2011-2012 PURUS PROJECT MONITORING REPORT

CarbonCo, LLC

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1 PROJECT DETAILS

1.1 Summary Description of Project

The Purus Project seeks to help protect and conserve tropical forest by providing payments for ecosystem services. This type of project is known as a Reducing Emissions from Deforestation and forest Degradation project (REDD project). Project activities intended to reduce deforestation are implemented in and around a privately-owned property in the State of Acre, Brazil and are funded by payments related to emission reduction credits generated by the project.

This project is being developed and registered under the Verified Carbon Standard (VCS) and the Climate, Community and Biodiversity Standard (CCBS). Project development activities have included meeting with the local communities surrounding the project area, engaging Acre state officials working on similar strategies at a regional/state level, developing a plan which will result in lowering the pressure on land and forest resources in consultation with the local community, putting into operation the REDD project implementation plan with the help of local partners and Purus Project staff, undertaking a forest carbon inventory, and modelling regional deforestation. Activities implemented as part of the project to reduce deforestation include:

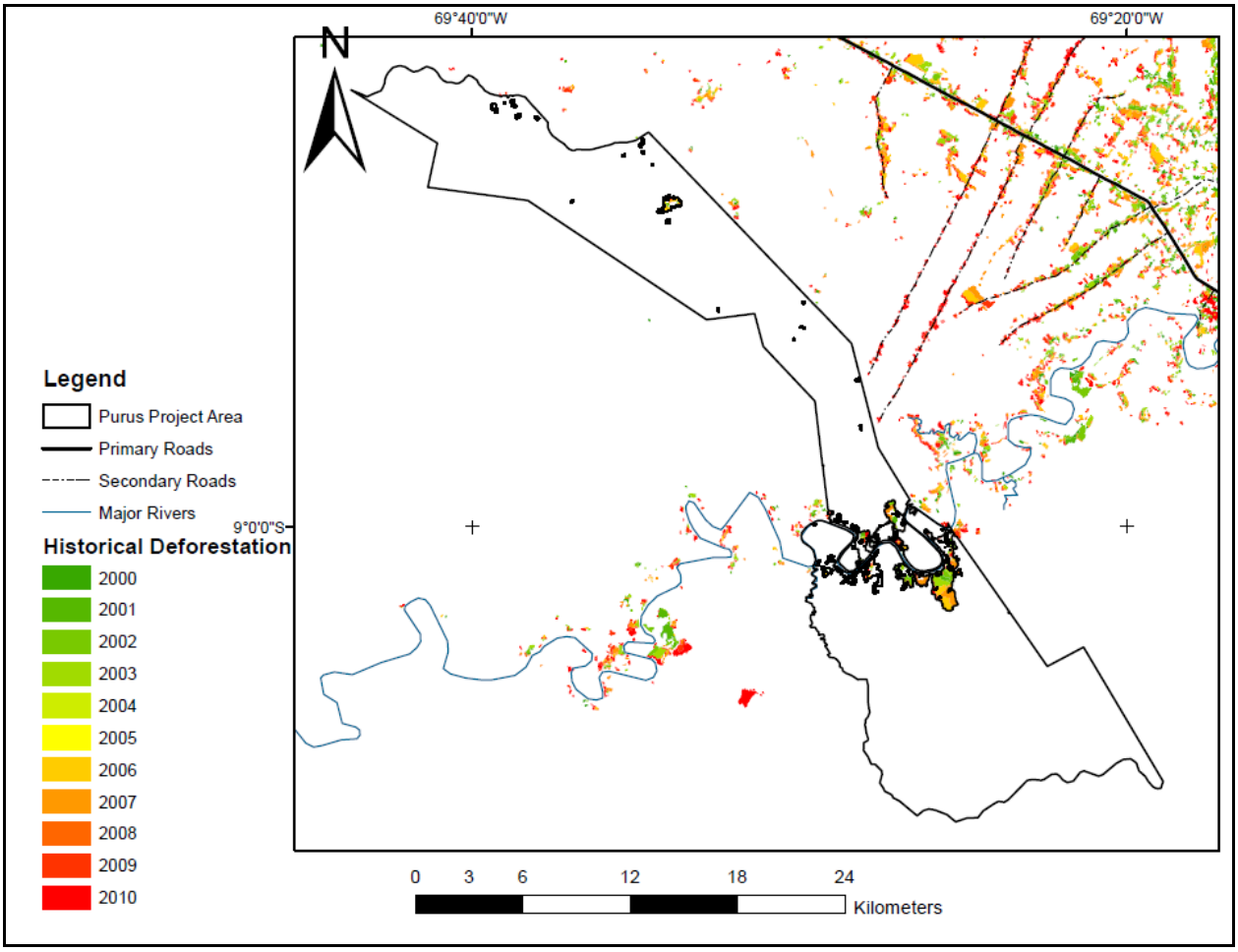
- Community outreach and education;
- Employment of local community members as project forest guards or other project staff (to replace other sources of income associated with deforestation and land use);
- Agricultural extension training which will help baseline agents to increase productivity on current lands (thus reducing the pressure to expand their farms in the adjacent forest);
- Reforestation of select non-forest areas and planting woodlots (to provide alternative sources of fuelwood); and
- Sharing a portion of carbon related revenue for communities living on the Moura & Rosa property (replacing other sources of income associated with deforestation and land use).

The above activities will directly address deforestation pressures in the region which are becoming more prevalent.

While the State of Acre historically has a low deforestation rate and a high level of forest governance, the paving of two primary roads BR-364 and BR-317 has greatly increased destruction of primary forests and conversion to cattle pastures. Deforestation pressures on the Purus Project property have increased significantly in the past several years as the paving of BR-364 is nearing completion. BR-364 which runs northwest-southeast, across the north of the state of Acre, is only 20 kilometers distance from the Purus Project area. The section nearest the project property, near the town of Manoel Urbano, was paved between March and August 2011 during the start of the project in May 2011. Upon being fully paved, BR-364 will allow for year-round transportation and most likely increase property values and market access. The Purus River, a major tributary of the Amazon River, runs through the project property potentially connecting areas upstream and downstream from BR-364 to consumer markets. Further, secondary

roads are fast approaching the project area (Figure 1.1) providing access to previously hard to reach areas for the agents of deforestation, small scale/subsistence farmers.

Figure 1.1. Deforestation in and around the project area within ten years of the project start date.



There are 18 communities living on the project property, all of which live along the banks of the Purus River. These small scale and subsistence farming communities are the agents of deforestation and clear a portion of forest (often annually) for land to engage in small scale farming and ranching for their livelihoods. Forest is generally cleared over a period of months. The process most often starts in May or June at the beginning of the dry season with the cutting of small trees and vines by machete. Next, the farmer or someone with a chainsaw cuts the larger trees down. The farmer then waits for the dead vegetation to dry for a period of time ranging from two weeks to several months. Some of the farmers then use fire to clear the land. Finally crops are planted for a year or two prior to conversion to pasture or the land is directly converted to pasture.

The project baseline has been developed after meeting with local communities to understand their use of the land, and in light of the above-mentioned increased accessibility of the project area in the near future. Further, the Purus Project is working closely with the State of Acre and is using a simple historic approach to setting the baseline to conform with Acre State's approach, which is still in development. Finally, data

and information provided by the UCEGEO, the Climate Change Institute's GIS department, was used in the development of the baseline.

There are three project proponents undertaking the Purus Project including CarbonCo, LLC ("CarbonCo"), Freitas International Group, LLC ("Carbon Securities"), and Moura e Rosa Empreendimentos Imobiliários LTDA ("Moura & Rosa"). CarbonCo, the wholly-owned subsidiary of Carbonfund.org, is responsible for project finance and managing project development. Carbon Securities acts as a liaison between CarbonCo and Moura & Rosa and provides logistical support during site visits. Moura & Rosa, an Acre based organization created by the Landowners, is primarily responsible for implementation of project activities and day-to-day management of the Purus Project.

1.2 Sectoral Scope and Project Type

Project Scope 14: Agriculture, Forest and other Land Use (AFOLU)

Project Category: Reduction Emission from Deforestation and Degradation (REDD)

Type of Activity: Avoided Unplanned Deforestation (AUDD)

This project is being registered under the Verified Carbon Standard (VCS) as a Reducing Emissions from Deforestation and Degradation (REDD) project and has been developed in compliance with the Verified Carbon Standard, Version 3.3 and VCS AFOLU Requirements. The project will reduce emissions from unplanned frontier deforestation.

1.3 Project Proponent

The three main project proponents are CarbonCo, LLC ("CarbonCo"), Freitas International Group, LLC ("Carbon Securities"), and Moura e Rosa Empreendimentos Imobiliários LTDA ("Moura & Rosa"). CarbonCo, the wholly-owned subsidiary of Carbonfund.org, is responsible for getting the project certified and for project finance. Carbon Securities acts as a liaison between CarbonCo and Moura & Rosa, acts as a translator, and assists with logistics for site visits. Moura & Rosa is an Acre, Brazil-based organization created by the Landowners and is primarily responsible for day-to-day management of the Project and the implementation of activities to stop deforestation. Table 1.1, below, details the role and responsibilities of each project proponent.

Table 1.1. List of Project Proponents.

Contact	Role	Responsibility
CarbonCo, LLC 3 Bethesda Metro Center, Suite 700 Bethesda, Maryland 20814 USA 001-240-247-0630	Project developer	• Finance project development costs • Manage technical contractors helping with project development, the forest carbon inventory, and baseline modeling • Assist with drafting the VCS and CCBS Project Documents • Manage validation and verification process including contracting auditors and addressing Corrective Action Requests

Moura e Rosa Empreendimentos Imobiliários LTDA Avenida Ceará nº364 – Sala 01 – Habitasa – Rio Branco – AC 55-68-3224-0562	Project manager	• Engage with local community to inform and explain the proposed project and gather feedback, and resolve any local issues • Develop and implement a plan to reduce deforestation
Freitas International Group, LLC (Carbon Securities) 201 S. Biscayne Boulevard, 28th Floor Miami, Florida 33131 USA 55-61-3717-1008	Project facilitator	• Serve as a liaison and translator for the landowners and CarbonCo, including establishing meetings with landowners and relevant stakeholders, arranging site visits, providing information and documentation such as previous studies, photographs, and satellite images related to the project

1.4 Other Entities Involved in the Project

Figure 1.2 provides an overview of the relationship of the various project proponents and entities involved in the project. Table 1.2 lists the role of the other entities.

Figure 1.2. Organizational Chart for the Purus Project

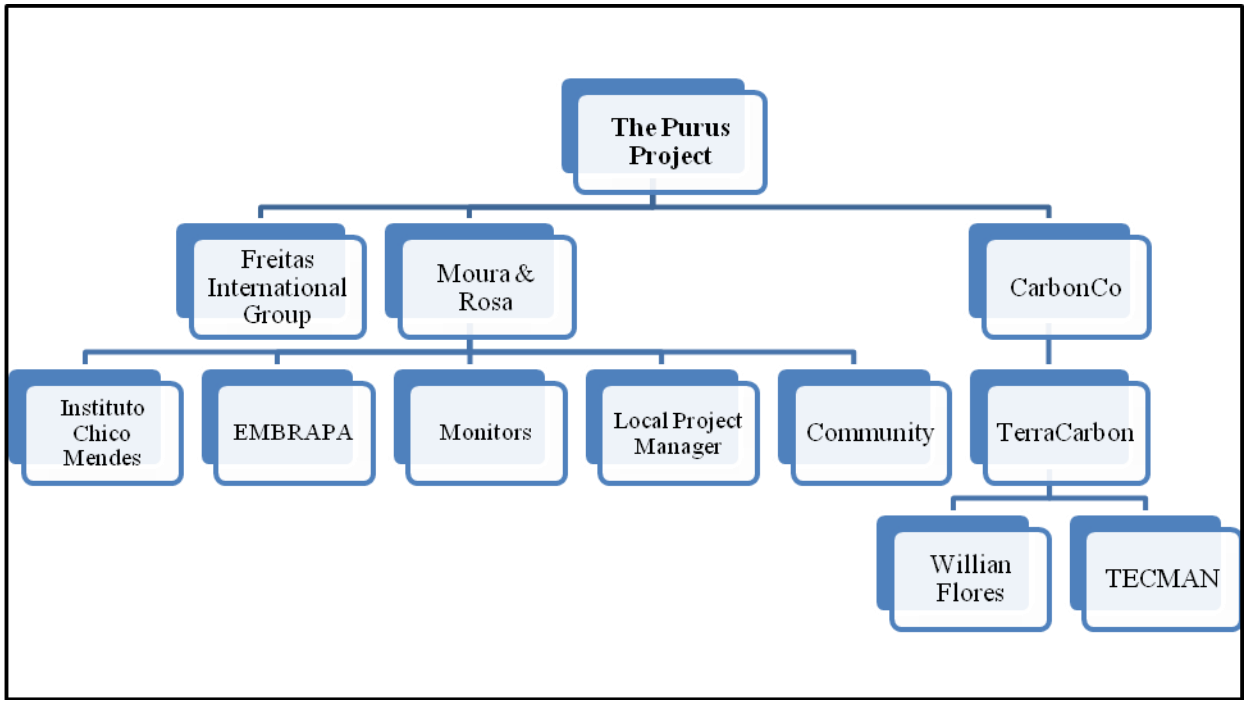


Table 1.2. List of Other Entities Involved in the Project.

Contact	Role	Responsibility
TerraCarbon LLC 5901 N. Sheridan Rd. Peoria, Illinois 61614, USA 001-434-326-1144	Independent Consultant	Co-lead project kickoff. Design and manage forest carbon inventory. Lead baseline development task. Develop project document and advise CarbonCo on all aspects of project

		development.
TECMAN Rua Copacabana, nº 148, Sala 204, Conjunto Village Maciel, CEP 69.914-380 Rio Branco, Acre, Brasil 55-68-3227-5273	Independent Consultant	Lead and supervise collection of field data during the course of the forest carbon inventory.
Antonio Willian Flores de Melo Universidade Federal do Acre Centro de Ciências Biológicas e da Natureza, Distrito Industrial, CEP 69.915-900 Rio Branco, Acre, Brasil 55-68-3901-2611	Independent Consultant	Delineate project boundaries and perform deforestation modeling used to develop the project baseline.
EMBRAPA Dr. Judson Valentin BR364 Km 14, PO Box 321, CEP 69.900-056 Rio Branco, Acre, Brasil 55-68-3212-3205	Independent Consultant	Provide technical assistance with regard to agricultural extension training, which shall be provided to the local communities
Instituto Chico Mendes Escritório Xapuri - Acre Rua Dr. Batista de Moraes, 495 Centro - CEP 69.930-000 Xapuri, Acre, Brasil 55-68-3224-2365	Local Contact	Informal assistance to Moura & Rosa during project planning phase.
SERVICO NACIONAL DE APRENDIZAGEM RURAL (SENAR-AR-AC) Jefferson Lunardelli Cogo - Superintendente. Rua Quintino Bocaiuva, 1767 – Bosque, CEP 69.909-400. Rio Branco- Acre. 68-3224-1797	Independent Consultant	Provide technical assistance with regard to agricultural extension training for,local communities

1.5 Project Start Date

The Purus Project has a project start date of May 23, 2011 which is the date of the initial signing of the communities' "Declaration"[1] to join the project and when the first social survey took place to gather information on the habits, customs and composition of the communities living in the Purus Project area. To strengthen this agreement, individual Memorandums of Understanding[2] with community members were later signed.

[1] A copy of the "Declaration" can be found in the project archive
[2] Copies of all signed MOUs can be found in the project archive.

1.6 Project Crediting Period

The Purus Project has an initial project crediting period of 30 years[3], starting on May 23, 2011. The initial baseline period started on May 23, 2011 and is set to continue through May 22, 2021. The initial project crediting period is set to end on May 22, 2041.

1.7 Project Location

The Purus Project area is located in Acre, Brazil along the banks of the Purus River about 20 kilometers southwest of Manoel Urbano. The Purus Project area consists of two contiguous properties known as the Seringal Itatinga and Seringal Porto Central. While the two properties total 35,797 hectares, the total project area (i.e., forested area of the property as of the project start date, and 10 years prior) is 34,702 hectares.

[3] An addendum to the initial Tri-Party Agreement between CarbonCo, Carbon Securities and Moura & Rosa stipulates there will be a 60-year project life-time, followed by two renewable terms of 25-years each.

Figure 1.3. Map of the Seringal Itatinga and Seringal Porto Central Properties (Google Earth, accessed 2012).

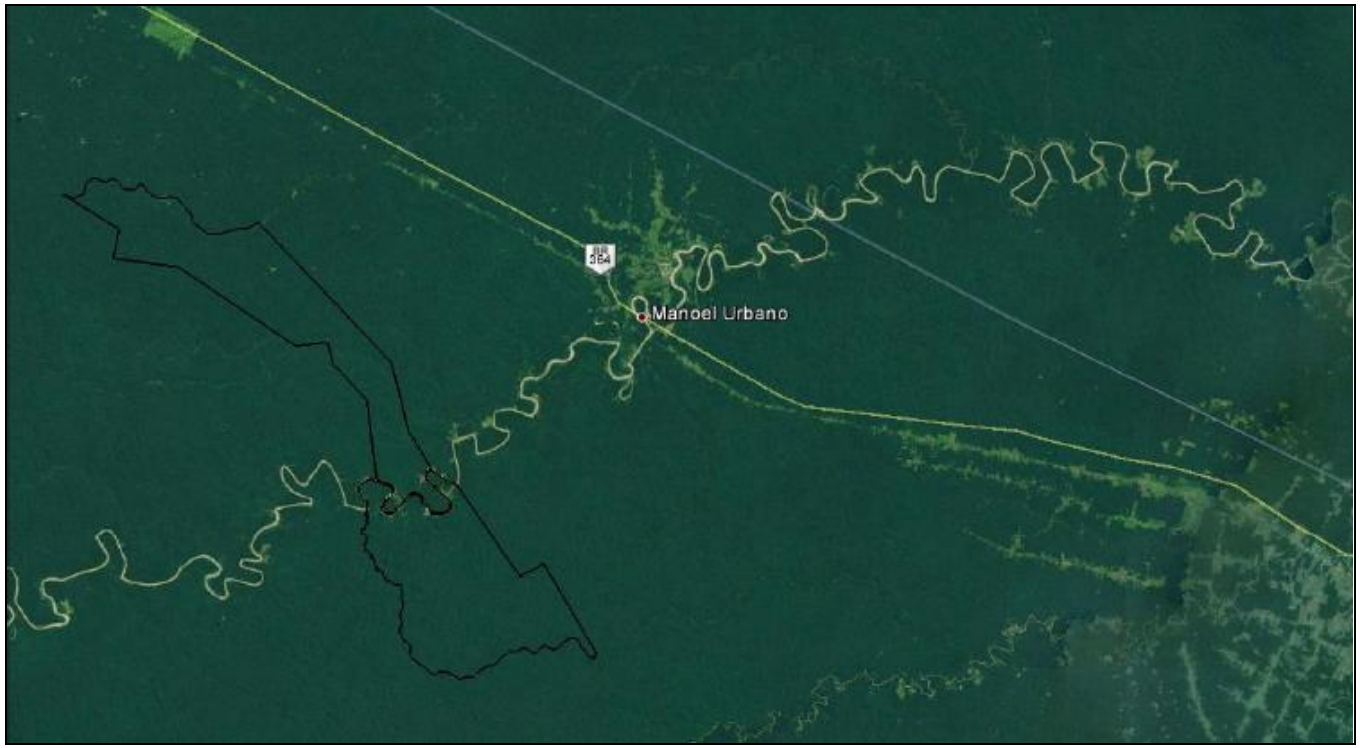


Figure 1.4. 2000 Image of the Purus Project Area, Forest Cover in Light and Dark Green, Deforestation in Pink/Red (ResourceSAT 2000 Image).

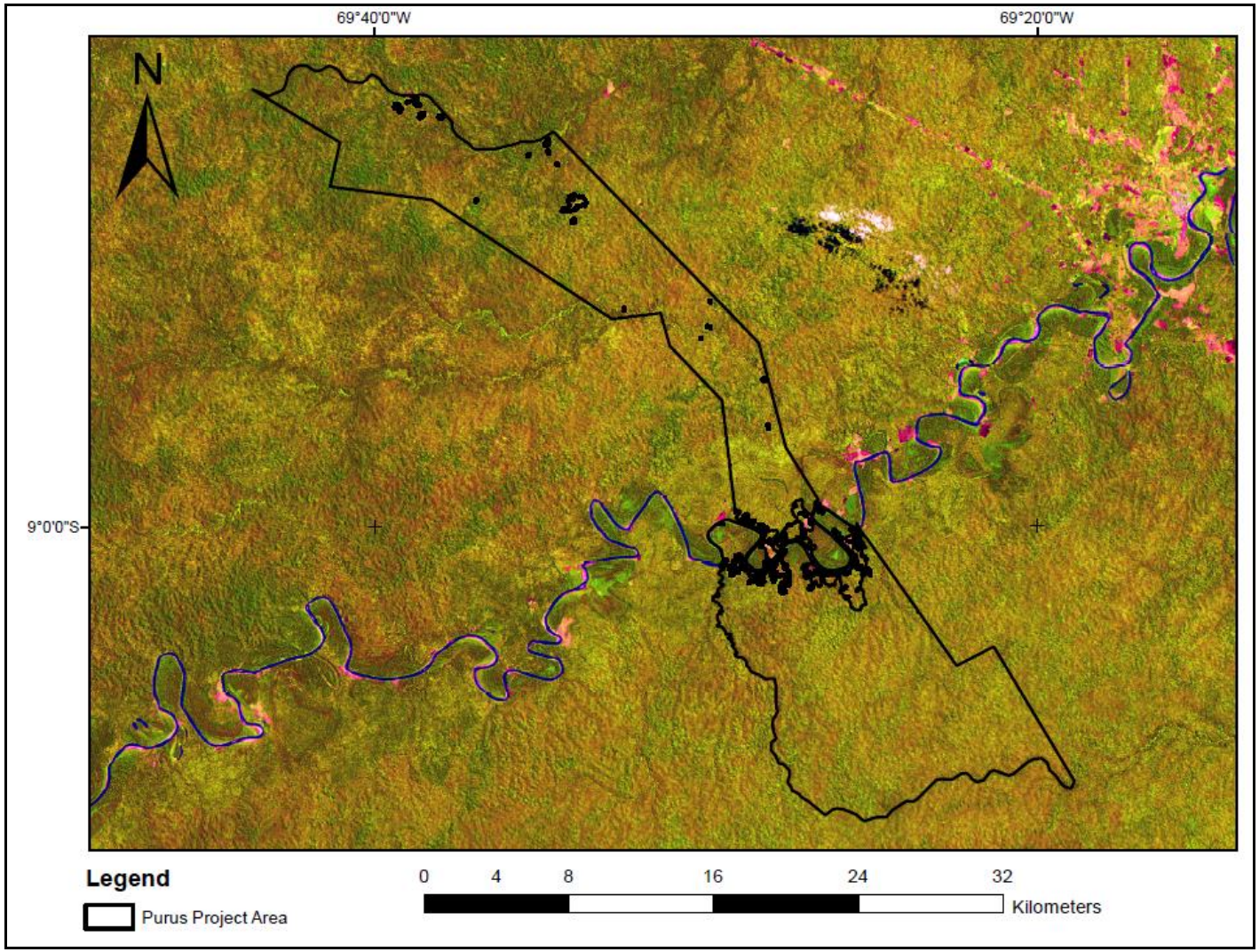
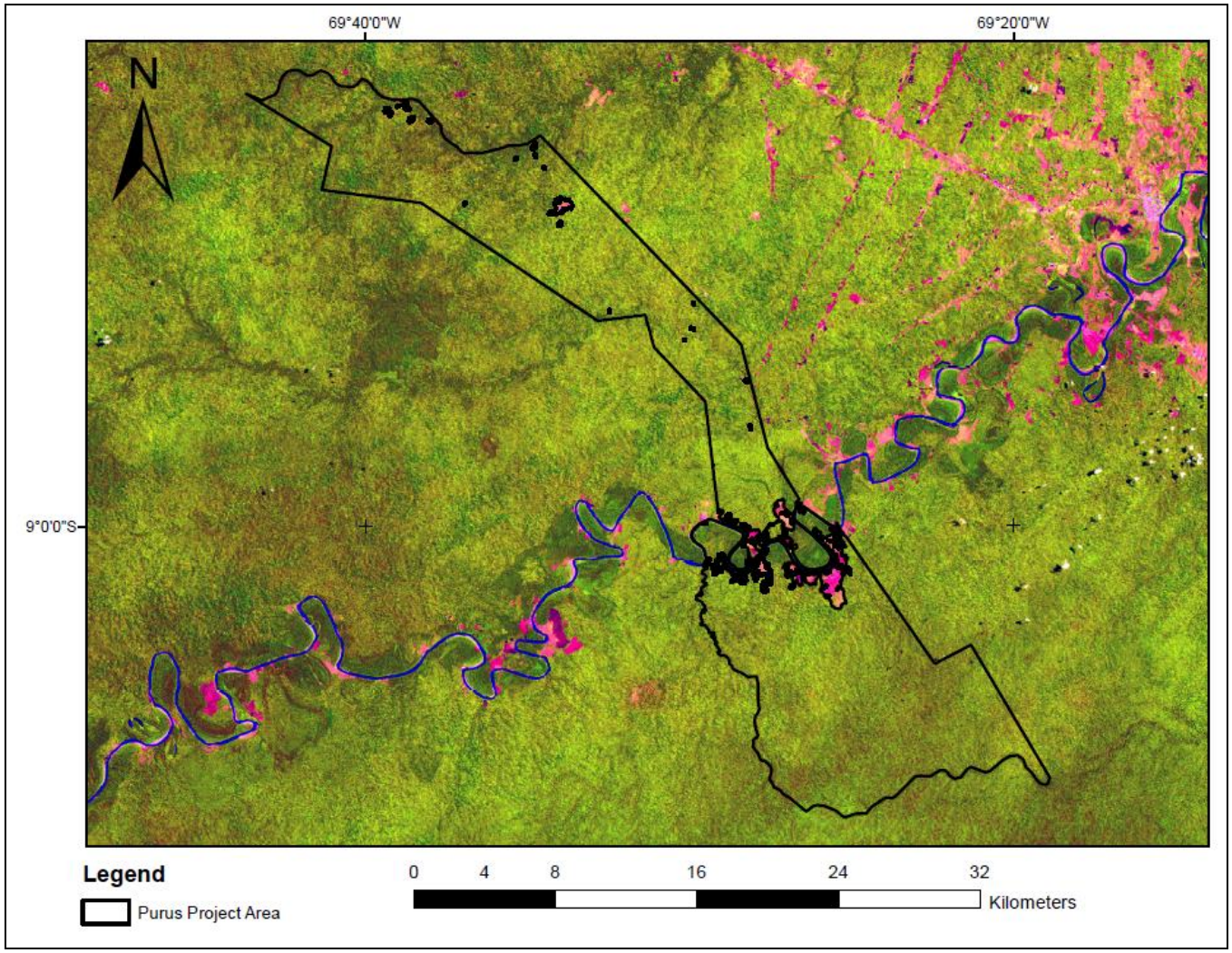


Figure 1.5. 2011 Image of the Purus Project Area, Forest Cover in Light and Dark Green, Deforestation in Pink/Red (ResourceSAT 2010 Image).



1.8 Title and Reference of Methodology

The Purus Project is utilizing the Avoided Deforestation Partners' VCS REDD Methodology, entitled, "VM0007: REDD Methodology Modules (REDD-MF)." The specific modules applied to the Purus Project are listed below.

REDD-MF, REDD Methodology Framework Version 1.3

Carbon Pool Modules:

CP-AB, "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools," Version 1.0

CP-D, "VMD0002 Estimation of carbon stocks in the dead-wood pool," Version 1.0

Baseline Modules:

BL-UP, "VMD0007 Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation," Version 3.1

Leakage Modules:

LK-ASU, "VMD0010 Estimation of emissions from activity shifting for avoided unplanned deforestation," Version 1.0

Monitoring Module:

M-MON, "VMD0015 Methods for monitoring of greenhouse gas emissions and removals," Version 2.1,

Miscellaneous Modules:

X –STR, "VMD0016 Methods for stratification of the project area," Version 1.0

X-UNC, "VMD0017 Estimation of uncertainty for REDD project activities," Version 2.0

Tools:

T-SIG, CDM tool "Tool for testing significance of GHG emissions in A/R CDM project activities," Version 1.0

T-ADD, "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities," Version 3.0

T-BAR, "Tool for AFOLU non-permanence risk analysis and buffer determination," Version 3.2

Use of modules, REDD-MF, M-MON, T-ADD, T-BAR, X-UNC, and X–STR, is justified as these modules are always mandatory when using the VM0007 methodology. Further use of modules, BL-UP and LK-ASU, is mandatory in the case of projects focusing on unplanned deforestation. Use of the module T-SIG is justified as it determines whether GHG emissions by sources and/or decreases in carbon pools are insignificant. Finally, CP-AB is justified as it is mandatory in all cases and CP-D is justified as it is mandatory as the dead wood pool is greater in the baseline than project scenario. The above modules are applicable because they meet the applicability conditions of the modules.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

Engage Local Communities

CarbonCo, Carbon Securities and Moura & Rosa (i.e., the Project Proponents) visited the Purus Project area and met with the local communities in March 2011, August 2011, March 2012 and June 2012. These meetings were to ensure the local communities were: fully aware of the Purus Project's goals and activities, able to contribute to the project design, able to openly express desired outcomes and concerns, understanding of the third-party grievance procedure, and able to voluntarily give free, prior and informed consent. In addition, CarbonCo hired the independent group PAV Comércio e Serviços Ltda ("PAV") to meet with the communities on two different occasions in October 2012.

Create Project Awareness

The Project Proponents presented the project to a wide-range of officials, including: Acre's Vice-Governor César Correia Messias, the Climate Change Institute of the State of Acre, Acre's General Prosecutor Patricia Rego, and EMBRAPA. Between May 2011 and December 2012, the following meetings and events took place to further project awareness:

- CarbonCo, Carbon Securities, Moura & Rosa, TerraCarbon, and TECMAN met with Acre State officials, including Monica Julissa De Los Rios de Leal and Lucio Flavio, on 3 August 2011 to discuss how to best design the forest carbon inventory to align with the State of Acre's goals and future forest inventory plans.
- CarbonCo, Carbon Securities, Moura & Rosa, TerraCarbon, and Professor Willian Flores met with Acre State officials, including Monica Julissa De Los Rios de Leal, Eufran Amaral and Lucio Flavio on 9 August 2011 to discuss: how to best develop the project-level baseline; how private projects will nest with a forthcoming state level baseline; and the type of GIS data available from the State of Acre.
- On 17 October 2011, Moura & Rosa and Professor Willian Flores met EMBRAPA in Rio Branco, Acre. During this meeting Moura & Rosa introduced the Purus Project via a PowerPoint Presentation, discussed the local communities' needs and presented ideas for mitigating deforestation pressures. Additionally, Moura & Rosa discussed the possibility of EMBRAPA sending two technicians, one a specialist in reforestation and the minimization of degradation and the other a specialist in agriculture and livestock, to the Purus Project.
- CarbonCo spoke with Natalie Unterstell, the focal point for REDD+ at Brazil's Federal Ministry of Environment on 10 February 2012. Discussions were based around: The role of Brazil's Federal Government in the REDD+ context; Progress of the Amazon Fund; How States, particularly Acre, might nest into National Government; How Brazil's domestic cap-and-trade market is shaping up; Market mechanisms and REDD+ as potentially eligible offset; Where to go for REDD+ information on federal government updates and how to inform the government of the Purus Project.
- From 9-15 March 2012, CarbonCo, Carbon Securities and Moura & Rosa also met with the Vice Governor of Acre, Mr. César Correia Messias to explain the Purus Project and to ask for a Letter of Support.

Hire Project Managers and Project Staff

In March 2012, Moura & Rosa hired two local project managers from the communities at the Purus Project, Sebastião Marques da Silva (Miguel) and Maria Souza de Moura (Socorro). Miguel and Socorro were contracted for maintenance of the Purus Project headquarters and to assist the Project Proponents during site visits. Socorro worked more on hospitality such as cooking for visitors and cleaning the headquarters' facilities. Miguel's primary role was to maintain the headquarters' security by providing a presence and protecting the local infrastructure.

Communication between Miguel and Moura & Rosa took place every fifteen days. Such discussions were mainly focused on the management of the local area. For example, discussions included: cutting the pasture; preparing for site visits (i.e., in addition to frequent visits by the Project Proponents and TECMAN, S.O.S. Amazônia and the Climate Change Institute also visited the Purus Project); providing general updates about the local community; and relaying information about informal monitoring of deforestation.

Kidney da Cunha Aires ("Kidney"), who lives in Rio Branco, was contracted by Moura & Rosa for the role of "Onsite Project Manager." Training for this position began in November 2012. Kidney is responsible for onsite logistics, transportation to and from the Purus Project, local communication with the communities about the Project, assisting with the community and biodiversity monitoring plans, and monitoring of deforestation along the Purus River. Kidney was contracted to work a revolving schedule which includes working onsite at the Purus Project for fifteen days and then returning to Rio Branco for fifteen days.

Acquire Agricultural Extension Services

The communities in and around the Purus Project were surveyed from 10-12 March 2012 to better understand which agricultural extension training courses would be the most beneficial. Moura & Rosa then purchased the top ten courses selected by the community on 30 March 2012 from the Center for Technical Production (CPT). Equipment, such as a projector with a sound system, was purchased by Moura & Rosa in July 2012 to assist with the teaching of these courses. SENAR is to begin teaching these courses in 2013.

Moura & Rosa also ordered a large boat in fall of 2012 and its construction should be completed in 2013. This particular boat will be used to increase the local communities' market access by transporting the communities' crops to Manoel Urbano.

Help Communities Obtain Land Rights / Delineate Family Areas

Community members that have been living on the land and who have increased the productivity of the land (e.g., by clearing land, growing crops or raising cattle) for ten years have the right to be titled to land. Moura & Rosa will voluntarily recognize whatever area is deforested and under productive use by each family. The minimum area to be titled to each family is one hundred hectares which is the minimum size that INCRA (Instituto Nacional de Colonização e Reforma Agrária) says a family in the State of Acre needs for a sustainable livelihood. Those communities who have deforested and put under productive use over one hundred hectares will receive the full area that has been deforested. All communities, whether they join the Purus Project or not, will be titled the land they have put under productive use.

To help the communities obtain land rights and to delineate family areas, the first step by Moura & Rosa took place in 2010 when Willian Figueiredo Bittencourt from the company PLANTEC did a geo-reference of the property and also went to the Purus Project to geo-reference the communities.

In 2012, PLANTEC was further contracted to start the process of legalizing the land for the communities. Satellite imagery was purchased twice in 2012 from Mr. Adalberto, an independent contractor to Moura & Rosa, to determine the land-use and how long settlements were cleared to define the communities' areas.

In addition, Brazilian Federal law was also reviewed by Moura & Rosa from 2010 to 2012 to determine the appropriate authorities for titling land, what exactly needs to be done in order to title land for local communities, and the rights of such rural communities. The institutions INCRA, the Public Ministry, FETACRE, and Sindicato dos Trabalha dores Rurais de Manoel Urbano (STR–Manoel Urbano; in English: Rural Union of Manoel Urbano) were contacted by Moura & Rosa.

During the second half of 2012, the President of STR–Manoel Urbano visited the communities of the Purus Project to better explain the goals of the Project and clarify to the community how land tenure regularization will work. STR–Manoel Urbano and the Public Ministry have been identified as the intermediaries to assist Moura & Rosa and the communities with titling land to the communities.

Initiate Patrols/Monitors of Deforestation

Between May 2011 and December 2012, the Project Proponents designed a forest monitoring plan, purchased a trike for aerial monitoring, participated in training on how to fly the trike, and initiated the deforestation patrols.

Wanderley Cesario Rosa, a Managing Director of Moura & Rosa, participated in training classes in São Paulo on how to operate a trike in April 2012. Moura & Rosa then purchased a trike in May 2012 and in June 2012; the trike was delivered to Rio Branco.

Aerial monitoring of deforestation began in August 2012 with Wanderley and the instructor flying the trike over the Purus Project. In September 2012, another flight of the trike with Wanderley and the instructor took place over the Purus Project. In October 2012, Wanderley did his first solo flight of the trike but was unable to fly over the Purus Project due to inclement weather. The last trike flight of 2012 took place in November 2012.

Moura & Rosa also purchased a fast boat in June 2012 which will provide transportation for the Project Proponents and facilitate deforestation monitoring along the Purus River.

A total of eleven official deforestation monitoring events were completed between 23 May 2011 and 31 December 2012.

Moura & Rosa purchased a phone tower for the Project headquarters in November 2012 to enable cellular phone communication with Miguel and Kidney at the Project headquarters. Moura & Rosa plan to install the phone tower in 2013.

How Leakage and Non-Permanence Risk Factors are Being Monitored and Managed

Between May 2011 and December 2012, the Project Proponents conducted an extensive risk analysis and identified the potential natural, anthropogenic and project risks to the climate, community and biodiversity benefits of the Purus Project. The overall risks associated with the Purus Project are considered low and justified a low Verified Carbon Standard buffer reserve. Nevertheless, the Project

Proponents are constantly monitoring the potential risks and periodically discuss the risks to see if any new risks should be added or previously identified risks are no longer a concern.

In addition, the Purus Project Proponents also comprehensively assessed the situations and particular occupations that could pose risks to worker safety. The Project Proponents will continue to inform workers of such risks, explain how to minimize such risks, and the Project Proponents will use best work practices.

The primary leakage mitigation activity undertaken between May 2011 and December 2012 was the monitoring of the Purus project area and the leakage belt by Moura & Rosa to quickly identify deforestation and its causes. Further, there are plans for Moura & Rosa to extend project activities (i.e., agricultural extension training) to communities living with the leakage belt.

2.2 Project Description Deviations

There are no deviations to the project description.

2.3 Grouped Project

The Purus Project is not a grouped project and therefore this section of the monitoring report is not applicable.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data and parameters calculated during the course of project development include those listed in this section.

Data Unit / Parameter:	$\Delta C_{BSL,PA,unplanned}$
Data unit:	t CO_2-e
Description:	Net CO_2 emissions in the baseline from unplanned deforestation in the project area
Source of data:	Derived in Section 3.1 of PD
Value applied:	

Year	ΔCBSL,PA (tCO2-e)
2011	126,240
2012	142,812
2013	137,409
2014	158,897
2015	202,300
2016	176,865
2017	185,232
2018	169,285
2019	201,212
2020	209,001

Justification of choice of data or description of measurement methods and procedures applied:	Derived and justified in Section 3 of VCS Project Description (PD) in which baseline is set
Any comment:	

Data Unit / Parameter:	$\Delta C_{BSL,LK,unplanned}$
Data unit:	t CO_2-e
Description:	Net CO_2 emissions in the baseline from unplanned deforestation in the leakage belt
Source of data:	Derived in Section 3.1 and 3.2 of PD
Value applied:	

Year	ΔCBSL,LB (tCO2-e)
2011	205,406
2012	225,355
2013	199,533
2014	225,397
2015	243,503
2016	233,368

	2017: 278,548 2018: 271,569 2019: 212,852 2020: 245,941
Justification of choice of data or description of measurement methods and procedures applied:	Derived and justified in Section 3 of PD in which baseline is set
Any comment:	

Data Unit / Parameter:	*CF*
Data unit:	t C t^{-1} d.m.
Description:	Carbon fraction of biomass
Source of data:	IPCC 2006GL
Value applied:	0.47
Justification of choice of data or description of measurement methods and procedures applied:	Global default
Any comment:	

Data Unit / Parameter:	C_{OLB}
Data unit:	t CO_2-e ha^{-1}
Description:	Area-weighted average aboveground tree carbon stock for forests available for unplanned deforestation outside the Leakage Belt
Source of data:	Derived from source data found in FAO. 2009. Global Forest Resources Assessment 2010, Brazil Country Report. Forestry Department, Food and Agriculture Organization of the United Nations, Rome.
Value applied:	372.3 t CO_2-e ha^{-1}
Justification of choice of data or description of measurement methods and procedures applied:	Derived above in Section 3.3 of the PD
Any comment:	

Data Unit / Parameter:	$\Delta C_{P,LB}$
Data unit:	t CO_2-e ha^{-1}
Description:	Area weighted average aboveground tree carbon stock for forests available for unplanned deforestation inside the Leakage Belt
Source of data:	Stock estimates of strata represented in the project area were derived from measurements from the forest carbon inventory of the project area, in addition to data from Salimon et al. for one unsampled forest strata. Salimon et al. 2011. Estimating state-wide biomass carbon stocks for a REDD plan in Acre, Brazil. Forest Ecology and Management 262: 555-560.
Value applied:	351 t CO_2e ha-1
Justification of choice of data or description of measurement methods and procedures applied:	Derived above in Section 3 of the Project Description
Any comment:	

Data Unit / Parameter:	ABSL,PA,unplanned,i,t
Data unit:	Ha
Description:	Projected area of unplanned baseline deforestation in the project area in stratum i at time t
Source of data:	Derived in Section 3.1 of PD
Value applied:	

Year	Aunplanned,i,t, FAB + FAP	AAunplanned,i,t, FAP-alluvial
2011	223.0	251.5
2012	247.7	277.8
2013	295.2	212.3
2014	293.4	274.8
2015	457.3	282.6
2016	358.2	257.9
2017	430.8	217.6
2018	351.4	211.6
2019	449.3	231.9
2020	532.9	180.2

Justification of choice of data or description of measurement	Derived and justified in Section 3 of PD in which baseline is set

methods and procedures applied:	
Any comment:	

Data Unit / Parameter:	COMF i
Data unit:	dimensionless
Description:	Combustion factor for stratum i
Source of data:	Derived from Table 2.6 of IPCC, 2006.
Value applied:	0.45
Justification of choice of data or description of measurement methods and procedures applied:	Value is for primary open tropical forest.
Any comment:	

Data Unit / Parameter:	Gg,i	
Data unit:	kg t-1 dry matter burnt	
Description:	Emission factor for stratum i for gas g	
Source of data:	Derived from Table 2.5 of IPCC, 2006.	
Value applied:	G,N20 (kg/t d.m. burnt)	G,CH4 (kg/t d.m. burnt)
	0.2	6.8
Justification of choice of data or description of measurement methods and procedures applied:		
Any comment:		

Data Unit / Parameter:	GWPg	
Data unit:	t CO_2/t gas g	
Description:	Global warming potential for gas g	
Source of data:	Default values from IPCC SAR	
Value applied:	GWP,N20 (t CO2/t gas g)	GWP,CH4 (t CO2/t gas g)
	310	21

Justification of choice of data or description of measurement methods and procedures applied:	
Any comment:	

3.2 Data and Parameters Monitored

Details on data and parameters monitored are provided below. Note that:

- "monitoring equipment" is left blank to provide flexibility in measurement and monitoring approach, essential for any longterm monitoring, reporting and verification (MRV) plan
- Where a parameter is calculated from a methodology equation (i.e. not raw data), the methodology module and equation number is specified and "Description of measurement methods and procedures to be applied" and "QA/QC procedures to be applied" are appropriately left blank
- To avoid repetition and maintain an economical use of space in the summary tables, "Description of measurement methods and procedures to be applied" and "QA/QC procedures to be applied" for monitored (not calculated) parameters reference detailed accounts of procedures provided in the monitoring plan description below.

Data Unit / Parameter:	$\Delta C_{P,Def,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock change as a result of deforestation in the project case in the project area in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year: ΔCP,DefPA,i,t (t CO2-e) 2011: 15,789 2012: 32,470
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 3, VMD0015
Any comment:	

Data Unit / Parameter:	$\Delta C_{P,DefLB,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock change as a result of deforestation in the project case in the leakage belt in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year: ΔCP,LB (t CO2-e) 2011: 29,026 2012: 63,673
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 4, VMD0015
Any comment:	

Data Unit / Parameter:	$\Delta C_{P,DistPA,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year: ΔCP,DistPA,i,t (t CO2-e) 2011: 0 2012: 0
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 20, VMD0015
Any comment:	

Data Unit / Parameter:	$A_{DefPA,u,i,t}$
Data unit:	Ha
Description:	Area of recorded deforestation in the project area stratum *i* converted to land use *u* at time *t*
Source of data:	Monitored at each monitoring/verification event through the use of classified satellite imagery
Description of measurement methods and procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	

Year	FAP-alluvial ADefPA,u,i,t (ha)	FAB +FAP ADefPA,u,i,t (ha)
2011	36.2	2.7
2012	66.7	15.4

Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Calculation method:	
Any comment:	

Data Unit / Parameter:	$A_{DefLB,u,i,t}$
Data unit:	Ha
Description:	Area of recorded deforestation in the leakage belt stratum *i* converted to land use *u* at time *t*
Source of data:	Monitored at each monitoring/verification event through the use of classified satellite imagery
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	

Year	FAP-alluvial ADefLB,u,i,t (ha)	FAB +FAP ADefLB,u,i,t (ha)	FAP + FAB ADefLB,u,i,t (ha)
2011	34.3	45.8	0.0
2012	88.7	83.5	0.0

Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description

Calculation method:	
Any comment:	

Data Unit / Parameter:	$A_{DistPA,q,i,t}$
Data unit:	ha
Description:	Area impacted by natural disturbance in post-natural disturbance stratum *q* in stratum *i,* at time *t*
Source of data:	Monitored at each monitoring/verification event through the use of classified satellite imagery and land managers observations
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year / $A_{DistPA,q,i,t}$ (t CO2-e): 2011 – 0; 2012 – 0
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{BSL,i}$
Data unit:	t CO_2-e ha^{-1}
Description:	Carbon stock in all pools in the baseline case in stratum *i*
Source of data:	Estimated from forest carbon inventory.
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	FAP-alluvial CBSL,i (t CO2-e/ha) / FAB +FAP CBSL,i (t CO2-e/ha) / FAP + FAB CBSL,i (t CO2-e/ha)

	411.3	325.5	512.9
Monitoring equipment:			
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description		
Calculation method:			
Any comment:			

Data Unit / Parameter:	$\Delta Cpools,Def,u,i,t$
Data unit:	t CO_2-e ha^{-1}
Description:	Carbon stock in all pools in post-deforestation land use *u* in stratum *i*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	None
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	Stratum specific values calculated as $C_{BSL,I}$-Cpost
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Stratum specific values calculated as $C_{BSL,I}$-Cpost
Any comment:	

Data Unit / Parameter:	$A_{DegW,i,t}$
Data unit:	ha
Description:	Area potentially impacted by degradation processes in stratum *i*
Source of data:	Delineated based on survey results indicating general area of project potentially accessed and typical depth of penetration of illegal harvest activities from points of access
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Repeated each time the PRA indicates a potential for degradation. PRA conducted every ≤

	2 years
Value applied:	0
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{DegW,i,t}$
Data unit:	t CO_2-e
Description:	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum *i* at time *t*
Source of data:	Estimated from diameter measurements of cut stumps in sample plots
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	0
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	AP_i
Data unit:	ha
Description:	Total area of degradation sample plots in stratum *i*
Source of data:	Calculated as 3% of $A_{DegW,i,t}$
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years where surveys and limited sampling continue to indicate possibility of illegal

	logging in the project area
Value applied:	0
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	Not used in this monitoring period

Data Unit / Parameter:	$\Delta C_{P,DegW,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock changes as a result of degradation in stratum *i* in the project area at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	Year: ΔCP,Deg,i,t (t CO2-e) 2011: 0 2012: 0
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 8, VMD0015
Any comment:	

Data Unit / Parameter:	$PROP_{IMM}$
Data unit:	Proportion
Description:	Estimated proportion of baseline deforestation caused by immigrating population
Source of data:	Calculated based on results of survey of communities in the area around the project.
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.

Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	0.203
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	$PROP_{RES}$
Data unit:	Proportion
Description:	Estimated proportion of baseline deforestation caused by population that has been resident for ≥5 years
Source of data:	Calculated based on results of survey of communities in the area around the project.
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	0.797
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	*TOTFOR*
Data unit:	ha
Description:	Total available national forest area
Source of data:	Official data, peer reviewed publications, remotely sensed imagery (coarse scale imagery is appropriate) or cadastral maps and other verifiable sources
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	Prior to each verification event and at least every

	5 years.
Value applied:	519,522,377
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	*PROTFOR*
Data unit:	ha
Description:	Total area of fully protected forests nationally
Source of data:	Official data, peer reviewed publications and other verifiable sources
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	Prior to each verification event and at least every 5 years.
Value applied:	0
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	*MANFOR*
Data unit:	ha
Description:	Total area of forests under active management nationally
Source of data:	Official data, peer reviewed publications and other verifiable sources
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	Prior to each verification event and at least every 5 years.
Value applied:	0

Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	*ARRL,forest,t*
Data unit:	ha
Description:	Remaining area of forest in RRL at time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Prior to each verification event and at least every 5 years.
Value applied:	2,254,620
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Calculated as the total area of the RRL minus all nonforested areas.
Any comment:	

Data Unit / Parameter:	*Aburn,q,i,t.*
Data unit:	ha
Description:	Area burnt in post-natural disturbance stratum *q* in stratum *i,* at time *t*;
Source of data:	*See parameter* $A_{DistPA,q,i,t}$
Description of measurement methods and procedures to be applied:	Monitored as part of $A_{DistPA,q,i,t}$
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	FAP-alluvial Aburn,q,i,t. (ha) / FAB +FAP Aburn,q,i,t. (ha) 36.2 / 2.7 66.7 / 15.4
Monitoring equipment:	

QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Calculation method:	
Any comment:	

Data Unit / Parameter:	dbh
Data unit:	cm
Description:	diameter at breast height
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in Appendix B of the project document
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Detailed in the 2011 Purus Project forest inventory
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	dbasal
Data unit:	cm
Description:	Basal diameter
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in Appendix B of the project document
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Detailed in the 2011 Purus Project forest inventory
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Calculation method:	

Any comment:	Dbh may be used as a conservative estimate of dbasal

Data Unit / Parameter:	H
Data unit:	m
Description:	Height of tree
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in Appendix B of the project document
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Detailed in the 2011 Purus Project forest inventory
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	Dn
Data unit:	cm
Description:	Diameter of piece n of dead wood along the transect
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in Appendix B of the project document
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Detailed in the 2011 Purus Project forest inventory
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	N
Data unit:	dimensionless
Description:	Total number of wood pieces intersecting the transect
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in Appendix B of the project document
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Detailed in the 2011 Purus Project forest inventory
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	L
Data unit:	m
Description:	Length of the transect
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided in Appendix B of the project document
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Detailed in the 2011 Purus Project forest inventory
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	Cpost
Data unit:	t CO_2-e ha^{-1}

Description:	Average carbon stocks remaining after deforestation.
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	None
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	46.9
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	See Table 3.12 of the PD.
Any comment:	

Data Unit / Parameter:	Bi,t
Data unit:	tonnes d. m. ha-1
Description:	Average aboveground biomass stock before burning stratum i,time t
Source of data:	Calculated using forest inventory data
Description of measurement methods and procedures to be applied:	Detailed forest inventory procedures are provided in Appendix B of the project document
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	FAP-alluvial B,i,t (t d.m./ha): 196.2 FAB +FAP B,i,t (t d.m./ha): 155.0
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Calculation method:	
Any comment:	

3.3 Description of the Monitoring Plan

This monitoring plan has been developed in close conjunction with module VMD0015 of the REDD Methodological Module, “Methods for monitoring of greenhouse gas emissions and removals (M-MON).” This section focuses on establishing procedures for monitoring deforestation, illegal degradation, natural disturbance, and project emissions ex-post in the project area and leakage belt. Further, procedures for updating the forest carbon stocks and revising the baseline are also provided below.

For accounting purposes, the project conservatively assumes stable stocks and no biomass monitoring is conducted in areas undergoing carbon stock enhancement, as permitted in the methodology monitoring module VMD0015, hence $\Delta C_{P,Enh,i,t}$ is set to 0.

Further as no commercial harvest of timber (including FSC selective logging) occurs in the baseline or with project case, the degradation due to harvest of timber will not be monitored, thus parameter $\Delta C_{P,SelLog,i,t}$ is set to 0.

A separate section on quality assurance/quality control and data archiving procedures covers all monitoring tasks.

Organizations responsible for monitoring are listed below in Table 3.1. These organizations are responsible for implementing all aspects of a particular monitoring task, as described in the monitoring sub-sections below.

Monitoring Deforestation and Natural Disturbance

Forest cover change due to deforestation and natural disturbance is monitored through periodic assessment of classified satellite imagery, see below, covering the project area. Emissions ($\Delta C_{P,Def,i,t}$ and $\Delta C_{P,DistPA,i,t}$ for deforestation and natural disturbance, respectively) are estimated by the multiplying areas $A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$,, for deforestation and natural disturbance, respectively, by the forest carbon stock remaining after deforestation or disturbance. Note that $A_{DistPA,q,i,t}$,, is limited to the area where credits have been issued and is identified as the overlap between the delineated area of the disturbance and the summed area of unplanned deforestation in the project area to the year in which the disturbance occurred. Stock estimates from the initial field inventory completed in 2011, are valid for 10 years (per VM0007). Table 3.1 shows the data and parameters monitored.

Table 3.1 Data and Parameters for Monitoring Deforestation and Natural Disturbance.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
$\Delta C_{P,Def,i,t}$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t	t CO_2e	Calculated
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum i at time t	t CO_2e	Calculated
$A_{DefPA,u,i,t}$	Area of recorded deforestation in the project area stratum i converted to land use u at time t	Ha	Monitored for each verification event
$A_{DistPA,q,i,t}$	Area impacted by natural disturbance in post-natural disturbance stratum q in stratum i, at time t	Ha	Monitored for each verification event

$C_{BSL,i}$	Carbon stock in all pools in the baseline case in stratum i	t CO_2e ha^{-1}	Estimated from the forest carbon inventory
ARRL,forest,t	Remaining area of forest in RRL at time t	Ha	Updated prior to each verification event

Changes in forest cover ($A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$) will be monitored using data provided by the State of Acre. UCEGEO, the GIS department within the Climate Change Institute, Acre State government, produces an annual dataset on the extent and spatial location of all deforestation within the state using Landsat images. Deforestation and natural disturbance will be distinguished using ancillary data which may include but is not limited to high resolution imagery, digital elevation models (to identify steep areas prone to landslides), information from local land managers, etc.

In the case where this dataset ceases to be available, ex-post deforestation will be determined by classification of remotely sensed imagery and land use change detection procedures.

The project area (and leakage belt boundary), as set in the PD, will serve as the initial "forest cover benchmark map" against which changes in forest cover will be assessed over the interval of the first monitoring period; the entire project area has been demonstrated to meet the forest definition at the beginning of the crediting period. For subsequent monitoring periods, change in forest cover will be assessed against the preceding classified forest cover map marking the beginning of the monitoring interval. Thus, the forest benchmark map is updated at each monitoring event.

The area of remaining forest in the RRL (ARRL,forest,t) is derived by subtracting by the nonforested area within the RRL, as found in the forest benchmark map (updated at each monitoring event), from the total area of the RRL.

Monitoring Illegal Degradation

Emissions due to illegal logging will be tracked by conducting surveys in the surrounding areas every two years. Locations surveyed will include:

- Families residing on the Moura & Rosa property adjacent to the project area; and
- Nearby ranches and rural properties, along the Purus River and secondary roads approaching the project area.

Surveys will produce information on wood consumers (fuel wood and wood for construction and charcoal production) in the surroundings areas, as well as general indications on the areas where wood is sourced from and maximum depth of penetration of harvest activities from access points.

In the event that any potential of illegal logging occurring in the project area is detected from the surveys (i.e. ≥ 10% of those interviewed/surveyed believe that degradation may be occurring within the project boundary), temporary sample plots will be allocated and measured in the area of the project indicated by the surveys as a potential source area for illegally-harvested wood. The potential degradation area within the project area ($A_{DegW,i}$) will be delineated based on survey results, incorporating general area information and maximum depth of penetration. Rectangular plots 10 meters by 1 kilometer (1 ha area)

will be randomly or systematically allocated in the area, sufficient to produce a 1% sample of the area, and any recently-cut stumps or other indications of illegal harvest will be noted and recorded. Diameter at breast height, or diameter at height of cut, whichever is lower, of cut stumps will be measured.

In the event that the sample plot assessment indicated that illegal logging is occurring in the area, supplemental plots will be allocated to achieve a 3% sample of the area. Biomass will be estimated from measured diameters (conservatively assuming that diameters of stumps cut below breast height are equivalent to diameter at breast height) applying the allometric equations of Brown (1997) and otherwise maintain consistency with analytical procedures applied in the original forest inventory report. Emissions due to illegal logging ($\Delta C_{P,DegW,i,t}$) are estimated by multiplying area ($A_{DegW,i}$) by average biomass carbon of trees cut and removed per unit area ($C_{DegW,i,t} / AP_i$).

The more intensive 3% sample will be carried out once every 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area to produce an estimate of emissions resulting from illegal logging ($\Delta C_{P,DegW,i}$). Estimates of emissions will be annualized (to produce estimates in t CO_2e per year) by dividing the emission for the monitoring interval by the number of years in the interval.

Table 3.2 Data and Parameters for Monitoring Illegal Degradation.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
$A_{DegW,i,t}$	Area potentially impacted by degradation processes in stratum i	Ha	Delineated based on survey results indicating general area of project potentially accessed and typical depth of penetration of illegal harvest activities from points of access
$C_{DegW,i,t}$	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum i at time t	t CO_2e	Estimated from diameter measurements of cut stumps in sample plots
AP_i	Total area of degradation sample plots in stratum i	Ha	Calculated as 3% of $A_{DegW,i,t}$
$\Delta C_{P,DegW,i,t}$	Net carbon stock changes as a result of degradation in stratum i in the project area at time t	t CO_2e	Calculated

Monitoring Project Emissions

With project emissions are calculated as the sum of emission from fossil fuel combustion (EFC,i,t) + non-CO_2 emissions due to biomass burning (EBiomassBurn,i,t) + direct N_2O emissions as a result of nitrogen application (N2Odirect-N,i,t.). As stipulated in the methodology, fossil fuel combustion in all situations is an optional emission source. Further, no nitrogen is applied on alternative land uses in the with project case and hence project emissions therefore equal EBiomassBurn and are calculated using the VMD0013, "Estimation of greenhouse gas emissions from biomass burning (E-BB)" of the AD Partners modular REDD Methodology.

Non-CO_2 emissions from biomass burning in the project case include emissions from burning associated with deforestation and burning associate with natural disturbance, i.e. forest fire. It will be conservatively assumed that the total area burnt during the deforestation process is equal to the area deforested, ADefPA,u,i,t. Thus, the area used when calculating E-BB is equal to Aburn,i,t. (area burnt) = Aburn,q,i,t. (area burnt in natural disturbance) + ADefPA,u,i,t (area burnt via deforestation in project ex post)."

Table 3.3 Data and Parameters for Monitoring Emissions from Biomass Burning.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
E BiomassBurn,t	Greenhouse emissions due to biomass burning as part of deforestation activities in stratum i in year t	tCO_2e of each GHG (CH_4, N_2O)	Calculated
Aburn,i,t	Area burnt for stratum i at time t	Ha	Monitored for each verification event
Bi,t	Average aboveground biomass stock before burning stratum i, time t	tonnes d. m. ha-1	Conservatively assumed to be the carbon stock in all pools in the baseline case (CBSL,i).
COMF i	Combustion factor for stratum i; dimensionless	dimensionless	0.45 for primary open tropical forest. Derived from Table 2.6 of IPCC, 2006.
Gg,i	Emission factor for stratum i for gas g	kg t-1 dry matter burnt	GCH_4 = 6.8 g kg-1 and GN_2O = 0.2 g kg-1. Derived from Table 2.5 of IPCC, 2006.
GWPg	Global warming potential for gas g	t CO_2/t gas g	Default values from IPCC SAR: CH_4 = 21; N_2O = 310).

Monitoring Leakage

Leakage by local agents of deforestation is quantified in the leakage belt. The area deforested in the leakage belt (ADefLB,i,t) is estimated in the same manner as the area deforested in the with project case ($A_{DefPA,u,i,t}$) using the procedures outlined above in the monitoring deforestation section. Activity shifting leakage within the leakage belt (ΔCLK-ASU-LB) is then calculated as the with project emissions in the leakage belt (ΔCP,LB) minus the baseline emissions in the leakage belt (ΔCBSL,LK,unplanned).

Table 3.4 Data and Parameters for Monitoring Activity Shifting Leakage.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
ΔCP,LB	Net greenhouse gas emissions within the leakage belt in the project case	t CO_2e	Calculated
ADefLB,i,t	Area of recorded deforestation in the leakage belt at time t	ha	Monitored for each verification event
$\Delta C_{P,Def,i,t}$	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t	t CO_2e	Calculated

Immigrant leakage is calculated using a series of equations found in the LK-ASU module. Most of the data for calculating immigrant leakage has been derived for the ex-ante estimates (including ΔCBSL,LK,unplanned; AVFOR; TOTFOR; PROTFOR; MANFOR; PROPLB; LBFOR; COLB; CLB; PROPCS; and ABSL,PA,unplanned,t) or gathered in the course of monitoring activity shifting leakage within the leakage belt and deforestation in the project area (including ADefPA; ADefLB,i,t; and ΔCP,LB).

The monitoring parameters MANFOR, PROTFOR, TOTFOR will be sourced from official data, peer reviewed publications or other verifiable sources, such as the Brazil Global Forest Resources Assessment Report published by the FAO and these monitoring parameters will be updated on review of current literature at least every 5 years. Demonstration that managed and protected forests will be protected against deforestation will further be demonstrated, as stipulated in the LK-ASU module.

Monitoring immigrant leakage will therefore consist of implementing surveys in communities living within 2 kilometers of the boundaries of the leakage belt and project area to determine what proportion of the agents of deforestation have been resident in and around the leakage belt and project area for ≥ 5 years (PROPRES) and the proportion of area deforested by population that has migrated into the area in the last 5 years (PROPIMM). As it is extremely sensitive to ask explicit questions regarding responsibility for deforestation, “the proportion of area deforested by population that has migrated into the area in the last 5 years” is assumed to be equal to the percentage of recent immigrants among local population with potential access to the project area (i.e. without directly asking if they are deforestation agents). Similarly, the “proportion of baseline deforestation caused by population that has been resident for ≥5 years” is assumed to be equal to the percentage of the local population residing in the area longer than 5 years with potential access to the project area.

Table 3.5 Data and Parameters for Monitoring Immigrant Leakage.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
PROPIMM	Proportion of area deforested by immigrant agents in the	proportion	Monitored prior to each verification event and at least every 5 years

	leakage belt and project area		
PROPRES	Proportion of baseline deforestation caused by population that has been resident for ≥5 years	proportion	Monitored prior to each verification event and at least every 5 years
TOTFOR	Total available national forest area	ha	Monitored prior to each verification event and at least every 5 years
PROTFOR	Total area of fully protected forests nationally	ha	Monitored prior to each verification event and at least every 5 years
MANFOR	Total area of forests under active management nationally	ha	Monitored prior to each verification event and at least every 5 years

Updating Forest Carbon Stocks Estimates

Forest carbon stock estimates will be derived from field measurements less than or equal to 10 years old. Sample plots will be randomly located in areas within the Purus Project and measured following standard operating procedures located in Appendix B of the project document. Biomass will be estimated applying the following allometric equations and otherwise maintain consistency with analytical procedures applied in the original inventory ("Forest biomass carbon inventory for the Purus REDD Project, Acre State, Brazil," 2011).

For live trees, biomass is calculated as a function of diameter at breast height (DBH; in cm) using the predictive model developed by Brown[4] for tropical moist forest stands. Results of this equation are conservatively adjusted downward using a calibration factor of 0.985. Application of the "moist" equation reflects the annual precipitation for the inventoried area, 2100mm.

aboveground biomass (kg) = ((42.69-12.8*(DBH)+1.242*(DBH)^2))*0.985 Equation 3.1

For palms, height and dbh (a conservative estimate of basal diameter) measurements are used to estimate the aboveground volume of a paraboloid and then mean (species level) Amazonian palm specific gravity of 0.31 g/cm3 estimated by Baker et al (2004) will be applied. The estimate of biomass for palms is therefore to be limited to the main trunk (bole) of the palm. Thus, for palms

aboveground biomass (Mg) = 0.5*Π*(basal diameter(cm)/200)^2*height(m)*0.31 Equation 3.2

[4]Brown, S., 1997. Estimating biomass and biomass change of tropical forests: A primer. FAO Forestry Paper: vii, 55 p.

Root biomass density is estimated at the cluster sample level applying the equation developed by Cairns et al.[5] , where

Root Biomass Density (t/ha) = EXP (-1.085 + 0.925 LN(aboveground biomass density)) Equation 3.3

The volume of lying dead wood per unit area is estimated using the equation (Warren and Olsen[6]) as modified by Van Wagner[7] separately for each dead wood density class:

$$V_{LDW} = \frac{\pi^2 * \left(\sum_{n=1}^{N} D_n^{\,2} \right)}{8 * L}$$ Equation 3.4

where:

V_{LDW} Volume of lying dead wood per unit area; m^3 ha^{-1}

D_n Diameter of piece n of dead wood along the transect; cm

N Total number of wood pieces intersecting the transect; dimensionless

L Length of the transect; m

Length of each transect was corrected for slope. The volumes per unit area of each dead wood density class are then multiplied by their respective densities to convert to a mass per unit area.

Biomass of standing dead wood is estimated using the allometric equation for live trees in the decomposition class 1. In decomposition class 2, the estimate of biomass was limited to the main trunk (bole) of the tree, in which case the biomass was calculated converting volume to biomass using dead wood density classes. Volume was estimated as the volume of a cone, as specified in the VM0007 module, “Estimation of carbon stocks in the dead wood pool”.

Density of dead wood is determined through sampling and laboratory analysis. Discs are collected in the field and decomposition class and green volume determined as per standard protocols (see Appendix B of the project document for more details). The resulting dry weight is recorded and used to calculate dead wood density as oven-dry weight (g) / green volume (cm^3) for each sample.

Dry mass is converted to carbon using the default carbon fraction of 0.47 t C/t d.m. (as recommended by IPCC[8] Guidelines for National Greenhouse Gas Inventories).

[5] Cairns, M. A., S. Brown, E. H. Helmer, and G. A. Baumgardner. 1997. Root biomass allocation in the world’s upland forests. Oecologia 111, 1-11.
[6] Warren, W.G. and Olsen, P.F. (1964) A line intersect technique for assessing logging waste. Forest Science 10: 267-276.
[7] Van Wagner, C.E. (1968). The line intersect method in forest fuel sampling. Forest Science 14: 20-26.
[8] IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Chapter 4 AFOLU (Agriculture, Forestry and Other Land-use).

Revision of the Baseline

The baseline as outlined here in the Project Description is valid for 10 years, through May 23, 2021. The baseline will be revised every 10 years from the project start date.

Data collection procedures in regards to revision of the baseline will include participatory rural appraisals, interviews and collaboration with the Acre State government, UCEGEO, the GIS department within the Climate Change Institute, and municipal officials. In the case, where the Acre State government no longer produces the annual dataset on the extent and spatial location of all deforestation within the state, deforestation maps will be prepared by classifying remotely sensed imagery. Other datasets used to substantiate aspects of the baseline with be from official government sources, peer reviewed publications, or other reputable sources.

Quality Assurance/Quality Control and Data Archiving Procedures

Monitoring Deforestation, Natural Disturbance, and Leakage

To ensure consistency and quality results, spatial analysts carrying out the imagery processing, interpretation, and change detection procedures will strictly adhere to best practices and good practice guidelines, when using the alternative method for quantifying deforestation. All data sources and analytical procedures will be documented and archived (detailed under data archiving below).

Accuracy of the classification will be assessed by comparing the classification with ground-truth points or samples of high resolution imagery. Any data collected from ground-truth points will be recorded (including GPS coordinates, identified land-use class, and supporting photographic evidence) and archived. Any sample points of high resolution imagery used to assess classification accuracy will also be archived. Samples used to assess classification accuracy should be well-distributed throughout the project area (as far as is possible considering availability of high resolution imagery and/or logistics of acquiring ground-truth data), with a minimum sampling intensity of 50 points each for the forest and non-forest classes.

The classification will only be used in the forest cover change detection step if the overall classification accuracy, calculated as the total number of correct samples / the total number of samples, is equal to or exceeds 90%.

All data sources and processing, classification and change detection procedures will be documented and stored in a dedicated long-term electronic archive.

Information related to monitoring deforestation maintained in the archive will include:

- Forest / non-forest maps;
- Documentation of software type and procedures applied (including all pre-processing steps and corrections, spectral bands used in final classifications, and classification methodologies and algorithms applied), if applicable; and
- Data used in accuracy assessment - ground-truth points (including GPS coordinates, identified land-use class, and supporting photographic evidence) and/or sample points of high resolution imagery.

Forest Carbon Stocks and Degradation

The following steps will be taken to control for errors in field sampling and data analysis:

1. Trained field crews will carry out all field data collection and adhere to standard operating procedures. Pilot sample plots shall be measured before the initiation of formal measurements to appraise field crews and identify and correct any errors in field measurements. Field crew leaders will be responsible for ensuring that field protocols are followed to ensure accurate and consistent measurements. To ensure accurate measurements, the height of diameter at breast height (1.3 m) will be periodically re-assessed by personnel during the course of the inventory.
2. An opportunistic sample of plots will be re-measured to identify and correct any field measurement issues which arise during implementation of the monitoring plan and to assess measurement errors. Re-measurement for this purpose will be done by different field personnel.
3. Field measurement data will be recorded on standard field data sheets and entered into an excel database for data management and quality control. Potential errors in data entry (anomalous values) will be verified or corrected consulting the original data sheets or personnel involved in measurement. Original data sheets will be permanently archived in a dedicated long-term electronic archive. The electronic database will also archive GIS coverages detailing forest and strata boundaries and plot locations.

Quality control procedures for sampling degradation will include steps 1 and step 3, above.

Quality control procedures related to monitoring leakage include conducting a review of the current literature at least every 5 years to source information on the area of the monitoring parameters MANFOR, PROTFOR, and TOTFOR. Further, participatory rural appraisals used to assess the length of time people have been living in the project area and leakage belt will be implemented by personnel with experience conducting community surveys in rural Brazil.

Personnel involved in the revising of the baseline will have detailed knowledge in regards to spatial modeling and land use change and deep familiarity with REDD methodologies. Remote sensing data used will include officially published dataset, or classified imagery, which meets accuracy assessment requirements as laid out in the methodology.

Data Archiving

Data archived will be maintained through at least two years beyond the end of the project crediting period. Given the extended time frame and the pace of production of updated versions of software and new hardware for storing data, electronic files will be updated periodically or converted to a format accessible to future software applications, as needed.

Organization, Responsibilities, and Monitoring Frequency

For all aspects of project monitoring, Purus Project staff will ensure that data collection, processing, analysis, management and archiving are conducted in accordance with the monitoring plan.

Table 3.6. Type of Monitoring and Party Responsible for Monitoring.

Variables to be monitored	**Responsible**	**Frequency**
Monitoring deforestation and natural disturbance	Moura & Rosa	Prior to each verification
Monitoring illegal degradation	Moura & Rosa	Every two years
Monitoring project emissions	CarbonCo	Prior to each verification
Activity shifting immigrant leakage assessment	Moura & Rosa	Prior to each verification event and at least every 5 years.
Updating forest carbon stocks estimates	CarbonCo	At least every 10 years.
Revision of the baseline	CarbonCo	At least every 10 years.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions for the project activities, for project years 2011 to 2012, are found in Table 4.1 below (derived from Section 3.1 of the VCS PD)

Table 4.1. Baseline emissions in the project area and leakage belt.

Year	ΔCBSL,PA (tCO2-e)	ΔCBSL,LB (tCO2-e)
2011	126,240	205,406
2012	142,812	225,355
Total	269,052	430,761

4.2 Project Emissions

Project emissions are estimated by applying module M-MON (VMD0015, Version 2.0) of Methodology VM0007. Equation 4.1 is used to calculate ex-post project emissions, along with parameters listed in Table 4.2.

Equation 4.1. Equation for calculating the net GHG emissions within the project area under the project scenario.

$$\Delta C_P = \sum_{t=1}^{t^*} \sum_{i=1}^{M} \left(\Delta C_{P,DefPA,i,t} + \Delta C_{P,Deg,i,t} + \Delta C_{P,DistPA,i,t} + GHG_{P-E,i,t} - \Delta C_{P,Enh,i,t} \right)$$

Table 4.2. Parameters used to calculate ex-post project emissions.

Parameter	Description
ΔC_P	Net greenhouse gas emissions within the project area under the project scenario; t CO_2e
$\Delta C_{P,DefPA,i,t}$	Net carbon stock change as a result of deforestation in the project area in the project case in stratum i at time t; t CO_2e
$\Delta C_{P,Deg,i,t}$	Net carbon stock change as a result of degradation in the project area in the project case in stratum i at time t; t CO_2e
$\Delta C_{P,DistPA,i,t}$	Net carbon stock change as a result of natural disturbance in the project area in the project case in stratum i at time t; t CO_2e
$GHG_{P-E,i,t}$	Greenhouse gas emissions as a result of deforestation and degradation activities within the project area in the project case in stratum i in year t; t CO_2e
$\Delta C_{P,Enh,i,t}$	Net carbon stock change as a result of forest growth and sequestration during the project in areas projected to be deforested in the baseline in stratum i at time t; t CO_2e

Deforestation

Emissions resulting from deforestation in the with-project case (ΔCP,DefPA,i,t) are calculated as the area of deforestation (ADefPA,u,i,t) multiplied by the net change in carbon stocks. All parameters in Table 4.3 are sourced from Section 3.1 and 3.2 of this report. The area deforested was derived from the 2012 Acre deforestation dataset (see Section 5 Additional Information, below) combined with the original strata map. CBSL and Cpost values were those derived in the original forest inventory and the project document, respectively.

Table 4.3 Net carbon stock change (t CO2-e) as a result of deforestation in the project area (ΔCP,DefPA,i,t).

Year	FAP-alluvial ADefPA,u,i,t (ha)	FAP-alluvial CBSL,i (t CO2-e/ha)	FAB +FAP ADefPA,u,i,t (ha)	FAB +FAP CBSL,i (t CO2-e/ha)	Cpost (t CO2-e ha-1)	ΔCP,DefPA,i,t (t CO2-e)
2011	36.2	411.3	2.7	325.5	46.9	13,960
2012	66.7	411.3	15.4	325.5	46.9	28,613
Total	103.0		18.1			42,573

While deforestation decreased relative to the baseline case, a total of 103 ha were still deforested over this monitoring period. There was no singularly large area of deforestation but rather numerous small areas of deforestation spread over the project area, mostly in close proximity to the Purus River.
This deforestation took place despite deforestation monitoring efforts. Forest monitoring at the Purus Project took place via a trike and via boat along the Purus River. The trike allowed for aerial monitoring throughout the Project Zone, while monitoring via boat focused on the Project Zone adjacent to the Purus River. There were a total of 11 official deforestation monitoring reports completed for the 2011 to 2012 monitoring period.

Degradation

Net carbon stock change as a result of degradation in the project area ($\Delta C_{P,Deg,i,t}$) are limited to emissions resulting from degradation due to illegal logging (ΔCP,DegW) as no commercial logging occurs in either the baseline or with-project case (i.e., ΔCP,SelLog,i,t is equal to zero).
While no acts of illegal logging were identified by forest monitors, additional degradation surveys were conducted by CarbonCo and Carbon Securities, with assistance from Moura & Rosa, on April 6 and 7, 2013. Fifty percent of the survey respondents (i.e., 5 out of 10) indicated they collect charcoal or timber from forested areas. Using conservative assumptions and further survey information on the amount of charcoal/timber collected, emissions from degradation were estimated. Degradation emission estimates were very small due to the low population pressures and insignificant amounts of charcoal and timber collected[9]. Degradation emissions (427 t CO2) have been deemed to be de minimis and do not have to be accounted for as this decrease in carbon stocks amounts to less than five percent of the total GHG benefits generated this monitoring period (186,126 t CO2).

[9] See project database for details of de minis analysis.

The net carbon stock change as a result of degradation in the project area ($\Delta C_{P,Deg,i,t}$) is therefore equal to zero for the monitoring period, 2011-2012.

Natural Disturbance

No areas of natural disturbance were reported in the area of projected deforestation in the baseline during the 2011-2012 period by forest monitors or local land managers, nor was evident or could be distinguished (from anthropogenic deforestation, accounted for above) with remote sensing, and therefore $A_{DistPA,q,i,t}$ is assumed to be 0. As there is no ground based evidence of natural disturbance, net carbon stock changes resulting from natural disturbance in the project area in the project case are reported to be zero (i.e., $\Delta C_{P,DistPA,i,t} = 0$).

GHG Emissions

As forest monitors reported evidence of fire on recently cleared land, N_2O and CH_4 emissions from biomass burning have been accounted for. Using parameters found in Section 3.1 and 3.2 and Table 3.3, emissions from biomass burning (EBB) were calculated as the product of the area burned, the aboveground carbon stocks, a combustion factor, a GHG emission factor, and the global warming potential. It was conservatively assumed that Aburn,i,t = ADefPA,u,i,t (i.e., all areas deforested in the project area were burnt).

Table 4.4. Calculation of N_2O emissions resulting from burning.

Year	FAP-alluvial Aburn,i,t (ha)	FAP-alluvial B,i,t (t d.m./ha)	FAB +FAP Aburn,i,t (ha)	FAB +FAP B,i,t (t d.m./ha)	COMF	G,N20 (kg/t d.m. burnt)	GWP,N20 (t CO2/t gas g)	E-N2O BiomassBurn (tCO2e)
2011	36.2	196.2	2.7	155.0	0.45	0.2	310.0	210
2012	66.7	196.2	15.4	155.0	0.45	0.2	310.0	432
Total								642

Table 4.5. Calculation of CH_4 emissions resulting from burning.

Year	FAP-alluvial Aburn,i,t (ha)	FAP-alluvial B,i,t (t d.m. /ha)	FAB +FAP Aburn,i,t (ha)	FAB +FAP B,i,t (t d.m. /ha)	COMF	G,CH4 (kg/t d.m. burnt)	GWP,CH4 (t CO2/t gas g)	E-CH4 BiomassBurn (tCO2e)
2011	36.2	196.2	2.7	155.0	0.45	6.8	21.0	484
2012	66.7	196.2	15.4	155.0	0.45	6.8	21.0	995
Total								1,479

Table 4.6. Calculation of EBB and GHGP.

Year	E-N2O BiomassBurn (tCO2e)	E-CH4 BiomassBurn (tCO2e)	E-BiomassBurn (tCO2e)	GHGP-E,i,t (t CO2-e)
2011	210	484	694	694

2012	432	995	1,427	1,427
Total	642	1,479	2,121	2,121

As justified in Section 3.3, project emissions (GHGP) equal emissions from biomass burning (EBB).

Forest growth and sequestration

As stated in the project document, it is conservative to exclude forest growth and sequestration during the project, hence the parameter $\Delta C_{P,Enh,i,t}$ has been set to zero.

Net project emissions

Net emissions within the project area calculated in Table 4.7.

Table 4.7. Net project emission within the project area, ΔCP (t CO2-e).

Year	ΔCP,DefPA,i,t (t CO2-e)	ΔCP,Deg,i,t (t CO2-e)	ΔCP,DistPA,i,t (t CO2-e)	GHGP-E,i,t (t CO2-e)	ΔCP,Enh,i,t (t CO2-e)	ΔCP (t CO2-e)
2011	13,960	0	0	694	0	14,654
2012	28,613	0	0	1,427	0	30,040
Total	42,573	0	0	2,121	0	44,694

4.3 Leakage

Leakage emissions from displacement of unplanned deforestation are estimated in conformance with the VCS modular REDD methodology VM0007, specifically the LK-ASU module. This module provides for accounting for activity shifting leakage resulting from both local and immigrant deforestation agents.

Activity shifting from local agents in the leakage belt was tracked by monitoring deforestation and stock changes in the leakage belt. Emissions were calculated as the difference between stocks before and after deforestation, as for project emissions. The area deforested was derived from the 2012 Acre deforestation dataset combined with the original strata map. CBSL and Cpost values were those derived in the original forest inventory and the project document, respectively.

Table 4.8. Area (ha) deforested in the leakage belt (ADefLB,u,i,t) and resulting emissions ΔCP,DefLB,i,t (t CO2e).

Year	FAP-alluvial ADefLB,u,i,t (ha)	FAP-alluvial CBSL,i (t CO2-e/ha)	FAB +FAP ADefLB,u,i,t (ha)	FAB +FAP CBSL,i (t CO2-e/ha)	FAP + FAB ADefLB,u,i,t (ha)	FAP + FAB CBSL,i (t CO2-e/ha)	Cpost (t CO2-e ha-1)	ΔCP,LB (t CO2-e)	ΔCBSL,LK,unplanned (t CO2-e)	ΔCLK-ASU-LB (t CO2-e)
2011	34.3	411.3	45.8	325.5	0.0	512.9	46.9	25,256	205,406	0
2012	88.7	411.3	83.5	325.5	0.0	512.9	46.9	55,580	225,355	0
Total	123.0		129.3					80,836	430,761	0

The net greenhouse gas emission in the project case for the leakage belt, parameter *ΔCP,LB*, is equal to the sum of stock changes dues to deforestation through 2012, equal to 80,836 t CO2e. Estimated baseline annual emissions in the leakage belt from 2011 through 2012 were 430,761 t CO2e. Emissions from deforestation in the leakage belt were less than the projected emissions from deforestation in the leakage belt, and thus no leakage from activity shifting within the leakage belt has occurred.

Activity shifting leakage outside the leakage belt was tracked by monitoring deforestation in the project area ($A_{DefPA,i,t}$) and leakage belt ($A_{DefLB,i,t}$). The area deforested by immigrants outside the Leakage Belt and project area under the project scenario (ALK-OLB) is then calculated as the difference between the total area deforested by immigrant agents in the baseline scenario in the project area (ALK-IMM,t) and the area deforested by immigrants in the project area and Leakage Belt under the project scenario (ALK-ACT-IMM,t). This area (ALK-OLB in Table 4.9) is then multiplied by the difference between stocks before and after deforestation outside the leakage belt to yield the estimate of emissions due to activity shifting immigrant leakage ΔCLK-ASU,OLB.

Table 4.9. Emissions calculations for activity shifting immigrant leakage outside the leakage belt

Year	PROPIMM	ABSL,PA,unplanned,t (ha)	ALK-IMM,t (ha)	ADefPA,i,t (ha)	ADefLB,i,t (ha)	ALK-ACT-IMM,t (ha)	ALK-OLB,t (ha)	COLB (t CO2-e ha-1)	Cpost (t CO2-e ha-1)	ΔCLK-ASU,OLB (t CO2-e)
2011	0.188	474.6	89.0	39.0	80.1	22.3	66.7	372.3	46.9	21,689
2012	0.188	525.5	98.5	82.2	172.2	47.7	50.8	372.3	46.9	16,543
Total										38,232

Total leakage (38,232 t CO2-e) is then calculated as the sum of activity shifting leakage resulting from both local and immigrant (Table 4.10).

Table 4.10. Estimation of total leakage due to the displacement of unplanned deforestation

Year	ΔCLK-ASU-OLB (t CO2-e)	ΔCLK-ASU-LB (t CO2-e)	GHGLK,E (t CO2-e)	ΔCLK-AS,unplanned (t CO2-e)
2011	21,689	0	0	21,689
2012	16,543	0	0	16,543
Total	38,232	0	0	38,232

4.4 Summary of GHG Emission Reductions and Removals

Uncertainty in baseline carbon stock estimates, GHG emission estimates, and baseline deforestation projections were calculated applying the VM007 module X-UNC.

As stated in the methodology, "it is here assumed that there is zero uncertainty in baseline rate of deforestation or degradation where numbers are equal to a long-term average (BL-UP)", hence uncertainty associated with the baseline deforestation projections are equal to zero.

As GHG emission sources in the baseline are conservatively assumed to be zero, uncertainty surrounding this estimate is also considered to be zero.

Uncertainty is therefore limited to the baseline carbon stock as determined by the Purus Project forest carbon inventory[10]. Overall, the inventory produced an estimate of biomass carbon stocks at the project level of 92.0 t C/ha with a precision level of +/- 11.2% of the mean at the 95% confidence level

As the precision surrounding estimates of forest carbon stocks, 11.2% of the mean (at the 95% confidence level) are less than precision requirements of the methodology, +/- 15% of the mean (at a 95% confidence level), no uncertainty deduction was warranted or applied.

Estimates of GHG credits eligible for issuance as VCUs were calculated in Table 4.11, below; where

Estimated GHG emission reduction credits =

Baseline emissions, fixed for 10 years at validation *minus*

Project emissions *minus*

Leakage *minus*

Non-permanence Risk Buffer withholding (calculated as a percent of net change in carbon stocks prior to deduction of leakage)

Table 4.11. Estimated of Net Emission Reduction Credits.

Years	Estimated baseline emissions or removals (tCO_{2e})	Estimated project emissions or removals (tCO_{2e})	Estimated leakage emissions (tCO_{2e})	Risk buffer (%)	Deductions for AFOLU pooled buffer account (tCO2e)	GHG credits eligible for issuance as VCUs (tCO_{2e})
2011	126,240	14,654	21,689	10%	11,159	78,738
2012	142,812	30,040	16,543	10%	11,277	84,952
Total	269,052	44,694	38,232	0	22,436	163,690

[10] Eaton and Agapejev. 2012. Forest biomass carbon inventory for the Purus REDD Project, Acre State, Brazil.

5 ADDITIONAL INFORMATION

Deforestation Data

UCEGEO, the GIS department within the Climate Change Institute, Acre State government, produces an annual dataset on the extent and spatial location of all deforestation within the state. This dataset was received from UCEGEO by an Acre based consultant, Willian Antonio Willian Flores de Melo, in March 2013, whom CarbonCo worked with in developing the Purus Project baseline. As mentioned in the monitoring plan, changes in forest cover were determined using the 2012 Acre deforestation database provided UCEGEO. Figure 5.1 shows the area of deforestation in the project area and leakage belt for this monitoring period. Figure 5.2 shows the 2012 forest benchmark map which was produced using the aforementioned deforestation dataset.

Figure 5.1. Map of the 2011 and 2012 deforestation in the project area and leakage belt.

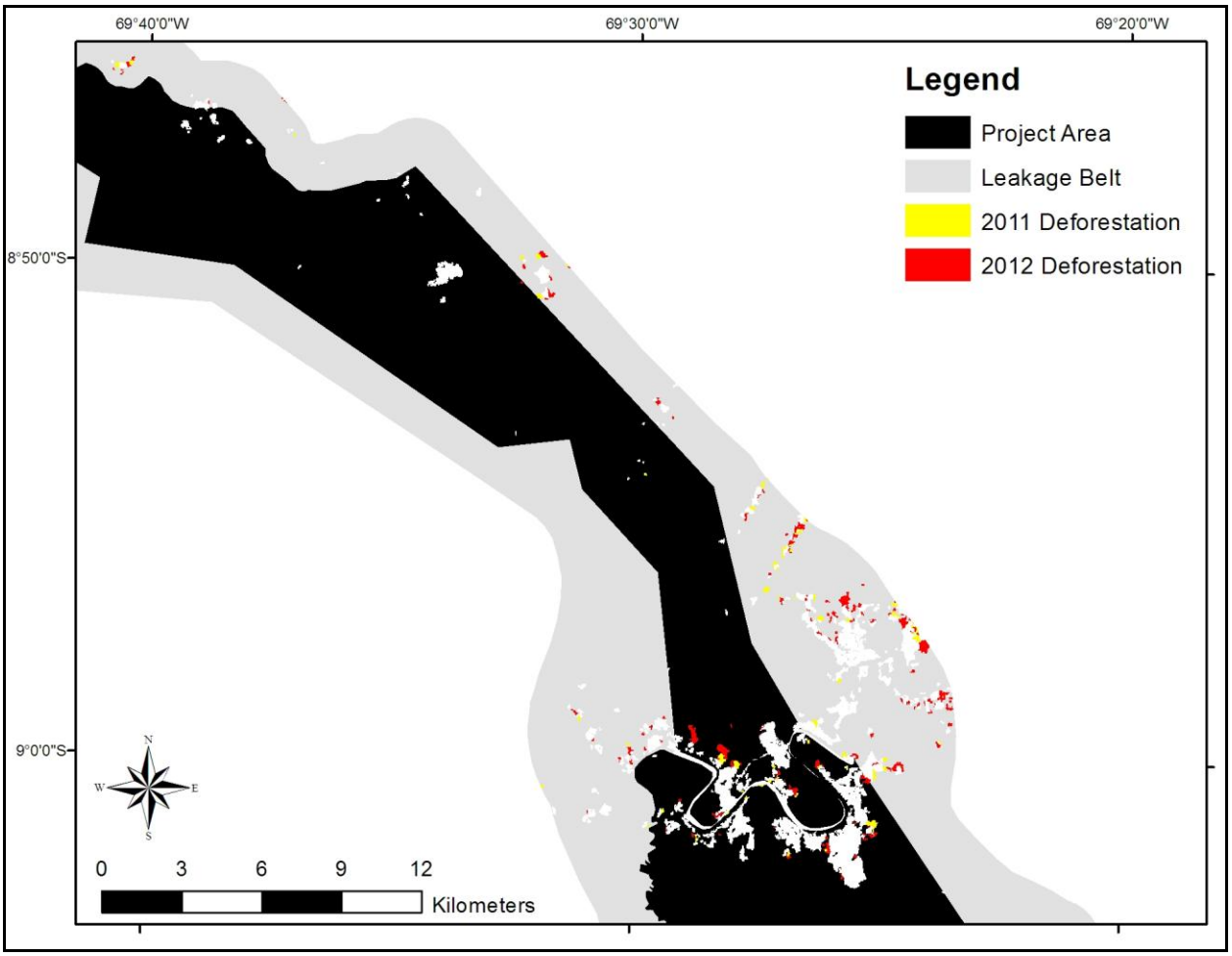
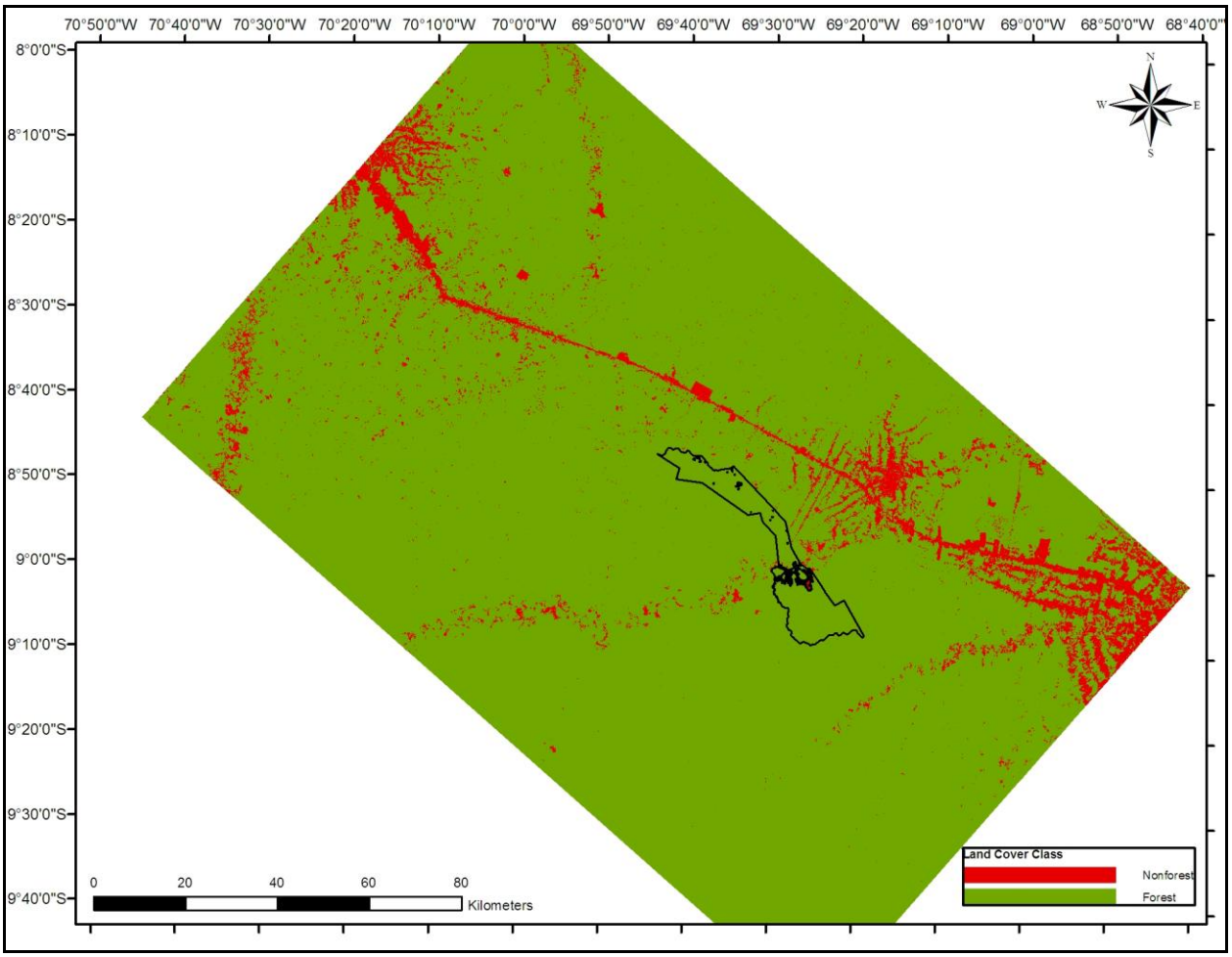


Figure 5.2. 2012 forest benchmark map.



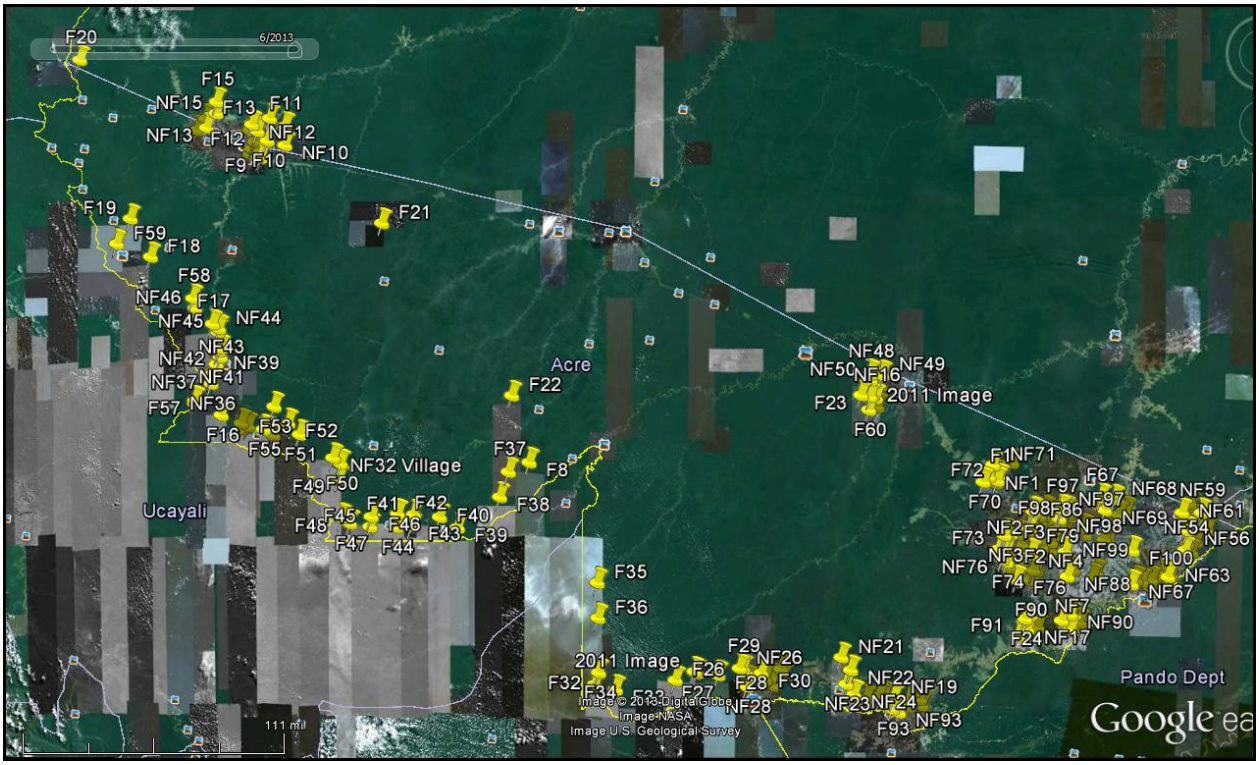
The deforestation in the project area and leakage belt is derived by subtracting the non-forested area at the time of the project start from the non-forested area at the end of 2012. The initial forest benchmark map at the time of the project start date referenced 2010 land cover data, which was the latest data available from UCEGEO at the time of the project start date.

Accuracy Assessment

Accuracy of the 2012 Acre deforestation database classification was assessed by Rebecca Dickson at TerraCarbon in May 2013 by comparing the classification with 200 ground truthing points derived from high-resolution imagery in Google Earth (e.g. Quickbird). The Quickbird satellite collects multispectral imagery at 2.4 and 2.8 meter resolutions, thus meets the requirements of the methodology of < 5m resolution for ground truthing imagery. All ground truthing sample points used to assess classification accuracy have been documented in a kml file and archived. Samples used to assess classification accuracy are distributed throughout the classification area (as far as is possible considering availability of high resolution imagery and/or logistics of acquiring ground truth data). All verification samples gathered from high-resolution imagery were from within 12 months of the classification year. Points were then compared to the forest/non-forest classification for 2012. The accuracy of the 2012 forest/non-forest map

was 99% for both the forest and non-forest class[11]. This meets the minimum map accuracy of 90% for each class as set forth in the methodology.

Figure 5.3. Map of the location of 100 forest and non-forest accuracy assessment points.



[11] More detailed results of the accuracy assessment can be found in the project archive.

APPENDICES

APPENDIX A. VCS NON-PERMANENCE RISK REPORT

A1.0 INTRODUCTION

The risk analysis has been conducted in accordance with the VCS AFOLU Non-Permanence Risk Tool, dated 04 October 2012. This tool assesses a project's internal risk, external risk, natural risk and mitigation measures which help to reduce risk. The risk ratings and supporting evidence are detailed in Section A1.1, A1.2, and A1.3, below. Letters in the risk factor column correspond to the risk factor explained in the VCS AFOLU Non-Permanence Risk Tool.

A1.1 INTERNAL RISKS

Project Management		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	Not applicable. Tree planting is not a project activity for which GHG credits will be issued.	0
b)	Ongoing enforcement is required to prevent encroachment by outside actors. The Purus Project employs forest patrols to prevent encroachment by outside actors into the project area.	2
c)	Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities.	2
d)	Local management partners are based in Rio Branco less than a day's travel from the project activity. There is a project manager living on the property and a project headquarters is being established on the property.	0
e)	Project proponents have developed other forest carbon projects and have been working in the forest carbon arena for over 5 years. Brian McFarland of CarbonCo has developed the "Tensas River National Wildlife Refuge Afforestation Project" under the VCS and the CCBS including managing the project design, implementation, and financing. The project proponents work alongside and have access to experts in carbon accounting and reporting (i.e., TerraCarbon) who have significant experience in all aspects of AFOLU project design and implementation, carbon accounting and reporting under the VCS Program. TerraCarbon has successfully validated and verified numerous projects under the VCS, including validation and verification of the VCS ARR project "Reforestation Across the Lower Mississippi Valley"	-2
f)	There is no adaptive management plan in place.	0
Total Project Management (PM) [as applicable, (a + b + c + d + e + f)] Total may be less than zero.		**2**

Financial Viability		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-d)	Project cash flow breakeven point is between years 4 and 7. Details are provided in a cash flow analysis which can be found in the project archive.	1
e-h)	Project has secured 100% of funding needed to cover the total cash out before the project reaches breakeven. Details are provided in a cash flow analysis which can be found in the project archive.	0
i)	Project has available at least 50% of the total cash out before project reaches breakeven. Project proponents are utilizing internal, non-restricted funds as evidenced in the project archive.	-2
Total Financial Viability (FV) [as applicable, ((a, b, c or d) + (e, f, g or h) + i)] Total may not be less than zero.		0

Opportunity Cost		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a	As the majority of baseline activities over the length of the project crediting period are subsistence-driven, an NPV analysis is not required. This risk category will be revised downward, once net positive community impacts can be clearly demonstrated, such as through certification against the Climate, Community & Biodiversity Standards or results of a participatory assessment of the project activities on the local communities which demonstrates net positive community benefits.	8
b-d)	Not applicable.	0
e-f)	Not applicable.	0
g)	None of the project proponents are a non-profit organization.	0
h-i)	There is a legal contractual agreement to maintain the project area as forest for at least a 60 year period (i.e. greater than the length of the crediting period) from the project start date.	-2
Total Opportunity Cost (OC) [as applicable, (a, b, c, d, e or f) + (g or h)] Total may not be less than 0.		**6**

Project Longevity		
a)	Not applicable.	0
b)	There is a legal contractual agreement to maintain the project activities and maintain the project area as forest for at least a 60 year period from the project start date.	0

	The landowners of the property are under contractual obligations[12] which limit their development/use of the property, as stated below. "The landowner acknowledges and agrees to not execute any activity that otherwise might interfere with the [project] implementation…including but not limited to, i. Clearing forest for livestock / cattle ranches; ii. Clearing forest for agriculture; iii. Expanding old roads or constructing new roads; iv. Expanding into new forests for infrastructure (i.e., bridges, housing, electricity, etc.); v. Expanding logging operations; [and] vi. Deforestation for new mining or mineral extraction."	
Total Project Longevity (PL) May not be less than zero		0

Total Internal Risks	
Total Internal Risks (PM + FV + OC + PL) Total may not be less than zero.	**8**

A1.2. EXTERNAL RISKS

Land Tenure and Resource Access/Impacts		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	The landowners, whom are also project proponents (Moura & Rosa), own the project area outright (see PD Section 1.12) and have full resource access/use rights, who are not shared with anyone. The property was geo-referenced and officially registered in the cadaster (Cadastro Ambiental Rural), a process which involved on the ground assessment of all property boundaries and consultations with neighboring landowners and resolution of any existing boundary disputes.	0
b-d)	Not applicable.	0
e)	Not applicable.	0
f)	There is a legal contractual agreement to maintain the project area as forest for at least a 60 year period (i.e. greater than the length of the crediting period) from the project start date.	-2
g)	Not applicable.	0
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e+ f)] Total may not be less than zero.		0

[12] See addendum to the Tri-Party Agreement located in the project archive.

Community Engagement		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	All households living on the Moura & Rosa property directly adjacent to the project area have been consulted. MOUs with each family living within the project property have been signed and are located in the project archive.	0
b)	To their knowledge, the project proponents have contacted all families reliant on the project area.	0
c)	Not applicable.	0
Total Community Engagement (CE) [where applicable, (a+b+c)] Total may be less than zero.		0

Political Risk		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-e)	The average governance score for 2007 through 2011 is 0.06, or between the governance score of -0.32 to less than 0.19. Details of the calculation are provided in Table A1, below.	2
f)	Acre, Brazil is participating in the Governors' Climate and Forest Taskforce. Further, Brazil has an established Designated National Authority under the CDM and has at least one registered CDM Afforestation/Reforestation project.[13]	-2
Total Political (PC) [as applicable ((a, b, c, d or e) + f)] Total may not be less than zero.		0

Table A1. Calculation of Brazil's average governance score.

Governance Indicator	2007	2008	2009	2010	2011
Control of Corruption	-0.12	-0.02	-0.11	0.05	0.17
Government Effectiveness	-0.13	-0.02	0.02	0.07	-0.01
Political Stability	-0.32	-0.24	0.23	0.08	-0.04
Regulatory Quality	-0.05	0.04	0.14	0.17	0.17
Rule of Law	-0.44	-0.37	-0.20	0.00	0.01
Voice and Accountability	0.51	0.54	0.49	0.53	0.50
Overall Mean					0.06

[13] Project 2569: Reforestation as Renewable Source of Wood Supplies for Industrial Use in Brazil (http://cdm.unfccc.int/Projects/DB/TUEV-SUED1242052712.92/view).
Project 3887: AES Tietê Afforestation/Reforestation Project in the State of São Paulo, Brazil (http://cdm.unfccc.int/Projects/DB/SGS-UKL1280399804.71/view).

Total External Risks	
Total External Risks (LT + CE + PC) Total may not be less than zero.	0

A1.3. NATURAL RISKS

Fire	
Discussion/ Evidence	Most of the project area is un-fragmented forest, with few areas of bordering pasture/non-forest. Most forest fires that occur in the region are anthropogenic, and thus sources of fire outbreaks in the project area are limited. In a study[14] of fires in the Amazon, Cochrane and Laurance documented a relationship between fire incidence and distance from forest edge, with decreasing fire return intervals with increasing distance from edge. They also found that effects of forest fires depend on the extent and condition of fuel sources. In general, drought conditions need to be present prior to the initiation of rainforest fires. While initial fires can have a significant effect on the smaller diameter (<40 cm dbh) trees, it is only with subsequent burns, that significant losses (mortality of up to 40% of trees) of forest biomass can be expected[15]. Despite fire induced tree mortality, tree mortality itself is unlikely to result in the loss of substantial biomass due to incomplete combustion of live aboveground biomass. Biomass is merely transferred from the live biomass to dead biomass pool, which is also accounted for in this project. Further as fire is unlikely to affect the whole project area, the significance of any single fire event is likely to be minor and result in less than 25% loss in carbon stocks in the project area. The Cochrane and Laurance study[16] mentioned above, calculated a fire return intervals in another part of the Amazon as 10 to 15 years. While the agents of deforestation (and fire) are similar between region of the study (Para) and the project region (Acre), deforestation rates and likely incidences of fire are greater in Para. This fire return interval therefore is likely to represent a conservative estimate of the fire return interval in the project region with the actual interval likely being longer than 15 years.
Significance	Minor (5% to less than 25% loss of carbon stocks)
Likelihood	Every 10 to 25 years

[14]Cochrane M.A.& Laurance W.F., 2002. Fire as a large-scale edge effect in Amazonian forests, Journal Of Tropical Ecology, 18:311-325.
[15]Cochrane M.A., Alencar A., Schulze M.D., Souza C.M., Nepstad D.C., Lefebvre P. & Davidson E.A., 1999. Positive feedbacks in the fire dynamic of closed canopy tropical forests, Science, 284(5421):1832-1835.
Cochrane M.A.& Schulze M.D., 1999. Fire as a recurrent event in tropical forests of the eastern Amazon: Effects on forest structure, biomass, and species composition, Biotropica, 31(1):2-16.
[16] Cochrane M.A.& Laurance W.F., 2002. Fire as a large-scale edge effect in Amazonian forests, Journal of Tropical Ecology, 18:311-325.

Score (LS)	2
Mitigation	None

Pest and Disease	
Discussion/ evidence	The forests of the project area have a high diversity of tree species, with over 200 tree species >10 cm dbh[17], and like other diverse tropical forests, are not known to be subject to catastrophic disturbance by insect pests or forest diseases. Forest pests and diseases as a source of risk are more relevant in temperate forests or plantations, with low species diversity and consequently susceptible to extensive damage due to pest and disease outbreaks, which tend to be concentrated on single host species. Further, there is no history of catastrophic forest disturbance due to forest pests or diseases in the region.
Significance	Insignificant
Likelihood	Once every 100 years or more. Risk is not applicable to the project area
Score (LS)	0
Mitigation	None

Extreme Weather	
Discussion/ Evidence	While extreme weather events in the region include drought, flooding, and disturbance by wind, this analysis is limited to disturbance by wind as this is the only disturbance which has a direct effect on carbon stocks. As flooding within the project region is common, high water levels in the forest do not lead to a reduction in the forest carbon stocks. Drought does not have a direct effect on existing forest carbon stocks, but instead can increase the severity of forest fires and hence is covered above in the section on fire risk. In relation to disturbance by wind, the recurrence intervals for large blow down disturbances in the western Amazon have been estimated at 27,000 years.[18]
Significance	Insignificant <5% loss of carbon stocks
Likelihood	Once every 100 years or more.
Score (LS)	0
Mitigation	None

[17] For more information see the results of Purus Forest Inventory located in Annex 1.
[18] Espírito-Santo, F.D.B.; Keller, M.; Braswell, B.; Nelson, B.W.; Frolking, S.; Vicente, G. 2010. Storm intensity and old-growth forest disturbances in the Amazon region. Geophysical Research Letters. 37, L11403, doi:10.1029/2010GL043146.

Geologic Risk	
Discussion/ Evidence	Neither volcanoes nor active tectonic fault lines are present within the project area. Landslides are not likely to occur within the project area because the project area is relatively level (less than 5% slope) terrain.
Significance	Minor
Likelihood	Once every 100 years or more
Score (LS)	0
Mitigation	None

Natural risk is quantified by assessing both the significance (i.e. the damage that the project would sustain if the event occurred, expressed as an estimated percentage of average carbon stocks in the project area that would be lost in a single event) and likelihood (i.e., the historical average number of times the event has occurred in the project area over the last 100 years) of the four primary types of natural risk, including the risk of fire, pest and disease, extreme weather, and geologic hazards. The significance of the risk of all natural disturbances has been assessed as “Minor” or “Insignificant” as none of the risks should they occur would lead to a loss of greater than 25% of the carbon stocks in the project area in the case of fire or greater than 5% in the case of pest and disease, extreme weather and geologic risk. The occurrence of any natural risk is unlikely to affect 50% of the project area. Where a natural risk does occur, it is unlikely to remove >50% or the carbon stocks in the project area. While it is possible for trees to be killed due to natural risks such as fire or flooding, the majority of biomass within the live biomass carbon pool would simply be transferred to the dead biomass carbon pool, also accounted for in this project and therefore not a loss of carbon.

It is at times difficult to quantify the likelihood of natural risks when these risks occur infrequently. By definition likelihood is the historical average number of times an event has occurred over the last 100 years. Another term often used when referring to the likelihood of natural risk is the return interval. The return interval is common in literature pertaining to fire and flooding (e.g., the 100 year flood). While the likelihood or return interval would also be useful for assessing pest and disease as well as geologic risk, a key feature when calculating the likelihood or return interval is that an event has occurred enough times in enough places such that there is sufficient data to calculate the return interval. A review of the literature revealed little data to support a return interval for the project area for either pest and disease or geologic risk. For this reason, we have assigned each risk a return interval of “once every 100 years or more.”

Score for Each Natural Risk Applicable to the Project (Determined by (LS × M)	
Fire (F)	2
Pest and Disease Outbreaks (PD)	0
Extreme Weather (W)	0
Geological Risk (G)	0

Other natural risk (ON)	
Total Natural Risk (as applicable, F + PD + W + G + ON)	**2**

A2.0. OVERALL NON-PERMANENCE RISK RATING AND BUFFER DETERMINATION

A2.1. Overall Risk Rating

The overall risk rating calculated using the VCS AFOLU Non-Permanence Risk Tool is calculated below.

Risk Category	Rating
a) Internal Risk	8
b) External Risk	0
c) Natural Risk	2
Overall Risk Rating (a + b + c)	**10**

The Purus Project will employ a non-permanence risk deduction of 10%; the minimum buffer withholding.

A2.2. Calculation of Total VCUs

Total VCUs including deductions to be deposited in the AFOLU pooled buffer account, are detailed in Section 4.4 of the 2011-2012 Purus Project Monitoring Report.