29	1,523.62	39.91	80.39	21,900.02	749.93
2011-2012	168.97	72,775.71	3,714.46	208.82	52,446.84	2,570.12	5.29	1,523.62	79.82	80.39	21,900.02	1,499.87
2012-2013	168.97	72,775.71	5,571.69	208.82	52,446.84	3,855.18	5.29	1,523.62	119.74	80.39	21,900.02	2,249.80

<i>IDicl=Terraza baja</i>						<i>IDicl=Terraza media</i>						Total baseline carbon stock changes in initial forest classes in the project area	
<i>ABSLPA_{icl,t}</i>						<i>ABSLPA_{icl,t}</i>						<i>annual</i> <i>ΔCBSLPA_{i,t}</i>	<i>cumulative</i> <i>ΔCBSLPA_{i,t}</i>
<i>Cabicl</i>		<i>Cbbicl</i>	<i>Cabicl</i>		<i>Cbbicl</i>	<i>Cabicl</i>		<i>Cbbicl</i>	<i>Cabicl</i>		<i>Cbbicl</i>	tCO ₂ -e	tCO ₂ -e
ha	t CO ₂ e		ha	t CO ₂ e		ha	t CO ₂ e		ha	t CO ₂ e			
27.27	6,609.55	168.71	76.83	33,131.99	838.24	27.27	6,609.55	337.42	76.83	33,131.99	1,676.48	193,326.81	193,326.81
27.27	6,609.55	337.42	76.83	33,131.99	1,676.48	27.27	6,609.55	506.13	76.83	33,131.99	2,514.73	198,265.90	391,592.71
27.27	6,609.55	506.13	76.83	33,131.99	2,514.73	27.27	6,609.55		76.83	33,131.99		203,204.98	594,797.69

Table 27. Ex - post carbon stock changes in final (post - deforestation) not-forest classes in the leakage belt

Project year t	Ex - post carbon stock changes in final (post - deforestation) not-forest classes in the leakage belt				Total baseline carbon stock changes in final non-forest classes in the project area	
	<i>ID_{icl}=non-forest</i>				<i>annual</i>	<i>cumulative</i>
	Vegetación no bosque	<i>C_{tot icl}</i>	Suelo desnudo	<i>C_{tot icl}</i>	ΔC_{BSLPAi_t}	ΔC_{BSLPAi_t}
	ha	t CO ₂ e ha ⁻¹	ha	t CO ₂ e ha ⁻¹	tCO ₂ e	tCO ₂ e
2010-2011	553.8	10.1	13.7	0	5,618.6	5,618.6
2011-2012	553.8	10.1	13.7	0	11,237.2	16,855.86
2012-2013	553.8	10.1	13.7	0	16,855.9	33,711.73

Table 28. Ex - post total net carbon stock changes in the leakage belt

Project year t	Total ex - post carbon stock changes in initial forest classes		Total ex - post carbon stock changes in final non-forest classes		Total ex - post carbon stock changes in the leakage belt	
	<i>annual</i>	<i>cumulative</i>	<i>annual</i>	<i>cumulative</i>	<i>annual</i>	<i>cumulative</i>
	C_{BSLPAi_t}	C_{BSLPAi}	C_{BSLPAf_t}	C_{BSLPAf}	C_{BSLPA_t}	C_{BSLPA}
	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e
2010-2011	193,326.8	193,326.8	5,618.6	5,618.6	187,708.2	187,708.2
2011-2012	198,265.9	391,592.7	11,237.2	16,855.9	187,028.7	374,736.8
2012-2013	203,205.0	594,797.7	16,855.9	33,711.7	186,349.1	561,086.0

As defined in the VCS Methodology VM0015 v1.1, deforestation above the baseline in the leakage belt area will be considered activity displacement leakage. Thus, leakage emissions due to activity displacement were calculated as the difference between the *ex ante* and the *ex post* assessment.

According to the methodology, as the result was >0, the total *ex post* leakage was set to zero. Therefore no credits were discounted due to activity displacement leakage during this monitoring period. More detail in Table 29 (21d).

Table 29. Total net carbon stock change in the leakage belt (Table 21 d methodology VM0015)

Project year t	Total <i>ex ante</i> baseline carbon stock change		Total <i>ex post</i> net actual carbon stock change		Total <i>ex post</i> leakage	
	annual $\Delta CBSLLK_t$ tCO ₂ -e	cumulative $\Delta CBSLLK$ tCO ₂ -e	annual $\Delta CBSLLK_t$ tCO ₂ -e	cumulative $\Delta CBSLLK$ tCO ₂ -e	annual $\Delta CBSLLK_t$ tCO ₂ -e	cumulative $\Delta CBSLLK$ tCO ₂ -e
2010-2011	836,423.6	836,423.6	187,708.2	187,708.2	648,715.4	648,715.4
2011-2012	609,683.0	1,446,106.6	187,028.7	374,736.8	422,654.4	1,071,369.8
2012-2013	719,235.9	2,165,342.5	186,349.1	561,086.0	532,886.7	1,604,256.5

The results of all *ex post* estimations of leakage summarize in Table 30 below. As there was no decrease in carbon stocks and/or increase in GHG emissions associated with leakage prevention activities or due to activity displacement leakage, no credits were discounted due to leakage during this monitoring period.

Table 30. *Ex post* estimated total leakage (VM0015 Table 35)

Project year t	Total <i>ex post</i> decrease in carbon stocks due to displaced deforestation		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	annual $\Delta CADLK_t$ tCO ₂ -e	cumulative $\Delta CADLK$ tCO ₂ -e	annual ΔCLK_t tCO ₂ -e	cumulative ΔCLK tCO ₂ -e	annual ΔELK_t tCO ₂ -e	cumulative ΔELK tCO ₂ -e
2010-2011	0	0	0	0	0	0
2011-2012	0	0	0	0	0	0
2012-2013	0	0	0	0	0	0

4.4 Net GHG Emission Reductions and Removals

The table 31 shows the ex post estimation of reductions in total net GHG emissions generated by the project and the ex-post calculation of the Verified Carbon Units (VCUs) achieved in the monitoring period from 2010 to 2013, can be seen in Table 32; for this calculation, the net annual emissions reductions were subtracted a 15%, which is the credit reservation for nonpermanence risk, calculated according to the AFOLU Non-permanence Risk Tool (VCS Version 3).

Table 31. Ex post estimated net anthropogenic GHG emission reductions (Δ REDDt) VM0015 Table 36

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2010-2011	465,901	247,865	0	218,036
2011-2012	343,801	247,931	0	95,870
2012-2013	405,740	247,997	0	157,743
Total	1,215,442	743,792	0	471,649

Table 32. Voluntary Carbon Units (VCUt)

Project year <i>t</i>	<i>Ex post</i> net anthropogenic GHG emission reductions		<i>Ex post</i> VCUs tradable		<i>Ex post</i> buffer credits	
	annual $\Delta REDD_t$ tCO ₂ -e	cumulative $\Delta REDD$ tCO ₂ -e	annual VCU_t tCO ₂ -e	cumulative VCU tCO ₂ -e	annual VBC_t tCO ₂ -e	cumulative VBC tCO ₂ -e
July 01, 2010 - June 30, 2011	218,036	218,036	185,331	185,331	32,705	32,705
July 01, 2011 – June 30, 2012	95,870	313,906	81,489	266,820	14,381	47,086
July 01, 2012 – June 30, 2013	157,743	471,649	134,081	400,901	23,662	70,748
Total	471,649		400,901		70,748	

ANNEXES:

- Annex 1 - List of project activities
- Annex 2 - VCS Non-Permanence Risk Report
- Annex 3 - Monitoring Report Deforestation
- Annex 4 - Map Monitoring of Project Area and Leak belt 2010-2013
- Annex 5 - SOP Deforestation Monitoring
- Annex 6 - SOP Information storage
- Annex 7 - Map of Forest_Non Forest Cover.
- Annex 8 - Monitoring of the Strategy for Reducing Emissions
- Annex 9 - Report of the carbon stock of forests 7 native communities of Ucayali
- Spreadsheet – REDD+ project emissions (24 August 2015)