2015 ENVIRA AMAZONIA PROJECT MONITORING REPORT

Document Prepared By

CarbonCo[1], LLC, East Aurora, NY USA

and

TerraCarbon[2], LLC, Peoria, IL USA

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Prepared By	James Eaton[2] and Brian McFarland[1]
Contact	Brian McFarland, CarbonCo, LLC 853 Main Street, East Aurora, New York - 14052 Phone: (240) 247-0630 Email: BMcFarland@CarbonCoLLC.com Website: www.CarbonCoLLC.com

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Envira Amazonia Project – A Tropical Forest Conservation Project in Acre, Brazil (the Envira Amazonia 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). This project is being developed and registered under the Verified Carbon Standard (VCS) and the Climate, Community and Biodiversity Standard (CCBS). Project development involved engaging a large landowner willing to forgo conversion of forest land to a ranching operation, working with the local communities surrounding the project area, engaging Acre state officials working on reducing deforestation pressures on the regional/state level, and putting into operation the REDD project implementation plan with the help of local partners.

The Envira Amazonia REDD APD Project will generate GHG emission reductions by foregoing forest conversion to grassland in favor of conservation of the tropical forest (i.e., maintaining existing carbon stocks). The project will also mitigate deforestation pressures in the wider region using a combination of environmental programs and social programs intended to improve the livelihoods of community members living in the vicinity of the project area. Social projects and programs for the local communities will not only generate sustainable economic opportunities, but will also result in a reduction in deforestation in the region and the preservation of biodiversity.

The Envira Amazonia Project is located near Feijó in Acre, Brazil. The property where the project area is located covers an area of 200,000 hectares. Feijó, the closest town to the Envira Amazonia Project, is located between the towns of Sena Madureira and Cruzeiro do Sul along Highway BR-364. The recent paving of Highway BR-364, the main east-west highway in Acre, in 2011 has greatly increased market access in the region and increased property values as cattle ranching along this road corridor has expanded. The project property is connected to BR-364 by a secondary road and is accessible by 4-wheeler paths found throughout the property.

A signed Tri-Party Agreement between JR Agropecuária e Empreendimentos LTDA, Carbon Securities and CarbonCo, LLC lays out the roles and responsibilities for each project proponent, and documents the transfer of some portion of the carbon rights from JR Agropecuária e Empreendimentos to Carbon Securities and CarbonCo. At the time of signing the initial Tri-Party Agreement (August 2, 2012), there were three investors in JR Agropecuária e Empreendimentos LTDA.

The principal investor Duarte Jose do Couto Neto ("Duarte") acquired extensive land holdings in the early 1980s and managed the lands for rubber extraction. At the height of Duarte's rubber extraction business, Duarte had acquired 840,000 hectares which was used primarily for rubber tapping and employed almost 1,500 workers. After seeing a boom in the 1980s, the rubber industry declined steadily in the 1990s leading Duarte to sell some of his lands and seek business partnerships to expand revenues.

Duarte's partnership with Bento Ferraz Pacheco ("Bento") started in 2005 on all of Duarte's remaining land holdings, which at that time totaled approximately 450,000 hectares. With Bento's experience in cattle ranching, the intention of this partnership was to expand cattle ranching and agriculture on the properties. At the height of Bento's business, he owned several ranches in Mato Grosso, over 200,000 head of cattle, and a slaughterhouse in Bolivia.

In 2009, Bento and Duarte both sold a percentage of their business to Rubens Vasques ("Rubens"), a forest management expert.

The company JR Agropecuaria e Empreendimentos LTDA (which translates into JR Agriculture-Livestock and Ventures LTDA) was established by Duarte on July 13, 2009. Their plan was to log 20% of the property prior to converting the land to pasture. As such Milva Vasquez M.E., a logging company owned by Rubens, was to harvest all commercially valuable wood and then clear-cut to help establish a large ranch. Bento would then lead the conversion of the cleared land to pasture, including the planting of grass and installing fencing.

JR Agropecuaria e Empreendimentos LTDA first decided to pursue a planned REDD project on their land in early 2012, after Duarte learned about REDD projects in early 2012 from Almir Santana Ribeiro, a real estate agent based in Rio Branco who had previously worked with Carbon Securities.

Implementation Status of the Project

The Envira Amazonia Project reduced deforestation and mitigated the associated greenhouse gas emissions by JR Agropecuária e Empreendimentos EIRELI voluntarily foregoing the conversion of its property's primary forests to a large-scale cattle ranch. Furthermore, the Project Proponents also: engaged numerous stakeholders; hired a community specialist to visit the local communities and fully discuss the Project; hired a local project manager to initiate monitoring for deforestation; established community and biodiversity impact monitoring plans; began designing various projects and programs such as commercializing the collection of medicinal plants and açaí, offering agricultural extension services, and granting land tenure; and the Project conserved the Project Area's rich tropical biodiversity including numerous endemic bird species and threatened tree species.

GHG Emission Reductions and Removals for the Current Monitoring Period

The total emissions reduced by the Envira Amazonia Project over the course of this monitoring period are 2,084,635 tCO_2e.

Years	GHG emission reductions (tCO2e)
2015	2,084,635
Total	2,084,635

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 Planned Deforestation (APD)

Grouped Project: No

This project is being registered under the Verified Carbon Standard (VCS) as a Reducing Emissions from Deforestation and Degradation (REDD) project and has been developed in compliance with the Verified Carbon Standard,[1] Version 3.5 and VCS AFOLU Requirements.[2] The project will reduce emissions from planned deforestation.

1.3 Project Proponent

The three main project proponents are CarbonCo, LLC ("CarbonCo"), Freitas International Group, LLC ("Carbon Securities"), and JR Agropecuária e Empreendimentos EIRELI. 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 JR Agropecuária e Empreendimentos, acts as a translator, and assists with logistics for site visits. JR Agropecuária e Empreendimentos is an Acre, Brazil-based organization created by the landowner and is primarily responsible for day-to-day management of the Project.

Organization name	CarbonCo, LLC
Contact person	Brian McFarland
Title	Director
Address	853 Main Street, East Aurora, New York, 14052, USA
Telephone	001-240-247-0630
Email	BMcFarland@CarbonCoLLC.com

Organization name	JR Agropecuária e Empreendimentos EIRELI
Contact person	Duarte Jose do Couto Neto or Rege Ever C. Vasques
Title	Duarte Jose do Couto Neto is Owner of Company
Address	Travessa Alagoas, Number 49, Altos, Bairro Centro Rio Branco, Acre, Brazil, CEP (Zip Code) 69900-412
Telephone	Duarte: 55 (68) 9232-7475 Rege: 55 (68) 9201-1060
Email	Duarte: GracaPCouto@gmail.com Rege: RegeEver@hotmail.com

Organization name	Freitas International Group, Doing Business as Carbon Securities
Contact person	Pedro Freitas

[1] VCS. 2015 VCS Standard. Version 3.5, 25 March 2015. Verified Carbon Standard, Washington, D.C.
[2] VCS. 2013 Agriculture, Forestry and Other Land Use (AFOLU) Requirements. Version 3.4, 08 October 2013. Verified Carbon Standard, Washington, D.C.

Title	Founder and President
Address	201 S. Biscayne Boulevard, 28th Floor, Miami, Florida, 33131, USA
Telephone	001-305-209-0909
Email	PedroFreitas@CarbonSecurities.org

1.4 Other Entities Involved in the Project

Organization name	TerraCarbon LLC
Role in the project	Independent consultant to co-lead project development kick-off; design and manage forest carbon inventory; lead baseline development task; develop project document and advise CarbonCo on all aspects of project development.
Contact person	James Eaton and David Shoch
Title	James Eaton, Senior Manager, Forestry and Technical Services David Shoch, Director, Forestry and Technical Services
Address	5901 N. Sheridan Road, Peoria, Illinois 61614, USA
Telephone	001-434-326-1144
Email	James.Eaton@TerraCarbon.com and David.Shoch@TerraCarbon.com

Organization name	TECMAN
Role in the project	Independent consultant to lead and supervise collection of field data during the course of the forest carbon inventory.
Contact person	Igor Agapejev de Andrade and Fabio Thaines
Title	Igor and Fabio are co-owners of TECMAN
Address	Rua Copacabana, nº 148, Sala 204, Conjunto Village Maciel, CEP 69.914-380 Rio Branco, Acre, Brasil
Telephone	55-68-3227-5273
Email	FabioThaines@tecman.eng.br and IgorAgapejev@tecman.eng.br

Organization name	Antonio Willian Flores de Melo of Universidade Federal do Acre Centro de Ciências Biológicas e da Natureza
Role in the project	Independent consultant to assist with review of the project baseline.
Contact person	Antonio Willian Flores de Melo
Title	Independent Consultant
Address	Universidade Federal do Acre Centro de Ciências Biológicas e da Natureza, Distrito Industrial, CEP 69.915-900, Rio Branco, Acre, Brasil
Telephone	55-68-3901-2611
Email	willianflores@gmail.com

1.5 Project Start Date

The Envira Amazonia Project has a project start date of August 2, 2012. On this day, the Tri-Party Agreement between the Project Proponents was signed and JR Agropecuária e Empreendimentos EIRELI agreed to pursue a forest conservation project rather than clear the land for lumber and for the establishment of a ranch.

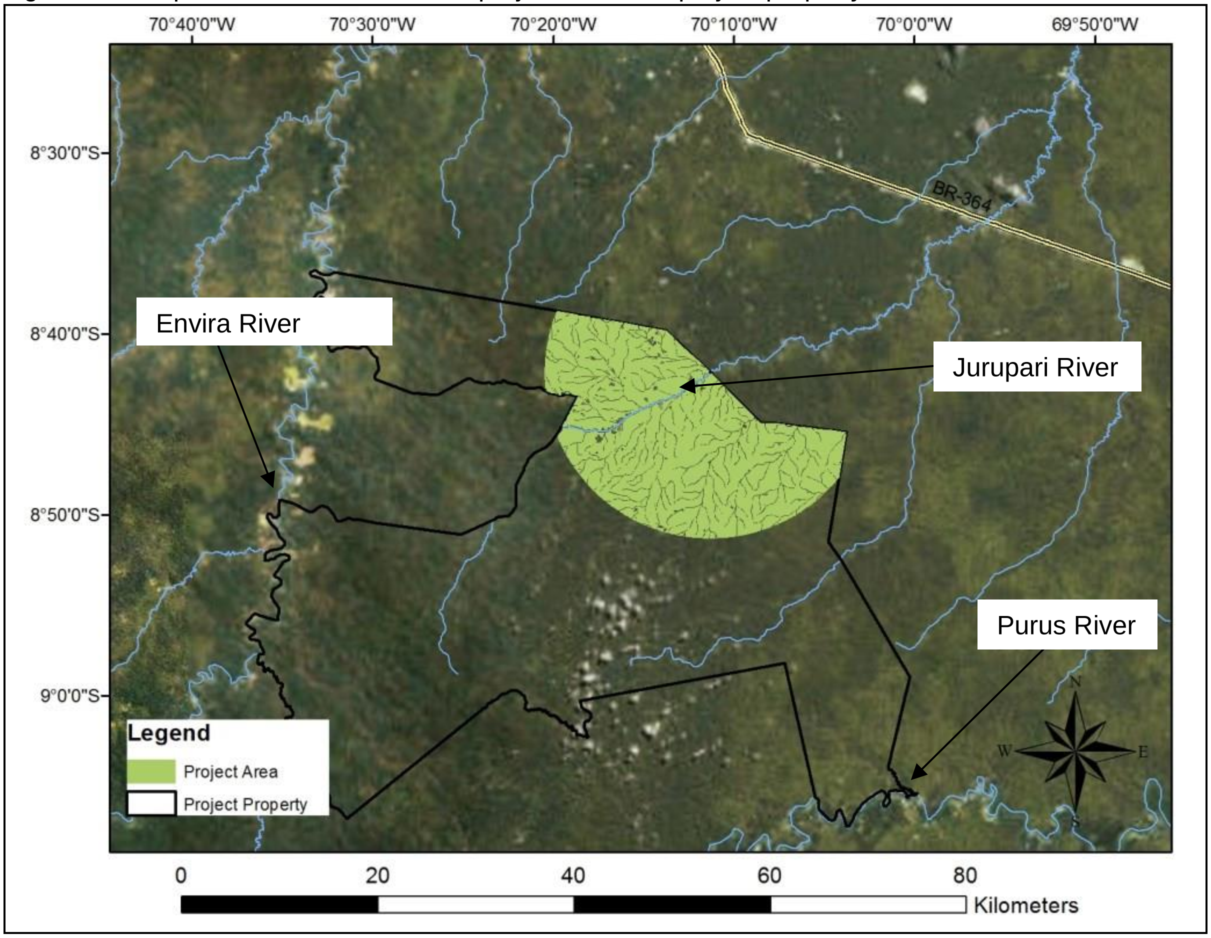
1.6 Project Crediting Period

The Envira Amazonia Project has an initial project crediting period of 30 years, starting on August 2, 2012. The initial baseline period started on August 2, 2012 and is set to continue through August 1, 2022. The initial project crediting period is set to end on August 1, 2042.

1.7 Project Location

The Envira Amazonia Project area is located in Acre, Brazil along the banks of the Jurupari River (see Figure 1.1) about 60 km southeast of the town Feijó. The total project area (i.e., forested area of the property as of the project start date, and 10 years prior) is 39,300.6 hectares. This represents less the 20% of the project property which totals 200,000 hectares. The project area is the portion of the property closest to BR-364 along the Jurupari River.

Figure 1.1. Map of the Envira Amazonia project area and project property.



1.8 Title and Reference of Methodology

The Envira Amazonia Project is utilizing the Avoided Deforestation Partners' VCS REDD Methodology, entitled, "VM0007: REDD Methodology Modules (REDD-MF)." The only eligible activity as part of this project is avoiding planned deforestation, hence only modules related to planned deforestation are required. This project is eligible as an avoiding planned deforestation project because the forest land is expected to be converted to non-forest land in the baseline case and the land is legally permitted to be converted to non-forest. The specific modules applied to the Envira Amazonia Project are listed below.

REDD-MF, REDD Methodology Framework Version 1.5

Carbon pool modules:

CP-AB "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools", version 1.1

CP-W "VMD0005 Estimation of carbon stocks in the long-term wood products pool", version 1.1

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

Baseline module:

BL-PL "VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation", version 1.2

Leakage modules:

LK-ASP "VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation", version 1.1

LK-ME "VMD0011 Estimation of emissions from market-effects", version 1.0. Mandatory where the process of deforestation involves timber harvesting for commercial markets

Monitoring module:

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

Miscellaneous Modules:

E-BB "VMD0013 Estimation of greenhouse gas emissions from biomass burning", v1.0.

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 always mandatory when using the VM0007 methodology. Further use of modules, BL-PL and LK-ASP, is mandatory in the case of projects focusing on planned deforestation. LK-ME and CP-W are mandatory where the process of deforestation involves timber harvesting for commercial markets. Use of the module T-SIG determines whether GHG emissions by sources and/or decreases in carbon pools are insignificant. Finally, CP-AB is mandatory in all cases and while CP-D is optional as the dead wood pool is greater in the project scenario than the baseline scenario.

1.9 Other Programs

Emission Trading Programs and Other Binding Limits

No emission reductions generated by the Envira Amazonia Project are part of an emissions trading 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 Envira Amazonia 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.[3]

Participation under Other GHG Programs

The Envira Amazonia Project has not been registered, nor is seeking registration, under any other GHG programs. The Envira Amazonia Project was validated and is now registered under the Climate, Community and Biodiversity Alliance Standard.[4]

1.10 Sustainable Development

The Envira Amazonia Project shall assist Brazil with meeting several of the Sustainable Development Goals (SDGs). This includes:

- Reducing poverty and improving food security (i.e., via agricultural extension trainings and increased employment opportunities)
- Improving health (via building a local health clinic)
- Gender equality and reduced inequalities
- Reducing deforestation and promoting climate action (i.e., by voluntarily foregoing the conversion of primary forests to cattle pasture)

These activities will be are being designed and implemented and shall be independently assessed against the Climate, Community and Biodiversity Standard (CCBS). For more information, please see the Envira Amazonia Project's CCBS Project Design Document (PDD) and the CCBS Project Implementation Report (PIR).[5]

[3] Forest Trends, "Our Initiatives," http://www.forest-trends.org/#
[4] The CCB project document is available at http://climate-standards.org/projects/
[5] The CCB project document is available at http://climate-standards.org/projects/

2 IMPLEMENTATION STATUS

The main objective of the Envira Amazonia REDD APD Project is the conservation of the tropical forest in the project region. The primary project activity, undertaken by JR Agropecuária e Empreendimentos EIRELI, is voluntarily foregoing the clearing of the project area and conversion of the land to a large-scale cattle ranch.

The Envira Amazonia Project will further mitigate deforestation in the region by mitigating deforestation pressures using a combination of environmental programs and social programs which are intended to improve the livelihoods of community members living in the vicinity of the project area. Social projects and programs for the local communities, will not only generate sustainable economic opportunities, but will also result in a reduction in deforestation in the region and the preservation of biodiversity.

2.1 Implementation Status of the Project Activity

Since August 2012, JR Agropecuária e Empreendimentos EIRELI has begun to implement and/or designed the following project activities:

- Forego Clearing of the Project Area and Conversion to Pasture;
- Raise Project Awareness;
- Hire Project Manager;
- Patrol and Monitor Deforestation;
- Provide Agricultural Extension Services; and
- Establish a Project Headquarters.

Forego Clearing of the Project Area
Beginning in August 2012, JR Agropecuária e Empreendimentos EIRELI has voluntarily foregone the conversion of the Project Area's primary forests to a large-scale cattle ranch despite having all the necessary licenses and approvals. Instead, JR Agropecuária e Empreendimentos EIRELI and the project team will continue to implement a forest conservation project.

Project Awareness
The communities near the Project Area are an essential component of the Envira Amazonia Project and throughout 2014, the Envira Amazonia Project was discussed in greater detail with the local families to ensure they were fully aware of the Project, were able to contribute to the Project design, able to openly express desired outcomes and concerns, understood the third-party grievance procedure, and were able to voluntarily give Free, Prior and Informed Consent (FPIC).

Ayri Saraiva Rando was hired as an independent community specialist and visited a total of 41 families between May 20th and June 11th, 2014. Local families who wanted to join the Envira Amazonia Project either verbally agreed to join the Project and/or signed an "ata" between May 20th and June 11th, 2014. As of June 2014, all of the community members interviewed within the Envira Amazonia Project area have either signed the "ata" or verbally agreed to assist the project in reducing deforestation.

In December 2014, JR Agropecuária e Empreendimentos EIRELI, CarbonCo, TerraCarbon, and Carbon Securities visited the local communities as part of the validation audit and to introduce the entire project team.

Through meeting with the local families, the Project Proponents have been able to gain the community's insights about project design and to better incorporate the communities into the Project.

A brief summary of project meetings and stakeholder comments have been provided below.

March 9-18, 2011 - CarbonCo, Carbon Securities and TerraCarbon traveled to Acre, Brazil to better understand how to implement REDD+ projects in Acre, Brazil. 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;
- 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 Purus Project's design, which would later influence how the Envira Amazonia Project was designed, 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); and began a close, consultative relationship with the State of Acre.

August 9-18, 2011 - CarbonCo, Carbon Securities, and TerraCarbon visited Rio Branco. A few key milestones included:

- TerraCarbon led a classroom forest carbon inventory training for TECMAN field crew for the Purus Project. TECMAN would later be hired for the Envira Amazonia Project.
- CarbonCo, Carbon Securities, TerraCarbon, and TECMAN met with Acre State officials, including Monica Julissa De Los Rios de Leal and Lucio Flavio, 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, and TerraCarbon visited the Purus Project to train TECMAN's field crew in forest inventory practices and standard operating procedures, which would later be used during the Envira Amazonia Project's forest carbon inventory.
- CarbonCo, Carbon Securities, and TerraCarbon met with Willian Flores to discuss the VCS methodology, VM0007 REDD Methodology Modules, applicable to modeling regional deforestation. Willian Flores would later be contracted for assistance with the Envira Amazonia Project.
- CarbonCo, Carbon Securities, 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.

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.

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 the 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 the Government of our Project.

August 2, 2012 – CarbonCo, Carbon Securities and JR Agropecuária e Empreendimentos EIRELI signed Tri-Party Agreement

April 5, 2013 - CarbonCo, Carbon Securities, and Ilderlei Souza Rodrigues Cordeiro (owner of Russas Project) met again with Eufran Amaral from the Climate Change Institute to give an update on all the Projects, including informing about moving forward with the Envira Amazonia Project, and received updates on the work of the Climate Change Institute.

April 30, 2013 – CarbonCo held another call with Natalie Unterstell of Brazil's Ministry of Environment to update her that the Purus Project became the first dual VCS-CCBS validated REDD+ Project in Acre and that the Envira Amazonia Project would undergo VCS-CCBS validation later in 2014.

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 7-9, 2014 – CarbonCo, Carbon Securities and TerraCarbon met JR Agropecuária e Empreendimentos EIRELI (particularly Duarte Jose do Couto Neto, Fredis C. Vasques and Jose Elves Araruna Sousa) to discuss the VCS Project Description and CCBS Project Design Document. The conversations focused on identifying proxy sites and further refining the proposed project activities.

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 Envira Amazonia 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 9, 2014 – CarbonCo, Carbon Securities, JR Agropecuária e Empreendimentos EIRELI (particularly Fredis C. Vasques) and TerraCarbon met TECMAN for a classroom training refresher on the Envira Amazonia Project's forest carbon inventory and standard operating procedures.

May 10, 2014 - CarbonCo, Carbon Securities, JR Agropecuária e Empreendimentos EIRELI (particularly Fredis C. Vasques) and TerraCarbon met TECMAN in the field to further refine field techniques for the Envira Amazonia Project's forest carbon inventory and further reviewed the standard operating procedures**.**

May 13, 2014 – CarbonCo and Carbon Securities met Ayri Saraiva Rando to review community surveys and discuss logistics to visit Envira Amazonia Project.

May 13, 2014 – CarbonCo and Carbon Securities met Fronika de Wit to introduce the Project Proponents, gave an overview of all Acre REDD+ projects underway (particularly the Envira Amazonia Project), and discussed how Fronika de Wit might be able to participate in the Project.

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

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

May 20 – June 11, 2014 – Ayri Rando met with a total of 10 families in the Project Zone and 31 families along the Envira River (i.e., outside the Project Zone) to: explain what is REDD+, explain the landowners' proposed activities and explain the overall Project design; discuss the benefits of the Project and listen to the concerns of the local families and listen to the families' anticipated results; inform the families about another visit in October or November to notify them about the CCBS Public Comment Period and another visit in December with an independent auditor; and to conduct research on basic necessities, agricultural needs, and participatory rural appraisals. The Project was significantly revised based off the families' input. For example, the Project was revised by incorporating specific agricultural extension courses, restructuring the Project's implementation schedule, and targeting the needs of women.

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.

August 10-31, 2014 - CarbonCo and Carbon Securities contacted several potential contractors to assist the Project Proponents in 2015 with a rapid assessment of endemic and vulnerable bird species throughout the Project Zone. This includes Brazilian biologists Guilherme Serpa, Luiz Henrique Medeiros Borges, Fernando Pacheco, and Tomaz Nascimento de Melo.

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

December 10, 2014 – CarbonCo, Carbon Securities, TerraCarbon and JR Agropecuária e Empreendimentos EIRELI met with Mr. Hammerly Albuquerque, the mayor of Feijó, during his visit to Rio Branco. The Project Proponents introduced the Project and discussed current land-use activities in Feijó.

December 12, 2014 - CarbonCo, Carbon Securities, TerraCarbon, and JR Agropecuária e Empreendimentos EIRELI met José Cláudio Araújo Bomfim (the Secretary of Environmental Affiars) and José Rivaldo Silva de Souza (the Secretary of Agriculture) to discuss the Project and to learn more about their work in Feijó.

January 30, 2015 - Brian McFarland of CarbonCo presented at the US-China Business and Cultural Exchange Center and gave an overview of forest carbon projects and particularly CarbonCo's work in Acre, Brazil.

June 23, 2015 - Brian McFarland of CarbonCo presented "A Global Perspective on the Voluntary Carbon Markets" in Thessaloniki, Greece which included a case study on the Purus Project.

August 29, 2015 - Brian McFarland of CarbonCo presented "Investing in the Voluntary Carbon Markets and Developing Forest Carbon Projects" for the Sustainability & Investing course at the University of Maryland's Robert H. Smith School of Business.

November 12, 2015 – The Project Proponents met again with Mr. Hammerly Albuquerque, the mayor of Feijó. The Project Proponents shared an update on the Envira Amazonia Project and the latest developments with REDD+ policy.

November 22, 2015 – Brian McFarland of CarbonCo met Antonio Viveiros in Brasilia. Antonio's family owns land adjacent to the Envira Amazonia Project. Brian and Antonio discussed how REDD+ projects are developed, the approximate costs, and discussed specifics about both the property of Antonio's family and specifics about the Envira Amazonia Project.

December 5-12, 2015 - CarbonCo and Carbon Securities attended COP21 in Paris, France.

Hire Project Manager

Jose Aurimar Tavares Carneiro (Jose's nickname is "Mazinho") is the local project manager of the Envira Amazonia Project. Mazinho helps with monitoring for deforestation, along with helping visitors at the Project by providing logistics. Mazinho also helped with the biodiversity and community impact monitoring plans. More specifically, Mazinho assisted the local community specialist Ayri Rando from May to June 2014 with the community surveys and then Mazinho assisted the local biologist Tomaz Nascimento from April to May 2015 with the bird study.

Mazinho was born on the property and has good rapport with the local families. Mazinho currently splits his time between staying at his house in Feijó and staying at his house along the Envira River.

In addition to Mazinho's assistance, Francisco Circlandio ("Francisco") will also assist with the Project as Francisco lives along with Jurupari River. Francisco is the son of Cazuza Circlandio; Cazuza lives in Feijó and Cazuza's house along the Jurupari River is temporarily serving as the Envira Amazonia Project's informal headquarters.

Patrol and Monitor Deforestation

In addition to serving as local project managers, Jose Aurimar Tavares Carneiro (Mazinho) and Francisco Circlandio will both monitor for deforestation in the project area. Mazinho was originally hired back in 2003 to informally monitor the property. Mazinho and Francisco will officially monitor for deforestation along by boat approximately every 60 days.

JR Agropecuária e Empreendimentos EIRELI ordered a boat with 15 seats and a boat engine in May 2014 which will be used to access the property and for deforestation monitoring. This order was not completed due to a lack of financial resources. The boat will be reordered in 2016 or 2017 and will be used shortly thereafter.

When deforestation is identified, JR Agropecuária e Empreendimentos EIRELI will document and transfer this information to Carbon Securities and CarbonCo. Collectively, CarbonCo and JR Agropecuária e Empreendimentos will discuss the appropriate actions to undertake to counteract any reported deforestation.

Forest monitors will write down observations, document community meetings, input this data into the monitoring template, and share this information among the Project Proponents. A monitoring template will be completed, including the following information:

- 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

In addition, satellite imagery from was reviewed by TerraCarbon and CarbonCo to assess deforestation within the Project Area.

Provide Agricultural Extension Services

In 2014, the Project Proponents discussed agricultural extension services with the local families and identified the most desired courses. Based off feedback from the local families, JR Agropecuária e Empreendimentos EIRELI will offer several agricultural extension courses in 2015 or 2016. Such agricultural extension courses shall include: alternatives to the use of fire in land preparation; improved pasture management, including rotational cattle pastures and vaccinations; extraction and processing of medicinal plants for commercial purposes; production of açaí; and raising chickens.

Between 2012 and 2014, the Project Proponents also discussed with the local communities the idea of creating a structure to collect, transport and sell locally-sourced rubber, açaí and medicinal plants. Upon receiving a high-level of interest, the Project Proponents then developed a high-level budget and timeline for their implementation.

Establish a Project Headquarters

In the past, JR Agropecuária e Empreendimentos EIRELI had a headquarters established along the Envira River and the headquarters was called the “Casarao Antigo do Seringal Canada.” In the future, this headquarters will be reactivated and an official headquarters will be established inside the Project Area along the Jurupari River. In the short term, Cazuza’s house will be temporarily used as the informal headquarters of the Envira Amazonia Project.

The future headquarters will provide: a place for visitors to sleep and eat; a place for community meetings and teaching courses; storage for project equipment and education.

Between 2012 and 2014, the idea of a formal headquarters was discussed amongst the Project Proponents, with CarbonCo and Carbon Securities sharing examples from their other REDD+ projects in Acre. In addition, the Project Proponents drafted a high-level timeline and budget for the eventual creation of a formal headquarters.

2.2 Deviations

2.2.1 Methodology Deviations

The following deviations to the methodology are applied.

1) Trees in the Cecropia genus will not be included as part of the forest inventory, due to the unavailability of applicable biomass equations. 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.

2) 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.

3) 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.[6] Cairns et al. is appropriate for determining belowground biomass as this equation is published in a peer-reviewed scientific journal. In fact, guidance for new methodologies as found in VCS AFOLU Requirements version 3.4 specifically mentions the Cairns et al. equations in reference to established procedures for quantifying belowground biomass, thus indicating the appropriateness of this source.

[6] 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.

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 r^2 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 of a parabaloid rather than the volume of a cylinder; and

-Only stem biomass is estimated, thus conservatively excluding other aboveground biomass including palm fronds.

5) Dead wood collected for density determination was opportunistically sampled from within forest strata present in the project area. The forest inventory collected a total of 39, 42, 37 samples for the sound, intermediate, and rotten[7] classes, respectively.

6) Parameter $U_{P,SS,i,pool\#}$ will be monitored at least once every 10 years, on re-measurement of forest carbon stocks. While module X-UNC requires that monitoring of this parameter occur every $\leq$ 5 years, this requirement is inconsistent with the VM0007 pools modules, which specify that stock estimates (from which uncertainty is calculated) are assumed valid for 10 years. Therefore, a deviation to module X-UNC is applied to permit parameter $U_{P,SS,i,pool\#}$ to be monitored every $\leq$ 10 years, putting it into alignment with modules CP-AB and CP-D.

7) Rather than monitoring Cpost using modules CP-AB and CP-D as described in the MON modules, C(post) can conservatively be assumed to be zero in the with project case, 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. This deviation may be used for the first and each subsequent monitoring period.

2.2.2 Project Description Deviations

There are no deviations to the project description.

2.3 Grouped Project

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

2.4 Safeguards

2.4.1 No Net Harm

The Envira Amazonia Project shall result in no net harm to the surrounding environment or local communities. The Project, as an avoided deforestation project, shall preserve a biologically diverse

[7] Note that 27 of the 37 rotten samples were sourced outside the project area as those sourced from within the project area did not return to the lab intact.

habitat. Ongoing monitoring of biodiversity impacts shall include informal monitoring for deforestation, an annual review of satellite imagery, along with a bird study every 5 years and a tree study every 10 years. For more information, please see the CCBS PDD and CCBS PIR.[8] Furthermore, the Project is implementing numerous, local projects and programs to help local communities including agricultural extension courses and building a health clinic. Ongoing monitoring of community impacts shall include several community surveys including a Basic Necessity Survey. Again for more information, please see the CCBS PDD and CCBS PIR.[9]

2.4.2 Local Stakeholder Consultation

The local communities are an essential component of the Envira Amazonia Project and in 2014 and 2015, the Envira Amazonia Project was discussed in great detail with the local families to ensure they were fully aware of the Project, were able to contribute to the Project design, able to openly express desired outcomes and concerns, understood the third-party grievance procedure, and were able to voluntarily give Free, Prior and Informed Consent (FPIC).

More specifically, Ayri Saraiva Rando was hired by CarbonCo in April 2014 as an independent community specialist and visited a total of 41 families between May 20th and June 11th, 2014.

Local families who wanted to join the Envira Amazonia Project either verbally agreed to join the Project and/or signed an “ata” between May 20th and June 11th, 2014. As of June 2014, all of the community members interviewed within the Envira Amazonia Project Area have either signed the “ata” or verbally agreed to join the Project.

Part of Ayri Rando’s initial discussion with the families included an explanation of the validation process such as describing the Public Comment Period and giving the families an early notice about the visit of an auditor in December 2014. Furthermore, the local project manager Mazinho and Kidney da Cunha Aires (a local project manager at another CarbonCo and Carbon Securities’ REDD+ project in Acre) visited the Project Zone in November 2014 to inform the families about the Public Comment Period, solicit comments, and to deliver the project documents.

For the initial verification of the Envira Amazonia Project, Mazinho visited the Project Zone in late October 2015 to inform the families about the Public Comment Period, solicit any comments, deliver the project documents (i.e., Project Implementation Report and Summary Document) and deliver dental kits, and to also inform the families of the auditor visit from approximately November 15-20, 2015.

For more information, including information on additional stakeholder engagements and how the Project design was modified, please see the CCBS PDD and CCBS PIR.[10]

[8] The CCB project document is available at http://climate-standards.org/projects/
[9] The CCB project document is available at http://climate-standards.org/projects/
[10] The CCB project document is available at http://climate-standards.org/projects/

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:	$\Delta C_{BSL,PAplanned}$
Data unit:	t CO_2-e
Description:	Net greenhouse gas emissions in the baseline from planned deforestation
Source of data:	Derived in Section 3.1 of PD
Value applied:	Year / ΔCBSL,PA,unplanned: 2013: 3,277,844 2014: 3,402,275 2015: 3,560,825 2016: 3,783,480 2017: 3,864,401 2018: 456,342 2019: 456,342 2020: 456,342 2021: 456,342 2022: 456,342
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 Data	*Calculation of baseline emissions*
Comments	

Data Unit / Parameter:	*CFn*
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 Data	*Calculation of baseline emissions*
Comments	

Data Unit / Parameter:	fj(X,Y)
Data unit:	t d.m. tree-1
Description:	Allometric equation for species j linking measured tree variable(s) to aboveground biomass of living trees.
Source of data:	Data resulting from the forest inventory.
Value applied:	*See forest inventory excel workbook.*
Justification of choice of data or description of measurement methods and procedures applied:	The Brown 1997 equation was validated as per methodological guidance. See "Forest biomass carbon inventory for the Russas and Valparaiso Properties, Acre State, Brazil," 2014 for details. Brown, S., 1997. Estimating biomass and biomass change of tropical forests: A primer. FAO Forestry Paper: vii, 55 p.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	

Data Unit / Parameter:	Root Biomass Density
Data unit:	t d.m. ha-1
Description:	Allometric equation for predicting root biomass density as a function of aboveground biomass density.
Source of data:	Data resulting from the forest inventory.
Value applied:	*See forest inventory excel workbook.*
Justification of choice of data or description of measurement methods and procedures applied:	Cairns et al. 1997 is a widely accepted peer reviewed scientific publication. 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.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	

Data Unit / Parameter:	LIF
Data unit:	t C m-3
Description:	Logging infrastructure factor;

Source of data:	LK-ME
Value applied:	*0.29*
Justification of choice of data or description of measurement methods and procedures applied:	Default value in LK-ME
Purpose of data	Calculation of leakage emissions
Comments	

Data Unit / Parameter:	BEF
Data unit:	dimensionless
Description:	Biomass expansion factor for conversion of merchantable volume to total aboveground tree biomass
Source of data:	Higuchi et al. 1998 (1/0.656=1.524390244).
Value applied:	1.524390244
Justification of choice of data or description of measurement methods and procedures applied:	BEF calculated using data from the Brazilian Amazon (i.e., country and ecoregion specific)
Purpose of data	Calculation of baseline emissions Calculation of leakage emissions
Comments	This parameter has been calculated as a BEF to fix equation 4 of the CP-W module.

Data Unit / Parameter:	LDF
Data unit:	t C m-3
Description:	Logging damage factor
Source of data:	LK-ME
Value applied:	*0.53*
Justification of choice of data or description of measurement methods and procedures applied:	Default value for broadleaf and mixed forests in LK-ME
Purpose of data	Calculation of leakage emissions
Comments	

Data Unit / Parameter:	LFME
Data unit:	dimensionless
Description:	Leakage factor for market-effects calculations
Source of data:	LK-ME
Value applied:	*0.4*
Justification of choice of data or description of measurement methods and procedures applied:	*The species that would be extracted in the project area are Amazonian species, and could only be sourced from other native forest sites in the Brazilian Amazon. They would also need to be sourced from relatively mature forests where millable size trees (> 40 cm DBH) can be readily found. Stem (merchantable portion) biomass as a percent of total aboveground biomass is fairly constant in mature Amazonian forests, averaging around 66% (Higuchi et al 1998), and is not expected to differ between those mature native forests in the project area and in other parts of the Brazilian Amazon.*
Purpose of data	Calculation of leakage emissions
Comments	

Data Unit / Parameter:	SLFs
Data unit:	dimensionless
Description:	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest for sawn wood
Source of data:	CP-W module
Value applied:	*0.2*
Justification of choice of data or description of measurement methods and procedures applied:	Default value from the CP-W module
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage emissions
Comments	

Data Unit / Parameter:	OFts

Data unit:	dimensionless
Description:	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest for sawn wood
Source of data:	CP-W module
Value applied:	*0.84*
Justification of choice of data or description of measurement methods and procedures applied:	Default value from the CP-W module
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage emissions
Comments	

Data Unit / Parameter:	WWs
Data unit:	dimensionless
Description:	The fraction immediately emitted through mill inefficiency for sawn wood
Source of data:	CP-W module
Value applied:	*0.24*
Justification of choice of data or description of measurement methods and procedures applied:	Default value from the CP-W module
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage emissions
Comments	

<table>
<tr><td>Data Unit / Parameter:</td><td>VBSL,EX,i,t</td></tr>
<tr><td>Data unit:</td><td>m^3</td></tr>
<tr><td>Description:</td><td>Volume of timber projected to be extracted from within the project boundary during the baseline in stratum i at time t</td></tr>
<tr><td>Source of data:</td><td>Calculated</td></tr>
<tr><td>Value applied:</td><td><table><tr><td>Year</td><td>VBSL,EX,i,t (m3)</td></tr><tr><td>2013</td><td>348,800</td></tr></table></td></tr>
</table>

	2014	348,800
	2015	348,800
	2016	348,800
	2017	318,306
	2018	0
	2019	0
	2020	0
	2021	0
	2022	0
Justification of choice of data or description of measurement methods and procedures applied:	Derived using Equation 4 of the LK-ME module	
Purpose of data	Calculation of leakage emissions	
Comments	None	

Data Unit / Parameter:	Dmn
Data unit:	t d.m. m-3
Description:	Mean wood density of commercially harvested species
Source of data:	Calculated
Value applied:	*0.74*
Justification of choice of data or description of measurement methods and procedures applied:	This value uses site specific data on commercial log volume and estimates of wood density as found in Chave et al. 2006.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	Value calculated using a combination of project specific data on commercial log volume and estimates of wood density as found in Chave et al. 2006. See "Env_ComVol_ 2015.03.13.xls" file in project archive.

Data Unit / Parameter:	PMLFT
Data unit:	%
Description:	Mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type
Source of data:	Feldpausch, T. R., McDonald, A. J., Passos, C. A., Lehmann, J., & Riha, S. J. (2006). Biomass, harvestable area, and forest structure estimated from commercial timber inventories and remotely sensed imagery in southern Amazonia. *Forest Ecology and Management*, *233*(1), 121-132
Value applied:	*8%-12%*
Justification of choice of data or description of measurement methods and procedures applied:	Volumetric weighted wood density as suggested by the methodology and volume by species.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Comments	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): 0.2 G,CH4 (kg/t d.m. burnt): 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

3.2 Data and Parameters Monitored

Data and parameters which will need to be monitored include those listed in this section. Details on data and parameters monitored are provided below.

Data Unit / Parameter:	$\Delta C_{P,Def,i,t}$
Data unit:	t CO_2-e
Description:	Net carbon stock change as a result of deforestation in the project case in the project area in stratum i at time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	*As this parameter was calculated rather than measured, no measurements methods are noted.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year: 2015 ΔCP,DefPA,i,t (t CO2-e): 31,812
Monitoring equipment:	None.
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 3, VMD0015
Comments	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.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	<table><tr><td>Year</td><td>ΔCP,DistPA,i,t (t CO2-e)</td></tr><tr><td>2015</td><td>0</td></tr></table>
Monitoring equipment:	None.
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 20, VMD0015
Comments	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. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	<table><tr><td>Year</td><td>FAP + FAB + FD ADefPA,u,i,t (ha)</td><td>FAP + FAB ADefPA,u,i,t (ha)</td><td>FAB + FAP ADefPA,u,i,t (ha)</td><td>FAB - Aluvial ADefPA,u,i,t (ha)</td></tr></table>

	2015 19.4 3.5 0.0 27.6
Monitoring equipment:	*ArcGIS*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	$A_{DefLK,,i,t}$
Data unit:	Ha
Description:	The total area of deforestation by the baseline agent of the planned deforestation in stratum I at time, t
Source of data:	Monitored at each monitoring/verification
Description of measurement methods and procedures to be applied:	Detailed procedures are provided below under monitoring plan description. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	Year | AdefLK,i,t (ha) 2015 | 0
Monitoring equipment:	*ArcGIS*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of leakage emissions
Calculation method:	Not relevant
Comments	This parameter is monitored. Ex-ante, it is assumed this value is zero and the agent of deforestation is a project proponent.

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
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	Year / $A_{DistPA,q,i,t}$ (ha): 2015 / 0
Monitoring equipment:	*ArcGIS*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	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 *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	Strata / CBSL,i (t CO2-e ha-1): FAP + FAB + FD / 546.5; FAP + FAB / 513.2

	<table><tr><td>FAB + FAP</td><td>498.0</td></tr><tr><td>FAB - Aluvial</td><td>655.4</td></tr></table>
Monitoring equipment:	*dbh tape, measuring tape, GPS, clinometer*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions
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)
Comments	None

Data Unit / Parameter:	ΔCpools,Def,u,i,t
Data unit:	t CO_2-e ha^{-1}
Description:	Net carbon stock changes in all pools in the project case in land use u 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.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 10 years.
Value applied:	536.5
Monitoring equipment:	*None.*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Equation 5, VMD0015
Comments	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. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Repeated each time the PRA indicates a potential for degradation. PRA conducted every ≤ 2 years
Value applied:	Year: 2015; $A_{DegW,i,t}$ (ha): 0
Monitoring equipment:	*None.*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	*PRAs indicated no degradation*

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. *Monitoring responsibilities are listed in section 3.3, below.*

Frequency of monitoring/recording:	Every $\leq$ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	Year: 2015; $C_{DegW,i,t}$ (t CO_2-e): 0
Monitoring equipment:	*None.*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 8, VMD0015
Comments	*PRAs indicated no degradation*

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. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	*N/A*
Monitoring equipment:	*ArcGIS*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Purpose of data	Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	$\Delta C_{P,Deg,i,t}$

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.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 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:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of project emissions
Calculation method:	Equation 8, VMD0015
Comments	*PRAs indicated no degradation*

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 $A_{DistPA,q,i,t}$ and ADefPA,u,i,t
Description of measurement methods and procedures to be applied:	Monitored as part of $A_{DistPA,q,i,t}$ *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	<table><tr><td>Year</td><td>FAP + FAB + FD</td><td>FAP + FAB</td><td>FAB + FAP</td><td>FAB - Aluvial</td></tr><tr><td>2015</td><td>19.4</td><td>3.5</td><td>0.0</td><td>27.6</td></tr></table>
Monitoring equipment:	None.
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description

Purpose of 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)
Comments	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 below in Appendix B *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 10 years
Value applied:	*See forest inventory excel sheet.*
Monitoring equipment:	*dbh tape, measuring tape,*
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	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 below in Appendix B *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 10 years
Value applied:	*See forest inventory excel sheet.*
Monitoring equipment:	*dbh tape, measuring tape,*

QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	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 below in Appendix B *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 10 years
Value applied:	*See forest inventory excel sheet.*
Monitoring equipment:	*measuring tape, clinometer*
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	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 below in Appendix B

	Monitoring responsibilities are listed in section 3.3, below.
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	*See forest inventory excel sheet.*
Monitoring equipment:	*dbh tape, measuring tape*
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	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 below in Appendix B *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	*See forest inventory excel sheet.*
Monitoring equipment:	*None*
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	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 below in Appendix B *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 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 data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	$U_{P,SS,i,pool\#}$
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 with-project case (1,2…n represent different carbon pools and/or GHG sources)
Source of data:	Calculations arising from field measurement data
Description of measurement methods and procedures to be applied:	Uncertainty in pools derived from field measurement with 95% confidence interval calculated as the standard error of the averaged plot measurements in each stratum multiplied by the t value for the 95% confidence level. *Monitoring responsibilities are listed in section 3.3, below.*

Frequency of monitoring/recording:	Monitored at least once every 10 years (on re-measurement of forest carbon stocks)
Value applied:	Same as UBSL,SS,i,pool# values below.
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	Same as UBSL,SS,i,pool# values below as forest carbon stock growth was not tracked.

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.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 10 years.
Value applied:	(see table below)

Strata	Live aboveground tree biomass	Belowground biomass	Standing dead wood	Lying dead wood
FAP + FAB + FD	6,388,286	1,430,909	25,996	242,238
FAP + FAB	7,455,498	1,676,716	56,615	205,832

FAB + FAP	1,150,968	259,555	9,093	31,791
FAB - Aluvial	1,701,983	376,116	38,440	33,835

Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	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.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	

Strata	Live aboveground tree biomass	Belowground biomass	Standing dead wood	Lying dead wood
FAP + FAB + FD	6.6%	6.1%	52.2%	76.8%
FAP + FAB	9.1%	8.4%	43.5%	37.2%

FAB + FAP	13.9%	12.9%	222.6%	66.6%
FAB - Aluvial	10.2%	9.4%	264.1%	122.0%

Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	See equation 4 in the X-UNC module.
Comments	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	EBSL SS,i
Data unit:	t CO2-e
Description:	Sum of combined carbon stocks and GHG sources in stratum i multiplied by the area of stratum i (Ai) 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.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	

Strata	**EBSL,SS,t,I (tCO2e)**
FAP + FAB + FD	8,087,429
FAP + FAB	9,394,661
FAB + FAP	1,451,406

	FAB - Aluvial — 2,150,373
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	Baseline stocks and sources are estimated ex-ante for each baseline period

Data Unit / Parameter:	UBSL,SS,i
Data unit:	%
Description:	Percentage uncertainty in the combined carbon stocks and greenhouse gas sources in stratum i 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.* *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years.
Value applied:	**Strata** — **UncertaintyBSL,SS,I (%)** FAP + FAB + FD — 5.8% FAP + FAB — 7.4% FAB + FAP — 11.4% FAB - Aluvial — 9.7%
Monitoring equipment:	None
QA/QC procedures to be applied:	Neither QA/QC procedures nor calibration are relevant for this calculated parameter.

Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	See equation 5 in the X-UNC module.
Comments	Baseline stocks and sources are estimated ex-ante for each baseline period

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. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	FAP + FAB + FD B,i,t (t d.m./ha): 261.0; FAP + FAB B,i,t (t d.m./ha): 244.7; FAB + FAP B,i,t (t d.m./ha): 237.3; FAB - Aluvial B,i,t (t d.m./ha): 313.8
Monitoring equipment:	None
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of 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)
Comments	Ex-ante Bi,t is the weighted average across all strata

Value applied:

FAP + FAB + FD B,i,t (t d.m./ha)	FAP + FAB B,i,t (t d.m./ha)	FAB + FAP B,i,t (t d.m./ha)	FAB - Aluvial B,i,t (t d.m./ha)
261.0	244.7	237.3	313.8

Data Unit / Parameter:	AGB

Data unit:	tonnes d. m. ha-1
Description:	Aboveground biomass density
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. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	*Plot level values can be found in the Forest Inventory Report*
Monitoring equipment:	*None*
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
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)
Comments	None

Data Unit / Parameter:	Asp
Data unit:	ha
Description:	Area of sample plots in ha
Source of data:	Recording and archiving of number and size of sample plots
Description of measurement methods and procedures to be applied:	Detailed forest inventory procedures are provided in Appendix B of the project document. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	*0.16619 ha or a 23m radius circle*
Monitoring equipment:	*m*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions

Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	Hsdw
Data unit:	m
Description:	Height of standing dead tree in m
Source of data:	Monitored during the course of each forest inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided below in Appendix B. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Every $\leq$ 10 years
Value applied:	*See forest inventory excel workbook.*
Monitoring equipment:	*measuring tape, clinometer*
QA/QC procedures to be applied:	Detailed procedures are provided below under monitoring plan description.
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

<table>
<tr><td>Data Unit / Parameter:</td><td>DDWdc</td></tr>
<tr><td>Data unit:</td><td>t d.m. m-3</td></tr>
<tr><td>Description:</td><td>Mean wood density of dead wood in the density class (dc) – sound (1),intermediate (2), and rotten (3); t d.m. m-3</td></tr>
<tr><td>Source of data:</td><td>Monitored during the course of each forest inventory</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>Detailed procedures provided below in Appendix B. Monitoring responsibilities are listed in section 3.3, below.</td></tr>
<tr><td>Frequency of monitoring/recording:</td><td>Every ≤ 10 years</td></tr>
<tr><td>Value applied:</td><td><table><tr><th>Density Class</th><th>Density (t d.m. m-3)</th></tr><tr><td>Rotten (P)</td><td>0.131</td></tr></table></td></tr>
</table>

	Intermediary (I) | 0.382 Solid (S) | 0.517
Monitoring equipment:	*dbh tape, measuring tape, drying oven*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of baseline emissions Calculation of project emissions
Calculation method:	Not relevant
Comments	None

Data Unit / Parameter:	CP,Dist,q,i
Data unit:	t CO2-e ha-1
Description:	Carbon stock in all pools in post-natural disturbance q in baseline stratum i
Source of data:	Monitored
Description of measurement methods and procedures to be applied:	Detailed procedures provided below in Appendix B. *Monitoring responsibilities are listed in section 3.3, below.*
Frequency of monitoring/recording:	Prior to each verification event and at least every 5 years.
Value applied:	*0*
Monitoring equipment:	*dbh tape, measuring tape, GPS, clinometer*
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Purpose of data	Calculation of project emissions
Calculation method:	Use equations as stated in the forest inventory, including allometric equations as found in Brown (1997) and a volumetric based palm equation, Cairns et al. (1997), Van Wagner (1968). Carbon stocks must be measured and estimated using the methods given in module CP-AB and CP-D.
Comments	Alternatively, it can be conservatively assumed that a post-natural disturbance live and dead vegetation pool is equal to zero

<table>
<tr><td>Data Unit / Parameter:</td><td>Ai</td></tr>
<tr><td>Data unit:</td><td>ha</td></tr>
<tr><td>Description:</td><td>Total area of stratum i</td></tr>
<tr><td>Source of data:</td><td>GIS coverages</td></tr>
<tr><td>Description of measurement methods and procedures to be applied:</td><td>N/A</td></tr>
<tr><td>Frequency of monitoring/recording:</td><td>Every ≤ 10 years</td></tr>
<tr><td>Value applied:</td><td><table><tr><td>Strata in Project</td><td>Ai (ha)</td></tr><tr><td>FAP + FAB + FD</td><td>14,800</td></tr><tr><td>FAP + FAB</td><td>18,306</td></tr><tr><td>FAB + FAP</td><td>2,915</td></tr><tr><td>FAB - Aluvial</td><td>3,281</td></tr></table></td></tr>
<tr><td>Monitoring equipment:</td><td>ArcGIS</td></tr>
<tr><td>QA/QC procedures to be applied:</td><td>Detailed procedures provided below under monitoring plan description</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions
Calculation of project emissions
Calculation of leakage</td></tr>
<tr><td>Calculation method:</td><td>N/A</td></tr>
<tr><td>Comments</td><td>Ex-ante, it shall be assumed that stratum area will remain constant for the baseline period</td></tr>
</table>

Data Unit / Parameter:	AAplanned,i,t
Data unit:	ha
Description:	Annual area of baseline planned deforestation for stratum i at time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	N/A
Frequency of monitoring/recording:	Every ≤ 10 years

Value applied:	<table><tr><td>Year</td><td>Actual AAplanned,i,t</td><td>Conservative AAplanned,i,t</td></tr><tr><td>2013</td><td>32,205</td><td>8,000</td></tr><tr><td>2014</td><td>7,095</td><td>8,000</td></tr><tr><td>2015</td><td>0</td><td>8,000</td></tr><tr><td>2016</td><td>0</td><td>8,000</td></tr><tr><td>2017</td><td>0</td><td>7,301</td></tr><tr><td>2018</td><td>0</td><td>0</td></tr><tr><td>2019</td><td>0</td><td>0</td></tr><tr><td>2020</td><td>0</td><td>0</td></tr><tr><td>2021</td><td>0</td><td>0</td></tr><tr><td>2022</td><td>0</td><td>0</td></tr></table>
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Purpose of data	Calculation of baseline emissions
Calculation method:	Uses Equation 3 in BL-PL
Comments	None

Data Unit / Parameter:	Aplanned,i
Data unit:	ha
Description:	Total area of planned deforestation over the baseline period for stratum i
Source of data:	Monitored
Description of measurement methods and procedures to be applied:	Determined using a GIS
Frequency of monitoring/recording:	Every $\leq$ 10 years
Value applied:	*200,000*
Monitoring equipment:	*GIS*

QA/QC procedures to be applied:	*None*
Purpose of data	Calculation of baseline emissions
Calculation method:	N/A
Comments	This is the total area of the project property.

Data Unit / Parameter:	ALT,i
Data unit:	t CO2-e
Description:	Summed emissions from timber harvest in stratum i in the baseline case potentially displaced through implementation of carbon project
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	*N/A*
Frequency of monitoring/recording:	Every $\leq$ 10 years
Value applied:	see table below
Monitoring equipment:	*N/A*
QA/QC procedures to be applied:	*N/A*

Year	ALT,i
2013	1,493,538
2014	1,493,538
2015	1,493,538
2016	1,493,538
2017	1,362,966
2018	0
2019	0
2020	0
2021	0
2022	0

Purpose of data	Calculation of leakage emissions
Calculation method:	Equation 3 in LK-ME
Comments	None

Data Unit / Parameter:	CXB,sawnwood
Data unit:	t CO2-e
Description:	Carbon emission due to displaces timber harvests in the baseline scenario in stratum in time t
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	*N/A*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	<table><tr><td>Year</td><td>CBSL,XBFWC,i,t</td></tr><tr><td>2013</td><td>348,800</td></tr><tr><td>2014</td><td>348,800</td></tr><tr><td>2015</td><td>348,800</td></tr><tr><td>2016</td><td>348,800</td></tr><tr><td>2017</td><td>318,306</td></tr><tr><td>2018</td><td>0</td></tr><tr><td>2019</td><td>0</td></tr><tr><td>2020</td><td>0</td></tr><tr><td>2021</td><td>0</td></tr><tr><td>2022</td><td>0</td></tr></table>
Monitoring equipment:	*N/A*
QA/QC procedures to be applied:	*N/A*
Purpose of data	Calculation of leakage emissions

Calculation method:	Equation 4 in LK-ME
Comments	None

Data Unit / Parameter:	Pcomi
Data unit:	dimensionless
Description:	Commercial volume as a percent of total aboveground volume in stratum i
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	*N/A*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	*0.13*
Monitoring equipment:	*N/A*
QA/QC procedures to be applied:	*N/A*
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	1) commercial portion of a tree (.656) x 49.1 tons d.m./ha, total aboveground biomass for commercial species, forest inventory 2) 246.5 tons d.m./ha, average total aboveground biomass, forest inventory
Comments	None

Data Unit / Parameter:	CWP100,i
Data unit:	t CO2/ha
Description:	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum *i*; t CO2-e ha-1
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	*N/A*

Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	*24.1*
Monitoring equipment:	*N/A*
QA/QC procedures to be applied:	*N/A*
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Uses Equation 2 in the CP-W module
Comments	None

Data Unit / Parameter:	CWP,i
Data unit:	t CO2/ha
Description:	Carbon stock entering wood products pool at time of deforestation from stratum *i*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	*N/A*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	*27.7*
Monitoring equipment:	*N/A*
QA/QC procedures to be applied:	*N/A*
Purpose of data	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Calculation method:	Uses Equation 2 in the CP-W module
Comments	None

Data Unit / Parameter:	NewRi,t
Data unit:	ha

Description:	New calculated forest clearance in stratum i at time t by the baseline agent of the planned deforestation where no leakage is occurring
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	*N/A*
Frequency of monitoring/recording:	Every ≤ 10 years
Value applied:	Year / NewRi,t: 2013 – 0; 2014 – 0; 2015 – 0; 2016 – 0; 2017 – 0; 2018 – 23; 2019 – 23; 2020 – 23; 2021 – 23; 2022 – 23
Monitoring equipment:	*N/A*
QA/QC procedures to be applied:	*N/A*
Purpose of data	Calculation of leakage
Calculation method:	Uses Equation 4 in the LK-ASP module
Comments	None

Value applied:

Year	NewRi,t
2013	0
2014	0
2015	0
2016	0
2017	0
2018	23
2019	23
2020	23
2021	23
2022	23

Data Unit / Parameter:	PMPi
Data unit:	%
Description:	Merchantable biomass as a proportion of total aboveground tree biomass for stratum i within the project boundaries

Source of data:	Within each stratum divide the summed merchantable biomass (defined as "Total gross biomass (including bark) of a tree 40 cm DBH or larger from a 30 cm stump to a minimum 10 cm top DOB of the central stem") by the summed total aboveground tree biomass Merchantable biomass is equal to merchantable volume multiplied by wood density (Dmn)
Description of measurement methods and procedures to be applied:	*N/A*
Frequency of monitoring/recording:	Must be monitored at least every 5 years or if verification occurs on a frequency of less than every 5 years examination must occur prior to any verification event
Value applied:	*11.9*
Monitoring equipment:	*N/A*
QA/QC procedures to be applied:	*N/A*
Purpose of data	Calculation of leakage
Calculation method:	*N/A*
Comments	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 areas. 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 with project case, the degradation due to harvest of timber will not be monitored, thus parameter $\Delta C_{P,SelLog,i,t}$ is set to 0.

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

Organizations responsible for monitoring are listed below in Table 3.8. These organizations are responsible for implementing all aspects of a particular monitoring task, as described in the monitoring sub-sections below.

Estimation of Ex-Post Net Carbon Stock Changes and Greenhouse Gas Emissions

Ex-post net carbon stock changes and greenhouse gas emissions can only be calculated after monitoring:

- The net carbon stock change as a result of deforestation in the project area;
- The net carbon stock change as a result of degradation in the project area;
- The net carbon stock change as a result of natural disturbance in the project area; and
- The greenhouse gas emissions as a result of deforestation and degradation activities within the project area.

Monitoring Deforestation and Natural Disturbance

Forest cover change due to deforestation and natural disturbance is monitored through periodic assessment of classified satellite imagery, see below, covering the project area. Emissions ($\Delta C_{P,Def,i,t}$ and $\Delta C_{P,DistPA,i,t}$ for deforestation and natural disturbance, respectively) are estimated by the multiplying areas $A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$,, for deforestation and natural disturbance, respectively, by average forest carbon stock per unit area. 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 deforestation in the project area to the year in which the disturbance occurred. Stock estimates from the initial field inventory completed in 2014, 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

Changes in forest cover ($A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$) will be monitored using data provided by the State of Acre. UCEGEO, the GIS department within the Climate Change Institute, Acre State government, produces an annual dataset on the extent and spatial location of all deforestation within the state using Landsat images. 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[11] 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 image and represent the variability within each class. A supervised classification[12] 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.

Additional details on pre-processing can be found in the UCEGEO methodology. Deforestation and natural disturbance will be distinguished using ancillary data which may include but is not limited to high resolution imagery, digital elevation models (to identify steep areas prone to landslides), information from local land managers, etc.

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

[11] 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.

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

The project area 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.

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 Envira property adjacent to the project area; and
- Nearby ranches and rural properties, along the Jurupari and Envira Rivers.

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.

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

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

Also, it is conservatively assumed that burning is a part of the forest conversion process in all incidents of deforestation taking place in the activity shifting leakage areas. Thus, the parameter $A_{burn,i,t}$ (Area burnt for stratum *i* at time *t*; ha) will be set equal to monitored parameter $A_{DefLK,i,t}$ (Area of recorded deforestation in the activity shifting leakage areas at time t; ha). The T-SIG tool can then be applied, and if parameter $E_{BiomassBurn,t}$ (Greenhouse emissions due to biomass burning as part of deforestation activities in stratum *i* in year *t*) is determined to be insignificant, $E_{BiomassBurn,t}$, can be assumed equal to zero.

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

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

Monitoring of Leakage Carbon Stock Changes and Greenhouse Gas Emissions

Two sources of leakage will be monitored: activity-shifting leakage and market leakage.

Activity-Shifting Leakage

Activity-shifting leakage will be monitored by tracking areas of deforestation ($A_{defLK,i,t}$), across all lands outside of the project area owned or under management by the baseline agent, JR Agropecuária e Empreendimentos EIRELI, including properties listed in Table 3.4. This will be accomplished by examining remote sensing data, and/or legal records and/or survey information.

The baseline agents of deforestation will be surveyed for verification events. Further, this information will be checked against remote sensing/aerial imagery where available, including but not limited to: the most recent Acre deforestation dataset, Google Earth, or other. In the event that deforestation is noted, further confirmation will be made that the deforestation resulted from authorized deforestation activities by JR Agropecuária e Empreendimentos EIRELI.

Table 3.4. List of properties in Brazil owned by the JR Agropecuária e Empreendimentos EIRELI.

Number	Property	Land Owner/Manager	State
1	Propriedade Envira	Duarte Jose do Couto Neto	Acre
2	Fazenda Pelicano	Rubens Vasques	Mato Grosso
3	Fazenda Esperanca	Bento Ferraz Pacheco	Mato Grosso
4	Seringal Canada	Duarte Jose do Couto Neto	Acre
5	Seringal Bom Principio	Duarte Jose do Couto Neto	Acre
6	Seringal Agrilo do Norte	Duarte Jose do Couto Neto	Acre
7	Seringal Porto Envira	Duarte Jose do Couto Neto	Acre
8	Seringal Nazareth	Duarte Jose do Couto Neto	Acre
9	Seringal Liberdade Parte A	Duarte Jose do Couto Neto	Acre
10	Seringal Ceci	Duarte Jose do Couto Neto	Acre
11	Gleba Canada II	Duarte Jose do Couto Neto	Acre

Market Leakage

Market leakage values calculated ex-ante are also used ex-post as no with project harvesting of timber, fuel wood or charcoal is destined for commercial markets.

Table 3.5 Data and Parameters for Leakage.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
ADefLK,i,t	The total area of deforestation by the baseline agent of the planned deforestation in stratum I at time, t	ha	Monitored for each verification event

Monitoring of Actual Carbon Stock Changes and Greenhouse Gas Emissions

Forest carbon stock estimates will be derived from field measurements less than or equal to 10 years old. Aboveground and belowground live tree and dead wood stocks will be re-assessed on or before 2023. For each stratum, where the re-measured estimate is within the 90% confidence interval of the t=0 estimate, the t=0 stock estimate takes precedence and is re-employed, and where the re-measured estimate is outside (i.e. greater than or less than) the 90% confidence interval of the t=0 estimate, the new stock estimate takes precedence and is used for the subsequent period.

Sample plots will be randomly located in areas within the Envira Amazonia Project and measured following standard operating procedures located in Appendix B. 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 Envira Project, Acre State, Brazil," 2014). For live trees, biomass is calculated as a function of diameter at breast height (DBH; in cm) using the predictive model developed by Brown[13] for tropical moist forest stands. Application of the "moist" equation reflects the annual precipitation for the inventoried area, 2200mm.

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

For palms, height and 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

[13]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.[14] , 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[15]) as modified by Van Wagner[16] separately for each dead wood density class:

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

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 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.

[14] 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.
[15] Warren, W.G. and Olsen, P.F. (1964) A line intersect technique for assessing logging waste. Forest Science 10: 267-276.
[16] Van Wagner, C.E. (1968). The line intersect method in forest fuel sampling. Forest Science 14: 20-26.

Dry mass is converted to carbon using the default carbon fraction of 0.47 t C/t d.m. (as recommended by IPCC[17] Guidelines for National Greenhouse Gas Inventories).

Table 3.6 Data and Parameters for Monitoring Carbon Stocks Changes and GHG Emissions.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
CWP100,i	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum i	t CO2-e ha-1	Calculated
ΔCAB_tree,i	Baseline carbon stock change in aboveground tree biomass in stratum i	t CO2-e ha-1	Estimated from the forest carbon inventory
ΔCBB_tree,i	Baseline carbon stock change in belowground tree biomass in stratum i	t CO2-e ha-1	Estimated from the forest carbon inventory
ΔCDW,i	Baseline carbon stock change in dead wood in stratum i	t CO2-e ha-1	Estimated from the forest carbon inventory

Revision of the Baseline

The baseline will be revised every 10 years from the project start date. As the entire project area will have been deforested during the initial baseline period, no new areas will be deforested post 2022 in the baseline. From 2023 onward, the baseline is therefore limited to delayed emissions in the dead wood, below ground biomass, and wood product pools resulting from deforestation in the initial baseline period. Should an analysis of proxy areas be warranted to estimate a rate of deforestation, the BL-PL module will be consulted. 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

[17] IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Chapter 4 AFOLU (Agriculture, Forestry and Other Land-use).

datasets used to substantiate aspects of the baseline with be from official government sources, peer reviewed publications, or other reputable sources.

Table 3.7 Data and Parameters for Revising the Baseline.

Parameter	Description	Units	Source/ Justification of Choice of Data or Description of Measurement Methods
ΔCBSL,planned	Net greenhouse gas emissions in the baseline from planned deforestation	t CO_2e	Calculated every 10 years
ΔCBSL,i,t	Net carbon stock changes in all pools in the baseline stratum i at time t	t CO2-e	Calculated every 10 years
GHGBSL-E,i,t	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i during project year t	t CO2-e year-1	Calculated every 10 years
AAplanned,i,t,	Annual area of baseline planned deforestation for stratum i at time t	ha	Calculated every 10 years
ΔCstocks,i	Baseline carbon stock change in stocks in stratum i	t CO2-e ha-1	Estimated from the forest carbon inventory. See Table 4.6 of the PD.

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).

Data provided by UCEGEO has undergone geometric correction, extensive processing, and accuracy evaluation as mentioned by the State of Acre (2011) in their “Review of deforestation dynamics of deforestation in Acre"[18]. Accuracy of the classification, for both the baseline and monitoring, will be assessed by comparing the classification with ground-truth points or samples of high resolution imagery. Any data collected from ground-truth points will be recorded (including GPS coordinates, identified land-use class, and supporting photographic evidence) and archived. Any sample points of high resolution imagery used to assess classification accuracy will also be archived. Samples used to assess classification accuracy should be well-distributed throughout the project area (as far as is possible considering availability of high resolution imagery and/or logistics of acquiring ground-truth data), with a minimum sampling intensity of 50 points each for the forest and non-forest classes.

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

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

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

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

Forest Carbon Stocks and Degradation

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

1. Trained field crews will carry out all field data collection and adhere to standard operating procedures. Pilot sample plots shall be measured before the initiation of formal measurements to appraise field crews and identify and correct any errors in field measurements. Field crew leaders will be responsible for ensuring that field protocols are followed to ensure accurate and consistent measurements. To ensure accurate measurements, the height of diameter at breast height (1.3 m) will be periodically re-assessed by personnel during the course of the inventory.
2. 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.

[18] ACRE - Governo do Estado do Acre. 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.

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

Quality control procedures related to monitoring leakage include conducting baseline agent surveys and reviewing records documenting deforestation by the agent of deforestation and checking these figures against remotely sensed imagery where available.

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.

All measurement and monitoring equipment requiring calibration will be calibrated according to the equipment's specifications and/or relevant national or international standards.

<u>Data Archiving</u>

Data archived will be maintained through at least two years beyond the end of the project crediting period. All project records are secure and retrievable. This includes project documents saved on the desktop of CarbonCo's Project Director and stored in the Director's file cabinets (based in Silver Spring, Maryland). An identical version of the project documents are remotely saved on an external hard drive and in the cloud via DropBox. Furthermore, many project documents (e.g., VCS Project Description, Monitoring Reports, CCBS Project Design Document, Project Implementation Reports, Validation and Verification Reports, etc.) are publicly available and stored on both the Standards' website and on the Markit Environmental Registry. 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, Envira Amazonia Project staff will ensure that data collection, processing, analysis, management and archiving are conducted in accordance with the monitoring plan.

Table 3.8. Type of Monitoring and Party Responsible for Monitoring.

Variables to be monitored	**Responsible**	**Frequency**
Monitoring deforestation and natural disturbance	JR Agropecuária e Empreendimentos EIRELI	Prior to each verification
Monitoring illegal degradation	JR Agropecuária e Empreendimentos EIRELI	Prior to each verification
Monitoring project emissions	CarbonCo	Prior to each verification
Activity shifting leakage assessment	JR Agropecuária e Empreendimentos EIRELI	Prior to each verification

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

Emissions for the baseline project activities are found in Table 4.1 below. These baseline emissions were derived from Section 3.1 of the VCS PD and are pasted into this document's appendix.

Table 4.1. Baseline emissions in the project area.

Year	ΔCBSL,planned (tCO_2e)
2013	3,277,844
2014	3,402,275
2015	3,560,825
2016	3,783,480
2017	3,864,401
2018	456,342
2019	456,342
2020	456,342
2021	456,342
2022	456,342

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 2015 Acre deforestation dataset (see Section 5 Additional Information, below) combined with the original strata map. CBSL, Cpost, and Cwp 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 + FAB + FD ADefPA,u,i,t (ha)	FAP + FAB ADefPA,u,i,t (ha)	FAB + FAP ADefPA,u,i,t (ha)	FAB - Aluvial ADefPA,u,i,t (ha)	FAP + FAB + FD CBSL,i (t CO2-e/ha)	FAP + FAB CBSL,i (t CO2-e/ha)	FAB + FAP CBSL,i (t CO2-e/ha)	FAB - Aluvial CBSL,i (t CO2-e/ha)	Cpost (t CO2-e/ha)	CWP,i With Project (t CO2-e/ha)	ΔCP,DefPA,i,t (t CO2-e)
2015	19.4	3.5	0.0	27.6	546.5	513.2	498.0	655.4	0.0	0.0	30,469

A total of 50.5 ha were deforested in the project area over this monitoring period. These emissions were not attributable to the project proponents.

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 the with-project case (i.e., ΔCP,SelLog,i,t is equal to zero). Degradation surveys were conducted by Ayri Rando, an independent contractor hired by CarbonCo, in 2014. One hundred percent of the survey respondents indicated they utilize charcoal or timber, most of which originates 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[19]. Using the T-SIG tool, degradation emissions (657 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 (2,119,925 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 2015 monitoring period.

Natural Disturbance

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

[19] See “2014_EnviraDegradation 2016.01.15.xls” in the project database for details of the de minis analysis.

GHG Emissions

As fire is commonly used to 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 E-BiomassBurning in the project area.

Year	FAP + FAB + FD ADefPA,u,i,t (ha)	FAP + FAB ADefPA,u,i,t (ha)	FAB + FAP ADefPA,u,i,t (ha)	FAB - Aluvial ADefPA,u,i,t (ha)	FAP + FAB + FD B,i,t (t d.m./ha)	FAP + FAB B,i,t (t d.m./ha)	FAB + FAP B,i,t (t d.m./ha)	FAB - Aluvial B,i,t (t d.m./ha)	E-N2O Biomass Burning (tCO2e)	E-CH4 Biomass Burning (tCO2e)	E-Biomass Burning (tCO2e)	GHGP-E,i,t (t CO2-e)
2015	19.4	3.5	0.0	27.6	261.0	244.7	237.3	313.8	406.6	936.4	1,342.9	1,342.9

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 4.5.

Table 4.5. 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)
2015	30,469	0	0	1,343	0	31,812

4.3 Leakage

Leakage emissions from displacement of planned deforestation are estimated in conformance with the VCS modular REDD methodology VM0007, specifically the LK-ASP module and LK-ME module. These modules provide for the accounting of activity shifting leakage resulting from the actions of the agents of deforestation and market effects leakage.

Activity Shifting Leakage

Activity-shifting leakage was tracked by monitoring areas of deforestation ($A_{defLK,i,t}$), across all lands outside of the project area owned or under management by the baseline agent, JR Agropecuária e Empreendimentos EIRELI, including properties listed in Table 3.4. Activity-shifting leakage ($LKA_{planned,i,t}$) is calculated as the area of leakage in the with project case ($A_{defLK,i,t}$) minus the leakage baseline (NewRi,t). Leakage emissions were then 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. CBSL and Cpost values were those derived in the original forest inventory and the project document, respectively.

Table 4.6. Calculation of the area of activity shifting leakage and associated leakage emissions.

Year	AdefLK,i,t	NewRi,t	$LKA_{planned}$ (ha)	ΔCBSL,i (t CO2-e/ha)	E-N2O Biomass Burning (tCO2e)	E-CH4 Biomass Burning (tCO2e)	E-Biomass Burning (tCO2e)	GHGLK-E,i,t (t CO2-e)	ΔCLK-AS,planned (t CO2-e)
2015	0	0	0	525.5	0.0	0.0	0.0	0.0	0

The baseline agents of deforestation, JR Agropecuária e Empreendimentos EIRELI, did not deforest any lands owned or under management by them as confirmed in a letter found in the project database. As such, there was no activity shifting leakage during this monitoring period.

Market Leakage

Market leakage values calculated ex-ante (in Section 3.3 of the PD) are also used ex-post as no with project harvesting of timber, fuel wood or charcoal is destined for commercial markets. Please see Table 4.7 for market leakage estimates.

Table 4.7. Market leakage estimates for the first baseline period.

Year	ΔCLK-ME (t CO2-e)
2013	597,415
2014	597,415
2015	597,415
2016	597,415
2017	545,186
2018	0
2019	0
2020	0
2021	0
2022	0

Total Leakage

Total project leakage for this monitoring period (597,415 t CO2-e) is calculated as the sum of activity shifting leakage and market effects leakage (Table 4.8).

Table 4.8. Estimation of total leakage due to the displacement of planned deforestation.

Year	ΔCLK-AS,planned (t CO2-e)	ΔCLK-ME (t CO2-e)	ΔCLK (t CO2-e)
2015	0	597,415	597,415

4.4 Net GHG Emission Reductions and Removals

Uncertainty was assessed applying module X-UNC.

Uncertainty in the baseline rate, parameter $Uncertainty_{BSL,RATE}$, is equal to 1.96%, as documented in Section 3.4 of the PD.

Total uncertainty in carbon stocks in forest (parameter $Uncertainty_{BSL,SS}$) is equal to combined uncertainty of forest carbon pool stock estimates, calculated using propagation of errors (equation 4 of VM0007 module X-UNC). Parameter $Uncertainty_{BSL,SS}$ is thus calculated to be 4.17% at the 95% confidence level (calculations detailed in Forest Biomass Carbon Inventory Report) for the initial forest inventory.

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.

Results of overall uncertainty calculations are presented below in Table 4.9. As the overall uncertainty calculations, 4.61%, are less than precision requirements of the methodology, +/- 15% of the mean (at a 95% confidence level), no uncertainty deduction was warranted or applied.

Table 4.9. Summary of uncertainty calculations.

X-UNC Equation Number	5		6	10	11
Parameter	$Uncertainty_{BSL,SS}$	$Uncertainty_{BSL,RATE,}$	$Uncertainty_{BSL,t*}$	$C_{REDD\_ERROR,t*}$	*Adjustment factor applied to* $C_{REDD,t*}$
Value	4.17%	1.96%	4.61%	4.61%	100%

Estimates of GHG credits eligible for issuance as VCUs were calculated in Table 4.10, 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 4.10. Estimate of Net Emission Reduction Credits. Values in this table have been rounded to the nearest whole number.

Years	Baseline emissions or removals (tCO_{2e})	Project emissions or removals (tCO_{2e})	Leakage emissions (tCO_{2e})	Risk buffer (%)	Deductions for AFOLU pooled buffer account (tCO2e)	Net GHG emission reductions or removals issued as VCUs (tCO_{2e})
2015	3,560,825	31,812	597,415	24%	846,963	2,084,635

5 ADDITIONAL INFORMATION

Deforestation Data

Monitoring results reported here used classified 2015 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[20] 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[21].

As mentioned above changes in forest cover were determined using the 2015 Acre deforestation database. Figure 5.1 shows the area of deforestation in the project area for this monitoring period. Figure 5.2 shows the 2015 forest benchmark map which was produced using the aforementioned deforestation dataset.

The deforestation in the project area is derived by subtracting the non-forested area at the time of the project start from the non-forested area at the end of 2015. The initial forest benchmark map at the time of the project start date referenced 2012 land cover data, which was the latest data available from UCEGEO at the time of the project start date.

[20] 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.
[21] 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 deforestation in the current monitoring period in the project area.

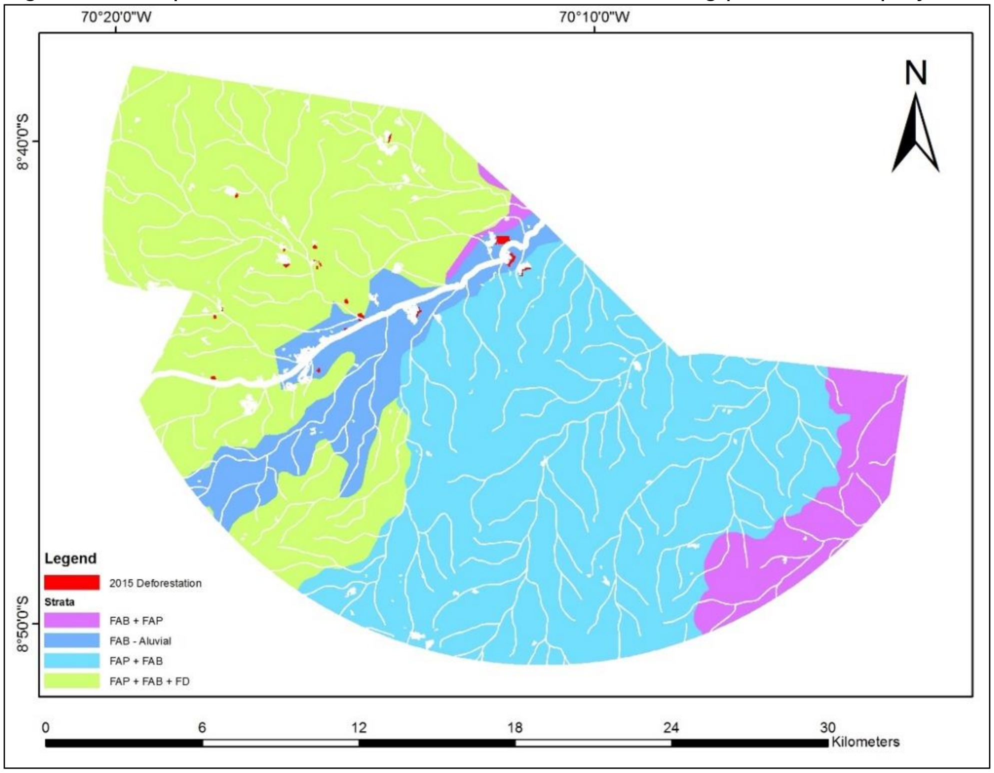
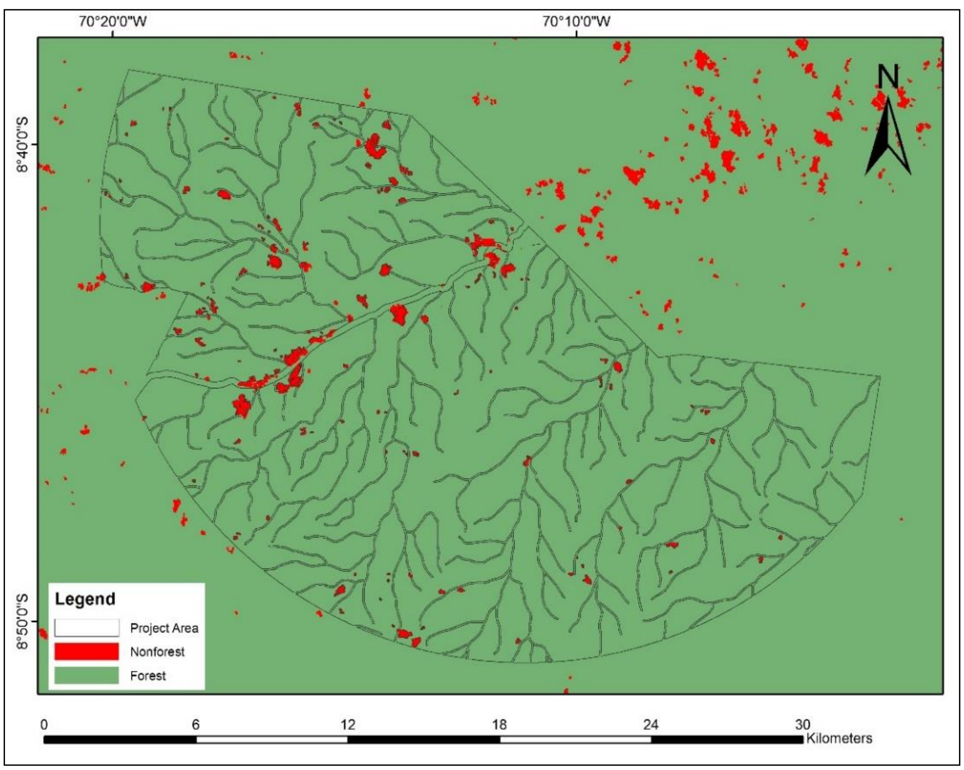


Figure 5.2. 2015 forest benchmark map for the project area.



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.

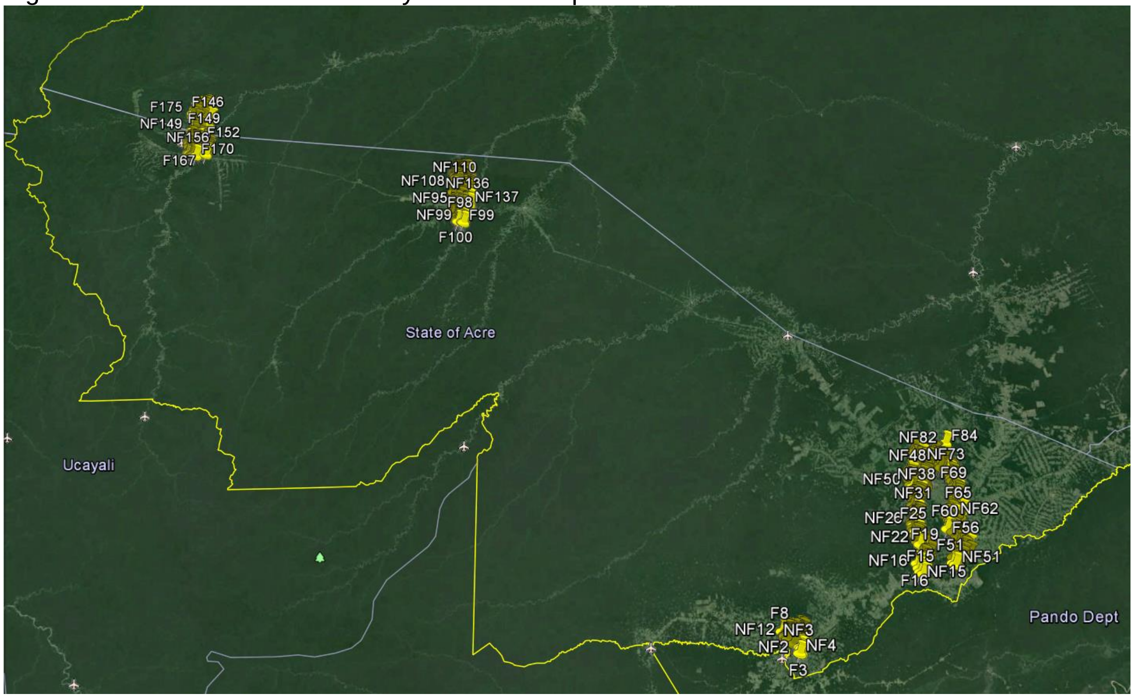
Results of the accuracy assessment are presented and analyzed in a matrix below, such that the following errors are presented:

- 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	150	16	166	90.4%	9.6%
Non-forest	2	161	163	98.8%	1.2%
Total	152	177	329		
Accuracy (%) ***Producer's accuracy*** ***(# correct/ column total)***	98.7%	91.0%			Overall Accuracy 94.5%
Error of Omission (%)	1.3%	9.0%			

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 2015 classification meets this criteria with overall accuracy of 95%.

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, dated 19 October 2016, version 3.3. 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 Envira Amazonia Project employs forest patrols to prevent encroachment by outside actors into the project area.	2
c)	Management team does include individuals with significant experience in all skills necessary to successfully undertake all project activities.	0
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 Russas, Valparaiso and Purus Projects 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.		**0**

Financial Viability		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating

a-d)	Project cash flow breakeven point is 4 years or less from the current risk assessment. Details are provided in a cash flow analysis which can be found in the project database.	0
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 database.	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 database.	0
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	The highest risk rating has been chosen as the NPV from the most profitable alternative land use activity (pasture) is expected to be at least 100% more than that associated with project activities. An NPV analysis is not required as the chosen risk rating is the highest and most conservative.	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 30 year period (i.e. 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 30 year period from the project start date. The landowners of the property are under contractual obligations[22] 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,	15

[22] See the Tri-Party Agreement located in the project database.

	i. Clearing the forest for livestock; ii. Clearing the forest for agriculture; iii. Expanding old roads or constructing new ones…; iv. Expansion into new forests on Property for community use or infrastructure facilities (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		15
Total Internal Risks		
Total Internal Risks (PM + FV + OC + PL) Total may not be less than zero.		**21**

A1.2. EXTERNAL RISKS

Land Tenure and Resource Access/Impacts		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-d)	The landowner, who is also a project proponent, owns the project area outright (see Section 1.12). Further, the property was geo-referenced and is being 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, JR Agropecuária e Empreendimentos EIRELI will voluntarily recognize whatever area is currently deforested and under productive use by each family. However these land tenure "disputes" mainly concern deforested areas, rather than the forested Project Area of the Envira Amazonia Project. While the legal ownership of the project area is not in question, there are overlapping claims of ownership on greater than 5% of the land.	10
e)	Not applicable.	0
f)	There is a legal contractual agreement to maintain the project area as forest for at least a 30 year period (i.e. the length of the crediting period) from the project start date.	-2
g)	The Project Proponents have discussed with the communities the desire to grant official land titles. JR Agropecuária e Empreendimentos EIRELI has also met with STR-Feijó to be a potential third-party mediator, if such an intermediary is necessary. In addition, the project activity of assisting the local communities with gaining official land tenure is part of the validation and verified project documents.	-2
Total Land Tenure (LT) [as applicable, ((a or b) + c + d + e+ f)]		6

Total may not be less than zero.	

Community Engagement		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a)	All households living on the Envira Amazonia property directly adjacent to the project area have been consulted.	0
b)	To their knowledge, the project proponents have contacted all families reliant on the project area.	0
c)	The project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area, as demonstrated in the CCBA monitoring report.	-5
Total Community Engagement (CE) [where applicable, (a+b+c)] Total may be less than zero.		-5

Political Risk		
Risk Factor	Risk Factor and/or Mitigation Description	Risk Rating
a-e)	The average governance score for 2010 through 2014 is 0.03, or between the governance score of -0.32 to less than 0.19. Details of the calculation are provided 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.[23]	-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.

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

Governance Indicator	**2010**	**2011**	**2012**	**2013**	**2014**
Control of Corruption	0.00	0.15	-0.07	-0.12	-0.38
Government Effectiveness	-0.04	-0.12	-0.12	-0.08	-0.15
Political Stability	0.01	-0.14	0.05	-0.28	-0.01
Regulatory Quality	0.16	0.17	0.09	0.06	-0.07
Rule of Law	0.00	-0.01	-0.11	-0.12	-0.08

[23] 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).

Voice and Accountability	0.53	0.47	0.43	0.37	0.41
Overall Mean					0.03

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[24] 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[25]. Despite fire induced tree mortality, tree mortality itself is unlikely to result in the loss of substantial biomass due to incomplete combustion of live aboveground biomass. Biomass is merely transferred from the live biomass to dead biomass pool, which is also accounted for in this project. Further as fire is unlikely to affect the whole project area, the significance of any single fire event is likely to be minor and result in less than 25% loss in carbon stocks in the project area. The Cochrane and Laurance study[26] 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

[24]Cochrane M.A.& Laurance W.F., 2002. Fire as a large-scale edge effect in Amazonian forests, Journal Of Tropical Ecology, 18:311-325.
[25]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.
[26] Cochrane M.A.& Laurance W.F., 2002. Fire as a large-scale edge effect in Amazonian forests, Journal of Tropical Ecology, 18:311-325.

	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 150 tree species >10 cm dbh[27], and like other diverse tropical forests, are not known to be subject to catastrophic disturbance by insect pests or forest diseases. Forest pests and diseases as a source of risk are more relevant in temperate forests or plantations, with low species diversity and consequently susceptible to extensive damage due to pest and disease outbreaks, which tend to be concentrated on single host species. Further, there is no history of catastrophic forest disturbance due to forest pests or diseases in the region.
Significance	Insignificant
Likelihood	Once every 100 years or more. Risk is not applicable to the project area
Score (LS)	0
Mitigation	None

Extreme Weather	
Discussion/ Evidence	While extreme weather events in the region include drought, flooding, and disturbance by wind, this analysis is limited to disturbance by wind as this is the only disturbance which has a direct effect on carbon stocks. As flooding within the project region is common, high water levels in the forest do not lead to a reduction in the forest carbon stocks. Drought does not have a direct effect on existing forest carbon stocks, but instead can increase the severity of forest fires and hence is covered above in the section on fire risk. In relation to disturbance by wind, the recurrence intervals for large blow down disturbances in the western Amazon have been estimated at 27,000 years.[28]
Significance	Insignificant <5% loss of carbon stocks
Likelihood	Once every 100 years or more.

[27] For more information see the results of the "Forest biomass carbon inventory for the Envira Project, Acre State, Brazil" in the project database.
[28] 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.

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

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

Score for Each Natural Risk Applicable to the Project (Determined by (LS × M)

Fire (F)	2
Pest and Disease Outbreaks (PD)	0
Extreme Weather (W)	0
Geological Risk (G)	0
Other natural risk (ON)	
Total Natural Risk (as applicable, F + PD + W + G + ON)	**2**

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

A2.1. Overall Risk Rating

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

Risk Category	Rating
a) Internal Risk	21
b) External Risk	1
c) Natural Risk	2
Overall Risk Rating (a + b + c)	**24**

The Envira Amazonia Project will employ a non-permanence risk deduction of 24%.

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.

APPENDIX B. BASELINE EMISSIONS FROM VALIDATED VCS PROJECT DESCRIPTION

3.1 Baseline Emissions

Development of the baseline for a planned deforestation project was conducted in conformance with the VCS modular REDD methodology VM0007, specifically the BL-PL module. The agent of deforestation has been identified as one of the project proponents, JR Agropecuária e Empreendimentos EIRELI. JR Agropecuária e Empreendimentos EIRELI translates into JR Agriculture-Livestock and Ventures LTDA. JR Agropecuária e Empreendimentos EIRELI poses an immediate site-specific threat as the company was established in 2009 with the plan to clear 20% of the Envira Amazonia Property. As such Milva Vasquez M.E., a logging company owned by one of the investors in JR Agropecuária e Empreendimentos EIRELI, was to harvest all commercially valuable wood and then clear-cut the land to establish a large ranch. Bento would then lead the conversion of the cleared land to pasture, including the planting of grass and installing fencing.

3.1.1. Threat of Deforestation

The immediate site specific threat can be demonstrated by documentary proof of the following:

- Legal permissibility for deforestation;
- Suitability of project area for conversion to alternative non-forest land use;
- Government approval; and
- Evidence of similar planned deforestation activities by the baseline agent within the previous five years to show intent to deforest.

<u>3.1.1.1 Legal Permissibility for Deforestation</u>

Legal permission to clear 20% of the project property is established by demonstrating compliance of the baseline with Brazilian forestry laws. The following are the most relevant Brazilian laws related to forestry and land use.

With respect to Federal Law, the Brazilian Forest Code is of particular importance to the Envira Amazonia Project. Versions of the Brazilian Forest Code include the following:

- The original Brazil Forest Code entitled, Law No. 4771, September 15, 1965.[29]
- Revision of Brazil Forest Code under Law No. 7803, July 18, 1989.[30]
- Provisional Measure entitled 2166-67, August 24, 2001.[31]
- Revision of Brazil Forest Code under Law No. 12.651 of May 25, 2012[32]

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[29] Presidency of the Republic, "Law No. 4771, September 15, 1965," Available: http://www.planalto.gov.br/ccivil_03/Leis/L4771.htm
[30] Presidency of the Republic, "Law No. 7803, July 18, 1989," Available: http://www.planalto.gov.br/ccivil_03/leis/L7803.htm
[31] Presidency of the Republic, "Provisional Measure 2166-67, August 24, 2001," Available: https://www.planalto.gov.br/ccivil_03/MPV/2166-67.htm
[32] Presidency of the Republic, Civil House Cabinet Subcommittee for Legal Affairs, "Law No. 12,651, OF 25 MAY 2012," Available: http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12651.htm

Title of Law

Law Number 12.651 of May 25, 2012 is the latest Brazilian Forest Code and supersedes earlier versions in 1965, 1989, and 2001.[33]

Summary of Law

The latest Brazilian Forest Code, “Provides for the protection of native vegetation; amends Laws Nos. 6938 of August 31, 1981, 9,393, of December 19, 1996, and 11,428 of December 22, 2006, repealing the Laws No. 4771, 15 September 1965 and 7754, of April 14, 1989, and Provisional Measure No. 2.166-67, of August 24, 2001, and other provisions.” Key tenets of the Brazilian Forest Code include:

- Chapter 1. General Provisions
    - Article 1-A. This act lays down general rules on the protection of vegetation, Permanent Preservation Areas and Legal Reserves, forest exploitation, the supply of forest raw materials, control the origin of forest products and the prevention and control of forest fires, and provides economic and financial instruments for the achievement of its objectives.
    - II. This act reaffirms the importance of the strategic role of farming and the role of forests and other forms of native vegetation in sustainability, economic growth, improving the quality of life of the population and the country's presence in the domestic and international food and bioenergy.
    - VI. This act states the creation and mobilization of economic incentives to encourage the preservation and restoration of native vegetation and to promote the development of sustainable productive activities.
    - Article 3. For the purposes of this Act, the following definitions apply:
        - I - Amazon: the states of Acre, Pará, Amazonas, Roraima, Rondônia, Mato Grosso and Amapá and the regions north of latitude 13 ° S, the states of Goiás and Tocantins, and west of 44 ° W , State of Maranhão;
        - II - Permanent Preservation Area - APP: protected area, or not covered by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, biodiversity, facilitate gene flow of fauna and flora, soil protection and ensure the well-being of human populations;
        - III - Legal Reserve area located within a rural property or ownership, demarcated according to Article 12, with the function of ensuring a sustainable economic use of natural resources of rural property, assist the conservation and rehabilitation of ecological processes and to promote the conservation of biodiversity, as well as shelter and protection of wildlife and native flora;
        - VI - alternative land use: replacement of native vegetation and succeeding formations other ground covers such as agricultural activities, industrial, power

[33] Presidency of the Republic, Civil House Cabinet Subcommittee for Legal Affairs, “Law No. 12,651, OF 25 MAY 2012,” Available: http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12651.htm

generation and transmission of energy, mining and transport, urban settlements or other forms of human occupation

- Chapter 2. Area of permanent preservation
  - Section I. Delimitation of Areas of Permanent Preservation
    - Licensing is done by a competent environmental authority.
    - The property will be registered in the Rural Environmental Registry (i.e., CAR).
- Chapter 4. Legal reserve area
  - Section I. Delimitation of the Legal Reserve Area
    - Article 12. All property must maintain native vegetation cover in rural area, as a legal reserve, without prejudice to the application of the rules on the Permanent Preservation Areas, subject to the following minimum percentages in relation to the area of the property, except as specified in art. 68 of this Act: (Amended by Law No. 12,727, 2012).
      - 80% of properties located in the Amazon
      - 35% of properties located in the Cerrado
      - 20% of properties located in other regions of the country
- Chapter 5. The suppression of vegetation for alternative use of soil
  - Article 26. The removal of native vegetation for conversion to alternative land uses, both public domain and private domain, depend on the registration of the property in CAR, mentioned in Article 29, and the prior authorization of the competent state agency, SISNAMA [Sistema Nacional do Meio Ambiente].

Compliance with Law

The Envira Amazonia Project baseline is in compliance with the latest Brazil Forest Code. Acre is considered part of the Legal Amazon and thus the property maintains 80% forest cover as a legal reserve in the baseline. Licensing to practice alternative land use (e.g., cattle ranching and agriculture) would be registered in the CAR and approved by IMAC (in English: The Acre Environmental Institute) which is overseen by SISNAMA.

3.1.1.2 Suitability of Project Area for Conversion to Alternative Non-Forest Land Use

Suitability for conversion of the project area to non-forest is demonstrated in Table 3.1. This table demonstrates that the project area has similar vegetation[34] and topography to the proxy areas that have already been converted to pasture (see analysis below). As there is little climatic variation in Acre state, and both the project area and proxy areas, are within the state, the climate is also suitable for conversion to pasture. While proxy areas have different soil types, most soil types in the state are suitable for conversion to pasture, including the cambisols present in the project area.

[34] Note the "other" vegetation class is predominantly open forest that was previously cleared for pasture.

The following pictures, taken along BR-364 between Cruzeiro do Sul and Sena Madureira, are indicative of the overall suitability of the region for conversion to cattle pasture.

Figure 3.1 Photo of large ranch taken along BR-364 (taken by Ilderlei Souza Rodrigues Cordeiro and Normando Rodrigues Sales).

Figure 3.2 Photo of ranch near Feijó (taken by Ilderlei Souza Rodrigues Cordeiro and Normando Rodrigues Sales).

3.1.1.3 Government Approval

The removal of native vegetation and conversion to alternative land uses for export sales, governmental loans, or for sale of the property needs final approval of the Cadastro Ambiental Rural (CAR) by SISNAMA, or the Sistema Nacional do Meio Ambiente, as stated in the 2012 Brazilian Forest Code. In the State of Acre to covert forest to pasture for domestic sales of cattle, the CAR (formerly known as the Licenciamento Ambiental Rural or LAR) process just needs to be opened.

This approval is solely contingent on the below requirements being met:

1) Compliance with all Brazilian forestry laws.
2) All federal and state tax on the property must be paid in full and up to date.
3) The legal reserve area and areas of permanent protection (APPs) must be documented. This is commonly accomplished by a forest engineer or agricultural scientist signing off on a management plan which could include clear-cutting, sustainable harvesting, or a combination of these.
4) The property is delineated and the geo-referenced boundaries are approved by the Instituto Nacional de Colonização e Reforma Agrária (INCRA) and registered in the Cadastro Ambiental Rural (CAR) (formerly known as the Licenciamento Ambiental Rural or LAR).

The Envira Amazonia Project's planned deforestation is in compliance with all Brazilian forestry laws. The geo-referenced boundaries of the 200,000 hectare parcel have been approved by INCRA on 09 April 2010 and the parcel opened up the LAR process on 15 April 2011.[35] Approval by INCRA indicates that the delineated boundaries, the legal reserve and APPs have been approved, the CCIR demonstrates all taxes are paid, and the LAR protocol number demonstrates the LAR process has been opened.

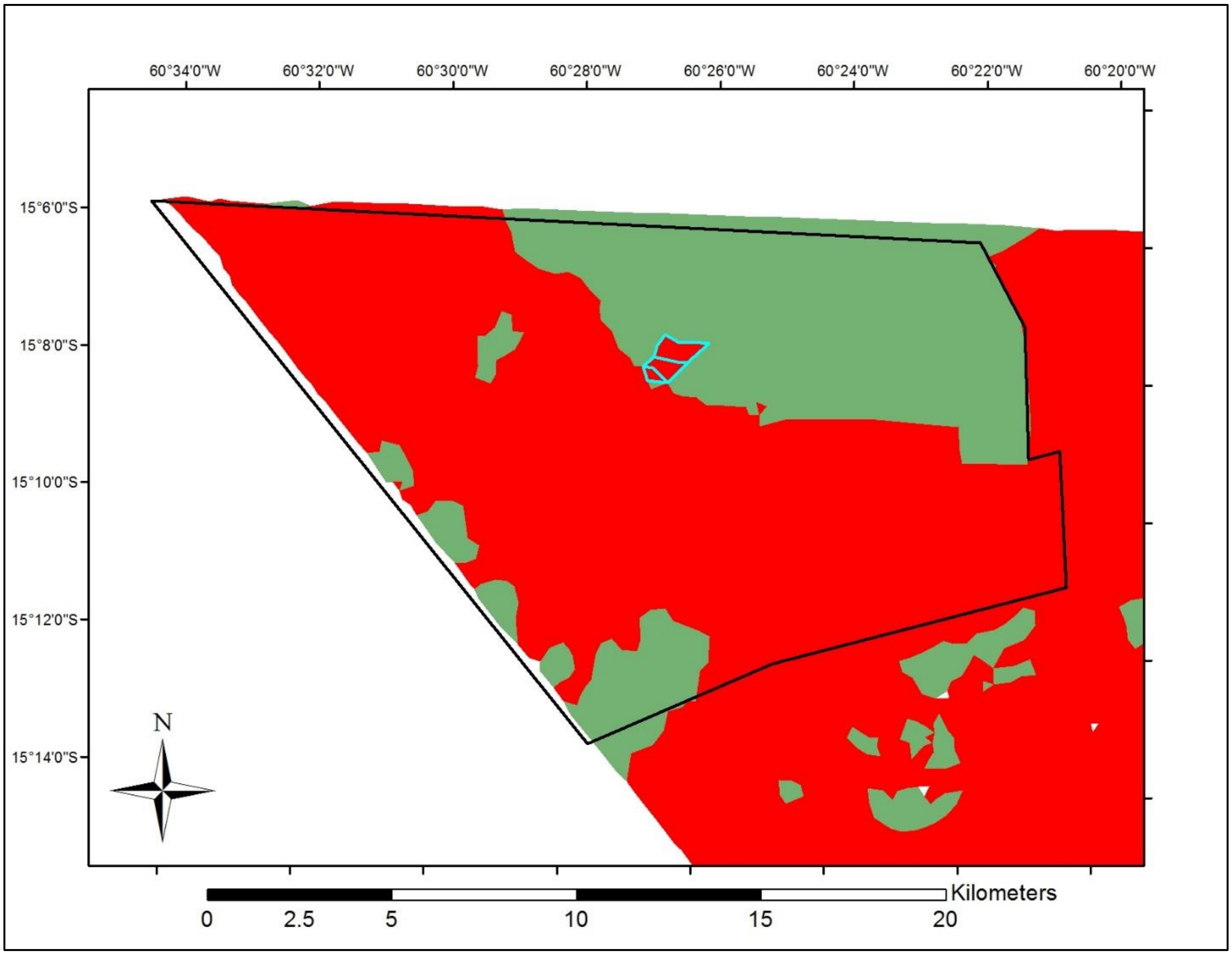
3.1.1.4 Evidence of Similar Planned Deforestation Activities by the Baseline Agent

As the agent of deforestation has been identified, JR Agropecuária e Empreendimentos EIRELI, the intent to deforest can be demonstrated by documenting their history of similar planned deforestation within the five years previous to without-project deforestation.

Exhibit D, in the project archive, documents an agreement where Bento hired Ruben's company, Milva Vasques ME, to log and clear part of Fazenda Esperanca, Bento's property, in the State of Mato Grosso, Brazil to establish a cattle ranch, in 2008/2009. This clearing is further substantiated using 2012 PRODES data in Figure 3.3.

[35] See the project archive for confirmation of the LAR registration.

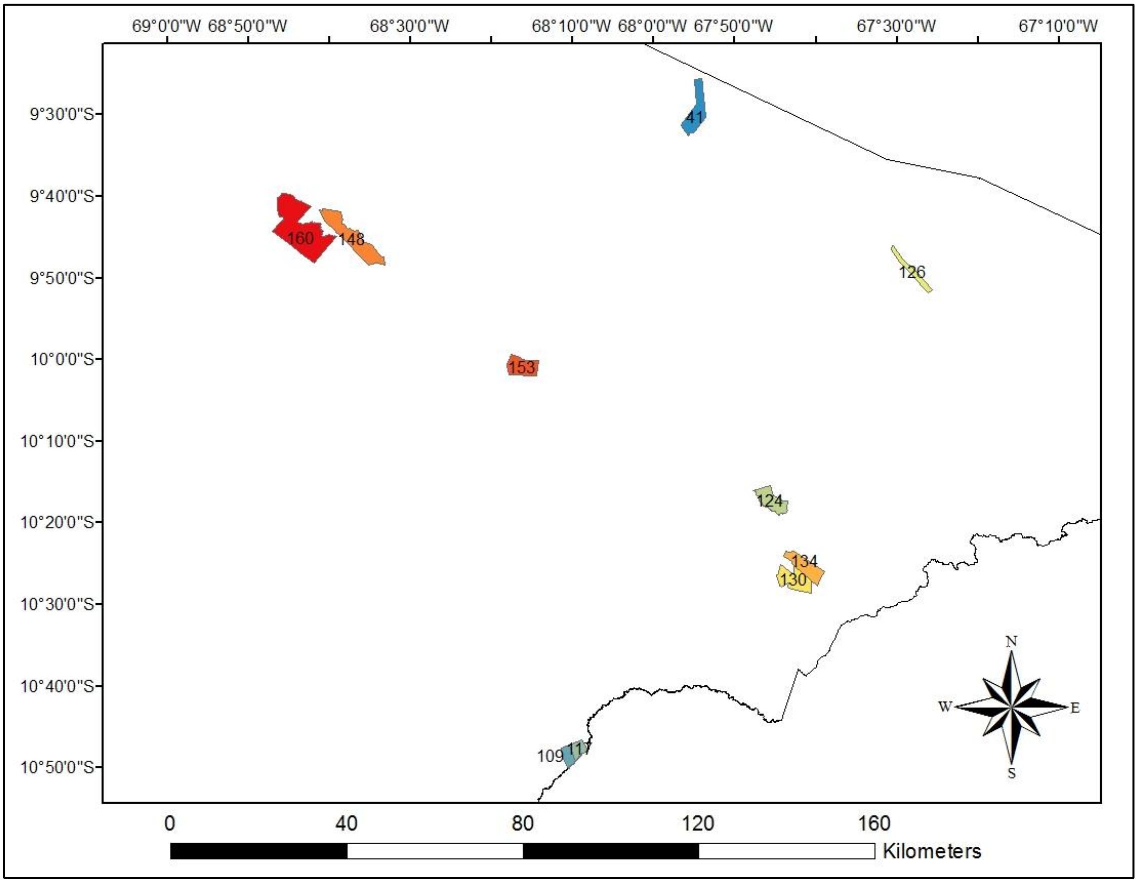
Figure 3.3. Forest Cover Map (Green = Forest; Red = Nonforest) with outline of Fazenda Esperanca (in black) and 2008/2009 clearing (outlined in blue). Classified Imagery is 2012 PRODES.



3.1.2. Identifying proxy areas

Ten areas were identified within Acre State that proved suitable to use as proxy sites from which to estimate rate of planned deforestation in the baseline (see Figure 3.4). Figure 2.2 depicts the deforestation on these properties which occurred from 2002 to 2011.

Figure 3.4. Map of the 10 proxy sites in Acre State.



Each proxy site was selected to meet the following criteria:

1. Land conversion practices are the same as those used by the baseline agent, and are similar on large authorized clearings throughout Acre, typically involving recovery of commercial timber followed by mechanized clearing and burning;

2. The post-deforestation land use is ranching/pasture, the same as the baseline scenario, confirmed via inspection of satellite imagery[36];

3. It has similar management and land use rights as the project area under the business as usual scenario, which are similar on large (>1,000 ha) private holdings throughout Acre (the areas are

[36] The boundaries of proxy areas overlaid high resolution aerial photos which depicted features typical of large scale ranches in Acre State, including many cattle trails and ponds.

confirmed to be private lands by process of elimination – i.e. no overlap with GIS layers of state lands, indigenous lands and INCRA settlements;

4. It is located within Acre State;

5. Deforestation is inferred to be legally permitted as the property is fully georeferenced and registered with INCRA and the CAR and under the oversight of the state of Acre;

6. It has deforestation which has occurred within 10 years prior to the baseline period.

The project area is similar in vegetation, elevation, slope, and soil type to each proxy area (See Table 3.1), and hence suitable for conversion to non-forest as these proxy sites have been. Acre State is dominated by open moist tropical forest, which also dominates the project and proxy areas. Note that the vegetation class “other” in most cases represents open forest that has been converted to pasture.

The vast majority of land (and soil) in Acre is suitable for ranching. Pasture can be successfully established on a variety of soils in Acre State, as indicated in Table 3.1. While Gleissolos (Gleysols), and Neossolos (Fluvisol) can support ranching, pasture is not as common on these soil types (as well as Espelho d' agua (Body of water).

All proxies and the project areas were 100% within the 0-500m elevation classes. This is reflective of the fact Acre State has little relief and elevations greater than 500 meters are not common. Similarly, slopes in the proxy site were similar to the project area (predominately <15%).

Table 3.1. Comparison of vegetation, soil type, and vegetation of the project area and proxy sites.

Factors Assessed	**Category**	**Project Area**	**41**	**109**	**117**	**124**	**126**	**130**	**134**	**148**	**153**	**160**
Vegetation (%)												
	Open Forest	100.0%	66.9%	45.9%	75.5%	46.6%	25.3%	7.7%	7.6%	64.2%	67.7%	80.1%
	Dense Forest	0.0%	0.0%	5.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Other	0.0%	33.1%	48.8%	24.5%	53.4%	74.7%	92.3%	92.4%	35.8%	32.3%	19.9%
Elevation (%)												
	0-500m	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Slope (%)												
	Gentle (<15%)	100.0%	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	98.7%
	Steep (>15%)	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%
Soil (%)												
	ARGISSOLO	0.0%	100.0%	100.0%	82.4%	93.8%	78.0%	0.0%	0.0%	0.0%	0.0%	89.2%
	CAMBISSOLO	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	ESPELHO D'Agua	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

	GLEISSOLO	0.0%	0.0%	0.0%	17.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	LATOSSOLO	0.0%	0.0%	0.0%	0.0%	6.2%	22.0%	100.0%	100.0%	0.0%	0.0%	0.0%
	LUVISSOLO	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
	NEOSSOLO	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	PLINTOSSOLO	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	10.8%

3.1.3. Rate and Annual area of deforestation cleared in the baseline

The rate of deforestation is calculated for each of the 10 proxy areas using Equation 3.1 and then averaged to derive a baseline rate of deforestation (D%planned,i,t).

Equation 3.1. Equation for estimating the projected annual proportion of land that will be deforested.

$$D\%_{planned,i,t} = \left(\sum_{pn=1}^{n^*} \left(D\%_{pn} \Big/ Yrs_{pn} \right) \right) \Big/ n$$

Table 3.2. Parameters and Values Used to Calculate the projected annual proportion of land that will be deforested.

Parameter	Description	Value	Justification
D%planned,i,t	Projected annual proportion of land that will be deforested in stratum i during year t.	16.1%	Calculated in Table 3.3.
D%pn	Percent of deforestation in land parcel *pn* etc of a proxy area as a result of planned deforestation as defined in this module; %	See Table 3.3.	See project workbook for calculations.
Yrspn	Number of years over which deforestation occurred in land parcel pn in proxy area	See Table 3.3.	See project workbook for calculations.
Aplanned,i, (ha)	Total area of planned deforestation over the baseline period for stratum i; ha	200,000	This is the total area of the project property. In order for Equation 2 to work with Equation 3 of the BL-PL module, both equations need to reference the "proportion of land that will be deforested". This approach is

			conservative because if the Aplanned was the sum of all areas of planned deforestation, the rate (D% planned) would necessarily be much greater.
L-Di	Likelihood of deforestation for stratum i; %	100%	As the project area is not under government control, "L-Di shall be equal to 100%" as set by the methodology.
AAplanned,i,t	Annual area of baseline planned deforestation for stratum i at time t; ha	See Table 3.3.	Calculated in Table 3.4.

Table 3.3. Calculation of the projected annual proportion of land that will be deforested.

Proxy Site ID	41	109	117	124	126	130	134	148	153	160	Sum/ Average
Area deforested 2002-2011 (Hectares)	941.7	322.6	221.6	514.4	308.5	1,790.0	781.8	1,190.3	558.4	2,227.5	
Parcel Area (Hectares)	3,331.6	1,016.7	1,006.1	2,480.6	1,496.9	3,044.7	2,779.3	5,454.3	2,565.9	10,717.2	
D%pn	28.3%	31.7%	22.0%	20.7%	20.6%	58.8%	28.1%	21.8%	21.8%	20.8%	
Yrspn	2.0	1.0	1.0	3.0	2.0	2.0	2.0	1.0	4.0	4.0	
pn	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
n											10
D%pn/Yrspn	14.1%	31.7%	22.0%	6.9%	10.3%	29.4%	14.1%	21.8%	5.4%	5.2%	
D%planned,i,t											16.1%

The area of land cleared in the baseline is calculated using Equation 3.2. The calculated annual area of planned deforestation, found in Table 3.4, was conservatively adjusted downward (see Table 3.5) due to the impracticality of clearing such a large amount of land at one location in one year. Discussions with Milva Vasquez M.E., a logging company owned by one of the investors in JR Agropecuária e Empreendimentos EIRELI, revealed it was possible to clear up to 8,000-10,000 hectares in any given year. The baseline areas cleared have therefore been adjusted downward, imposing a maximum annual area deforested of 8,000 ha. Note that the calculated baseline applying the methodology yields over 30,000 ha per year. Further, we have conservatively assumed that strata with the lowest carbon stocks are deforested first.

Equation 3.2. Equation for estimating the annual area of planned deforestation in the baseline.

$$AA_{planned,i,t} = \left(A_{planned,i} * D\%_{planned,i,t}\right) * L - D_i$$

Table 3.4. Calculation of the annual area of planned deforestation in the baseline, per methodology.

Year	Aplanned,i, (ha)	D%planned,i,t Actual	L-Di	AAplanned,i,t (ha)
2013	200,000	16.1%	100%	32,205.5
2014	200,000	16.1%	100%	7,095.1
2015	200,000	16.1%	100%	0.0
2016	200,000	16.1%	100%	0.0
2017	200,000	16.1%	100%	0.0
2018	200,000	16.1%	100%	0.0
2019	200,000	16.1%	100%	0.0
2020	200,000	16.1%	100%	0.0
2021	200,000	16.1%	100%	0.0
2022	200,000	16.1%	100%	0.0
Total	200,000			39,300.6

Table 3.5. Conservative planned deforestation baseline, imposing a maximum value of AAplanned,i,t of 8,000 ha.

Year	AAplanned,i,t (ha)	AAplanned,i,t FAP+FAB+FD (ha)	AAplanned,i,t FAP+FAB (ha)	AAplanned,i,t FAB+FAP (ha)	AAplanned,i,t FAB-Aluvial (ha)
2013	8,000	0	5,085	2,915	0
2014	8,000	0	8,000	0	0
2015	8,000	2,780	5,220	0	0
2016	8,000	8,000	0	0	0
2017	7,301	4,020	0	0	3,281
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
2022	0	0	0	0	0
Total	39,301	14,800	18,306	2,915	3,281

3.1.4. Estimation of Carbon Stock Changes and GHG Emissions

3.1.4.1 Stratification of the Total Area Subject to Deforestation

The project area was stratified, according to module X-STR, using a vegetation map obtained from the State of Acre.[37] The forest types and strata areas present in the Envira Amazonia Project area are listed in Table 3.6. A map of the vegetation strata in the project area can be found in Figure 1.3.

Table 3.6. Areas of Strata within the Project Area.

Stratum	Stratum Description	Area (hectares)
FAP + FAB + FD	Open forest with palm and bamboo and dense forest	14,800
FAP + FAB	Open forest with palm and bamboo	18,306

[37] ACRE. Governo do Estado do Acre. Secretaria de Estado de Planejamento e Desenvolvimento Econômico-Sustentável, Secretaria de Estado de Meio Ambiente e Recursos Naturais. Programa Estadual de Zoneamento Ecológico-Econômico do Acre. Zoneamento Ecológico-Econômico do Acre Fase II. Documento Síntese, 2006.

FAB + FAP	Open forest with bamboo and palm	2,915
FAB – Aluvial	Open alluvial forest with bamboo	3,281

3.1.4.2 Estimation of Carbon Sequestered in Long-Lived Wood Products

Carbon sequestered in long-lived wood products is calculated using module CP-W Option 2, Commercial Inventory Estimation. The trees harvested would have been made into sawnwood as is typical for the tropical hardwood species in Acre State (Igor Agapejev de Andrade, pers comm.), hence only one wood product class (sawnwood, "s") is extracted in the baseline. No other wood is extracted for commercial markets. Table 3.7 list all parameters used for CP-W Option 2.

Table 3.7. Parameters and Values used estimate carbon stocks entering the wood products pool.

Parameter	Description	Value	Justification
CXB,sawnwood (t CO2/ha)	Mean stock of extracted biomass carbon by class of wood product *ty* from stratum	36.4	Calculated in Table 3.8.
CAB_tree,I (t CO2/ha)	Mean aboveground biomass carbon stock in stratum i; t CO2-e ha-1	424.8	Calculated from forest inventory data.
BEF	Biomass expansion factor for conversion of volume to total aboveground tree biomass; dimensionless	1.52	BEF calculated using data from the Brazilian Amazon (i.e., country and ecoregion specific) using Higuchi et al. 1998 data (1/0.656=1.524390244).
Pcomi	Commercial volume as a percent of total aboveground volume in stratum i; dimensionless	0.13	1) commercial portion of a tree (.656) x 49.1 tons d.m./ha, total aboveground biomass for commercial species, forest inventory 2) 246.5 tons d.m./ha, average total

			aboveground biomass, forest inventory
WWs	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product ty; dimensionless	0.24	Default value for developing countries from CP-W module
CWP,i (t CO2/ha)	Carbon stock entering the wood products pool from stratum *i*;	27.7	Calculated in Table 3.9.
SLFs	SLFty Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product ty; dimensionless	0.20	Default for sawnwood from CP-W module
Ofs	OFty Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product ty; dimensionless	0.84	Default value from previous version of methodology module CP-W
CWP100,i (t CO2/ha)	Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years from stratum *i*	24.1	Calculated in Table 3.10.

Equation 3.3. Equation for estimating the mean stock of extracted biomass.

$$C_{XB,i} = C_{AB\_tree,i} * \frac{1}{BCEF} * Pcom_i$$

Table 3.8. Calculation of the mean stock of extracted biomass.

CAB_tree,I (t CO2/ha)	BEF	Pcomi	$C_{XB,sawnwood}$ (t CO2/ha)
425	1.52	0.13	36.4

Equation 3.4. Equation for estimating the carbon stock entering the wood products pool.

$$C_{WP,i} = \sum_{ty=s,w,oir,p,o} C_{XB,ty,i} * (1 - WW_{ty})$$

Table 3.9. Calculation of the carbon stock entering the wood products pool.

$C_{XB,sawnwood}$ (t CO2/ha)	WW_s	$C_{WP,i}$ (t CO2/ha)
36.4	0.24	27.7

Equation 3.5. Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years

$$C_{WP100,i} = C_{WP,i} - C_{WP,i} * (1 - SLFp) * (1 - Ofp)$$

Table 3.10. Carbon stock entering the wood products pool at the time of deforestation that is expected to be emitted over 100-years.

$C_{WP,i}$ (t CO2/ha)	SLF_s	Ofs	$C_{WP100,i}$ (t CO2/ha)
27.7	0.20	0.84	24.1

3.1.4.3 Estimation of Carbon Stocks and Carbon Stock Changes per Stratum

Forest carbon stocks were directly measured in a forest inventory of the Envira Amazonia Project area in 2014. Results are detailed in the "Forest biomass carbon inventory for the Envira Amazonia Project, Acre State, Brazil" 2014 which can be found in the project database. Results are summarized for forest strata in Table 3.11, below. Stratum specific values for live aboveground biomass (CAB_tree,i), belowground biomass, (CBB_tree,i) and dead wood (CDW,i) and stratum totals (CBSL,i) were derived from the forest inventory. The total carbon stock entering the wood products pool ($C_{WP,i}$) and 100-year emissions ($C_{WP100,i}$) can be found in Table 3.7 and were derived using the CP-W module.

After a thorough review of literature, the best source of information on Nonforest biomass stocks was a local study by Salimon et al.[38] entitled "Estimating state-wide biomass carbon stocks for a REDD plan in Acre, Brazil". This peer reviewed study produced a biomass value for pasture of 16.0 tons d.m./ha and was in part supported by the Acre Environment Office and Fundação de Tecnologia do Estado do Acre. This value was converted to the total aboveground and belowground biomass stock using allometric root equation developed by Cairns[39] and converted to stocks of carbon using a carbon fraction of 0.47, as per the VM007 module. The resulting estimate for post-deforestation pasture CO_2 stocks are listed in Table 3.11.

[38] Salimon et al. 2011. Estimating state-wide biomass carbon stocks for a REDD plan in Acre, Brazil. Forest Ecology and Management 262: 555-560.
[39] 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.

Table 3.11. Estimation of Carbon Stocks and Post-Deforestation carbon stocks for all carbon pools and strata.

Stratum	Description	FAP + FAB + FD	FAP + FAB	FAB + FAP	FAB - Aluvial	Area Weighted Mean for the Project Area	Cpost Baseline
CAB_tree,i (t CO2-e ha-1)	Carbon stock in aboveground tree biomass in stratum i; t CO_2e ha-1	431.7	407.3	394.9	518.8	424.8	27.6
CBB_tree,i (t CO2-e ha-1)	Carbon stock in belowground tree biomass in stratum i; t CO_2e ha-1	96.7	91.6	89.1	114.6	95.2	7.6
CDW,i (t CO2-e ha-1)	Carbon stock in dead wood in stratum i; t CO_2e ha-1	18.1	14.3	14.0	22.0	16.4	0.0
CBSL,i (t CO2-e ha-1)	Carbon stock in all carbon pools in forest stratum i; t CO_2e ha-1	546.5	513.2	498.0	655.4	536.5	35.2
$C_{WP,i}$ (t CO2/ha)	Total carbon stock entering the wood products pool at the time of deforestation; t CO2-e ha-1					27.7	
$C_{WP100,i}$ (t CO2/ha)	Carbon stock entering the wood products pool at the					24.1	

	time of deforestation that is expected to be emitted over 100-years from stratum i; t CO2-e ha-1						

Stocks of belowground biomass and dead wood are emitted from the year of conversion/deforestation at a linear rate equal to 1/10 of the initial stock annually, for 10 years. Carbon stocks entering the wood products pool and that are expected to be emitted over 100-years are emitted from the year of conversion/deforestation at a linear rate equal to 1/20 of the initial stock annually, for 20 years. Net emissions (CBSL -C post) from steady decomposition of these pools are elaborated in Tables 3.12, 3.13, and 3.14.

Table 3.12. Emissions from steady decomposition of belowground biomass post deforestation in the project area, ($CBSL_{BB}$ -C $post_{BB,}$ t CO2-e).

Year	**BGB Emissions from Deforestation (t CO2)**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
2013	664,716	66,472	66,472	66,472	66,472	66,472	66,472	66,472	66,472	66,472	66,472
2014	672,127		67,213	67,213	67,213	67,213	67,213	67,213	67,213	67,213	67,213
2015	686,275			68,627	68,627	68,627	68,627	68,627	68,627	68,627	68,627
2016	712,842				71,284	71,284	71,284	71,284	71,284	71,284	71,284
2017	709,422					70,942	70,942	70,942	70,942	70,942	70,942
2018	0						0	0	0	0	0
2019	0							0	0	0	0
2020	0								0	0	0

2021	0									0	0
2022	0										0
Total		66,472	133,684	202,312	273,596	344,538	344,538	344,538	344,538	344,538	344,538

Table 3.13. Emissions from steady decomposition of dead wood post deforestation in the project area, ($CBSL_{DW}$ -C $post_{DW}$, t CO2-e).

Year	DW Emissions from Deforestation (t CO2)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2013	113,793	11,379	11,379	11,379	11,379	11,379	11,379	11,379	11,379	11,379	11,379
2014	114,696		11,470	11,470	11,470	11,470	11,470	11,470	11,470	11,470	11,470
2015	125,225			12,522	12,522	12,522	12,522	12,522	12,522	12,522	12,522
2016	144,995				14,500	14,500	14,500	14,500	14,500	14,500	14,500
2017	145,129					14,513	14,513	14,513	14,513	14,513	14,513
2018	0						0	0	0	0	0
2019	0							0	0	0	0
2020	0								0	0	0
2021	0									0	0
2022	0										0
Total		11,379	22,849	35,371	49,871	64,384	64,384	64,384	64,384	64,384	64,384

Table 3.14. Emissions from steady decomposition of wood products post deforestation in the project area, (C_{WP} -C $post_{WP}$, t CO_2-e).

Year	Wood Product Emissions from Deforestation (t CO2)	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
2013	193,054	9,653	9,653	9,653	9,653	9,653	9,653	9,653	9,653	9,653	9,653
2014	193,054		9,653	9,653	9,653	9,653	9,653	9,653	9,653	9,653	9,653
2015	193,054			9,653	9,653	9,653	9,653	9,653	9,653	9,653	9,653
2016	193,054				9,653	9,653	9,653	9,653	9,653	9,653	9,653
2017	176,176					8,809	8,809	8,809	8,809	8,809	8,809
2018	0						0	0	0	0	0
2019	0							0	0	0	0
2020	0								0	0	0
2021	0									0	0
2022	0										0
Total		9,653	19,305	28,958	38,611	47,420	47,420	47,420	47,420	47,420	47,420

3.1.4.4 Estimation of the Sum of Baseline Carbon Stocks Changes in all pools

Net CO_2 emissions in the baseline for the project area are calculated by summing the net changes in carbon stocks using equation 3.6. The parameters ΔCAB_non-tree, ΔCLI, ΔCBB_non-tree, ΔCSOC have been left out of calculations as they are not included in the project boundary.

Equation 3.6. Equation for estimating the Sum of Baseline Carbon Stocks Changes in all pools.

$$\Delta C_{BSL,i,t} = AA_{planned,i,t} * \left(\Delta C_{ABtree,i} + \Delta C_{ABnon-tree,i} + \Delta C_{LI,i}\right) + \sum_{t-10}^{t}\left(AA_{planned,i,t} * \left(\Delta C_{BBtree,i} + \Delta C_{BBnon-tree,i} + \Delta C_{DW,i}\right) * \frac{1}{10}\right) + \sum_{t-20}^{t}\left(AA_{planned,i,t} * \left(C_{WP100,i} + \Delta C_{SOC,i}\right) * \frac{1}{20}\right)$$

Table 3.15. Calculation of the Sum of Baseline Carbon Stocks Changes in all pools.

Year	AAplanned,i,t FAP+FAB+FD (ha)	AAplanned,i,t FAP+FAB (ha)	AAplanned,i,t FAB+FAP (ha)	AAplanned,i,t FAB-Aluvial (ha)	$CBSL_{AB}$ (t CO2-e)	C $post_{AB}$ (t CO2-e)	$CBSL_{BB}$ - C $post_{BB}$ (t CO2-e)	$CBSL_{DW}$ -C $post_{DW}$ (t CO2-e)	C wp (t CO2-e)	ΔCBSL,i
2013	0	5,085	2,915	0	3,222,159	220,587	66,472	11,379	9,653	3,089,076
2014	0	8,000	0	0	3,258,255	220,587	133,684	22,849	19,305	3,213,507
2015	2,780	5,220	0	0	3,326,003	220,587	202,312	35,371	28,958	3,372,058
2016	8,000	0	0	0	3,453,221	220,587	273,596	49,871	38,611	3,594,712

2017	4,020	0	0	3,281	3,437,097	201,302	344,538	64,384	47,420	3,692,137
2018	0	0	0	0	0	0	344,538	64,384	47,420	456,342
2019	0	0	0	0	0	0	344,538	64,384	47,420	456,342
2020	0	0	0	0	0	0	344,538	64,384	47,420	456,342
2021	0	0	0	0	0	0	344,538	64,384	47,420	456,342
2022	0	0	0	0	0	0	344,538	64,384	47,420	456,342

3.1.4.4 Estimation of GHG Emissions in the Baseline

Greenhouse gas emissions in the baseline resulting from deforestation activities within the project area (GHGBSL,E,i,t) are calculated in Table 3.18 using Equation 3.7. Parameters are found in Table 3.16 and Table 4.3.

Equation 3.7. Equation for Calculating GHG Emissions as a Result of Deforestation Activities within the Project Area in the Project Case.

$GHG_{BSL\text{-}E,i,t} = E_{BiomassBurn,i,t}$ = Aburn,i,t * Bi,t * COMF I * Gg,I * 10^-3 * GWPg

Table 3.16. Parameters and Values Used to Calculate Annual Ex-Ante GHG Emissions.

Parameter	**Description**	**Value**	**Justification**
GHGBSL-E,i,t	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i during project year t; t CO2-e year-1	See Table 3.18.	Calculated below.
EBiomassBurn,i,t	Non-CO_2 emissions due to biomass burning in stratum i in year t; t CO_2e	See Table 3.18.	Biomass burning is expected to occur in the with project case.

3.1.5. Project Baseline

Net CO_2 emissions in the baseline for the project area are calculated by summing the net changes in GHG emissions and net changes in carbon stocks using equation 3.8.

Equation 3.8. Equation for estimating the baseline net GHG emissions for planned deforestation.

$$\Delta C_{BSL,planned} = \sum_{t=1}^{t*} \sum_{i=1}^{M} \left(\Delta C_{BSL,i,t} + GHG_{BSL-E,i,t} \right)$$

Table 3.17. Parameters and Values used estimating the baseline net GHG emissions for planned deforestation.

Parameter	**Description**	**Value**	**Justification**
ΔCBSL,planned	Net greenhouse gas emissions in the baseline from planned deforestation; t CO2-e	See Table 3.18.	Calculated below.
ΔCBSL,i,t	Net carbon stock changes in all pools in the baseline stratum i at time t; t CO2-e	See Table 3.18.	Calculated above.
GHGBSL-E,i,t	Greenhouse gas emissions as a result of deforestation activities within the project boundary in the baseline stratum i during project year t; t CO2-e year-1	See Table 3.18.	Calculated below.

Table 3.18. Calculation of the baseline net GHG emissions for planned deforestation.

Year	ΔCBSL,i	E-N2O Biomass Burning (tCO2e)	E-CH4 Biomass Burning (tCO2e)	GHGBSL-E,i,t	ΔCBSL,planned
2013	3,089,076	57,146.4	131,621.2	188,768	3,277,844
2014	3,213,507	57,146.4	131,621.2	188,768	3,402,275
2015	3,372,058	57,146.4	131,621.2	188,768	3,560,825
2016	3,594,712	57,146.4	131,621.2	188,768	3,783,480
2017	3,692,137	52,150.4	120,114.2	172,265	3,864,401
2018	456,342	0.0	0.0	0	456,342
2019	456,342	0.0	0.0	0	456,342

2020	456,342	0.0	0.0	0	456,342
2021	456,342	0.0	0.0	0	456,342
2022	456,342	0.0	0.0	0	456,342
Total	19,243,197	280,736	646,599	927,335	20,170,532