2014 PURUS PROJECT MONITORING REPORT

Document Prepared By

CarbonCo[1], LLC, Bethesda, MD USA

and

TerraCarbon[2], LLC, Peoria, IL USA

Project Title	The Purus Project
Version	Version 01.0
Report ID	*Identification number of this document*
Date of Issue	05-11-2015
Project ID	963
Monitoring Period	01-01-2014 to 31-12-2014
Prepared By	James Eaton[2] and Brian McFarland[1]
Contact	Brian McFarland, CarbonCo, LLC 3 Bethesda Metro Center, Suite 700 – Bethesda, Maryland, 20814 – USA Phone: (240) 247-0630 Email: BMcFarland@CarbonCoLLC.com Website: www.CarbonCoLLC.com

Table of Contents

1 PROJECT DETAILS 3
1.1 Summary Description of the Implementation Status of the Project 3
1.2 Sectoral Scope and Project Type 5
1.3 Project Proponent 6
1.4 Other Entities Involved in the Project 7
1.5 Project Start Date 8
1.6 Project Crediting Period 8
1.7 Project Location 8
1.8 Title and Reference of Methodology 12
1.9 Other Programs 13
2 IMPLEMENTATION STATUS 14
2.1 Implementation Status of the Project Activity 14
2.2 Deviations 23
2.3 Grouped Project 24
3 DATA AND PARAMETERS 25
3.1 Data and Parameters Available at Validation 25
3.2 Data and Parameters Monitored 29
3.3 Monitoring Plan 47
4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS 58
4.1 Baseline Emissions 58
4.2 Project Emissions 58
4.3 Leakage 62
4.4 Net GHG Emission Reductions and Removals 64
5 ADDITIONAL INFORMATION 65

APPENDICES 69
APPENDIX A. VCS NON-PERMANENCE RISK REPORT 69

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the 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.

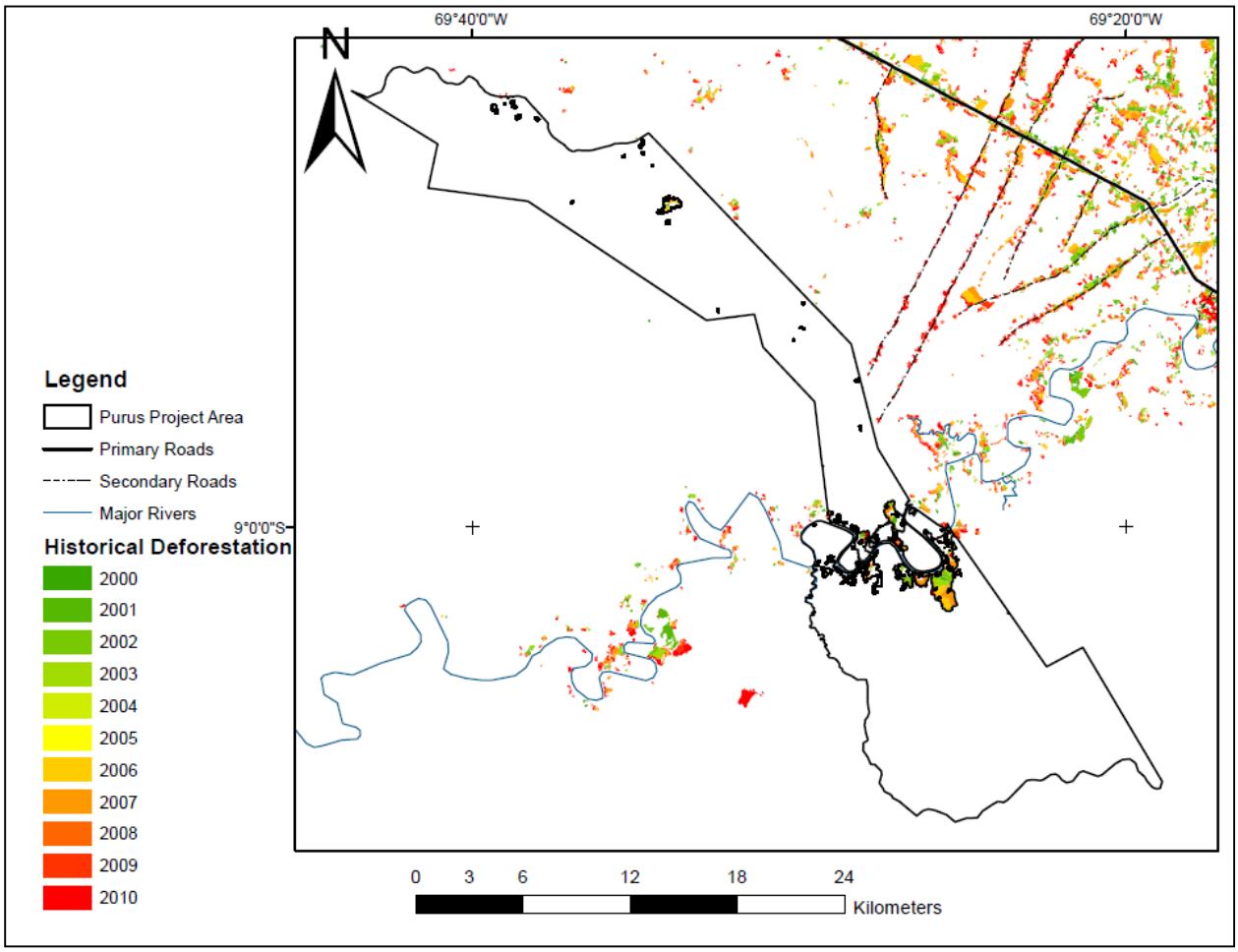
This project was developed and registered under the Verified Carbon Standard (VCS) and the Climate, Community and Biodiversity Standard (CCBS). Project development activities have included meeting with the local communities surrounding the project area, engaging Acre state officials working on similar 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 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.

Implementation Status of the Project

The Purus Project was validated to the CCBS with Gold Distinction and validated to the VCS in January 2013. This VCS Monitoring Report for the Purus Project covers the monitoring period of January 1, 2014 to December 31, 2014. The following measures were implemented at the Purus Project from January 1, 2014 and December 31, 2014. The Project Proponents continued to reduce deforestation within the Project Area throughout 2014. Along with reducing deforestation pressures, project activities during this monitoring period led to the continued preservation of biologically diverse habitats. Other project initiatives completed during this period include: completion of study using motion-sensitive wildlife camera traps; installation of a permanent phone at the Project headquarters; medical assistance provided to local communities; ongoing project awareness and engagement of local communities; and initiation of granting official land title to several local communities.

GHG Emission Reductions and Removals for the Current Monitoring Period

The total emissions reduced by the Purus Project over the course of the 2014 monitoring period is 60,387 tCO_2e.

Years	GHG emission reductions (tCO2e)
2014	60,387
Total	60,387

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 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 reduces 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 nº 364 – 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

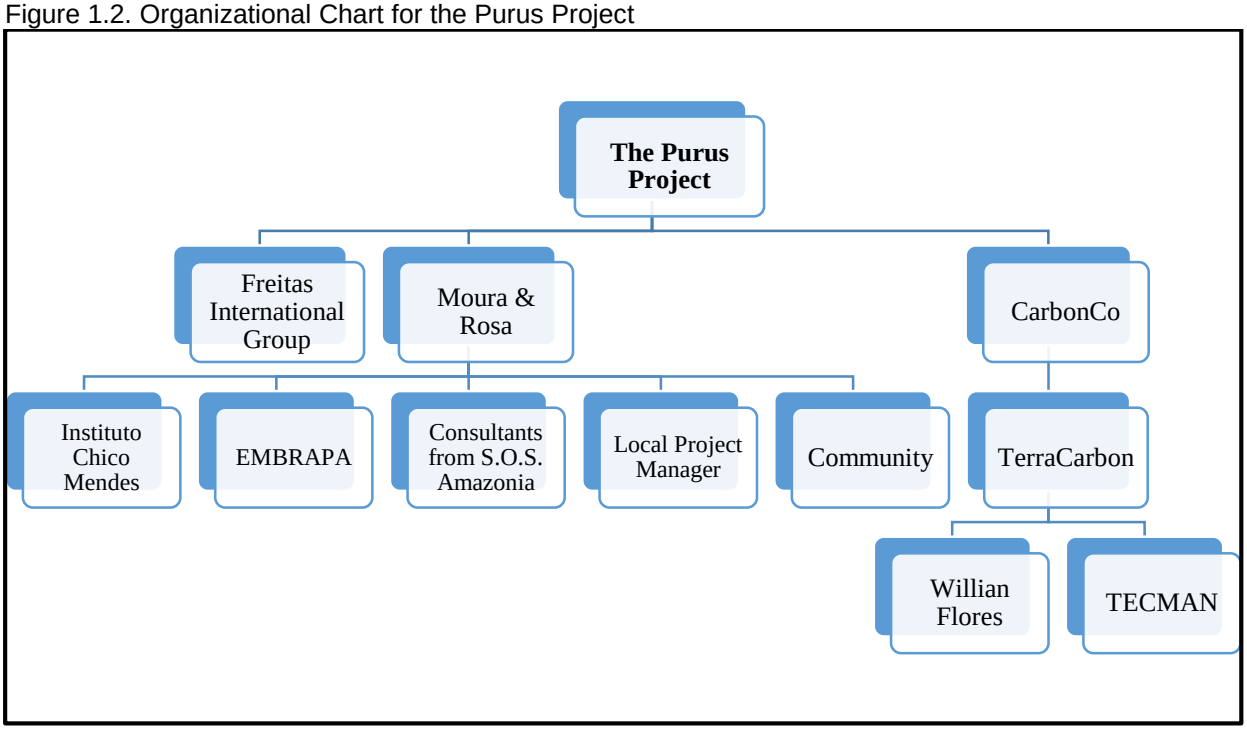


Table 1.2. List of Other Entities Involved in the Project.

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 and monitoring.
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.
S.O.S. Amazonia Rua Pará, 61, Cadeia velha CEP 69.905-082 Rio Branco, Acre, Brasil 55-68-3223-1036	Independent Consultant	Consultants from S.O.S. Amazonia 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.

1.6 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.

[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.
[3] An addendum to the initial Tri-Party Agreement between CarbonCo, Carbon Securities and Moura & Rosa stipulates there will be a 60-year project lifetime, 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).

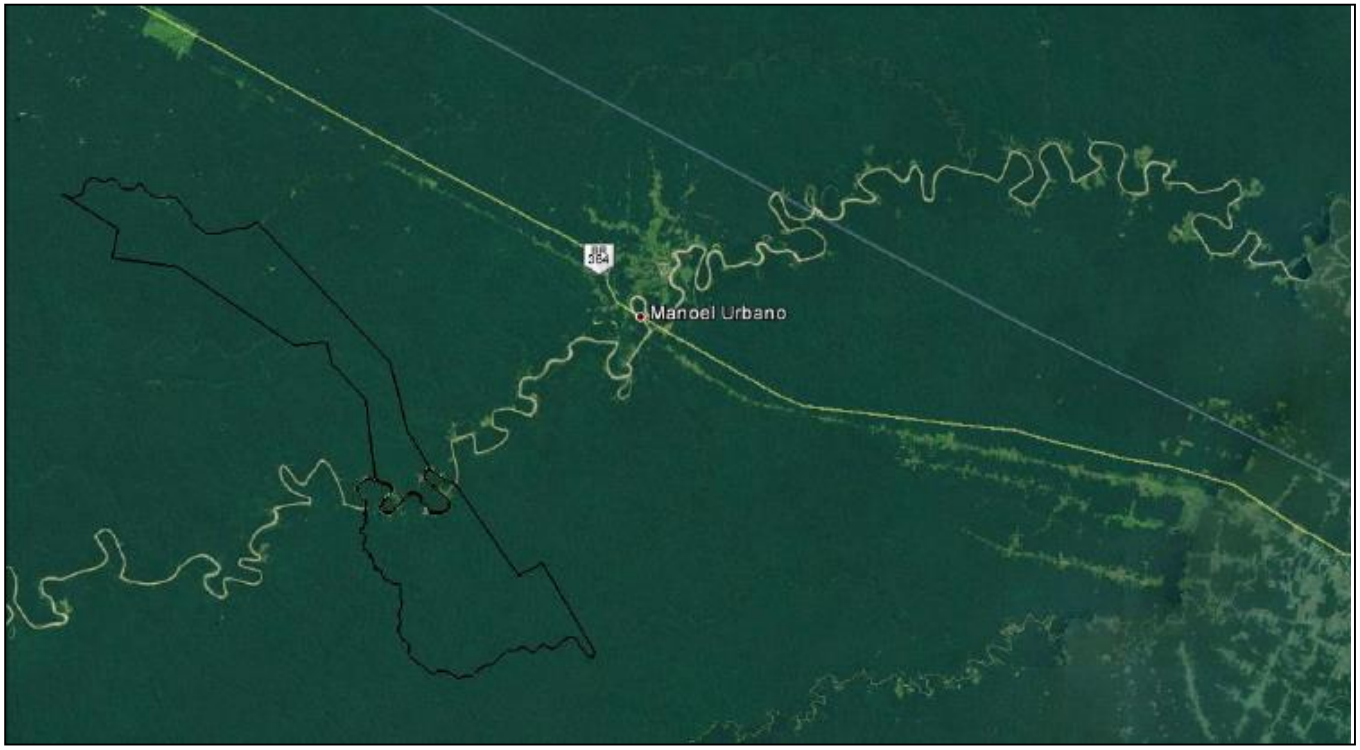


Figure 1.4. 2000 Image of the Purus Project Area, Forest Cover in Light and Dark Green, Deforestation in Pink/Red (ResourceSAT 2000 Image).

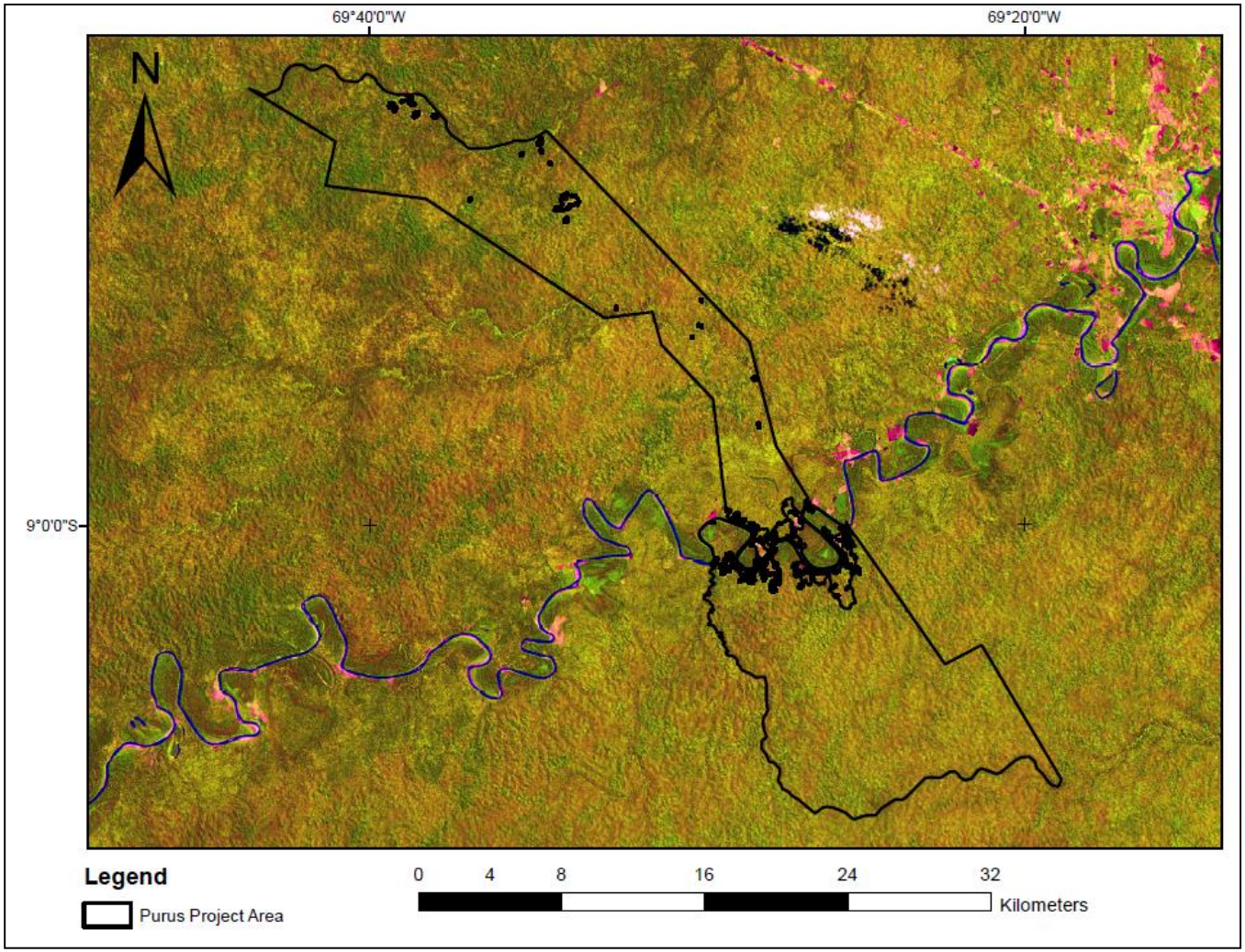
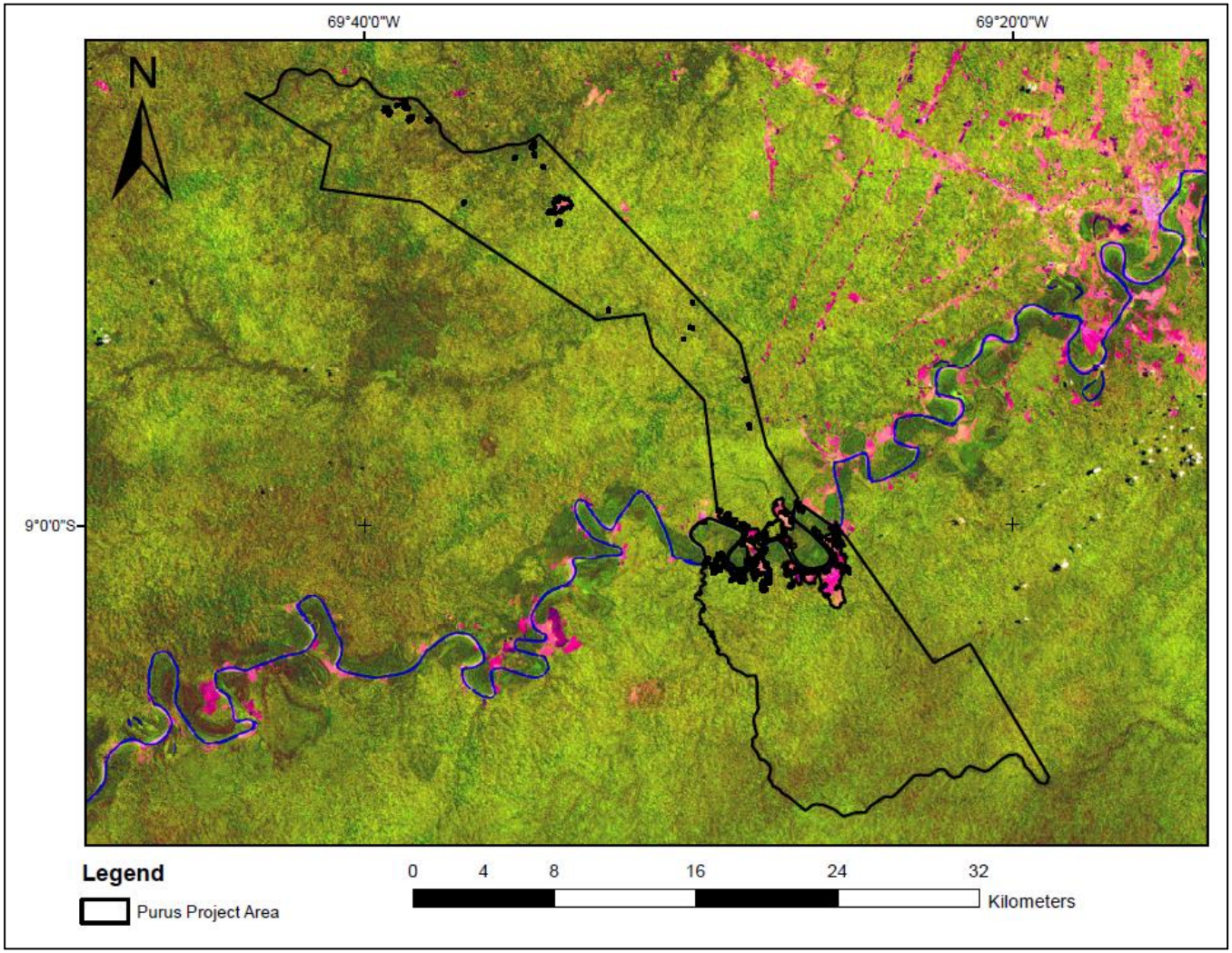


Figure 1.5. 2011 Image of the Purus Project Area, Forest Cover in Light and Dark Green, Deforestation in Pink/Red (ResourceSAT 2010 Image).



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.

1.9 Other Programs

Emission Trading Programs and Other Binding Limits

No emission reductions generated by the project are part of any other emissions trading program. The project has neither submitted to nor been rejected from any other greenhouse gas program. Further, Brazil does not currently have a national, legally binding limit on greenhouse gas (GHG) emissions nor is there currently a compliance emissions trading program which accepts REDD credits.

Other Forms of Environmental Credit

The project has not nor intends to create non-VCS GHG emission reductions or any another form of environmental credit. This includes, but is not limited to, biodiversity credits, species banking, water certificates, and nutrient certificates.

Participation under Other GHG Programs

The Purus Project has been registered under the Climate, Community and Biodiversity Alliance Standard. The Purus Project has not been registered, nor is seeking registration, under any other GHG programs.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The following project activities were implemented at the Purus Project since May 2011, including activities undertaken in the most recent monitoring period, January 1, 2014 and December 31, 2014.

Engage Local Communities

Between May 23, 2011 and December 31, 2012, the Project Proponents visited the Purus Project together and met with the local communities in March 2011, August 2011, March 2012, and June 2012. In addition, CarbonCo hired the independent group PAV Comércio e Serviços Ltda ("PAV") to visit the communities in October 2012.

Between January 1, 2013 and December 31, 2013 the Project Proponents visited the Purus Project together and met with the local communities in March-April 2013 and August 2013. Starting around February 2013, Kidney da Cunha Aires ("Kidney"), the local project manager, visited the communities approximately once a month for fifteen days. Overall, Kidney visited the Purus Project approximately twenty times in 2013 and once stayed at the Purus Project for approximately one consecutive month.

Between January 1, 2014 and December 31, 2014 the Project Proponents visited the Purus Project together and met with local communities in May 2014 and August 2014. Furthermore, Kidney visited the Purus Project approximately 32 times in 2014.

The communities are an essential component of the Purus Project and likewise, it has been absolutely necessary to openly and frequently discuss the Project with the communities. Through meeting with the communities, the Project Proponents have been able to gain the communities' insights about project design and to better incorporate the communities into the Project. As a result, the community objective of generating sustainable economic opportunities and implementing social projects and programs will be best achieved with active, ongoing participation and input from the local communities.

Create Project Awareness

A brief summary of project meetings and stakeholder comments have been provided below which took place during since 2011 and particularly during the third monitoring and reporting period from January 1, 2014 to December 31, 2014.

January 21, 2011 - Normando Sales initially met Pedro Freitas in Brasilia, Brazil. Normando Sales was familiar with the process of developing a REDD+ project and was interested in developing this project. Pedro Freitas later presented a draft Tri-Party Agreement to Normando Sales for review, while Normando offered his Project Identification Note for the Purus Project. The Tri-Party Agreement, which is a cornerstone document of the Purus Project, was revised and mutually accepted based off discussions among Moura & Rosa, Carbon Securities, and CarbonCo.

March 9-18, 2011 - CarbonCo, Carbon Securities and TerraCarbon traveled to Acre, Brazil to conduct a preliminary assessment of the Purus Project. A few key milestones included:

- CarbonCo, Carbon Securities and TerraCarbon held initial meetings with PESACRE (Grupo de Pesquisa e Extensão em Sistemas Agroflorestais do Acre), IPAM (Instituto de Pesquisa Ambiental da Amazônia), FUNTAC (Fundacao de Tecnologia do Estado do Acre), and SISA (System of Incentives for Environmental Services) to gain an

understanding of the agents and drivers of deforestation in Acre state, how forest biomass stocks vary across the state, and local REDD+ and forest conservation initiatives;

- CarbonCo and TerraCarbon then visited the Purus Project property for an initial assessment on Wednesday, March 16th. This visit included firsthand observations of the forest and local drivers of deforestation, along with some initial casual conversations with a few local community members in the Project Area;
- CarbonCo, Carbon Securities, and TerraCarbon met with Moura & Rosa and the Chico Mendes Foundation on Thursday, March 17th to discuss forest conservation and payment for ecosystem services schemes, such as REDD+; and
- Carbon Securities and TerraCarbon met with Acre State Officials, including Monica Julissa De Los Rios de Leal and Eufran Amaral, on Friday, March 18th.
- The Project was revised based off this initial site visit in March 2011. For example, the Project Proponents: began to design the Project around the identified drivers and agents of deforestation (i.e., selection of appropriate VCS methodology); chose the source of satellite imagery (i.e., FUNTAC/Climate Change Institute); incorporated the Chico Mendes Foundation into the Project; and began a close relationship with the State of Acre.

March 17, 2011 - Tri-Party Agreement was executed by CarbonCo, Carbon Securities, and Moura & Rosa on March 17th, 2011.

May 9, 2011 – Moura & Rosa met with the State of Acre's General Prosecutor Patricia Rego to discuss the Purus Project. This included a general introductory discussion of the Project, the expectations of the State for the Project's area of permanent preserve (APP) being destroyed by the local coomunities and how to legalize the destruction, how to improve quality of the communities' livelihoods, how the State can help the Purus Project, how the State can offer protection for this sort of Project, and the outcomes of a successful Project.

May 13-14, 2011 - CarbonCo and Carbon Securities met with Moura & Rosa in Goiânia, Goiás, Brazil to discuss elements of the VCS Project Description and the CCBS Project Design Document.

August 1-12, 2011 - CarbonCo, Carbon Securities, and TerraCarbon visited Rio Branco and the Purus Project site during a project implementation trip. A few key milestones included:

- TerraCarbon led a classroom forest carbon inventory training for TECMAN field crew;
- 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 Wednesday, August 3rd to discuss how to best design the forest carbon inventory to align with the State of Acre's goals and future forest inventory plans. The Project's forest carbon inventory design (for example, the size of each plot and the plot design) was revised based off the State of Acre and TECMAN's input;
- CarbonCo, Carbon Securities, TerraCarbon, and Moura & Rosa visited the Purus Project area from Thursday, August 4th through Monday, August 8th.
    - TerraCarbon trained TECMAN field crew members in forest inventory practices and standard operating procedures

  - Moura & Rosa, CarbonCo and Carbon Securities met with the local community to discuss the project and get feedback on how to best implement measures to reduce deforestation. The communities were overall receptive of reducing deforestation in exchange for alternative income and assistance, but were nervous about monitoring for local deforestation because it appeared as a local police force. Based off this input, the monitoring plan was revised so that Moura & Rosa would undertake the initial monitoring via a trike instead of having the initial monitoring conducted by local community members.
- CarbonCo, Carbon Securities, and TerraCarbon met with Willian Flores to discuss the VCS methodology, VM0007 the REDD Methodology Modules, applicable to modeling regional deforestation
- CarbonCo, Carbon Securities, Moura & Rosa, TerraCarbon, and Willian Flores met with Acre State officials, including Monica Julissa De Los Rios de Leal, Eufran Amaral and Lucio Flavio on Tuesday, August 9th 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.

October 17, 2011 - Moura & Rosa and Professor 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.

November 21, 2011 – CarbonCo spoke with Shaina Brown, Project Director at the Green Technology Leadership Group and Tony Brunello, the REDD Offset Working (ROW) Group's facilitator to better understand the developments in the State of California and how they relate to the State of Acre.

November 30, 2011 – Carbon Securities and CarbonCo held a call with Maria José Miranda de Souza Noquelli from Tenóryo Dias e Alternativa Ambiental to learn more about the rapid biodiversity assessment that was conducted at the Purus Project, the specific species which were identified on the Purus Project site, whether there were occurrences of globally threatened species, along with the available methodologies and approximate costs to perform regular biodiversity monitoring plans.

Early December 2011 – Moura & Rosa met with EMBRAPA to discuss what EMBRAPA needs from Moura & Rosa and EMBRAPA gave a general presentation on how they could assist Moura & Rosa. This included free-range, rotational cattle pastures and intensified agriculture. EMBRAPA also requested an official letter from the Project Proponents.

Late December 2011 - Moura & Rosa again met with EMBRAPA. This discussion focused on the timing of when EMBRAPA could help, costs of EMBRAPA's assistance, and how EMBRPA could officially sponsor the project.

February 6, 2012 – Brian McFarland spoke to Dan Bisaccio, Director of Science Education at Brown University, to better understand wildlife camera traps and biodiversity monitoring plans. The biodiversity monitoring plan - particularly the specific types of cameras, duration of the biodiversity plan, and the number of cameras to be used – was revised.

February 10, 2012 – CarbonCo spoke with Natalie Unterstell, the focal point for REDD+ at Brazil's Federal Ministry of Environment. 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 offsets; Where to go for REDD+ information on Federal government updates and how to inform Government of our Project.

March 9-15th, 2012 – CarbonCo, Carbon Securities and Moura & Rosa visited the Purus Project for the following tasks:

- Met with 16 communities who participated in a Participatory Rural Assessment (PRA) to better understand the activities which contribute to deforestation, the cycle of deforestation, and how far communities enter the forest to collect wood;
- These same 16 communities also participated in a Basic Necessities Survey (BNS) which shall serve as a baseline for the community impact monitoring plan to ensure the communities' poverty scores, poverty index, average owned assets, and average owned assets per capita are positively impacted as a result of the Project;
- The Project proponents also surveyed these 16 communities on which agricultural extension training courses would be of most interest and thus, which proper crops and agricultural techniques that EMBRAPA should focus upon;
- The onsite project managers Sebastião Marques da Silva and Maria Souza de Moura were officially hired;
- CarbonCo, Carbon Securities and Moura & Rosa also met with Prof. Dr. Armando Muniz Calouro, Professor at UFAC, about biodiversity monitoring plans using wildlife camera traps to assess the population and distribution of medium-to-large mammals;
- CarbonCo, Carbon Securities and Moura & Rosa also with the Vice Governor of Acre, Mr. César Correia Messias to explain the Purus Project and to ask for a Letter of Support;
- The community impact monitoring plan was revised based off the PRAs, BNS and agricultural survey. In addition it was decided that instead of eliminating all cattle from the Project, it would be better to allow the communities to keep their cattle and instead to encourage the communities to not increase the overall number of cattle.

March 26, 2012 – CarbonCo and TerraCarbon held a follow up call with Monica Julissa De Los Rios de Leal to discuss a variety of topics, including:

- How the State of Acre's baseline is coming along?
- How should we register the Purus Project with the State of Acre?

May 2012 – Moura & Rosa met with SENAR. During this visit, Moura & Rosa: presented the draft CCBS PDD; discussed the Purus Project; explained what is needed in regards to technical, education, and training support and specifically talked about the agricultural extension training courses; and discussed timelines.

June 2012 – CarbonCo and Moura & Rosa met with André Luis Botelho de Moura, a former graduate student of Dr. Armando Muniz Calouro, to begin refining the full biodiversity plan. Such discussions

included: the proper locations of cameras; a short, Standard Operating Procedures (SOPs) guidance document needs to be developed that will be used as a training manual for the communities; wildlife camera traps need to be brought to the Purus Project, the communities need to be trained on the proper placement and preventative maintenance of such cameras, and the cameras need to be setup in the field; periodic movement of cameras to different strata; assistance for one year to periodically identify species that the Purus Project team is unable to identify.

June 2012 - The Purus Projet was presented at United Nations Conference on Sustainable Development (UNCSD) Rio+20 Conference in Rio de Janeiro.

July to December 2012 – CarbonCo identified an independent firm to visit the communities twice to ensure the local communities were fully aware of the Purus Project, were able to contribute to the Project design, able to openly express desired outcomes and concerns, understood the third-party grievance procedure, were able to give free, prior and informed consent. The Purus Project was revised by: giving all communities at least 100 hectares and communities with over 100 hectares are allowed to keep the land they put under productive use; identifying an independent group (i.e., the Public Ministry of Acre) during the titling process as desired by some communities; making sure to address the communities general concerns about no longer being able to use fire which could reduce crop production by incorporating this discussion into the agricultural extension training courses; ensuring the local project managers (instead of via radio announcements) are the primary means of conveying information about the project to the local communities; and scheduling community-wide discussions on the weekends as requested by most local communities.

March 25-April 12, 2013 – CarbonCo, Carbon Securities and Moura & Rosa visited the Purus Project. The Project Proponents met with the local communities. The second Participatory Rural Assessment (PRA), which focused on degradation, was also administered at the Purus Project.

June 9-21, 2013 – CarbonCo, Carbon Securities and Moura & Rosa met in Rio Branco, Acre to discuss the Purus Project. The wildlife camera traps were installed at the Purus Project.

August 13-15, 2013 – Brian McFarland travelled to San Francisco, California to meet with REDD+ industry representatives including Code REDD and members of the REDD Offset Working Group.

August 18-31, 2013 – CarbonCo, Carbon Securities and Moura & Rosa participated in verification site visit. This visit included meetings with S.O.S Amazônia and the Climate Change Institute.

November 27 and 28, 2013 - There is a Ramal (which translates into “small road” in English) that is nearing the Project Zone from the Northeast boundary of the Purus Project. This Ramal will encourage new communities to settle near the Project Zone. The Ramal was planned and funded by the municipality of Manuel Urbano and Moura & Rosa met with the mayor of Manuel Urbano on November 28, 2013 to re-explain the Project and specifically educate the mayor about the impact the Ramal could have on the Project with respect to increased deforestation. In addition, the local project manager Kidney visited the communities living along the Ramal on November 27th and 28th, 2013 to inform the communities of the Project and that forest conservation is the cornerstone of the Project.

January 31, 2014 – Brian McFarland of CarbonCo presented at the Forests as Capital Conference hosted by the Yale School of Forestry & Environmental Studies’ Chapter of the International Society of

Tropical Foresters. Brian's presentation gave an introduction to CarbonCo, described CarbonCo's Acre REDD+ Projects, and discussed REDD+ and other conservation financing instruments.

May to October 2014 - Moura e Rosa Empreendimentos Imobiliários LTDA met with STR – Manoel Urbano several times to discuss titling land to the local communities at the Purus Project.

May 8, 2014 – CarbonCo, Carbon Securities and TerraCarbon met with the Climate Change Institute to give an update on all Acre REDD+ projects, including the Purus Project, and received updates on the latest developments at the Climate Change Institute. More specifically, this meeting was with Monica Julissa De Los Rios de Leal and Magaly Medeiros, the new director of the Climate Change Institute.

May 19, 2014 – Carbon Securities met with Rodrigo Fernandes das Neves, the State Prosecutor, to discuss the Acre REDD+ Projects including the Purus Project, and to get an update on the state-level baseline.

May 20-21, 2014 – CarbonCo and Carbon Securities met Maron Greenleaf to introduce the Project Proponents, give an overview of all Acre REDD+ projects underway (particularly the Purus Project), and discussed Maron Greenleaf's anthropological research in Acre for her PhD at Stanford University.

June 24, 2014 – Brian McFarland of CarbonCo presented at Ecosystem Marketplace's State of the Voluntary Carbon Market and gave an overview of CarbonCo's work in Acre, Brazil.

September 3, 2014 - CarbonCo and TerraCarbon held a call with the VCSA to give an update on the Acre REDD+ Projects, including the Purus Project, and discussed the future developments necessary to best position the Acre REDD+ Projects for their potential inclusion in a California compliance carbon market.

Hire Project Managers and Project Staff

José Rogério de Oliveira Sabóia ("Rogério") was hired and began living at the Project headquarters starting November 2013 to assume the responsibilities of: maintaining the facilities at the headquarters; monitoring for possible deforestation and burning; listening to the local communities and; serving as an intermediary between the communities and Moura & Rosa, in the absence of the Kidney. Rogério received the worker rights explanation letter.

Kidney da Cunha Aires ("Kidney"), who lives in Rio Branco, was contracted by Moura & Rosa under a probationary training period which was formalized in January 2013. This probationary training period began in November 2012 and Kidney received the worker rights explanation letter. Kidney's official title is "Onsite Project Manager." Kidney is responsible for onsite logistics, transportation to and from the Purus Project, communication with the local communities about the Project, assistance with the community and biodiversity monitoring plans, and monitoring for 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. Kidney visited the Purus Project once in November 2012 during an initial visit to see the Project and to meet the local communities. Kidney also visited the Purus Project twice in December 2012.

In 2013, Kidney's accomplishments included: improving relations with the local communities and engaging communities in the leakage belt; overseeing of local projects including the building of stairs,

painting of houses and offering of agricultural extension courses; and monitoring for deforestation. Kidney also organized a soccer match that included donated jerseys and donated food in November 2013.

In 2014, Kidney's accomplishments included: improving relations with the local communities and engaging communities in the leakage belt; overseeing of local projects including the installation of the phone tower, providing assistance to doctors, and planting fruit trees around the Project headquarters; monitoring for deforestation; and assisting with wildlife cameras.

Uniforms were purchased for local staff in May 2014.

Acquire Agricultural Extension Services

The communities in and around the Purus Project were surveyed from March 10-12, 2012 to better understand which agricultural extension training courses would be of the most interest. A total of 32 courses, ranging from rotational pasture management to organic coconuts, were offered.

Moura & Rosa then purchased these top-ten courses on March 30, 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.

Moura & Rosa's intention was to begin teaching the most desired agricultural extension trainings in order of importance starting November 2012; however, this initial timing was delayed because SENAR was not available until 2013. It was then later determined that consultants from S.O.S. Amazônia would be better equipped to provide the agricultural extension trainings.

In July 2013, courses on the production / cultivation of bananas, rural property management and the sustainable use of legumes were taught by Adair Pereira Duarte of S.O.S. Amazônia. In August 2013, courses on the sustainable management of cattle pastures and alternative system of establishing chicken coups were taught by Mirlailson Andrade of S.O.S. Amazônia.

The course on bananas focused on: the origin of bananas; the different species of bananas; proper planting, spacing, and tillage systems; identification and control of diseases; harvesting and transportation techniques; and market access. The rural property management course taught how to manage one's property and the need to plan each phase including site preparation, implementation, procurement, sales and receipts. The course on sustainable use of legumes taught how to fertilize using locally-sourced manure, humus, and compost, and how legumes are nitrogen-fixation species. The sustainable management of cattle pastures course focused on how to use the pasture without degrading the pasture, how to implement a sustainable pasture rotation system, and proper division of grazing paddocks. The course of chicken coups taught how to: raise chicks; slaughtering techniques; how to maintain a semi-confined and confined chicken coup; types of feed; treatment of diseases; and the communities that participated were built a chicken coup, and received chicks and feed.

A total of five to seven people participated in each of the trainings, including residents of the leakage belt. The results and feedback are being monitored via the Project's local project manager, as well as via the community impact monitoring plans' community surveys. Many of the teachings are currently being implemented by the local communities. For example, the family of Mr. Benedito has improved the management of their land by starting to properly prune crops and have expanded their banana plantations in lieu of cattle pastures. In addition, several chicken coups were built and hundreds of chicks, with feed, were given away to the local communities.

Agricultural extension training courses will resume in 2015.

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 Trabalhadores Rurais de Manoel Urbano (STR–Manoel Urbano; in English: Rural Workers 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.

In 2013, Moura & Rosa continued to research the laws and to better understand the process of granting title to the local communities. Kidney continued to meet with the local communities to improve their trust. Moura & Rosa also reviewed the surveys and began to expedite the process of granting title to the local communities.

In 2014, Moura & Rosa met several times with STR and the local communities to fully explain the land title situation. A total of three families as of September 1, 2015 were in the process of receiving official land title from Moura & Rosa. Negotiations are continuing with the other families in order to grant them official land tenure as well. As of September 1, 2015, Moura & Rosa went as far as possible to award the title to the first three communities and now the granting of the final, official title is in the hands of INCRA and the Cartório. Moura & Rosa drafted an Agreement and signed this Agreement with the first three families. Moura & Rosa then went to INCRA and applied for a new registration number for these first three families. This registration number is known as the CCIR (acronym translates into Certificate of Registration of Rural Property) number. From there the process goes from INCRA to the Cartório where the Cartório will review everything and eventually issue all the new titles and landownership documents such as the Memorial Descritivo. Then, the landowners sign off on this final documentation from the Cartório. As of September 17, 2015, Benedito Nunes da Silva was waiting on the Cartório and the other

two communities (Jose Artenizio de Silva and Jose Mariano Nunes Frota) are waiting on INCRA. This process for the first three communities should be completely finalized by December 2015.

Initiate Patrols/Monitors of Deforestation

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

Wanderley Cesário 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.

Between January 1, 2013 and December 31, 2013, the Project Proponents continued to monitor deforestation via trike, by boat, and by satellite imagery. For example, Wanderley flew the trike over the Purus Project on January 30th, May 18th, July 6th, August 28th, and November 24th.

Wanderley's son, Leonardo Silva Cesário Rosa, was also trained on how to operate the trike in January 2013. Wanderley is still the primary operator of the trike, but Leonardo was trained as a potential back-up operator if necessary.

Between January 1, 2014 and December 31, 2014, the Project Proponents continued to monitor deforestation via trike, by plane, by boat, and by satellite imagery. Despite the trike being broken and wrong parts being delivered, Wanderley did flyovers with a rented plane over the Purus Project on September 22nd, October 8th, October 29th, November 2nd and December 13th.

To complement this aerial monitoring via trike, climate impact monitoring is also informally conducted by boat and by ground. Such terrestrial monitoring by Kidney took place approximately every two weeks.

If and when deforestation is identified, Moura & Rosa will immediately document and transfer this information to Carbon Securities and CarbonCo. Collectively, CarbonCo and Moura & Rosa will discuss the appropriate actions to undertake to counteract any reported deforestation.

The monitors will write down observations in a notebook, document the community meetings, input this data into the monitoring template, and upload the document onto a shared DropBox account among the Project Proponents. The monitoring template includes:

- Name of Monitor
- Date of Monitor
- Communities Visited
- Meeting Notes with Community
- Grievances and Concerns of Community
- Location and Date of Deforestation
- Responsible Actor for Deforestation

- Observations Pertaining to Deforestation
- Biodiversity Observed
- Other Notes Related to the Project

A total of five official monitoring templates were completed between January 1, 2014 and December 31, 2014.

Moura & Rosa also purchased a fast boat in June 2012 which provides transportation for the Project Proponents and allows for deforestation monitoring by the Purus River.

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

Between May 2011 and December 2013, 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 2014 was the monitoring of the Purus project area and the leakage belt by Moura & Rosa to quickly identify deforestation and its causes. To further mitigate deforestation from the leakage belt encroaching into the project area, Moura & Rosa will implement several activities. First, Moura & Rosa will continue to monitor deforestation throughout the project area and the leakage belt via trike and plane. Second, Moura & Rosa will use a motorcycle to periodically visit the end of the Ramal to ensure there is no encroachment into the Project Area. These visits will be used to help inform the communities along the Ramal about the Purus Project, community benefits (i.e., free doctor visits and access to the health clinic), and about the importance of not deforesting the project area. Third, Moura & Rosa may build a small headquarters, if necessary, with a project sign to establish a permanent presence on that side of the Purus Project. In 2016, Moura & Rosa plan to install a gate at the end of the Ramal that is adjacent to the project area with a sign for the Purus Project.

Plant Trees

Trees will be planted to reforest select non-forest areas, outside the project boundary. Agroforestry crops, including bananas and coconuts, were planted around the Project headquarters in 2014. The planting of trees will result in net GHG emission reductions because of carbon sequestration (i.e., it is important to note that such removals will not be credited as VCUs) and due to agroforestry providing alternative incomes to local communities and placing less pressure on forest resources.

2.2 Deviations

2.2.1 Methodology Deviations

The following deviations to the methodology were applied.

Trees in the Cecropia genus were not measured as part of the forest inventory. This has been proposed as a deviation as it stands in conflict with the CP-AB requirement that "all the trees above some minimum DBH in the sample plots" be measured.

While sampling lying dead wood using the line intersect method:

- Two 92-meter transect lines were used rather than two 50-meter transect lines;
- The sampling lines did not bisect each sample plot, but rather ran from one plot center to the next; and
- The sampling lines were oriented to the north and east, and no randomization in the bearing of the first line was employed.

For validation of the allometric equation, commercial height were estimated from total height measured in the field by applying a factor of 62.9%. This commercial height to total height ratio is Amazon specific and was developed by Higuchi et al. 1998 (n = 315 trees).

Rather than using a root to shoot ratio to estimate belowground biomass as per the CP-AB module, belowground biomass was estimated using an allometric equation developed by Cairns et al.[4]

The forest inventory has deviated from the criteria for selection (i.e., the equation is based on a datasets comprising at least 30 trees, with an r2 that is ≥ 0.8) and validation of the allometric equation related to palm biomass, however the equation used is likely to result in a conservative estimate of palm biomass for the following reasons:

-Volume is calculated as the volume a parabaloid rather than the volume of a cylinder;

-Only stem biomass is estimated, thus conservatively excluding other aboveground biomass; and

- A conservative measure of basal diameter (i.e., dbh) was used.

A calibration factor of 0.985 was applied to the Brown (1997) equation to ensure use of this equation results in conservative estimates of live aboveground biomass.

In the with-project case, C(post) can conservatively be assumed to be zero, not only for natural disturbance (CP,Dist,q,i , as stated in Section 5.2.3 of the M-MON module) but also for deforestation (CP,post,u,i). This deviation is conservative because subtracting zero from the baseline stocks, leads to the conclusion that ΔCpools,Def,u,i,t is equal to C(BSL,i), which leads to the maximum emission in the with-project case, which is conservative.

AVFOR will be stratified using information and data derived from official (government) publications, peer-reviewed published sources, or other verifiable sources. Stratification is not limited to the delineation of different strata where contiguous areas of at least 100 ha differ in stocks by ≥20%

2.2.2 Project Description Deviations

Rather than initially assessing the significance of illegal logging using temporary sample plots covering 1% of the potential degradation area (*ADegW,i*) as proposed in the project document and monitoring module of the VM0007 methodology; information gathered during the course of the participatory

[4] 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.

appraisals including amounts of fuelwood, charcoal, and timber collected by communities members will be used along with conservative assumptions to assess whether emissions due to degradation are significant using the T-SIG tool, and plot level monitoring of degradation is warranted. This deviation will be used for the first and each subsequent monitoring period. This deviation was added during the course of the first verification event. This deviation was included as it was our understanding that we could use T-SIG to determine the significance of any with-project emission. Further, this deviation was warranted due to the significant amount of work necessary to monitoring degradation using temporary plots and the likely insignificant amount of emission resulting from degradation.

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
Purpose of the data	Calculation of baseline emissions
Comment	None

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
Purpose of the data	Calculation of baseline emissions Calculation of leakage
Comment	None

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
Purpose of the data	Calculation of baseline emissions
Comment	None

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
Purpose of the data	Calculation of leakage
Comment	None

Data Unit / Parameter:	$C_{P,LB}$
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
Purpose of the data	Calculation of leakage
Comment	None

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 methods and procedures applied:	Derived and justified in Section 3 of PD in which baseline is set		
Purpose of the data	Calculation of baseline emissions		
Comment	None		

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.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comment	None

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:	Default parameter from IPCC	

Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comment	None

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): 310 GWP,CH4 (t CO2/t gas g): 21
Justification of choice of data or description of measurement methods and procedures applied:	Default parameter from IPCC
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Comment	None

3.2 Data and Parameters Monitored

Details on data and parameters monitored are provided below.

Data / 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	As this parameter was calculated rather than measured, no measurements methods are noted.
Frequency of monitoring/recording	Every ≤ 5 years
Value applied:	

Year	ΔCP,DefPA,i,t (t CO2-e)
2011	13,960
2012	30,119
2013	48,295
2014	76,110

Monitoring equipment:	None.

QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of project emissions
Calculation method:	Equation 3, VMD0015
Comment	None

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:	As this parameter was calculated rather than measured, no measurements methods are noted.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year: ΔCP,LB (t CO2-e) 2011: 25,256 2012: 58,379 2013: 44,811 2014: 76,686
Monitoring equipment:	None.
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of leakage
Calculation method:	Equation 4, VMD0015
Comment	None

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:	As this parameter was calculated rather than measured, no measurements methods are noted.
Frequency of monitoring/recording:	Every ≤ 5 years

Value applied:	

Year	ΔCP,DistPA,i,t (t CO2-e)
2011	0
2012	0
2013	0
2014	0

Monitoring equipment:	None.
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of project emissions
Calculation method:	Equation 20, VMD0015
Comment	None

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	70.2	16.3
2013	61.3	70.9
2014	71.9	143.0

Monitoring equipment:	ArcGIS
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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	93.4	87.4	0.0
2013	62.3	59.0	0.0
2014	91.1	0.0	114.4

Monitoring equipment:	ArcGIS
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of leakage
Calculation method:	Not relevant
Comment	None

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
2013	0
2014	0

Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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): 411.3 FAB +FAP CBSL,i (t CO2-e/ha): 325.5 FAP + FAB CBSL,i (t CO2-e/ha): 512.9
Monitoring equipment:	dbh tape, measuring tape, GPS, clinometer
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Use equations as stated in the forest inventory, including allometric equations as found in Brown (1997), a volumetric based palm equation, Cairns et al. (1997), Van Wagner (1968)
Comment	None

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:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Stratum specific values calculated as $C_{BSL,i}$-Cpost
Comment	None

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:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method:	Equation 8, VMD0015
Comment	None

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:	ArcGIS
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of the data	Calculation of project emissions
Calculation method:	Not relevant

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:	As this parameter was calculated rather than measured, no measurements methods are noted.
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; 2013 – 0; 2014 – 0
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of project emissions
Calculation method:	Equation 8, VMD0015
Comment	None

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:	0.188
Monitoring equipment:	None

QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of leakage
Calculation method:	Not relevant
Comment	None

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:	0.812
Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of leakage
Calculation method:	Not relevant
Comment	None

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:	None
QA/QC procedures to be applied:	Detailed procedures provided below.
Purpose of the data	Calculation of leakage
Calculation method:	Not relevant
Comment	None

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:	None
QA/QC procedures to be applied:	Detailed procedures provided below.
Purpose of the data	Calculation of leakage
Calculation method:	Not relevant
Comment	None

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:	None
QA/QC procedures to be applied:	Detailed procedures provided below.
Purpose of the data	Calculation of leakage
Calculation method:	Not relevant
Comment	None

Data Unit / Parameter:	*ARRL,forest,2014*
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:	As this parameter was calculated rather than measured, no measurements methods are noted.
Frequency of monitoring/recording:	Prior to each verification event and at least every 5 years.
Value applied:	2,238,571
Monitoring equipment:	ArcGIS
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of project emissions
Calculation method:	Calculated as the total area of the RRL minus all nonforested areas.
Comment	None

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 $\leq$ 5 years

Value applied:	

Year	FAP-alluvial Aburn,q,i,t. (ha)	FAB +FAP Aburn,q,i,t. (ha)
2011	36.2	2.7
2012	70.2	16.3
2013	61.3	70.9
2014	71.9	143.0

Monitoring equipment:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of the data	Calculation of project emissions
Calculation method:	Aburn,q,i,t.= $A_{DistPA,q,i,t}$ (area burnt in natural disturbance) + ADefPA,u,i,t (area burnt via deforestation in project ex post)
Comment	None

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 $\leq$ 10 years
Value applied:	Detailed in the 2011 Purus Project forest inventory
Monitoring equipment:	dbh tape, measuring tape,
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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:	dbh tape, measuring tape,
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
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:	measuring tape, clinometer
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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:	dbh tape, measuring tape
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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:	None
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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:	184 m
Monitoring equipment:	measuring tape,
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comment	None

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:	0
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	See Table 3.12 of the PD.
Comment	None

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 FAP + FAB B,i,t (t d.m./ha): 244.8
Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Use equations as stated in the forest inventory, including allometric equations as found in Brown (1997) and a volumetric based palm equation, Van Wagner (1968)
Comment	None

Data Unit / Parameter:	*EBSL SS,i, pool#*
Data unit:	t CO2-e
Description:	Carbon stock or GHG sources (e.g. trees, dead wood, soil organic carbon, emission from fertilizer addition, emission from biomass burning etc.) in the baseline case
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted.
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	Parameter: Live aboveground tree biomass; Belowground biomass; Standing dead wood; Lying dead wood

	EBSL,SS,FAB+FAP,pool# (tCO2e)	7,504,145	1,750,860	95,312	410,491
	EBSL,SS,FAP-A,pool# (tCO2e)	1,508,604	345,310	34,569	51,694

Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	See X-UNC module.
Comment	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	*UBSL,SS,i,pool#*
Data unit:	%
Description:	Percentage uncertainty (expressed as 95% confidence interval as a percentage of the mean where appropriate) for carbon stocks and greenhouse gas sources in the baseline case (1,2…n represent different carbon pools and/or GHG sources)
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted.
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	
Monitoring equipment:	None

Parameter	Live aboveground tree biomass	Belowground biomass	Standing dead wood	Lying dead wood
UBSL,SS,FAB+FAP ,pool# (%)	14.0%	12.9%	58.0%	98.7%
UBSL,SS,FAP-A ,pool# (%)	16.3%	15.1%	60.5%	45.4%

QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Calculation of baseline emissions	Calculation of baseline emissions
Calculation method:	See X-UNC module.
Comment	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	E BiomassBurn,t
Data unit:	tCO2-e
Description:	Greenhouse emissions due to biomass burning as part of deforestation activities in stratum i in year t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	As this parameter was calculated rather than measured, no measurements methods are noted.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	E BiomassBurn2014,PA: 3,342.4 E BiomassBurn2014,LB: 3,369.0
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of the data	Calculation of project emissions Calculation of leakage
Calculation method:	Use equation 1 as found in the E-BB module of VM0007
Comment	None

3.3 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. As such, parameters related to calculating emissions from commercial timber harvest, including ADECKS,I,t; AROAD,i,t; CAB_tree_dest, i; CBB_tree_dest, i; CS/U,lg; CB,lg; Lsk; VEXT,z,i,t; VEXT,j,z,i,t; and WSKID, are not included in the project.

None of the project area has been or will be registered under another carbon trading scheme during the VCS project lifetime, other than CCBA. Further, the property is under the private ownership of Moura & Rosa, a project proponent, and registration under the CDM or under any other carbon trading scheme is not feasible without their consent.

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 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 Central Unit of GIS and Remote Sensing within the Climate Change Institute (ICM) in Acre, produces an annual dataset on the extent and spatial location of all deforestation within the state using Landsat images. This dataset extends back to 1988. The definition of forest used in the classified dataset is in broad agreement with the Brazilian definition of a forest[5] as set by the Clean Development Mechanism Designated National Authority.

The UCGEO classification methodology includes atmospheric and geometric correction and uses a supervised classification approach. Landsat images with cloud cover covering less than 10% of a scene were downloaded and corrected for any atmospheric problems (using Carlotto HAZE algorithm) and geometric correction (using images Geocover 2000). Georeferencing was conducted with the nearest neighbor method, using a minimum of 20 points, and had an error (RMS) of less than 1 pixel. The image processing phase includes image segmentation (into statistically homogeneous areas) using Landsat bands 3, 4 & 5 (Blue, green and red). Then representative samples (training sites) of Forest, Non-Forest Water, Cloud and Cloud Shadow are selected using expert knowledge that are distributed throughout the

[5] The Clean Development Mechanism Designated National Authority in Brazil has set the forest definition as:
1. Minimum tree crown cover of 30 per cent;
2. Minimum land area of 1 hectare; and
3. Potential to reach a minimum tree height of 5 meters at maturity

See http://cdm.unfccc.int/DNA/ARDNA.html?CID=30, accessed March 5, 2012.

image and represent the variability within each class. A supervised classification[6] approach was used with the Support Vector Machine (SVM) classification algorithm. All processing was implemented in ENVI + IDL 4.6 except georeferencing which was carried out using ERDAS IMAGINE 9.

Deforestation and natural disturbance may 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. For this monitoring period no ancillary data was required and all information on deforestation was acquired from the UCGEO classification.

In the case where this dataset ceases to be available, or if newer and/or higher quality data becomes 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 ($A_{RRL,forest,t}$) is derived by subtracting 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), then an estimation of emissions associated with illegal logging will be produced from the survey data and the T-SIG tool applied. The information collected in the PRAs will be used to calculate logging emissions in conjunction with conservative assumptions/estimates including that all wood collected was live, use of a regional charcoal recovery rate, use of a logging damage factor from the methodology, and that trees harvested were in the 99th percentile in terms of dbh, ≥ 69cm.

[6] There is no overlap between the accuracy assessment points and the data used for classification.

In the event that the initial assessment indicated that illegal logging is occurring and significant in the area; the potential degradation area within the project area ($A_{DegW,i}$) will be delineated based on survey results, incorporating general area information and depth of penetration. Degradation monitoring plots will be allocated to achieve a 3% sample of this area. Rectangular plots 10 meters by 1 kilometer (1 ha area) will be randomly or systematically allocated in the area, sufficient to produce a 3% 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. 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 3% sample will be carried out once every 5 years where initial surveys 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 (E BiomassBurn,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 E BiomassBurn 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 average aboveground biomass stock in the baseline case.
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. Aburn,i,t is assumed to be equal to ADefLB,i,t unless monitoring and on the ground observations demonstrate otherwise. 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 leakage belt and project area	proportion	Monitored prior to each verification event and at least every 5 years
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[7] 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

[7]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.[8] , 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[9]) as modified by Van Wagner[10] 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[11] Guidelines for National Greenhouse Gas Inventories).

[8] 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.
[9] Warren, W.G. and Olsen, P.F. (1964) A line intersect technique for assessing logging waste. Forest Science 10: 267-276.
[10] Van Wagner, C.E. (1968). The line intersect method in forest fuel sampling. Forest Science 14: 20-26.
[11] 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 (Landsat 3,4 & 5) 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 year 2014, 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)
2014	158,897	225,397

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 2014 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)
2014	71.9	411.3	143.0	325.5	0.0	76,110

While deforestation decreased relative to the baseline case, a total of 214.9 ha were still deforested over this monitoring period. There were numerous areas of deforestation in 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 rented plane and via boat along the Purus River. The rented plane 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 5 official deforestation monitoring reports completed for the 2014 monitoring period. Upon discovering deforestation, the local project manager Kidney would talk to the communities about the importance of stopping deforestation in order for the implementation of social projects and programs.

Degradation

Net carbon stock change accounted as a result of degradation in the project area ($\Delta C_{P,Deg,i,t}$) is limited to emissions resulting from degradation due to illegal logging (ΔCP,DegW). No commercial logging occurs in either the baseline or with-project case (i.e., ΔCP,SelLog,i,t is equal to zero).

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[12]. Using the T-SIG tool, degradation emissions (432 t CO2) are determined to be de minimis because they are less than five percent of the total GHG benefits generated during the same monitoring period (61,182 t CO2), and thus are not accounted in net GHG benefit calculations. 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, 2014.

Natural Disturbance

No areas of natural disturbance were reported in the area of projected deforestation in the baseline during the 2014 period by forest monitors or local land managers, nor was evident or could be distinguished

[12] See "2014_PurusDegradation 2015.09.16.xls" in the project database for details of the de minis analysis.

(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, N2O and CH4 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 N2O 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)
2014	71.9	196.2	143.0	155.0	0.45	0.2	310.0	1,012

Table 4.5. Calculation of CH4 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)
2014	71.9	196.2	143.0	155.0	0.45	6.8	21.0	2,331

Table 4.6a. Calculation of E-BiomassBurning in the project area.

Year	E-N2O BiomassBurn (tCO2e)	E-CH4 BiomassBurn (tCO2e)	E-BiomassBurn (tCO2e)	GHGP-E,i,t (t CO2-e)
2014	1,012	2,331	3,342	3,342

As justified in Section 3.3, total project GHG emissions (GHGP) equal emissions from biomass burning (EBB) as other sources are equal to zero.

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 are 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)
2014	76,110	0	0	3,342	0	79,452

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. Much of the deforestation in the leakage belt is attributable to a recent INCRA settlement. This INCRA settlement is located partially within the leakage belt and abuts the project area's north northwest boundary. This INCRA settlement is likely to represent a large percentage of the project's leakage emissions for the foreseeable future. Emissions were calculated as the difference between stocks before and after deforestation, as for project emissions. Emissions due to biomass burning were also calculated as per the procedures in the E-BB module. As justified in Section 3.3, total project GHG emissions (GHGP) equal emissions from biomass burning (EBB) as other sources are equal to zero. The area deforested was derived from the 2014 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 4.8a. Calculation of E-BiomassBurning in the leakage belt.

Year	COMF	G,N20 (kg/t d.m. burnt)	GWP,N20 (t CO2/t gas g)	E-N2O Biomass Burning (tCO2e)	G,CH4 (kg/t d.m. burnt)	GWP,CH4 (t CO2/t gas g)	E-CH4 Biomass Burning (tCO2e)	E-Biomass Burning LB (tCO2e)
2014	0.45	0.2	310.0	1019.9	6.8	21.0	2349.1	3,369.0

Table 4.8b. 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)	E-Biomass Burning LB (tCO2e)	ΔCP,LB (t CO2-e)	ΔCBSL,LK,unplanned (t CO2-e)	ΔCLK-ASU-LB (t CO2-e)
2014	114.4	411.3	91.1	325.5	0.0	512.9	0.0	3369.0	80,055	225,397	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 2014, equal to 80,055 t CO2e. Estimated baseline annual emissions in the leakage belt in 2014 were 225,397 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)
2014	0.188	568.1	106.5	214.9	205.4	78.8	27.7	372.3	0.0	10,319

Total leakage (10,319 t CO2-e) is then calculated as the sum of activity shifting leakage resulting from both local and immigrant agents (Table 4.10). GHG emissions from leakage mitigation activities (GHGLK) equal zero as none of the mitigation activities involve biomass burning or fertilizer usage.

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)
2014	10,319	0	0	10,319

4.4 Net 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[13]. Overall, the inventory produced an estimate of biomass carbon stocks at the project level of 92.0 t C/ha (or 337.2 tCO2/ha) with a precision level of +/- 10.1% of the mean at the 95% confidence level.

As stated in the uncertainty module "where no ex post (re-)measurements of carbon pools or GHG sources have been made, i.e. uncertainty from these sources is already included in UncertaintyBSL,t*, cumulative project uncertainty through time t is therefore equal to uncertainty in baseline estimates." As no ex post measurements of carbon pools or GHG sources have occurred, parameters related to calculating uncertainty in the with-project scenario, including EP,SS,i, Pool# and UP,SS,i,pool#, have not been included in the project.

As the precision surrounding estimates of forest carbon stocks, 10.1% 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. Estimate of Net Emission Reduction Credits. Values in this table have been rounded to the nearest whole number.

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})
2014	158,897	79,452	10,319	11%	8,739	60,387

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

5 ADDITIONAL INFORMATION

Deforestation Data

Monitoring results reported here used classified 2014 satellite imagery produced by UCEGEO, the GIS department within the Climate Change Institute, Acre State government, which produces an annual dataset on the extent and spatial location of all deforestation within the state. This dataset is based on classification of a series of Landsat imagery. Each image selected for classification contains less than 10% cloud cover. This is followed by processing of the images by applying the filter HAZE. This algorithm was developed by Carlotto[14] and aims to improve visibility by reducing the effect of atmospheric haze and smoke. This algorithm was applied using the software ENVI, version 4.6. This step was followed by geometric correction using the NASA GeoCover 2000 product as the base data. ENVI + IDL, version 4.6 were used to group multispectral bands (Landsat 3, 4 & 5), while ERDAS IMAGINE 9.1 software was used for georeferencing. The RMS error of the georeferenced product was < 1 pixel, meeting good practice standards in remote sensing. Additional details on pre-processing can be found in the UCEGEO methodology[15].

As mentioned above changes in forest cover were determined using the 2014 Acre deforestation database. Figure 5.1 shows the area of deforestation in the project area and leakage belt for this monitoring period. Figure 5.2 shows the 2014 forest benchmark map (covering both the project area and leakage belt) which was produced using the aforementioned deforestation dataset.

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 2014. 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.

[14] CARLOTTO, M. J. Reducing the effects of space-varying wavelength-dependent scattering in multispectral imagery. International Journal of Remote Sensing, v. 20, n. 17, p. 3333-3344, 1999.
[15] ACRE - Governo do Estado do Acre (no prelo). REVISÃO DA DINÂMICA DO DESMATAMENTO NO ESTADO DO ACRE: ANÁLISE TEMPORAL DE 23 ANOS (PERÍODO DE 1988 A 2010). Rio Branco: (UCEGEO - FUNTAC/SEMA), 2011.

Figure 5.1. Map of the 2014 deforestation in the project area and leakage belt.

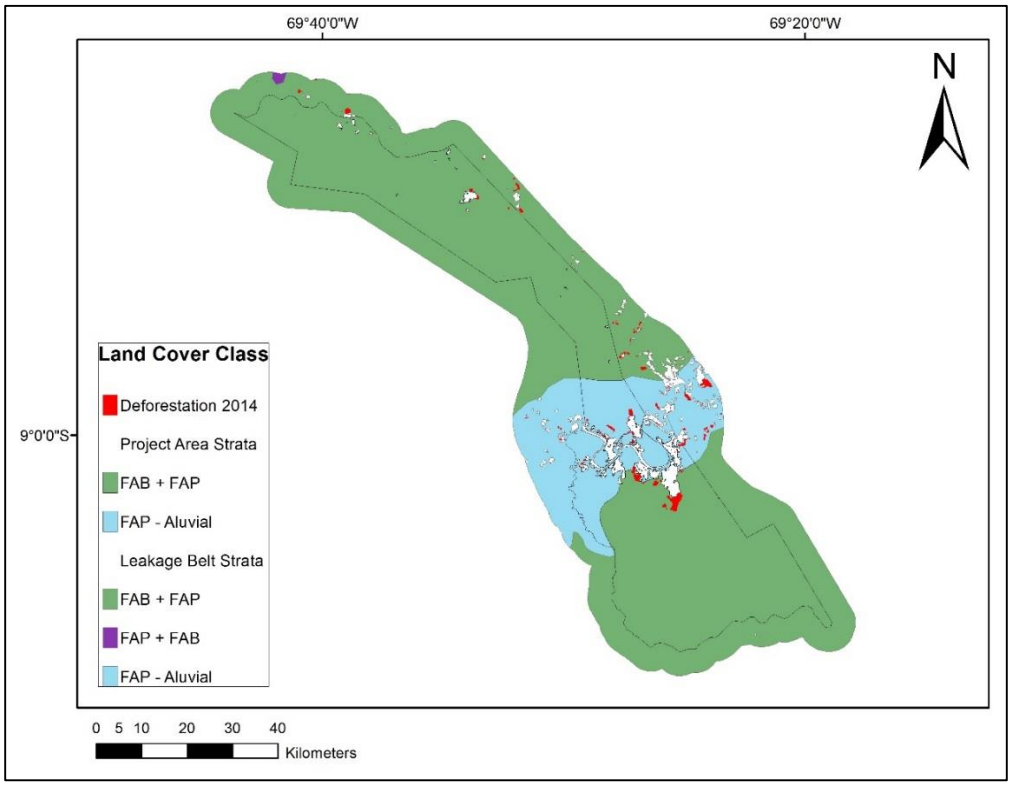
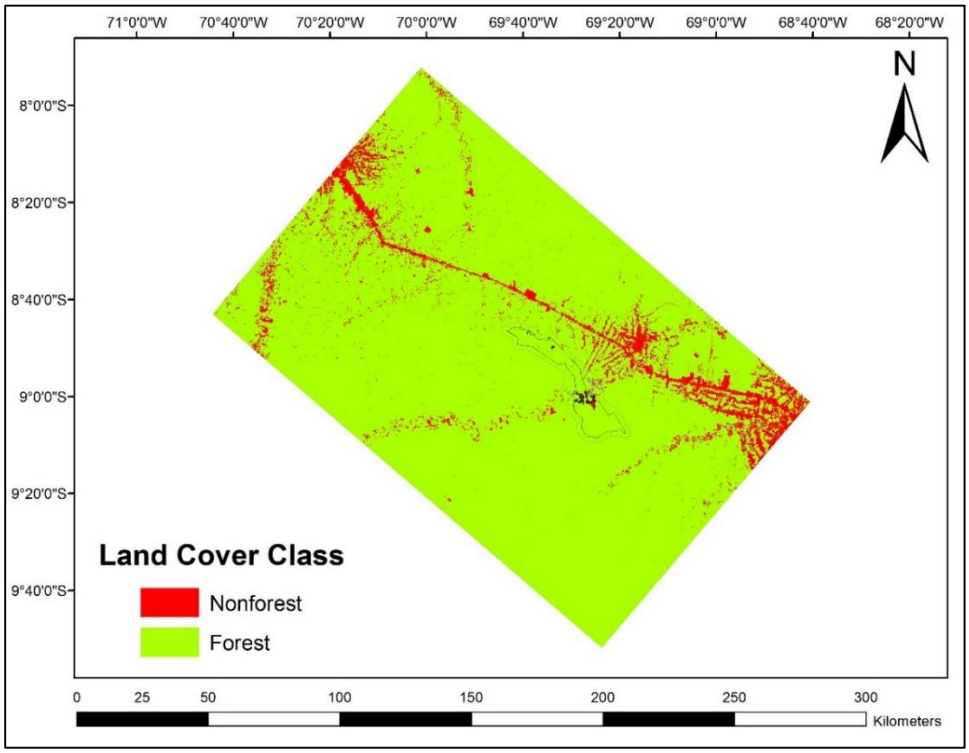


Figure 5.2. 2014 forest benchmark map for the project area and leakage belt.



Accuracy Assessment

Accuracy of the classification was assessed by comparing the classification with ground truth points from samples of high-resolution imagery (e.g. Digital globe) available through Google Earth. Only high resolution imagery is used in the analysis, for example the Digital globe satellites collect multispectral imagery at 2 meter resolution. Any sample points of high resolution imagery used to assess classification accuracy are recorded and archived (with an ID number, geographic position information, identified land-use class). Samples used to assess classification accuracy are well-distributed throughout the 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 date.

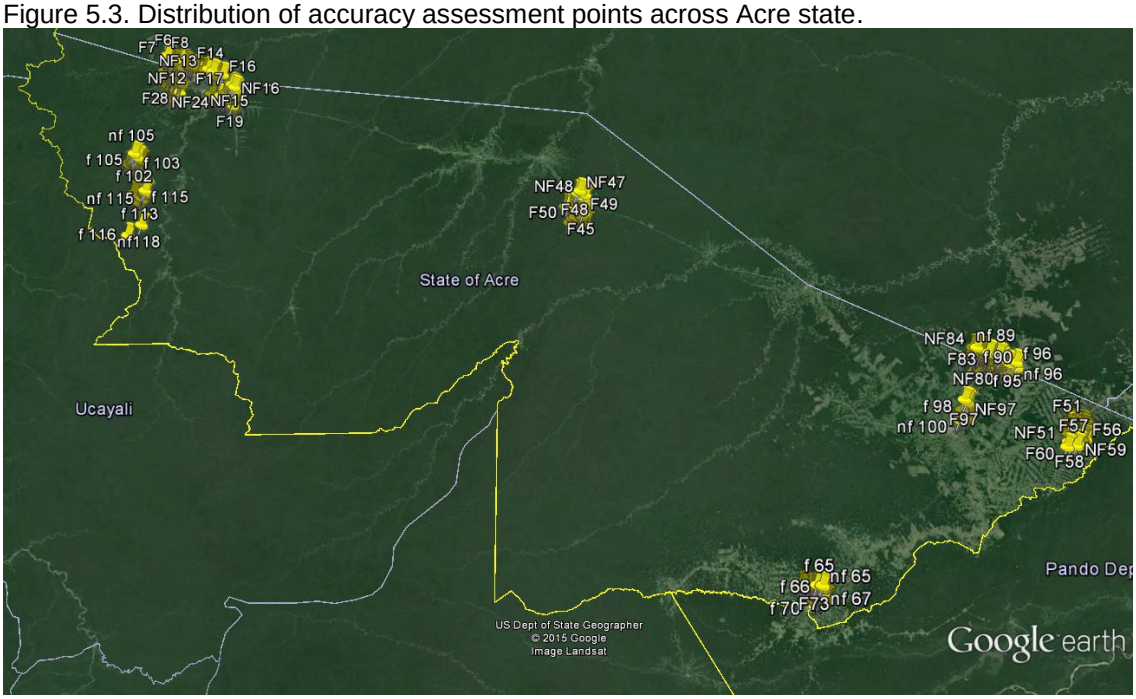
Results of the accuracy assessment are presented and analyzed in a matrix below, such that the following errors are presented:

- Classification accuracy
- Error of omission of each land-use category (forest and non-forest)
- Error of commission of each land-use category (forest and non-forest)

Classification	**Land-use class as determined from ground-truth points**		**Total**	**Accuracy (%)** ***User's accuracy*** ***(# correct/ row total)***	**Error of Commission (%)**
	Forest	**Non-forest**			
Forest	107	3	110	97.3%	2.7%
Non-forest	11	115	126	91.3%	8.7%
Total	118	118	236		
Accuracy (%) ***Producer's accuracy*** ***(# correct/ column total)***	90.7%	97.5%			Overall Accuracy 94.1%
Error of Omission (%)	9.3%	2.5%			

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%. The accuracy of the 2014 classification meets this criteria with overall accuracy of 94%.

Figure 5.3. Distribution of accuracy assessment points across Acre state.



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, version 3.2, 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[16] 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-c)	Not applicable.	0
d)	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. Community members that have been living on land adjacent to the project area and who made the land productive (e.g., by growing crops or raising animals) for ten years, have the right to be titled. To resolve ongoing disputes over land, Moura & Rosa will voluntarily recognize whatever area is currently deforested and under productive use by each family living on the Seringal Porto Central and Seringal Itatinga parcels. One family continues to disregard Moura & Rosa's engagement and clear ownership and insists on taking liberties in their access/use of the project property and its resources. As such, this infringement on the Moura & Rosa property has resulted in a dispute over access/use rights on a small part of the project property.	5
e)	Not applicable.	0

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

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)	The Project Proponents have been implementing activities to resolve the ongoing access/use right disputes. The Project Proponents have met with STR and the local communities, including the Guitas, to discuss land titling numerous times since the Project State Date (see section entitled, "Create Project Awareness"). In addition, Moura & Rosa have initiated the titling process with three local families and the Agreement between these three local families and Moura & Rosa was provided to ESI.	-2
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e+ f)] Total may not be less than zero.		1

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. A total of nine MOUs with families living within Moura & Rosa's 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 2009 through 2013 is 0.05, 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.[17]	-2
Total Political (PC) [as applicable ((a, b, c, d or e) + f)] Total may not be less than zero.		0

Political risk was evaluated using the latest World Bank index data.

[17] 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).

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

Governance Indicator	2009	2010	2011	2012	2013
Control of Corruption	-0.12	0.00	0.15	-0.07	-0.12
Government Effectiveness	-0.10	-0.04	-0.12	-0.12	-0.08
Political Stability	0.16	0.01	-0.14	0.05	-0.28
Regulatory Quality	0.11	0.16	0.18	0.09	0.07
Rule of Law	-0.22	0.00	-0.01	-0.11	-0.12
Voice and Accountability	0.49	0.53	0.47	0.43	0.37
Overall Mean					0.05

Total External Risks	
Total External Risks (LT + CE + PC) Total may not be less than zero.	1

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[18] 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[19]. 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.

[18]Cochrane M.A.& Laurance W.F., 2002. Fire as a large-scale edge effect in Amazonian forests, Journal Of Tropical Ecology, 18:311-325.
[19]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.

	The Cochrane and Laurance study[20] 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
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[21], 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.

[20] Cochrane M.A.& Laurance W.F., 2002. Fire as a large-scale edge effect in Amazonian forests, Journal of Tropical Ecology, 18:311-325.
[21] For more information see the results of Purus Forest Inventory located in Annex 1.

	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.[22]
Significance	Insignificant <5% loss of carbon stocks
Likelihood	Once every 100 years or more.
Score (LS)	0
Mitigation	None

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% of 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

[22] 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.

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	1
c) Natural Risk	2
Overall Risk Rating (a + b + c)	**11**

The Purus Project will employ a non-permanence risk deduction of 11%.

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 Monitoring Report.