JARI/AMAPÁ REDD+ PROJECT

Jari Celulose Jari Florestal BIOFÍLICA

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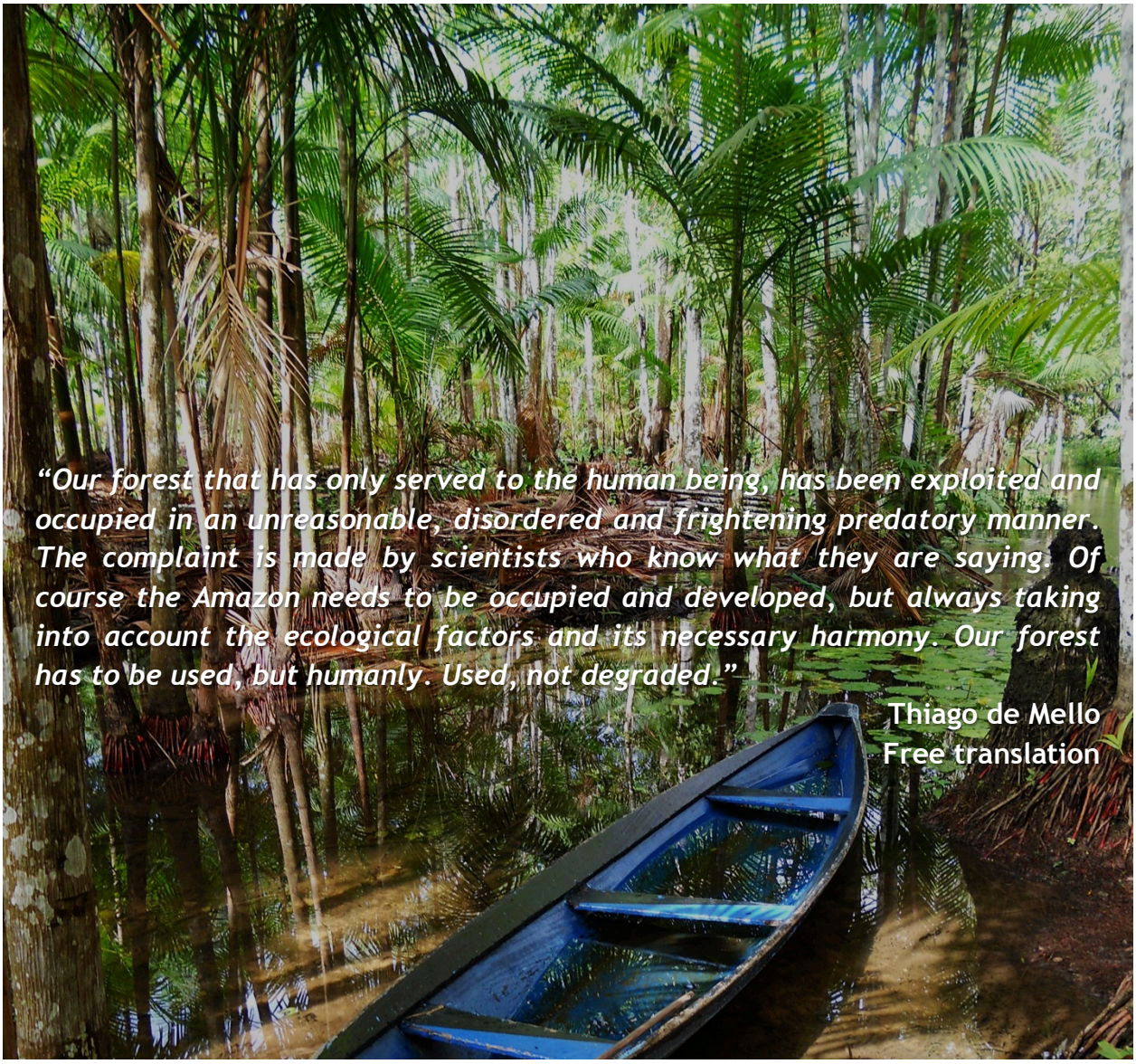
"Our forest that has only served to the human being, has been exploited and occupied in an unreasonable, disordered and frightening predatory manner. The complaint is made by scientists who know what they are saying. Of course the Amazon needs to be occupied and developed, but always taking into account the ecological factors and its necessary harmony. Our forest has to be used, but humanly. Used, not degraded."
Thiago de Mello
Free translation

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PROJECT DETAILS

1.1 Summary Description of the Project

The Jari/Amapá REDD+ Project is a partnership between Biofílica Investimentos Ambientais S.A. Jari Florestal and Jari Celulose, both belonging to Grupo Jari, for the promotion of forest conservation and reduction of potential GHG emissions based on a local economic development model that value the standing forest through a mosaic of activities.

The Project is located in the Valley of Jari, in the municipalities of Laranjal do Jari and Vitória do Jari in the state of Amapá. The Valley of Jari enacts a very important role as home for over two thousand rural families, and as an ecological corridor connecting several Conservation Units. With a very rich biodiversity, its vegetation includes eight forest and non-forest formations, and species of extreme importance ecologically (54 species of flora are considered threatened) and socially (extractivists' communities have the diverse flora as a source of income and food). In the Project region three important rivers flow (Jari, Cajari and Maracá), and it is also home for over two thousand species of fauna, from which over a hundred are considered endangered.

Despite the social and environmental importance of the Valley of Jari, this region is threatened by agricultural and cattle activities and human settlements as well as large infrastructure work.

Thus, the main project components are:

- Forest protection and monitoring: implementation of conservation activities which will reduce deforestation risks;
- Scientific researches in the area: promotion of studies focused on the efficient use of natural resources and scientific research applied to biodiversity; and
- Social inclusion of the communities in the areas where the Project operates: activities developed by the Fundação Jari focusing on favoring sustainable business chains to generate additional income to the communities.

Such activies will be economically feasible with the combination of the FSC-certified Management (FSC certified low impact forest management) and the commercialization of carbon credits generated through the REDD+ mechanism.

Table 1. Project Summary

Project Proponent	Biofílica Investimentos Ambientais S.A., Jari Florestal S.A., Jari Celulose S.A.
Executioners	Biofílica Investimentos Ambientais S.A., Jari Florestal S.A., Jari Celulose S.A. and Fundação Jari
Partner companies	Fundação Jari, Imazon and Arvorar/IPÊ
Country	Brazil
Region	Valley of Jari, south of Amapá state.
State	Amapá
Property	Jari Celulose S.A.
Project Area	65,980 ha
Reference Region	1,333,931 ha
Project start date	February, 14th 2011
Project crediting period start date	February, 14th 2011
Project crediting period	30 years
Emissions at baseline scenario	5,536,218.6 tCO_2
Deforestation at baseline	11,070 ha
Estimate of emissions prevented by the Project	3,450,278 tCO_2
Estimate of average annual emissions prevented by the Project	115,009.3 tCO_2/year
Deforestation at Project scenario	703 ha
Emissions in the Project scenario	398,174 tCO_2
REDD Standards	VCS
Methodology	Approved VCS Methodology VM0015 for Avoided Unplanned Deforestation, version 1.1
Communities in the Project Area	França Rocha, Fé em Deus, Valdomiro/Barbudo, Tira Couro, Sombra da Mata, Igarapé das Pacas, Nova Conquista and Água Azul
Protected Areas in the Project Surroundings	Jari Ecological Station, Paru State Forest, Sustainable Development Reserve Iratapuru, Maracá Extractive Settlement Project and Cajari River Sustainable Development Reserve

1.2 Sectoral Scope and Project Type

- Sectoral Scope: 14 – Agriculture, Forestry and Other Land Uses (AFOLU)
- Reducing Emissions from Deforestation and Degradation (REDD)
- Methodology for Avoided Unplanned Deforestation (AUD)
- This is not a grouped Project

1.3 Project Proponents

The Project proponents, their responsibilities and contact information are described in **Table 2**.

Table 2. Project proponents' identification and responsibilities

ORGANIZATION	DESCRIPTION
Biofílica Investimentos Ambientais S.A.	Biofílica Investimentos Ambientais is a Brazilian Company that promotes the management of forest areas in the Amazon biome. The company was created in 2008 aiming to create pioneering alternatives and to turn environmental preservation into an economically attractive activity for forest owners, communities and investors. Biofilica's mission is to reduce deforestation and carbon emissions into the atmosphere, to preserve biodiversity and hydric resources, to promote social inclusion and the development of the communities living in the Amazon biome through the trade of environmental services credits and to promote and finance scientific researches and the development of sustainable business chains. **Responsibilities in the Project:** general coordination of the socioeconomic and environmental assessment (DSEA) and baseline studies and carbon stock; PD (Project document) development and financing; credits validation/checking and trading; Project co-management throughout the Projet lifetime. **Contact information :** Plínio Ribeiro **Phone:** +55 11 3073-0430 **E-mail:** plinio@biofilica.com.br **Website:** www.biofilica.com.br

Jari Florestal S.A.	Jari Florestal S.A.[1] is a Grupo Jari [2] company, which commercial focus is the production of FSC-certified tropical sawn wood. As a result of having its own and private management area and a sawmill, it can ensure a perfect control of its chain of custody: from the inventory to the client, providing total certainty regarding the origin of the wood. Constant investments in technology and production as well as efficient logistics structure have made Jari Florestal one of the main green stamped Brazilian companies. Founded in 2003, located in the Valley of Jari in Pará, Jari Florestal turned into a global reference for developing sustainable forest management (FSC-certified Management) in 745 thousand hectares in the Amazon using low impact techniques to match the use of the forest to its conservation. **Responsibilities in the Project:** Jari Florestal is responsible for the co-management of the Project, for operating the sustainable forest management, as well as all related activities such as the environmental and social management of the Project to reduce negative impacts and generate positive ones. **Contact information :** João Antônio Prestes **Phone**: +55 11 4689-8700 **E-mail:** jprestes@grupoorsa.com.br **Website:** www.grupoorsa.com.br
Jari Celulose S.A.	Jari Celulose S.A.[3] is a Grupo Jari company with two divisions: the Cellulose Division, which produces bleached eucalyptus pulp and is the only Brazilian company and the first in the world to receive the FSC Pure Label certificate for its whole chain of custody; and the Paper and Packaging Division, the second largest integrated industry, which supplies to almost all economic segments. **Responsibilities in the Project: Jari is the landowner. It is responsible for** title and land tenure regulation, security and land surveillance. **Contact information :** Vinícius M. Garcia **Phone:** +55 11 4689-8700 **E-mail:** vmgarcia@grupoorsa.com.br **Website:** www.grupoorsa.com.br

[1] Jari Florestal is the very recent name of the former Orsa Florestal company.
[2] Grupo Jari is the very recent name of the former Grupo Orsa.
[3] Jari Celuloseis the veryrecent name of the former Jari Celulose, Papel e Embalagens company.

1.4 Other Entities Involved in the Project

Table 3. Identification and responsibilities of participating institutions.

ORGANIZATION	DESCRIPTION
Fundação Jari	Fundação Jari is a non-profity organization belonging to Grupo Jari that, together with a large network of partners, develops programs and projects on education, health, human rights guarantee, environment, culture and employment and income geneation. Its main source of financing is the fixed contribution of 1% gross revenue of Grupo Jari. Since 1994, the foundation has assisted over 6.8 million people in Brazil. **Responsibilities in the Project**: development of social activities; Project's social management. **Contact information :** Jorge Rafael Almeida **Phone:** +55 93 3735-1140 **E-mail:** jralmeida@fundacaoorsa.com.br **Website:** www.fundacaoorsa.org.br
Instituto do Homem e Meio Ambiente da Amazônia – IMAZON	Imazon is a nongovernmental organization that has been promoting the development of the Amazon for 17 years through its studies, public policies formulation, broad dissemination of information and construction capacity. **Responsibilities in the Project**: development of baseline studies and carbon stock. **Contact information:** Carlos Souza Jr. **Phone:** +55 91 3182-4000 **E-mail:** souzajr@imazon.org.br **Website:** imazon.org.br

ORGANIZATION	DESCRIPTION
Instituto de Pesquisas Ecológicas *(Institute for Ecological Research)* – IPÊ and Arvorar	IPÊ is currently one of the largest NGOs in Brazil, and it takes on an integrated action model developed over years of experience combining research, environmental education, habitats restoration, social involvement and sustainable development, preservation and preparation of policies. Arvorar is an IPÊ company subsidiary that innovates solutions for current environmental challenges using modern forest restoration techniques. **Responsibilities in the Project:** Technical coordination of the socioeconomic module and development of environmental and socioeconomic assessment. **Contact information :** Angela Pelin **Phone:** +55 11 4597-1327 **E-mail:** angela@arvorar.com **Website:** www.arvorar.com
Centro Internacional de Pesquisa Florestal (*Center for International Forestry Research*) (CIFOR)	CIFOR is a non-profit research organization located in Bogor, Indonesia whose mission is to promote human well-being, environmental preservation and equity by conducting research to inform practices and policies affecting forests in developing countries. **Responsibilities in the Project:** Carrying out Global Comparative Study on REDD+. **Contact information** : Amy Duchelle **Phone:** +55 21 2285-3341 **E-mail:** a.duchelle@cgiar.org **Website:** www.cifor.org/

1.5 Project Start Date

The Jari/Amapá REDD+ Project starting date is February 14th, 2011, which is the date when the first socioeconomic and environmental assessment planning meeting was held.

1.6 Project Crediting Period

The Project accreditation period is February 14th, 2011 through February 14th, 2041, upon completing 30 years.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Table 4. Project scale

Project	**X**
Large-project	

Table 5. Expected GHG emission reductions

Years	Estimate GHG emission reductions (tCO2e)
2011	102,821.9
2012	99,579.5
2013	83,228.3
2014	81,983.4
2015	126,100.0
2016	127,792.6
2017	160,182.6
2018	188,256.5
2019	175,866.1
2020	177,816.1
2021	251,396.3
2022	163,967.6
2023	131,061.3
2024	163,084.4
2025	150,087.0
2026	131,317.2
2027	127,666.4
2028	118,426.7
2029	96,532.0
2030	90,481.6
2031	90,697.4
2032	73,362.9
2033	79,872.5
2034	66,835.9
2035	76,834.0
2036	67,732.5
2037	71,156.6
2038	63,995.3
2039	55,156.2
2040	56,987.4
Total estimated ERs	3,450,278.3
Total number of crediting years	30
Average annual ERs	115,009.3

1.8 Description of the Project Activities

The Jari/Amapá REDD+ Project brings together two very synergetic activities: the certified forest management and complementary activities for Reducing Emissions from Deforestation and Degradation ("REDD+"), such as social inclusion and local socioeconomic development, monitoring of deforestation and forest degradation, security and land surveillance.

Thus, the Project activities were designed and are conducted in order to promote the responsible use of forest resources, forest conservation, deforestation decrease and related GHG emission, biodiversity and water resources protection, the fostering of applied scientific research. This set of actions will make it possible to generate financial resources through forest assets in line with social development and the preservation of natural resources.

The integration between certified forest management and the trade of environmental services credits, especially REDD+ credits registered by the VCS aim to ensure adequate funding to meet the previously mentioned targets and maintain the results throughout the Jari/Amapá REDD+ Project life cycle.

This way the two complementary components are carried out as described ahead. For a better understanding the Environmental and Social Management specific activities are described in Sections 5 and 6.

1.8.1 Forest Stewardship Council Certified Forest Management ("FSC Certified Management")

Under the responsibility of the Grupo Jari, represented by Jari Florestal, the FSC-certified management targets the sustainable management of forest resources from Grupo Jari property in the Valley of Jari in the state of Amapá by using low impact harvest systems associating forest longevity, ecological balance maintenance, social-environmental responsibility and economic-financial efficiency.

The methodology used in the planning and execution of FSC-certified management abides by the requirements included in all applicable regulations and legislations (see Section 1.11) and is based on the following assumptions:

- The forest is a renewable natural resource; therefore, low impact, technically planned forestry in compliance with FSC management standards ensures the perpetuation of forest resources and, consequently, the maintenance of economic, social and environmental benefits;
- Forest residues have economic interest and are vital for enterprise feasibility; and
- Forest management at industrial scale making it possible for the investor to have return in capital invested in the project.

In order to comply with these fundaments, the management planning is based on the information on the structure and composition of the forest and on the demand for raw material. The FSC-certified Management development and methodological base is based on a previously done forest inventory (Pre-harvest Forest Inventory described on Table 6, which made it possible to plan the implementation and execution of the project over the following years).

The total FSC-certified management area is 200 thousand hectares of native forest in the Valley of Jari region in the state of Para, of which 65,980 thousand hectares comprise the Jari/Amapá REDD+ Project.

For operational purposes the area was divided in 25 large Annual Production Units (APU) representing the potential forest areas managed each year for the next 25 years (operation cut cycle). Therefore, the APU 01, whose management is planned for 2014, will be managed again in 2039 and after that in 2064 and so on ensuring the perpetuation of the forest cover and the Amazon ecosystem.

FSC certification

Since 2004, every production of Jari Florestal in Pará, another area operated by the company, has been certified by the FSC (Forestry Stewardship Council), which is currently the most acceptable international forest market stamp. In 2011 the company started a certification process for its management unit in Amapá, where the Jari/Amapá REDD+ Project activities takes place, through audits by the SCS Global Services, an organization accredited by the FSC. Thus, with the Jari/Amapá REDD+ Project, Jari Florestal will total an area of approximately 745 thousand hectares of well-managed forests and good social-environmental practices.

The certification encompasses from the responsible management of the forest to the processing in its sawmill. By complying with all the specificities of FSC criteria, Jari Florestal entered the selected group of companies in full compliance with environmentally responsible, socially beneficial and economically viable international standards.

In order to obtain such certification it is necessary to comply with the following FSC Principles and their respective Criteria and Indicators (see full *FSC Certification Standards for Forest Management in "Terra Firme"* (*Dry upland) in the Brazilian Amazon* and *FSC International Standard – FSC Principles and Criteria for Forest Stewardship*).

Principle 1 – Compliance with laws and FSC principles

Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.

Principle 2 – Tenure and use rights and responsibilities

Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.

Principle 3 – Indigenous people's rights

The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.

Principle 4 – Community relations and workers' right

Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.

Principle 5 – Benefits from the forest

Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

Principle 6 – Environmental impact

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by doing so, maintain the ecological functions and the integrity of the forest.

Principle 7 – Management plan

A management plan – appropriate to the scale and intensity of the operations – shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated.

Principle 8 – Monitoring and assessment

Monitoring shall be conducted – appropriate to the scale and intensity of forest management – to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.

Principle 9 – Maintenance of high conservation value forests

Management activities in high conservation value forests shall maintain and/or enhance the applicable conservation attributes that define such forests. Decisions related to high conservation value forests shall always be taken into consideration under a precautionary approach.

This means that the development of forest management not only generates the conservation of the forest and its resources, but also generates benefits for the local communities, fostering regional social-economic growth.

Besides that, the FSC Certification ensures the origin of forest products through a tracking system called Chain of Custody (CoC). For such, Jari Florestal has an information management system, which proves that all sold timber come from a well-managed forest.

The credibility of the certification process is reinforced by its transparency. All the information regarding the audits of certified companies, Jari Forestal included, is available for consultation and downloading at the certifying agency website: www.scscertified.com.

FSC-certified Management activities

Jari Florestal uses a quality management system where all activities carried out by the company are described through operational procedures, work instructions and environmental procedures. Thus, the execution of the activities is standardized regarding the methodology, team formation, necessary equipment, taking into consideration the legal requirements and best management practices currently known. The procedures are rigorously revised and updated every year.

All activities are assessed (in parallel with operations) regarding their compliance with FSC Principles and Criteria and the quality required by the company. This monitoring is done by a specialized team, which assesses the activities regarding operational, environmental and occupational safety aspects according to specific procedures for the monitoring of the activity. To do so, the specialists actively circulate through the areas during operation time and intercede notifying any irregularity or noncompliance.

The company also adopts an annual training system in order to train all own and outsourced workers in sustainable forest management activities. According to the company policies, after hiring, and before starting forest management activities, all workers shall be qualified and trained on the operational and environmental procedures related to their area of work as well as on other themes such as Sustainable Management, Certification and Occupational Safety.

The main activities of the Jari/Amapá REDD+ Project related to FSC-certified Management components are summarized in Table 6; Table 7 presents the chronology of the micro activities related to the main activities of the FSC-certified Management component usually employed over the operation cycle.

The information about the FSC-certified Management was taken from the *Sustainable Forest Management Plan – Amapá (PMFS – Amapá),* prepared by Jari Florestal and made available to the validation/verification body (VVB). Such document presents a full and detailed description of the company, objectives, activities, procedures, operational techniques and planning, team, methodologies, steps and complementary information of this component.

Table 6. Summary of Jari/Amapá REDD+ Project main activities in the FSC-certified Management component.

ACTIVITY	DESCRIPTION	APPLICABLE PROCEDURE	STATUS
1. Exploitation sizing activities			
1.1 Pre-harvest inventory	100% Pre-harvest inventory conducted in sample plots throughout the 200 thousand hectares of forest management area in order to support forest management planning by quantifying and qualifying forest resources determining the wood potential of the area through statistical sampling techniques.	PA-MFS 016 - Inventário Diagnóstico	Finished (concluded in 2011)
1.2 Property zoning	Macro and micro zoning of the forest management area for Forest Management Units (UPA, in portuguese) delimitation, identification, classification and delimitation of the different classes of soil use, hydrography, landscaping, operational and non-operational areas, vines and other environmental aspects, and definition of the areas for the 100% Pre-harvesting Inventory.	Elaboração e revisão de plano de manejo florestal	Finished (UPA 01 macrozoning and micro zoning concluded in 2011; micro zoning of other UPA to be carried out throughout the operation cycle)
1.3 Definition of Forestry System and Production Regulation	Definition of forest management operational planning (cutting cycle, number of UPAs, volume of wood to be extracted, protected species to be managed and other operational aspects).	Elaboração e revisão de plano de manejo florestal	Finished (concluded in 2011)
2. Pre-management activities			
2.1 Implementation and mapping of the plots	Delimitation of permanent preservation, operation and non-operational areas. Determining the location of the plot for the 100% pre-harvest inventory.	PA-MFS 001 - Implantação e Mapeamento de Parcelas	Finished (concluded in 2011 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
2.2 100% pre-harvest inventory or forest census	Field measurement, identification, classification and location of the trees in the UPA for later processing of such information and definingf the species and volume to be cut. It is the main instrument for the preparation of the Annual Operation Plans (POA, in portuguese).	PA-MFS 002 - Inventario Florestal 100%	Finished (concluded in 2011 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)

2.3 Implementation and measurement of permanent sample plots	Implementation and collection of data regarding the permanent plots, taking into consideration the relation of the existing species, number of trees per species and the quality of the species, in order to assess the impact on the forest by monitoring its regeneration.	PA-MFS 003 - Parcelas Permanentes	Finished (concluded in 2011 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
2.4 Training and qualification of workers	Training courses to qualify workers on the operational and environmental procedures related to their area of work, as well as other subjects such as Sustainable Management, Certification and Safety at Work.	Sistemática de Treinamento	Finished (first activities concluded in 2011; it will be continuously carried out throughout the operation cycle)
3. Management Activities			
3.1 Planning, opening and maintenance of forest roads and bridges	Planning and execution of activities related to the opening and management of roads, bridges and manholes in the forest management area.	PA-Planejamento, Abertura e Manutenção de Estradas Florestais	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
3.2 Guided felling of the trees pre-selected for cutting	Guided felling of the pre-selected trees for cutting using tree felling techniques to diminish the risk of accidents, the formation of large clearings in the forest and the decrease of environmental impacts.	PA-MFS 004 - Derruba Direcionada de Madeira Nativa PA-MFS 012 - Formação de Grandes Clareiras	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
3.3. Logging of trees	Logging of trees to make their skidding to storage patios easier and using felling techniques to decrease the risk of accidents and reduce the impacts on the environment.	PA-MFS 005 - Traçamento de Madeira Nativa	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)

3.4 Planning of skidding trails and storage patios	Planning of skidding trails and storage patios in the forest management operational areas based on felling techniques to decrease the risk of accidents and reduce the impacts on the environment.	PA-MFS 006 - Planejamento de trilhas de Arraste	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
3.5 Skidding the cut logs to the storage patios	Skidding and piling the logs in the forest management operational areas based on techniques to decrease the risk of accidents and reduce the impacts on the environment.	PA-MFS 007 - Arraste de Madeira Nativa	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
3.6 Manipulation and transportation of forest biomass (forest management residues)	Manipulation and transportation of forest biomass (forest management residues) from forest management operational areas to other areas and later use in energy generation using techniques to reduce environmental impact.	PA-MFS 008 - Preparo e Arraste de Biomassa Florestal	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
3.7 Transportation of logs and forest biomass	Loading, unloading and road transportation of logs and forest biomass.	PA-MFS 009 - Transporte de Madeira Nativa	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4. Post-management activities (operational monitoring)			
4.1 Measurement of permanent plots	Measurement of trees and collection of data from the permanent plots taking into consideration the existing relationship between the species, number of trees per species and quality of the species in order to assess the impacts of the operation on the forest by monitoring its regeneration.	PA-MFS 003 - Parcelas Permanentes	Planned (start in 2015 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)

4.2 Selection and distribution of the plots for operational monitoring	Distribution and systematizing of the plots where the monitoring of forest management operations will take place.	PA MFS 017 - Monitoramento da Derruba	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4.3 Monitoring of the 100% pre-harvest inventory or forest census	Execution of the monitoring activities of the 100% pre-harvest inventory.	PA MFS 015 - Monitoramento do Inventário Florestal 100%	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4.4 Monitoring of the storage patios and forest roads opening	Execution of the monitoring activities of the operational quality of storage patios and forest roads opening.	PA MFS 021 - Monitoramento da Abertura de Estradas de Colheita	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4.5 Monitoring of felling of trees	Execution of the monitoring activities of the operational quality of the felling of selected trees.	PA MFS 017 - Monitoramento da Derruba	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4.6 Monitoring of the logging, measurement and marking of the logs.	Execution of the monitoring activities of the operational quality of the logging, measurement and marking of the logs.	PA MFS 018-Monitoramento do Traçamento, Medição e Marcação de toras	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)

4.7 Monitoring of skidding trails and storage yards planning	Execution of the monitoring activities of the operational quality of skidding trails and storage yards planning.	PA-MFS 016 - Monitoramento do Planejamento de trilhas de Arraste	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4.8 Monitoring log skidding to storage yards	Execution of the monitoring activities of the operational quality of log skidding to storage yards.	PA MFS 019 -Monitoramento do Arraste de Toras	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4.9 Monitoring of the manipulation and transportation of forest biomass (forest management residues)	Execution of the monitoring activities of the operational quality of the manipulation and transportation of forest biomass (forest management residues).	PA MFS 019 -Monitoramento do Arraste de Toras rev 4.doc e POMFS 019 -Monitoramento do Arraste de Toras	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)
4.10 Monitoring of logging and forest biomass transportation	Execution of the monitoring activities of the operational quality of logging and forest biomass transportation.	POMFS0022 - Monitoramento do Carregamento e Transporte de Madeira	Planned (start in 2014 for UPA 01; for other UPAs it will be carried out throughout the operation cycle)

Table 7. Chronology of micro activities related to the main activities of the Jari/Amapá REDD+ Project in the FSC-certified Management component.

1 TO 2 YEARS BEFORE MANAGEMENT
Delimitation of Forest Management Unit (UPA, in Portuguese)
Delimitation of Work Units (subdivision of the UPA in blocks of 1,600 ha and plots of 10 ha)
Opening of trails
Micro zoning (creeks, vine areas, rocky formations, topography, among other aspects of the landscape)
100% pre-harvest inventory or forest census – data collection
Cutting of vines
Implementation and measurement of permanent plots
Processing of 100% pre-harvest inventory data
Preparation of the Annual Operation Plan (POA, in Portuguese) – Forest Management Planning
Planning of forest roads
Location of the gravel beds
Opening of main and secondary roads
IN THE YEAR OF MANAGEMENT
Review of operational procedures
Training of workers involved in the operations (forest management, reduced impact, certification, operational procedures)
Construction of tertiary roads
Preparation of tree cutting maps (felling)
Cutting (felling) and logging of trees
Pre-planning of storage patios
Preparation of harvest maps including storage patios and skidding trails
Planning of storage patios and skidding trails
Skidding
Chain of Custody Control
Forest transportation (data bank daily supply)
Harvesting of forest residues (forest biomass)
1 YEAR AFTER MANAGEMENT
Silviculture treatment after harvest (when necessary)
Measurement of permanent plots to assess growth (forest recovery)
Maintenance of permanent infrastructure (roads, bridges and others)
2 YEARS AFTER MANAGEMENT
Maintenance services will take place every 5 years, or whenever necessary
3 YEARS AFTER MANAGEMENT
Measurement of permanent plots to assess growth (forest recovery)
5 YEARS AFTER MANAGEMENT
Measurement of permanent plots to assess growth (every 5 years after that)
24 YEARS AFTER MANAGEMENT – 1 YEAR BEFORE THE SECOND CYCLE
Maintenance of roads and patios
100% pre-harvest inventory (forest census)
25 YEARS AFTER MANAGEMENT – START OF THE SECOND CYCLE

1.8.2 Complementary activities for Reducing Emissions from Deforestation and Degradation ("REDD+")

Under Biofílica Investimentos Ambientais' responsibilities on the REDD+ activities are the social inclusion and socioeconomic development and the efficient reduction of unplanned deforestation in the Project area, so as to reduce GHG emissions from these illegal activities, and to generate REDD+ credits certified by VCS and traded in the carbon market. Besides the GHG emission reduction, the avoided deforestation is important to the maintenance of other environmental services provided by the standing forest, such as hydric flow and water quality regulation, climate regulation, biodiversity gene flow maintenance, nutrients cycling, soil protection, fauna sheltering, supply of food, fiber and other products, scenic beauty, among others.

Thus, the Jari/Amapá REDD+ Project becomes more financially robust to invest in forest resources conservation and monitoring specific activities as it has complementary revenue to that from the trade of FSC-certified Management products. These activities involve intensifying forest protection and monitoring, increasing security and land surveillance, promoting scientific research for the responsible use of natural resources, and establishing business chain that create alternatives to deforestation for the communities involved in the Project.

REDD+ activities

Besides having a specialized workforce and the competence, Biofílica Investimentos Ambientais is considered a reference in the development of forest conservation projects that together with the experience and knowledge of Grupo Jari in forest management and the social-environmental dynamics of the Project area, ensures the quality and efficacy of the developed REDD+ activities.

Throughout the Project cycle, the activities will have strict quality control and will be monitored by qualified professionals according to all applicable regulations, specifications, criteria and VCS standards and their tools, as well as those of the applied methodology (VM0015 Version 1.1).

The main activities of the Jari/Amapá REDD+ Project included in the REDD+ activities component are described in Table 8, which include the initial activities of Project planning, development and conception until the management and monitoring activities throughout the duration of the Project. Table 9 presents the chronology of the micro activities related to the main activities in the REDD+ component.

Table 8. Summary of the Jari/Amapá REDD+ Project main activities in the REDD+ activities component

ACTIVITY	DESCRIPTION	STATUS
1. Planning Activities		
1.1 Activities Planning Meeting	Proponents meeting for Project activities planning from its conception to validation and first verification.	Finished (concluded in 2011)
1.2 Survey of institutions and identification of partners	Survey and identification of local partners such as consultants, researchers and institutions to develop the Project.	Finished (concluded in 2011)
2. Development Activities		
2.1 Conducting Socioeconomic and Environmental Asseessment (DSEA)	Study developed together with Arvorar Soluções Florestais and Instituto de Pesquisas Ecológicas (IPÊ) and 10 specialized researchers. The objective of the DSEA was to characterize the Project and surrounding areas in 4 modules (socioeconomy, flora, fauna, and physical environmental aspects) and to conduct a preliminary assessment of possible impacts of the Project on local socio-economic and environmental context, as well as suggest monitoring measures based on scientific reports and articles already developed in the area.	Finished (concluded in 2012)
2.2 Carbon stock estimate	Study developed in partnership with Imazon aiming at estimating the forest carbon stock and producing a map of the carbon stock for the Project area based on data of forest inventories carried out in the FSC-certified Management component.	Finished (concluded in 2012)
2.3 Determination of the baseline and the carbon credits generation potential	It was also developed in partnership with Imazon aiming to determine the Project baseline and estimate the amount of REDD+ credits to be potentially generated by the Project.	Finished (concluded in 2012)
3. Management and conception design activities		
3.1 Carrying out a workshop to plan and design the Project.	Proponents and partners of the Project meet up to present the results of previous studies, identification of potential social and environmental activities to be developed throughout the Project as well as definition of the Project monitoring actions.	Finished (concluded in 2012)
3.2 Carrying out stakeholder consultations	Meeting between project proponents and partners and State and local government agencies and other sta(*Instituto Estadual de Florestas, Secretaria de Estado do Meio Ambiente, Instituto de Desenvolvimento Rural do Amapá, Secretaria de Estado da Indústria, Comércio e Mineração, Secretaria Municipal de Agricultura de Vitória do Jari, Instituto de Desenvolvimento Rural, Secretaria Municipal de Meio Ambiente e Turismo, Instituto Federal do Amapá, Center for International Forestry Research*), as well as the communities involved by the Project (Comunidades Fé em Deus, França Rocha, Tira Couro, Sombra da Mata, Ramal Valdomiro/Barbudo,	Finished (concluded in 2012)

	Instituto de Desenvolvimento Rural, Nova Conquista, Igarapé das Pacas and Água Azul) to present the Project design and its planned activities, collect suggestions, align expectations, open a communication channel and understanding of possible partnerships to be established.	
3.3 Consolidation of the Project management plan	The Project management plan consolidates the results of the studies carried out and the information on Project operation such as planning, management and monitoring.	Finished (concluded in 2012)
4. Validation/verification Activities		
4.1 Definition of applicable standard and methodology	Selection of the standard and methodology to be used for Project validation/verification.	Finished (concluded in 2011)
4.2 Preparation of the Project description document	From the management plan the Project description document *(Project Description)* was prepared according to the criteria established by the VCS.	Finished (concluded in 2012)
4.3 Selection and contracting of validation agency and registration platform	Survey of validation/verification institutions accredited by the VCS and definition of the Project validation/verification bodies (VVB).	Finished (concluded in 2012)
4.4 Follow up of the audit process for validation/verification	Audit to be conducted by the selected VVB.	Planned (start in 2012)
5. Management and Monitoring Activities		
5.1 Social and Environmental Management	Implementation of actions to generate positive social and environmental impact as described in sections 5 – Environmental Impact and 6 – Social Impacts	Finished (start in 2011; continuously throughout the Project)
5.2 Permanent quality control	Monitoring of the implementation, efficiency and efficacy of social and environmental management actions and procedures described in Sections 5 – Environmental Impact and 6 – Social Impacts, including periodical meetings with proponents, partners and people involved in the Project, as well as the continuous institutional articulation to identify and establish partnerships.	Finished (start in 2011; continuously throughout the Project)
5.3 Monitoring of deforestation and emissions	Using the procedures and methods described in Section 4 - Monitoring, including the intensification of premises security and surveillance activities conducted by the FSC-certified Management (increase in the frequency and comprehensiveness) as well as the monitoring of the deforestation dynamics through satellite images, checking of data in the field and monitoring reports.	Finished (start in 2011; continuously throughout the Project)
5.4 Follow up of audit processes for verification	Audit to be periodically conducted by the selected VVB.	Planned (first verification starts in 2012; following verifications every 2 years)
5.5 Updating and complementation of the studies	Carrying out the necessary technical studies to develop Project activities throughout its duration and subsequent verification such as: review of baseline study, complementation of DSEA using current and/or primary data, updatings of carbon stock estimate through new inventory data from the FSC-certified Management, among other actions whenever necessary.	Planned (start in 2014; continuously throughout the Project)

Table 9. Chronology of the micro activities related to the Jari/Amapá REDD+ Project main activities in the REDD+ component

1 TO 1.5 YEAR BEFORE THE VALIDATION AND FIRST VERIFICATION
Activities planning meeting
Coordination of institutions and identification of partnerships
Consolidation of activities time schedule
Carrying out the socioeconomic and environmental assessment
Carbon stock estimate
Determination of baseline and carbon credits generation potential
Feasibility studies of other environmental services
Workshop to plan and design the Project
Consolidation of Project design
Consolidation of management plan and drawing of Project description
Review and translation of Project description
Preparation of monitoring reports
IN THE VALIDATION AND FIRST VERIFICATION YEAR
Selection and contracting of validation/verification body and credit registration platform
Writing of validation/verification follow-up bulletins
Follow-up of the field audit
Registration of Project and credits
YEARS 2 TO 30
Development and monitoring of management and environmental activities
Monitoring of deforestation and emissions
Verification of credits (selection and contracting verification body; writing of follow-up bulletins, follow-up of the field audit, registration of credits)
Conduction of credit trading processes

1.9 Project Location

The Project is located in the Valley of Jari, in the municipalities of Laranjal do Jari and Vitória do Jari, south of the state of Amapá, on the left margin of the Jari River on the border of the state of Pará, north of Brazil.

The area of study, which was the reference for the definition of the Project area, is 245,000 ha.

The Project area can be accessed by the following ways:

- By land – from Macapá (AP), through BR-156 southwest towards Laranjal do Jari (AP)
- By water – from Belém (PA) or Macapá (AP) through the Amazonas and Jari rivers, traveling time varies from 12 to 36 hours on commercial line boats.
- By air – daily flights to Monte Dourado (PA) from Belém (PA) ± 1 hour, Santarém (PA) ± 40 min and Macapá (AP) ± 30 min.

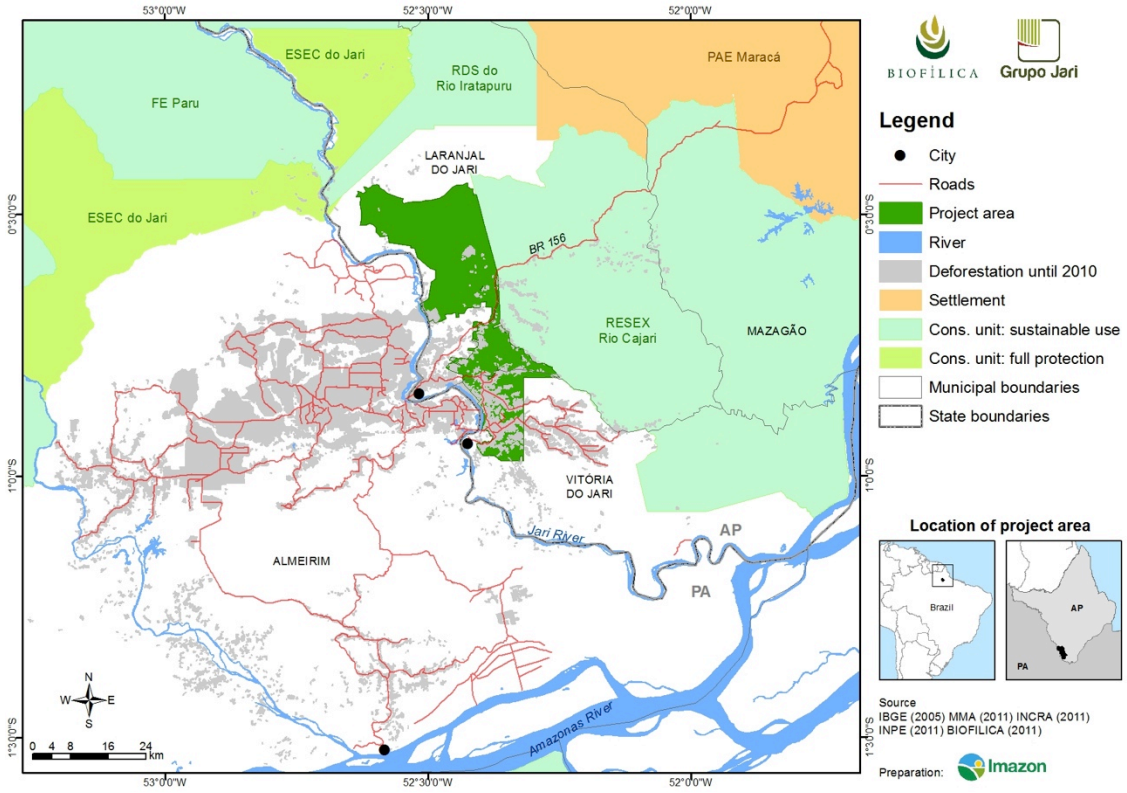

Figure 1. Jari/Amapá REDD+ Project location

1.10 Conditions Prior to Project Initiation

The dynamic of deforestation is prior to the implementation of the Project as described in details in item 2.4 Baseline Scenario. Thus, the Project has not been implemented with the purpose of generating GHG emissions, but to change the recurring dynamics that generates such fact.

Below is described some characteristics of the Jari/Amapá REDD+ Project area surveyed in the Socioeconomic and Environmental Assessment[4] (DSEA).

Vegetation and flora

In the area including the total Project area the vegetation is composed by different physiognomies, such as the floodplains vegetation and freshwater swamp vegetation along the rivers and, especially, the dryland forest, which practically dominates the whole landscape (ALVES; MIRANDA, 2008) and forms the main type of existing vegetation: the subperennial equatorial forest (PIRES and PRANCE, 1985) – with diverse vegetation including eight forest and non-forest formations.

Upon applying the vegetation classification from the Brazilian Geography and Statistics Institute (IBGE, 2008) and VELOSO et al. (1991) the vegetation of the Project region can be considered, at a macro level, as formed by Dense Submontane Ombrophilous Forest and Dense Lowland

[4] Arvorar, 2011.

Ombrophilous Forest in its vast majority, (83.6%) and the rest is Seasonal Wooded Savanna, river-influenced Pioneer Formation and/or lacustrine herbaceous without palm trees and Open Ombrophilous Forests with vines (**Table 10**).

Table 10. Forest typology registered in the Project management area based on the Brazilian Vegetation Classification (IBGE, 2008).

CLASS OF VEGETATION	AREA (HA)
Open Submontane Ombrophilous forest with vines	36,902
Dense Submontane Ombrophilous forest - emerging canopy	70,090
Dense Submontane Ombrophilous forest – uniform canopy	75,334
Dense Lowland Ombrophilous forest	246
Dense Lowland Ombrophilous forest – emergent canopy	55,575
River-influenced Pioneer Formation and/or lacustrine-herbaceous without palm trees	1,526
Wooded Savanna without riparian forest	799
Savanna Parkland without riparian forest	224
TOTAL	240,696 [5]

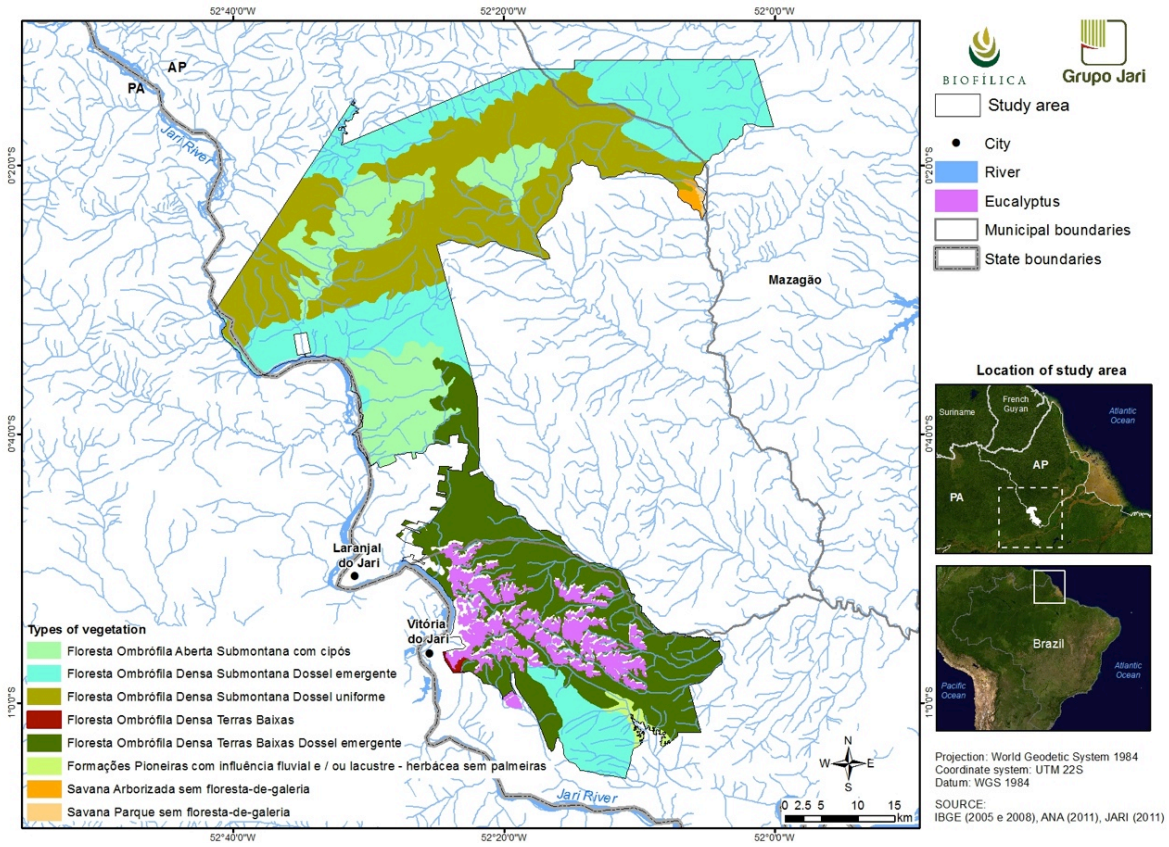

Figure 2. Types of vegetation recorded in the study area based on the Brazilian Geography and Statistics Institute (IBGE, 2008) vegetation classification.

[5] DSEA study area where Jari/Amapa REDD+ Project is inserted.

According to Veloso *et al*. (1991) in the Dense Ombrophilous Forest areas, it is constantly observed individuals of *Bertholletia excelsa* Bonpl (Lecythidaceae), known as the Brazilian nut tree; in the DSEA area of study, records of this species appeared in all the areas sampled by the inventory (0.12% of the total Jari/Amapá REDD+ Project management area), that is, in all types of recorded vegetation. These data confirm the presence of the species in the area as a fact of extreme importance for the planning of social actions, as such species represents a historically important source of income for the forest extractivists' communities, and from an ecological perspective, it is in the endangered species official list.

The Project area has a number of recorded taxon, which makes evident the existence of an extremely rich flora as compared to other works developed in the Amazon (OLIVEIRA, 2000; NELSON & OLIVEIRA, 2001). The most valuable and abundant families in the project area are: Leguminosae (Caesalpinoideae, Mimosoideae and Papilionoideae), Sapotaceae, Burseraceae, Lecythidaceae and Vochysiaceae.

Based on the analysis of satellite images, three main phytophysiognomies have been identified: pasture, secondary forest and primary forest. Primary forest area represents 97.6% of the total area coverage, while pasture coverage (clean pasture, dirty pasture and in recovery pasture) makes for 0.85% of the total, and secondary forest areas makes for 1.55% of total coverage (Figure 3).

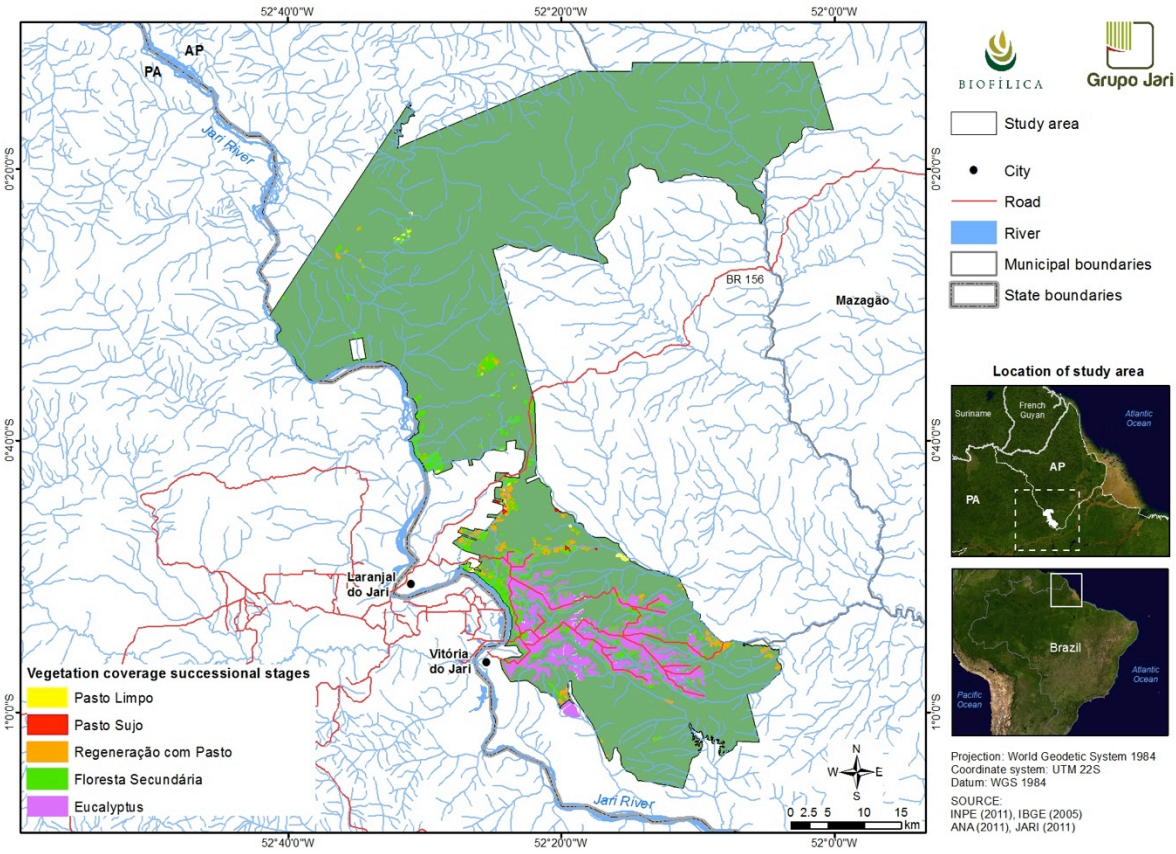

Figure 3. Map of the vegetation coverage successional stages in the study area.

Regarding endangered species, 54 species have been found:

- 45 are on Brazilian Official lists (IUCN and IBAMA);
- 16 are on the State of Pará Official list;
- 07 are on both lists.

From the total, 08 species are in the Endangered (EN), 03 in the Critically Endangered (CR) and 23 in the Vulnerable (VU) categories, and the others are in the Least Concern, Near Threatened and Insufficient Data categories.

Fauna

The Valley of Jari area presents a diversified fauna including 2,069 recorded species.

Regarding mammals, 144 species have been recorded:

- 34 species of small non-flying mammals;
- 46 medium and large mammals;
- 64 species of Chiroptera (bats).

Up to date 516 bird species have been recorded. Almost half of them (255 species) have been sampled by Barlow et al (2007a).

Data gathered so far indicate that the Valley of Jari presents a diversity of both amphibians and reptiles, having 157 species recorded distribute in:

- 88 species of amphibians;
- 32 species of lizards;
- 27 species of snakes;
- 08 species of chelonians;
- 02 species of jacarés (alligators).

The fish are economically important as they are a source of both proteins and income for the communities. According to the Environmental Impact Assessment of Santo Antônio do Jari Power Plant, there are at least 277 species of fish in the area.

So far, 859 species of insects have been recorded in the Valley of Jari area:

- 129 species of butterflies;
- 335 species of moths;
- 44 species of grasshopper;
- 68 species of dipterous;
- 22 species of bees;
- 176 species of ants;
- 85 species of scarab beetles.

Up to date 116 species of arachnids were found in the Valley of Jari region, being mostly spiders.

From the 2,069 species recorded in the DSEA study area, 133 are on the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) list of endangered species.

On the Brazilian Environment Institute (IBAMA) list are listed the armadillo (*Priodontes maximus*), the jaguar (*Panthera onca*) and the woodcreeper chicken (*Dendrexetastes rufigula*). On the IUCN list are the sun parakeet (*Aratinga solstitialis*), the toad (*Atelopus spumarius)*, the giant anteater (*Myrmecophaga tridactyla*), the armadillo (*Priodontes maximus*), the spider monkey (*Ateles paniscus*), the tapir (*Tapirus terrestris*), the spectral bat (*Vampyrum spectrum*), the jaguar (*Panthera onca*), the white-lipped peccary (*Tayassu pecari*), the Guiana crested eagle (*Morphnus guianensis*) and the harpy eagle (*Harpia harpyja*).

Besides those, there are 632 species from the Least Concern and 05 from the Insufficient Data categories (CITES, IBAMA or IUCN).

Climate

The state of Amapá is located in an area where the main element of the climate dynamics is the Intertropical Convergence Zone (ITCZ), which most important characteristics are the displacements caused by trade winds.

The climate dynamics in the area is characterized for having two distinct periods: the drier period occurring from September to November and having precipitation below 200 mm in the period, and the rainy period occurring from March to May with an average precipitation of more 1,000 mm in the period.

Annual average precipitations in the south of the state are on average 2,100 mm, while north/northeast/southeast areas with more than 2,600 mm annual rainfall.

Hydrography

The study area plays an important role in the preservation of the springs of tributary rivers of three important river basins in the south of Amapá: Jari river basin, Cajari river basin and Maracá river basin (Figure 4).

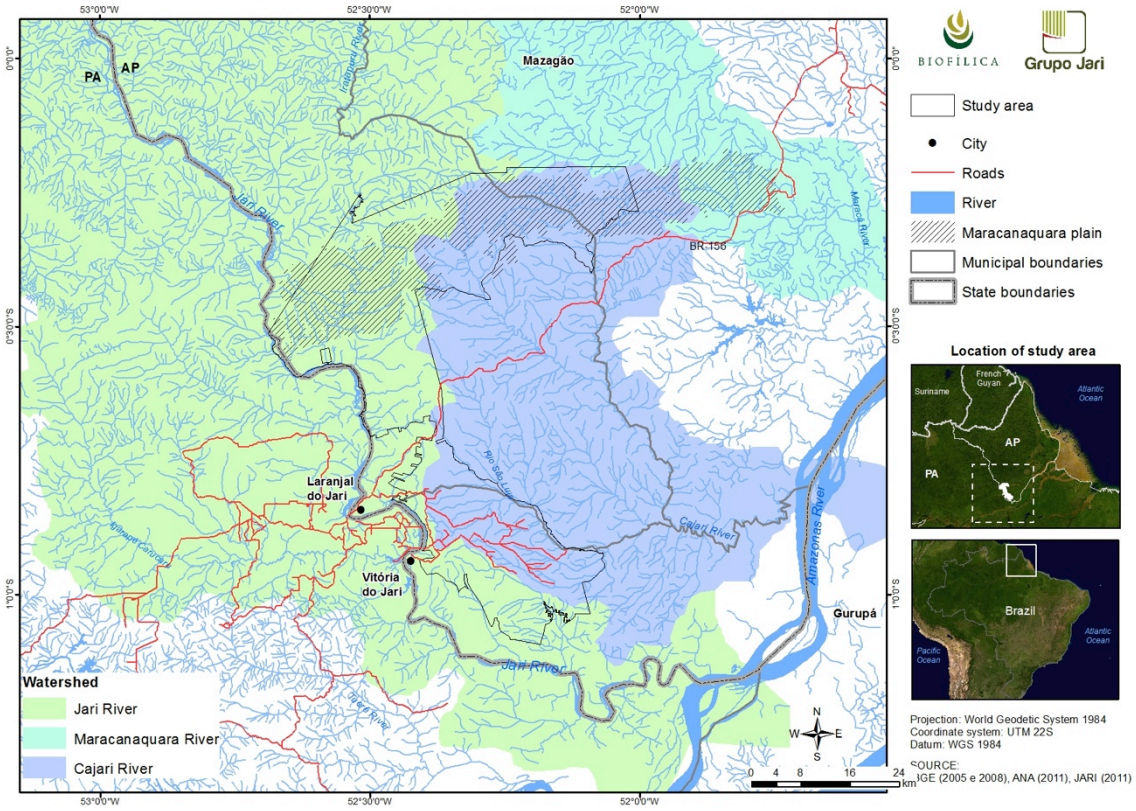

Figure 4. Map of the hydrographic characterization of the study area.
Source: Adapted from AMAPÁ (2000)

The Jari river basin encompasses 80% of the drainage network inside the DSEA study area. The Jari River starts on the Tumucumaque Mountains, as a typical plain's river running mostly on crystalline basement. The rugged terrains, or highly rugged areas, cause rapids along the river, the main one called Santo Antônio.

On the outer border of the Maraquanacara plain, where the rugged area is located, the Jari river channel forms deep gorges sculpted on cliff walls formed on the left margin (Amapá side) and right margin (Pará side).

Outflow varies from 200 m^3/s in the months of less rain and 2,000 m^3/s in rainy months.

Geology

The geological environment of the Project area encompasses a mosaic of terrains where geotectonic formations of Phanerozoic platformal cover prevail over approximately 90% of the Project management area. These formations go from the south limit to the north border of the Amazon plain, which coincide with the rugged landscape locally called rock wall (Figure 5).

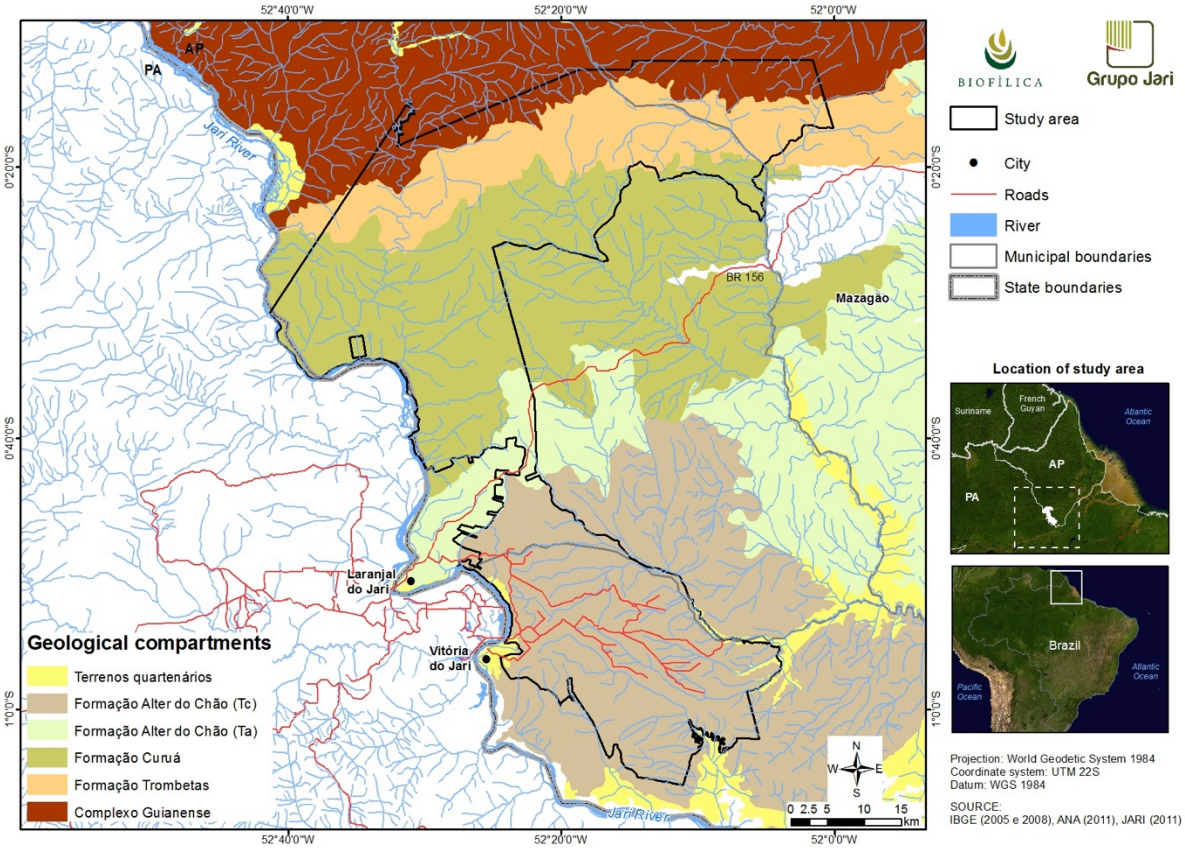

Figure 5. Map of the geological compartments of the study area.
Source: Adapted from AMAPÁ (2000).

Geomorphology

Over 90% of the Project management area is formed by low plains and plateaus. Thus, one of the basic units of the model to be considered as fundamental in the physical dynamic is the slope. In the historical time, the slopes are modified by the current climate dynamic through the transportation of material on slopes and the anthropic actions. In the historical time erosion process on the slopes is, therefore, highly connected with human intervention.

The model of the relief in the study area as well as in the entire south extension of the state of Amapá can be compared with an extensive ramp whose surface flows are directed to the lower part of the large Amazon plain.

Soil

In almost 90% of its area, the state of Amapá is dominated by soils with large aluminum content; besides that, these soils are extremely acidic and present different levels of fertility.

The area has two predominantly large soil types groups: podzolic and latosols, the latter being the predominant in the state of Amapá.

Podzolic soils inside the Project area are distributed both on high declivity landscapes and on softly waved and plain landscapes. It is on podzolic soils of average fertility (PVa4, PVa3) located between the road BR 156 and Muriacá river floodplains that the Jari Celulose silviculture project was

implemented on the Amapá side. These soils resulting from tertiary sedimentary rocks, although located in plain, softly waved and waved landscape areas are not good for traditional agriculture.

The highest concentration of small rural producers is located between Igarapé Mané Preto in BR 156, Igarapé Maicá and the Jari river because of the fertility of the very clayey latosols on plain and softly waved landscape. In these soils there are banana and manioc (cassava) plantations together with nut collecting.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The compliance with laws, statutes and other regulatory frameworks by the Project is linked to the forest management activity. In the state of Amapá the activities of Jari Celulose S.A. is being licensed by IBAMA (Brazilian Environmental and Natural Renewable Resources Agency), thus the federal legislation is applicable as presented in item 1.11.1.

State legislation can be applied subsidiary to federal legislation. Item 1.11.1 presents the main laws, statues and other regulatory structures in the state of Amapá linked to the activity of forest management.

Besides the compliance with the Brazilian forest legislation, the *Forest Stewardship Council* (FSC) certification that Jari Florestal has for its forest management in Pará since 2004 was extended to Amapá in 2012.

The FSC certification is an international certification system used to assess performance standards of companies that process forest products in order to state that they respect the environmental, social and economic characteristics of the area where they operate, as well as that they comply with national and international legal and regulatory aspects.

The FSC has several certification standards for Forest Management in “Terra Firme” (*Dry upland*) in the Brazilian Amazon. The compliance with FSC principles and criteria is an evidence of the Project proponents’ commitment to respect the laws, statues and other regulatory structures among which we can highlight Principle 1 – Criteria 1: “Forest management shall respect all national and local laws and administrative requirements”.

1.11.1 Federal Legislation

Law n.12.651, of 25/05/2012: establishes provisions on the protection of native vegetation; alters Laws n. 6.938, of August 31, 1981; n. 9.393, of December 19, 1996; and, n. 11.428, of December 22, 2006; revokes Laws n. 4.771, of September 15, 1965; and n. 7.754, of April 14, 1989 and Provisional Law n. 2.166-67, of August 24, 2001; and other related matters.

Provisional Law n. 571 of 25/05/2012: alters Laws n. 12.651, of May 25, 2012, which establishes provisions on the protection of native vegetation; alters Laws n. 6.938, of August 31, 1981; n. 9.393, of December 19, 1996; and n. 11.428, of December 22, 2006; revokes Laws n. 4.771, of September 15, 1965; and n. 7.754, of April 14, 1989; and Provisional Law n. 2.166-67, of August 24, 2001.

Decree n. 58.054, of 23/03/1966: promulgate the Convention for the protection of the flora, fauna and scenic beauty of the American countries. .

Decree n. 96.944, of 12/10/1988: creates the Legal Amazon Ecosystems Complex Defense Program, and other related matters.

Decree n. 2.661, of 08/07/1998: regulates the single paragraph of article 27 of Law n. 4.771, of September 15, 1965 (Forest Code), establishing precautionary regulations regarding the use of fire in agricultural and cattle raising practices, and other related matters.

Decree n. 2.959, of 10/02/1999: establishes provisions on measures to be implemented in the Legal Amazon for monitoring, prevention, environmental education and fighting forest fires.

Decree n. 5.975, of 30/11/2006: regulates articles 12 - final part, 15, 16, 19, 20 and 21 of Law n. 4.771, of September 15, 1965; article 4, item III, of Law n. 6.938, of August 31, 1981; article 2 of Law n. 10.650, of April 16, 2003; alters and adds provisions to Decrees n. 6.514/08 and 3.420/00, and other related matters.

CONAMA Resolution n. 16, of 07/12/1989: institutes the Legal Amazon Assessment and Environmental Control Integrated Program.

CONAMA Resolution n. 378, of 19/10/2006: defines the enterprises with potential to cause national and regional environmental impacts regarding the provisions in item III, § 1, article 19 of Law n. 4.771, of September 15, 1965, and other related matters.

CONAMA Resolution n. 379, of 19/10/2006: creates and regulates the data and information system related to forest management regarding the Environment National System - SISNAMA.

IBAMA Administrative Rule n. 218, of 04/05/1989: establishes provisions on the cutting and management of native forest and the formation of Atlantic Forest successor native forests, and other related matters.

IBAMA Administrative Rule n. 37-N, of 03/04/1992: recognize as the Official List of the Brazilian Flora Endangered Species the list presented in the Administrative Rule.

MMA Administrative Rule n. 103, of 05/04/2006: establishes provisions on the implementation of the Forest Origin Document – DOF, and other related matters.

MMA Administrative Rule n. 253, of 18/08/2006: institutes, from September 1, 2006, with regard to IBAMA (Brazilian Environmental and Natural Renewable Resources Agency), the Document of Forest Origin – DOF in replacement of the Forest Products Transportation Authorization – ATPF.

MMA Normative Instruction n. 1, of 05/09/1996: establishes provisions on the Mandatory Forest Recovery and the Forest Integrated Plan.

MMA Normative Instruction n. 07, of 27/04/1999: establishes provisions on the authorization for deforestation in Legal Amazon states.

MMA Normative Instruction n. 02, of 10/05/2001: establishes provisions on the economic management of forests, in rural properties located in the Legal Amazon including areas of Legal Reserve and except for areas of permanent preservation established in the legislation in force, to be carried out through sustainable forest management practices of multiple uses.

IBAMA Normative Instruction n. 30, of 31/12/2002: regulates the calculation of standing tree volume through specific volume equation, and other related matters.

IBAMA Normative Instruction n. 112, of 21/08/2006: regulates o Document of Forest Origin - DOF, instituted by Administrative Rule /MMA/ n. 253, of August 18, 2006; (altered by IBAMA Normative Instruction n. 134, of 22/11/2006).

MMA Normative Instruction n. 06, of 15/12/2006: establishes provisions on forest recover and the consumption of forest raw material, and other related matters.

IBAMA Normative Instruction N. 178, of 23/06/2008: defines the IBAMA's guidelines and procedures to assess and grant the issuance of authorization for the suppression of forests and other forms of native vegetation in areas larger than two thousand hectares in rural properties located in the Legal Amazon and one thousand hectares in rural properties located in other areas of the country.

1.11.2 State Legislation

Law n. 702, of 28/06/2002: establishes provisions on the State Policy regarding Forests and other forms of vegetation in the state of Amapá, and other related matters.

COEMA Resolution n. 0001/99: establishes guidelines to characterize enterprises with the potential to cause environmental degradation; for environmental licensing; and other related matters.

Complementary Law n. 005, of August 18, 1994: institutes the Environmental Protection Code of the state of Amapá, and other related matters.

1.12 Ownership and Other Programs

1.12.1 Right of Use

Jari Celulose S.A., a company controlled by Grupo Jari is the rightful owner of the area where the Jari/Amapá REDD+ Project is located and the Right of Use of the Project area is respected according to the criteria in VCS Standard v3.2 (page 17):

> *"1) A right of use arising or granted under statute, regulation or decree by a competent authority.*
> *2) A right of use arising under law.*
> *4) A right of use arising by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission decreases and/or removals (where such right includes the right of use of such decreases or removals and the Project proponent has not been divested of such right of use)."*

The Project area includes two properties identified as follows:

1) Property - Santo Antonio da Cachoeira, corresponding to Land Title Deed n. 12/2006, granted by the State of Amapá on August 30, 2006 regarding registration n. 20, pages 16/62 of book 3-A of the Mazagão/AP municipality Registry of Deeds. As the Santo Antonio da Cachoeira property is located in the Iratapurú terrain whose largest part is located in the Laranjal do Jari municipality, a new registration was done in the Laranjal do Jari/AP Registry of Deeds under n. 1.887 pages 038 of book 2-H on May 5, 2008[6].

2) Property - Porto Salvo, corresponding to Land Title Deed n. 02/2009, granted by the state of Amapá on March 05, 2009, regarding registration n. 08, pages 08 of book 2-A of the Mazagão/AP municipality Registry of Deeds. Although the largest part of the Porto Salvo property is located in the current municipality of Vitória do Jari[7], which does not have a Registry of Deeds, a new registration was open in the Laranjal do Jari/AP Registry of Deeds under n. 1.947, pages 099 of book 2-H on July 13, 2009.

Proof of title deed ownership is available and can be requested, if necessary, to the Laranjal do Jari Registry of Deeds and to the state of Amapá Environment and Land Planning Institute in Brazil as presented in Table 11 and Table 12.

[6] The municipality of Mazagão was created by Law 226, on November 28, 1890. It is bordered by the municipalities of Santana, Porto Grande, Pedra Branca do Amapari, Laranjal do Jari and Vitória do Jari. The municipality of Laranjal do Jari was created by Law 7.639 of December 6, 1987. It is bordered by the municipalities of Oiapoque, Pedra Branca do Amapari, Mazagão and Vitória do Jari, the state of Pará and also Suriname and the French Guiana. Available on: http://www.ibge.gov.br/cidadesat/topwindow.htm?1 Accessed on May 10, 2012.

[7] The municipality of Vitória do Jari was created by Law171 on September 8, 1994 but was installed on January 1, 1997. It is bordered by the municipalities of Laranjal do Jari, Mazagão and the state of Pará. c

Table 11. Information from the Laranjal do Jari Registry of Deeds

Title	Size of the Area (ha)	Project Area (ha)	Registration	Date of Registration	Date of Deed (survey)
Title Deed n. 12/2006	246,247	56,743	1.887	05/05/2008	08/03/2012
Title Deed n. 02/2009	18,269	9,237	1.947	13/07/2009	30/03/2012
Total (ha)	264,516	65,980			

Table 12. Information from state of Amapá Environment and Land Planning Institute

Process	Property	Title	Requested Information	Date of Deed (survey)
4.000.664/95	Santo Antonio da Cachoeira	Title Deed n. 12/2006	Certificate of Authenticity and Legitimacy	20/12/2011
4.000.653/95	Porto Salvo	Title Deed n. 02/2009	Certificate of Authenticity and Legitimacy	20/12/2011

Document survey showed that there are no encumbrances over the previously mentioned properties and there are no impediments for the Jari/Amapá REDD+ Project such as locks, liens, mortgages or foreclosures.

Biofílica Investimentos Ambientais has a contract agreement with Grupo Jari and the Jari Celulose S.A. to carry out the Jari/Amapá REDD+ Project. Therefore, Biofílica Investimentos Ambientais is the sole and exclusive developer of the Jari/Amapá REDD+ Project, in partnership with Jari Florestal and Jari Celulose S.A., and holds part of the REDD+ credits to be generated in the property.

Regarding external risks that may affect the right of property or rights of use and access to the natural resources, the following points have to be taken into consideration:

- Jari Celulose S.A., as per the Brazilian Federal Constitution and Civil Code is the owners of the properties where the Jari/Amapá REDD+ Project is to take place, it holds the rights of use and economic management of the properties as well as the right to the natural resources therein.
- There are no disputes with third parties over Jari Celulose S.A. ownership of the area object of the Jari/Amapá REDD+ Project, nor traditional squatters claiming recognition of ownership of their pieces of land. There are also no disputes over the natural resources therein or over the use of the property.
- Although there are no disputes over the ownership of the land, property or rights of use/access, some measures have been implemented to solve any possible disputes or juxtaposition of claims as well as to provide support to solve any land issues in designated public offices. For such, Jari Celulose S.A. has entered an Agreement Commitment, a Protocol of Intentions, a Cooperation Agreement and a Compromise Termsheet with the state of Amapá in order to create a large partnership program to,

if necessary, solve any possible occupation of traditional communities by exchanging areas that may be of interest to Jari Celulose S.A. as well as promote activities that may be necessary to foster the social-economic development of the area.

- It is also important to highlight that Jari Celulose S.A. has a land surveillance team in the area that monitors the properties and, upon the occurrence of an invasion, it makes an official complaint to the police informing of the invasion of the private property, which is sent to the company legal department for applicable measures, and also denounces environmental crimes to the Brazilian Environment and Renewable Natural Resources Institute (IBAMA).

Proving the legitimacy of the right of use of the Project area is also a requirement to get the FSC forest management certification, as stated in item 1.11. The compliance with FSC principles and criteria is an evidence of the proponents' commitment to respecting the rights of ownership and use of the land as well as the engagement of the company in resolving conflicts and disputes related to the use of the Project area.

Among the FSC principles and criteria we can highlight Principle 2, which establishes the "Land tenure and property and use rights and responsibilities", which requirement is that "long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established". It is also important to highlight the following criteria:

- **Principle 2 – Criterion 1:** Clear evidence of long-term right of use of forest resources (e.g. land title, customary rights, or lease agreements) shall be demonstrated.
- **Principle 2 – Criterion 3:** Appropriate mechanisms shall be employed to resolve disputes over tenure claims and use rights. The circumstances and status of any outstanding disputes will be explicitly considered in the certification evaluation. Disputes of substantial magnitude involving a significant number of interests will normally disqualify an operation from being certified; and
- **Principle 2 – Criterion 4:** The land tenure of local communities with rights of customary possession or use of the land in the management unit must be normalized through documented agreements which ensure their presence in harmony with the forest management activities, or which promote their relocation in a participate and planned manner, or which foresee fair remuneration.

Therefore, it is ensured to the company that owns the Jari/Amapá REDD+ Project area the legitimate Right of Use.

1.12.2 Emissions Trading Programs and Other Binding Limits

Brazil is a non-Annex I country under Kyoto Protocol and does not have any GHG reduction commitments under the Convention. Moreover, Jari/Amapá REDD+ Project does not have any project related to carbon credit generation under the CDM or other regulatory scheme within the project area.

1.12.3 Participation under Other GHG Programs

The Jari/Amapá REDD+Project has not been registered under any other GHG program. However, the Project proponents intend on submitting this project to validation/verification under the CCB Standard (Climate, Community and Biodiversity Standard). It is important to mention that the CCB Standard does not issue or register any type of carbon certificates.

Also, currently there is no national or international REDD+ regulatory regime applicable to the Jari/Amapá REDD+Project. However, the Jari/Amapá REDD+ Project is being developed in order to integrate and comply with possible future regulatory regimes.

1.12.4 Other Forms of Environmental Credit

The Jari/Amapá REDD+Project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.12.5 Projects Rejected by Other GHG Programs

The Jari/Amapá REDD+Project has not been submitted to validation/verification under any other GHG Program. Therefore, it has not been rejected by any other GHG Program.

1.13 Additional information Relevant to the Project

Eligibility Criteria

This is not a grouped project.

Leakage Management

Leakage management areas are lands deforested untill 2010, located next to communities influenced by the Jari/Amapá REDD+ Project. In such areas activities will be developed aiming at avoiding the occurence of activity displacement (as described in Section 6). Therefore, it is not expected leakage due to activity displacement.

It is not expected that leakage management activities include agriculture improvement or grazing management that increase carbon stocks or GHG in comparison with baseline scenario in leakage belt. Thus, leakage associated with leakage prevention measures is not expected. However, if such activities are implemented during the project period, its emissions will be monitoring and accounted for, as described in Section 4.3 .

Commercially Sensitive Information

The following information were made available to validation/verification bodies:

- Project Financial Performance Spreadsheet and other related documents
- Jari Florestal's Sustainable Forest Management Plan (Plano de Manejo Florestal Sustentável – Amapá – da Jari Florestal);
- Contract between Biofílica Investimentos Ambientais, Jari Florestal and Jari, Celulose, Papel e Embalagens;
- Forest inventory;
- Descriptive Memorial;
- Grupo Jari's operational and environmental procedures;
- Estimate of opening areas in the UPAs of the PMFS - Amapá (Estimativa de abertura de áreas nas UPAs do PMFS do Amapá);
- Minutes of Biofílica's Board meetings

Further Information

Does not apply.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

VCS Approved Methodology VM0015 – Methodology for Avoided Unplanned Deforestation, version 1.1

2.2 Applicability of Methodology

The VCS approved Methodology VM0015 is applicable to the Jari/Amapá REDD+ Project because it meets the applicability criteria as described in Table 13.

Table 13. Methodology applicability criteria and how the Jari/Amapá REDD+ Project meets them.

Applicability Criteria	Description of how the Project meets the criteria
a) Baseline activities may include planned or unplanned logging for timber, fuel-wood collection, charcoal production, agricultural and grazing activities, provided the category is unplanned deforestation according to the most recent VCS AFOLU requirements.	Baseline activities include unplanned deforestation according to the recent version of VCS AFOLU Requirements as a result of agricultural and cattle grazing activities.
b) Project activities may be included one or a combination of the eligible categories defined in the description of the scope of the methodology.	Project activities include protection with controlled logging, thus being in compliance with the description in scope B of VM0015 (see details on page 12 of VM0015, Table 1 and Picture 2-B)

c) The Project area can include different types of forest such as, but not limited to, old growth forest, degraded forest, secondary forests, planted forests and agro-forestry systems meeting the definition of "forest".	The Jari/Amapá REDD+ Project includes old growth forests and degraded forests following the definition of "forest" by the Brazilian Designated National Authority accepted by VCS.
d) At the Project commencement, the Project area shall include only land qualifying as "forest" for a minimum of 10 years prior to the Project start date.	Only areas qualified as "forest" for a minimum of 10 years prior to the Project starting date have been included in the Project area (Figure 10).
e) The Project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the Project area includes a forest wetland growing on peat (e.g. peat swamp forests), this methodology is not applicable.	The types of forests found in the Project area do not include forest wetlands growing on peat or peat swamp forests.

2.3 Project Boundary

Five distinct spatial limits are required by the methodology VM0015: reference region, Project area, leakage belt, leakage management area, and forest area. Figure 6 presents the spatial limits of the Jari/Amapá REDD+ Project.

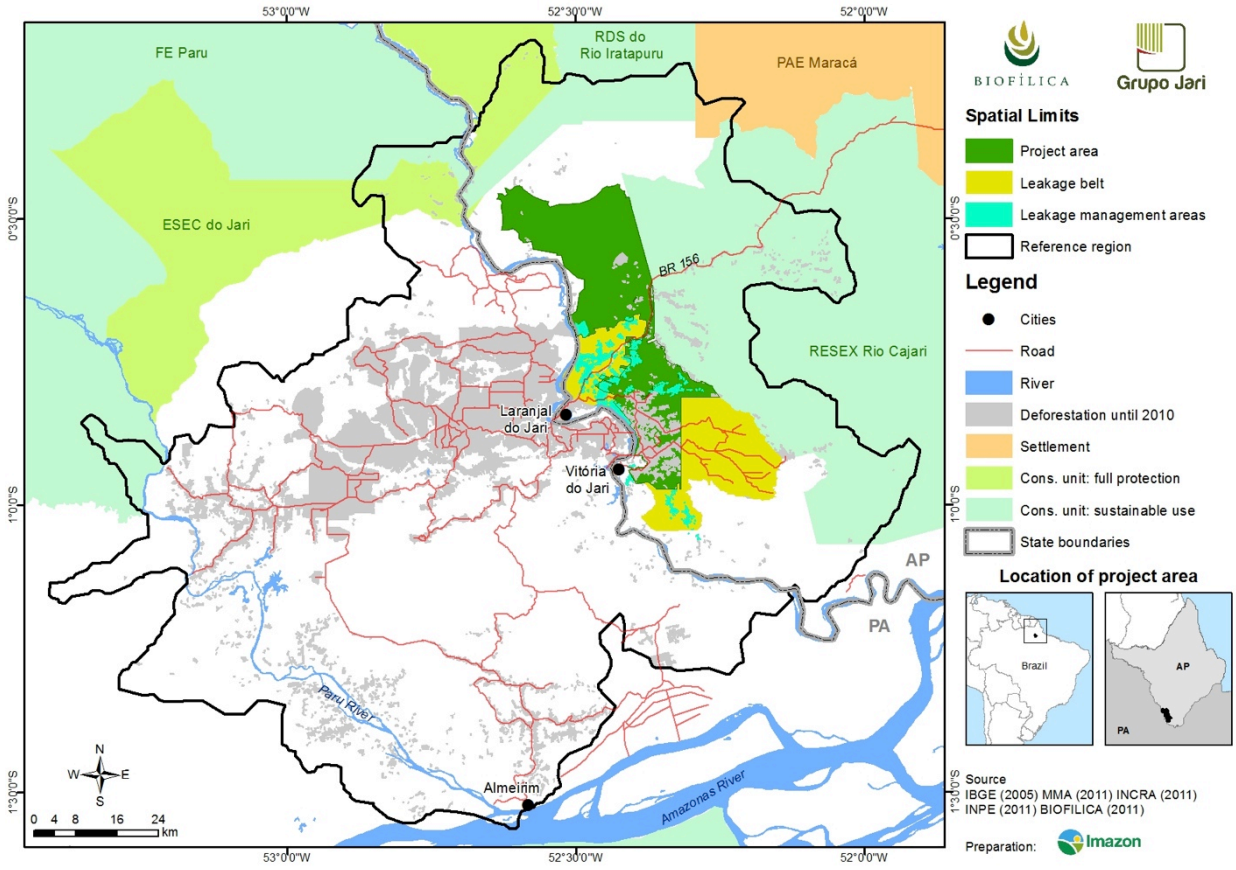

Figure 6. Location of the reference region, Project area, leakage management area and leakage belt of the Jari/Amapá REDD+ Project.

Reference Region:

The Jari/Amapá REDD+ Project reference region encompasses an area of 1,333,931 hectares (one million, three hundred thirty-three thousand, nine hundred thirty-one hectares) and presents a deforestation historical rate (between 2000 and 2010) of 29,628 hectares per year (0.27% per year in relation to the forest remnant area).

For the definition of the reference region spatial limit it was considered the environmental characteristics (hydrographic basins limits) and the deforestation direction driver. The definition of the reference region limit follows the guidelines described in VCS approved methodology VM0015 version 1.1 as well as the interval suggested by Brown et al. (2007) being the final area within the interval suggested in footnote number 9 of Methodology VM0015 (page 18).

The characteristics of the reference region meet the requirements of similarity with the Project area determined by the approved VCS methodology VM0015 version 1.1 (pages 18 and 19), presenting the following characteristics:

- **Agents and drivers of deforestation:**

Agents groups: deforestation agents are squatters who have a diffuse occupation standard on the reference region, with characteristics of low property density, isolated occupation distributed along the main accesses to the region (roads, road branches and rivers). Deforestation agents with this profile can be found all over the Valley of Jari in the states of Pará and Amapá (POEMA, 2005).

Infrastructure Drivers: the main deforestation drivers in the region are the roads (official and unofficial), navigable stretches of the Jari, Paru and other smaller rivers; the construction of Santo Antônio Hydroelectric power plant; the increase of the traffic flow on BR156 road; activities related to the construction and maintenance of the Jurupari-Oriximina transmission line; among other spatial drivers presented in step 3 of the study *Determinação da linha de base e dinâmica de desmatamento para o Projeto REDD+ Jari/Amapá,* made available to the validation/verification body.

- **Landscape configuration and ecological conditions:**

Forest/vegetation classes: the Project area contains more than 90% of the same forest classes found in the reference region.

Elevation: more than 90% of the Project area is less than 250 m above sea level, totaling 1,243,223, ha (93.2%) of the reference region.

Slope: all pixels in the Project area (0% to 71% declivity) are within the reference region declivity variation (0% to 122%).

- **Social-economic and cultural conditions**

Legal status of the land: the legal status of the Project area is private property, which can be found in other areas within the reference region as the Gleba Jari I in the state of Pará, also a property of the Grupo Jari.

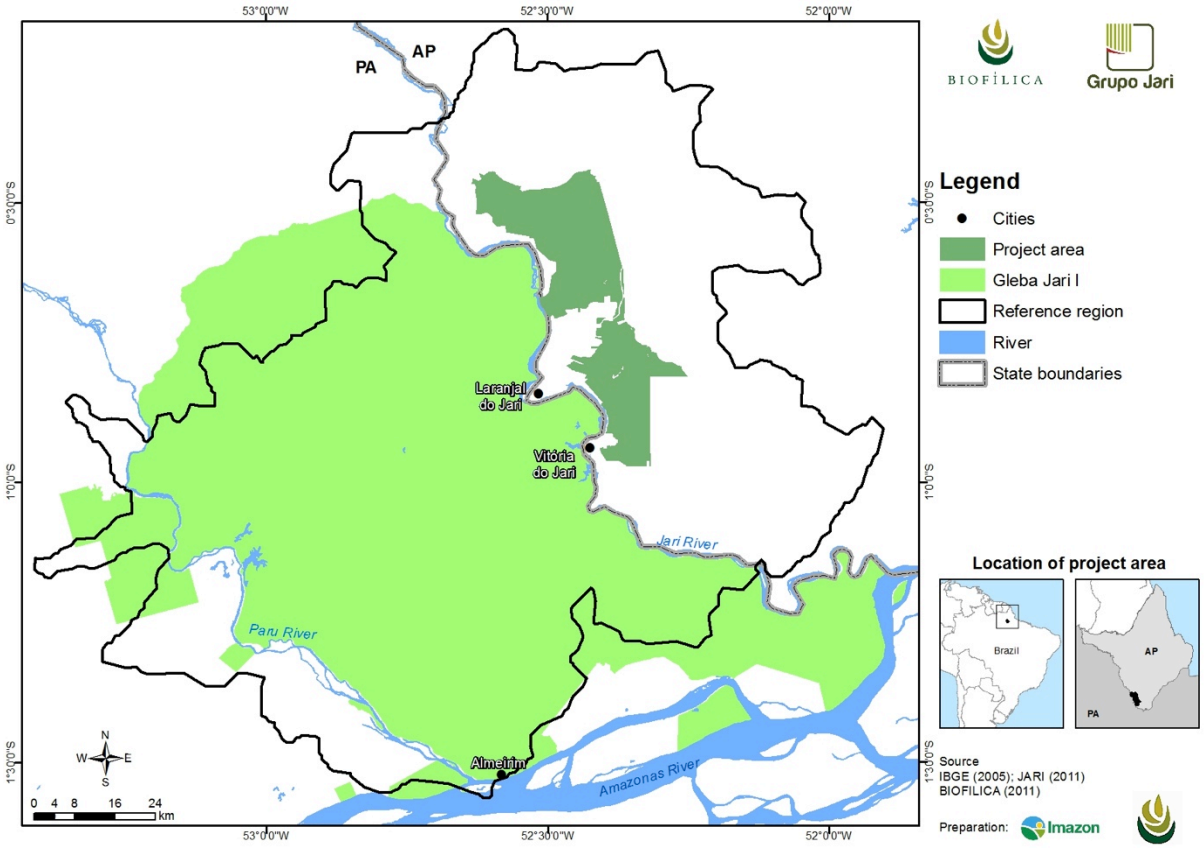

Figure 7. Location of Gleba Jari I in the state of Pará, property of Grupo Jari.

Land tenure: land tenure in the Project area (private property title deed) is found in other areas of the reference region, under which the same obligations, rules, institutions and process regulating right of ownership, accesses and use of the land and its resources apply as they are located in the same federative unit as the Project area.

Land use: current and projected classes of land-use and land-cover of the Project area (forest, non-forest vegetation, anthropic vegetation and hydrography) are the same all over the reference region.

Enforced policies and regulations: the Project area is governed by the same policies, legislations and regulations applicable to other areas in the reference region as they all belong to the same federation (Brazil), and also because part of the reference region is located in the same federative unit of the Project area (the state of Amapá).

Project Area

The Jari/Amapá REDD+ Project corresponds to an area of 65,980 hectares under Grupo Jari control onto which FSC-certified forest management, social, contention of deforestation and monitoring activities (REDD+) will be developed. The limits of the Project area have been defined as follows:

- Name of Project area: Jari/Amapá;

- Physical boundary of each discrete area of land included in the Project area are presented in Figure 6, Figure 8 and Table 14;

- Description of the current land-tenure and ownership are presented in 1.12 Ownership and Other Programs;

- List of Project participants and brief description of their roles in the proposed AUD Project: presented in Section 0 – Item 1.3 Project Proponent.

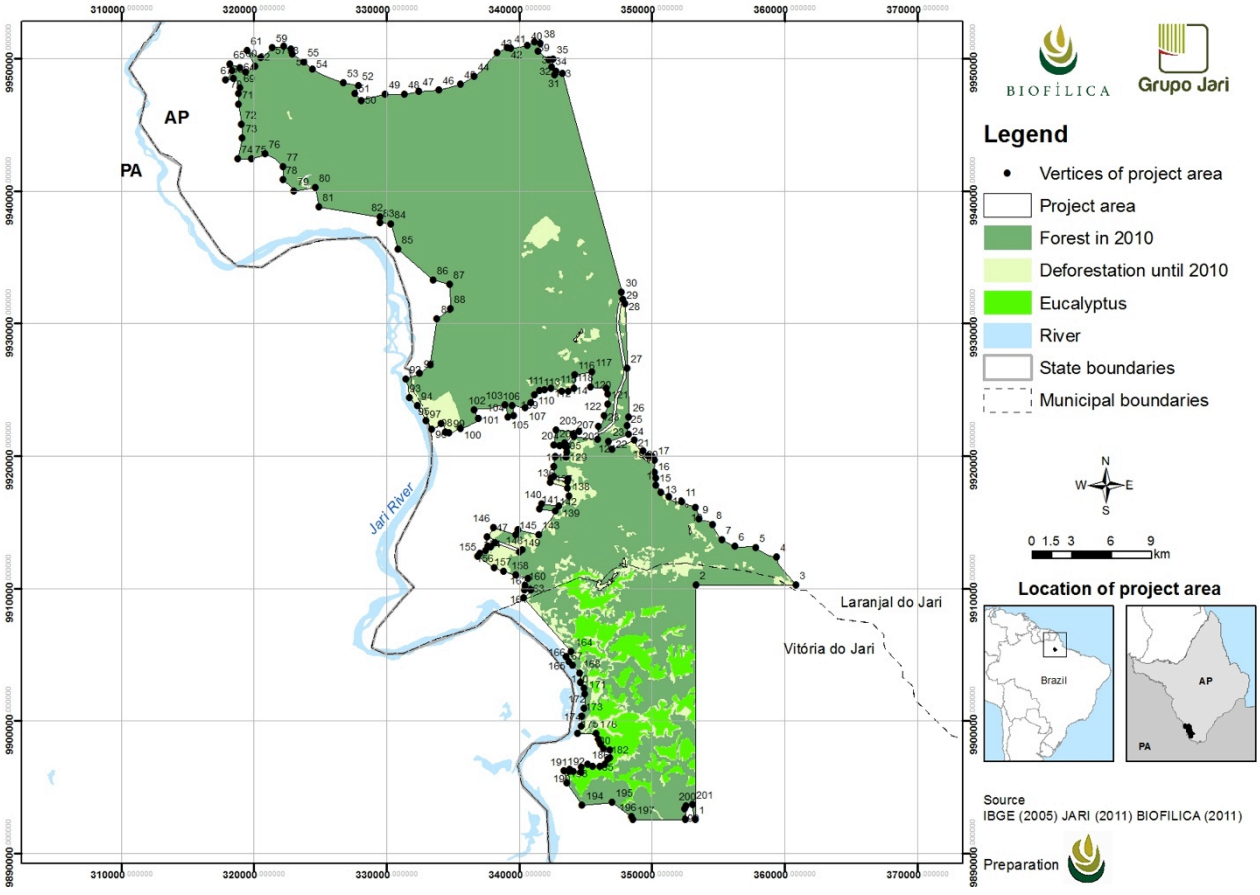

Figure 8. **Coordinates of the physical boundary of the Project Area (UTM – Zone 22S, Datum SIRGAS 2000).**

Table 14. Vertices and coordinates of the Project Area polygons (meter).

Vertex	X	Y
1	353318.346	9892531.538
2	353336.113	9910260.460
3	360870.617	9910259.451
4	359417.669	9912349.040
5	357852.884	9913054.482
6	356294.972	9913169.482
7	355299.062	9913689.483
8	354586.717	9914819.488
9	353570.587	9915231.489
10	353296.461	9916088.491
11	352283.676	9916545.493
12	351308.111	9916912.495
13	350719.453	9917246.496
14	350341.671	9917793.698
15	350329.890	9918350.699
16	350203.014	9918780.701
17	350224.576	9919679.704
18	350066.670	9919961.705
19	349744.698	9920030.706
20	349337.604	9920413.707
21	348669.650	9921222.085
22	347014.250	9920519.281
23	346766.749	9921072.021
24	348258.152	9921652.266
25	348144.379	9922295.714
26	348282.589	9922931.135
27	348146.958	9926621.449
28	347967.687	9931499.155
29	347840.497	9931818.174
30	347740.949	9932340.758
31	343283.238	9948867.336
32	342667.996	9948770.192
33	342801.992	9949038.183
34	342444.670	9949395.504
35	342578.666	9949976.152
36	342266.010	9949931.487
37	341417.371	9950556.799
38	341596.032	9951182.111
39	341149.380	9951271.442

Vertex	X	Y
40	340613.398	9951003.451
41	339347.653	9950792.464
42	339078.933	9950839.198
43	338335.474	9950467.469
44	336593.532	9948680.862
45	335566.233	9948100.214
46	333958.287	9947653.563
47	332439.671	9947519.567
48	331367.707	9947296.241
49	329904.017	9947332.892
50	328119.910	9946817.686
51	327615.832	9947385.572
52	327857.107	9947944.930
53	326722.528	9948189.545
54	324399.939	9949216.844
55	323774.627	9949752.826
56	322881.323	9950333.473
57	322768.026	9950758.337
58	322227.195	9950963.108
59	321362.707	9950824.790
60	320514.069	9950110.147
61	319486.770	9950601.464
62	320067.417	9949440.170
63	319397.440	9948993.518
64	318950.788	9949350.839
65	318191.480	9949574.165
66	318325.475	9949082.848
67	317867.095	9948400.067
68	318459.471	9948502.201
69	318950.788	9947787.558
70	318816.792	9947385.572
71	318816.792	9946581.598
72	319068.165	9945031.464
73	319084.783	9943991.018
74	318772.127	9942427.737
75	319799.426	9942427.737
76	320853.240	9942826.725
77	322211.346	9941847.090
78	322211.346	9940864.456

Vertex	X	Y
79	322984.920	9939987.285
80	324640.727	9940279.249
81	324898.723	9938816.081
82	329492.914	9938050.226
83	329524.612	9937608.832
84	330320.777	9937519.605
85	330883.536	9935625.399
86	333506.600	9933301.314
87	334751.755	9932988.134
88	334811.662	9931119.822
89	333816.452	9930342.615
90	333289.669	9926902.878
91	332514.829	9926238.314
92	331440.601	9925815.477
93	331755.752	9924409.195
94	332312.196	9923792.870
95	332969.036	9922655.581
96	333397.250	9922007.437
97	334096.984	9922453.755
98	334439.882	9921810.482
99	334735.647	9921733.236
100	335581.970	9922059.710
101	336938.741	9922802.367
102	336624.371	9923460.015
103	338926.382	9923861.224
104	339153.314	9922955.272
105	339596.602	9923065.960
106	339475.564	9923799.740
107	340462.795	9923665.194
108	340870.336	9924033.825
109	341143.524	9924600.506
110	341525.351	9924920.826
111	341930.177	9924991.188
112	342419.515	9925097.153
113	343244.124	9924897.886
114	343687.614	9924883.407
115	344145.175	9925107.274
116	344194.189	9926158.253
117	345502.883	9926348.572
118	345368.237	9925218.406
119	346552.360	9925110.689
120	346702.000	9924676.794
121	346703.198	9923923.271

Vertex	X	Y
122	346393.931	9923039.196
123	345964.310	9922212.547
124	345938.249	9921271.239
125	344153.339	9921455.849
126	343481.655	9920713.422
127	343617.986	9920686.579
128	343602.285	9920254.515
129	343520.614	9919908.443
130	342720.838	9919958.040
131	342606.773	9919214.392
132	342620.515	9918450.870
133	343697.367	9918256.384
134	343647.591	9918054.243
135	342432.822	9918315.459
136	342348.095	9918027.466
137	343674.215	9917589.276
138	343754.312	9916972.600
139	343008.062	9916218.237
140	341689.300	9916366.909
141	341554.617	9915983.724
142	342755.406	9915843.328
143	341460.097	9914071.522
144	339913.558	9914404.581
145	339737.131	9914070.387
146	338089.335	9914565.082
147	337559.221	9913911.048
148	340225.155	9912907.132
149	340033.254	9912756.827
150	338171.279	9913453.671
151	337846.052	9913150.365
152	337635.576	9913162.625
153	337485.731	9912859.531
154	337025.073	9912643.677
155	336901.834	9912410.233
156	338104.836	9911551.538
157	338811.103	9911294.017
158	339735.239	9911001.178
159	340651.015	9910720.361
160	340470.683	9910192.328
161	340419.345	9909881.556
162	340873.095	9909849.248
163	340359.377	9909271.239
164	343945.347	9905214.935

Vertex	X	Y
165	343531.941	9904836.025
166	343752.726	9904456.897
167	344012.343	9904175.930
168	344549.594	9903587.730
169	344644.891	9902903.254
170	344898.951	9902452.764
171	344975.178	9902012.209
172	344923.228	9900941.451
173	344751.916	9900329.278
174	344668.743	9899594.837
175	344414.048	9899023.057
176	345801.282	9899019.432
177	345999.783	9898625.431
178	346136.190	9898224.429
179	346338.909	9897882.428
180	346847.976	9897774.646
181	346834.692	9897221.426
182	346660.285	9897074.425
183	346476.597	9896725.424
184	346110.908	9896568.424
185	345547.500	9896532.423
186	345189.686	9896685.424
187	344702.622	9896468.423
188	344701.082	9896111.424
189	344082.681	9896156.279
190	343836.526	9896354.423
191	343743.916	9896180.851
192	343390.963	9896206.158
193	343612.527	9895309.802
194	344756.541	9893615.066
195	347028.553	9893815.130
196	348461.901	9892776.789
197	348607.373	9892538.285
198	352549.856	9892532.633
199	352502.984	9893355.653
200	352584.239	9893551.415
201	353064.858	9893684.107
202	344506.672	9921877.821
203	342797.827	9921958.351
204	342619.200	9920849.127
205	343082.969	9920773.651
206	343454.408	9920958.316
207	344069.488	9921651.212

Leakage belt

There is no available data or studies in the reference region demonstrating that the economic advantage is an important deforestation driver. Thus, the leakage belt was defined using the mobility approach (option II offered by the VCS approved methodology VM0015 version 1.1, page 24). A multi-criteria approach combining the deforestation risk map, which identifies the areas where deforestation can occur, with data from the Project area and conservation units, was used to define the spatial limits of the leakage belt. Based on this approach it was assumed that the leakage belt is located in regions at high risk of deforestation close to the Project area and out of the conservation units.

Leakage management areas

The leakage management areas were defined considering the following criteria: areas that were deforested until 2010 located close to the communities where the Jari/Amapá REDD+ Project operates. The limit of the leakage management area encompasses 7,268 hectares and the land use prior to Project activities is agricultural or forest production, grazing and regeneration of secondary vegetation. The activities to be developed in these leakage areas are described in Section 6 Social Impact.

Forest

The definition of forest is in accordance with resolution number 2 of the Interministerial Commission on Global Climate Change (CIMGC[8]). Data from the Forest Satellite Monitoring Project (PRODES[9], in Portuguese) of the National Institute of Space Research (INPE) was used to produce the forest cover benchmark map (Figure 9) The Minimum Mapping Unit (MMU) in PRODES Digital data corresponds to 1 hectar. Cloud-covered areas were analyzed through complementary SAR images.

[8] Definition of forest by the Brazilian Designated National Authority: minimum area of 1 hectare with 30% of the surface covered by trees with the potential to reach heights of at least 5 m.
[9] http://www.obt.inpe.br/prodes

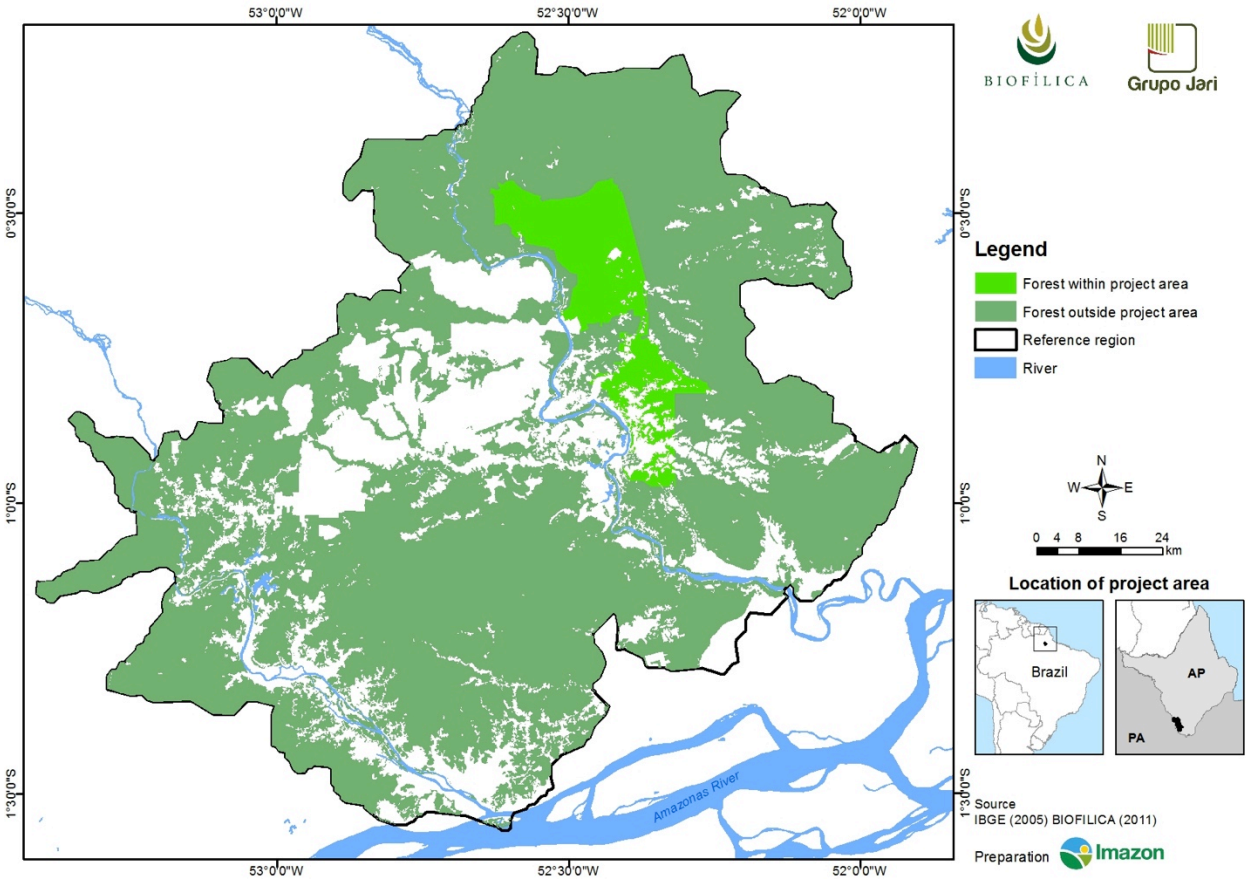

Figure 9. Forest cover benchmark map.

TEMPORAL BOUNDARIES

Starting date and end date of the historic reference period: the historical reference period of the Jari/Amapá REDD+ Project is limited to the years 2000 to 2010 (Figure 10). These dates have been defined taking into especially consideration the availability of data from PRODES Project used to generate land coverage maps that were in compliance with the methodology (starting date up to 10-15 years in the past and end date as close as possible to Project starting date).

Starting date of the Project crediting period of the AUD Project activity: the starting date of the crediting period is 14/02/2011. Deforestation in the baseline scenario has been projected up to 2040.

Starting date and end date of first fixed baseline period: the fixed baseline period is 10 years as determined by the VCS approved methodology VM0015 version 1.1. Baseline scenario will be reevaluated until 2020.

Monitoring period: The monitoring period of land-use and land-use change is one year, starting in 2011.

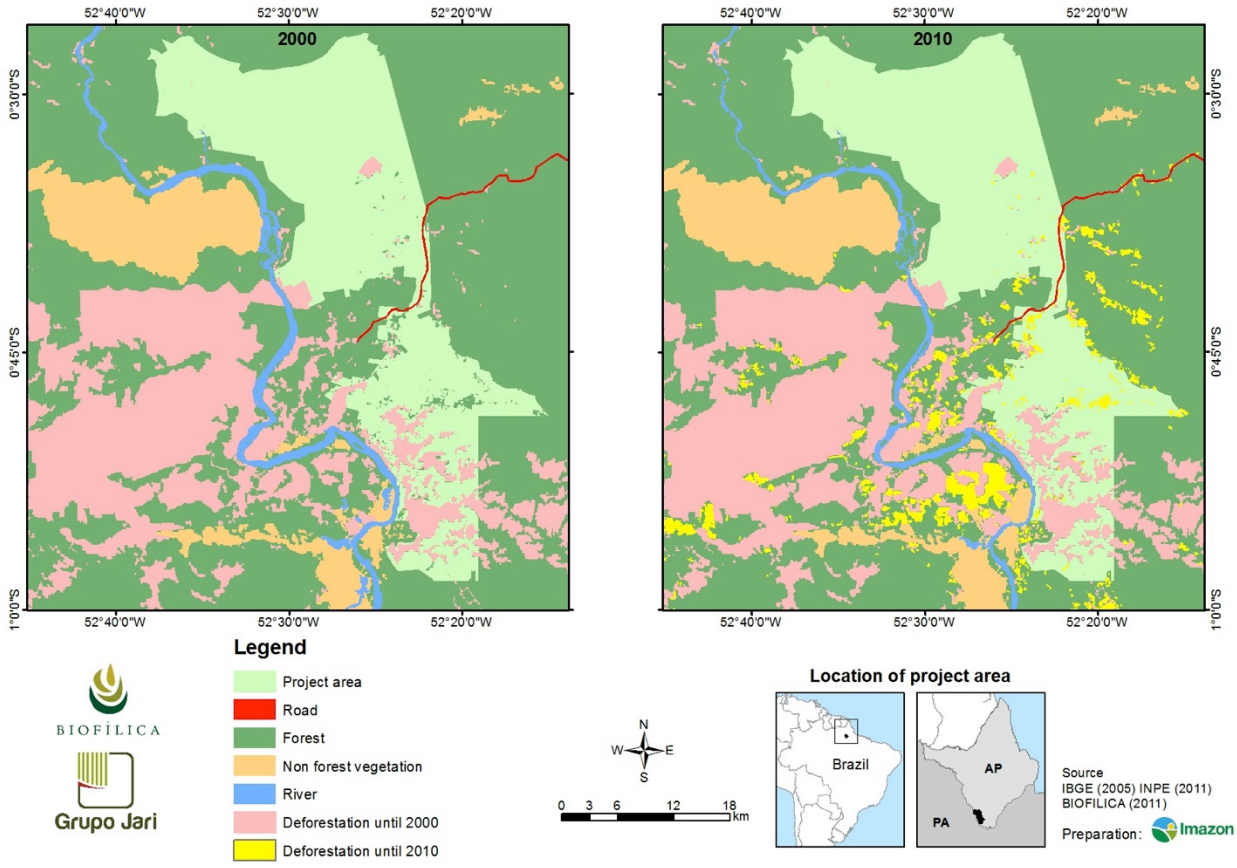

Figure 10. Land-use and land-cover maps in years 2000 and 2010.

CARBON POOLS

Carbon pools considered in the Project are presented in Table 15. Methodological details of carbon reservoir estimate can be found in the document *Estimativa do Estoque de Carbono Florestal na Área do Projeto REDD+Jari/Amapá made* available to the validation/verification body.

GHG sources, carbon sinks and pools in the baseline scenario

Table 15. Carbon pools included or excluded within the boundary of the Jari/Amapá REDD+ Project (Table 3 of Methodology VM0015).

Carbon pools	Included / Excluded	Justification / Explanation for the choice
Above-ground	Tree: included	Carbon stock change in this pool is always significant.
	Non-tree: included	Pool included in the forest class used in the baseline scenario.
Below ground	Included	Significant pool representing 17% of baseline scenario emissions.
Dead wood	Included	Pool included in the forest class used in the baseline scenario.
Harvested wood products	Excluded	Pool not included as harvested wood products in the baseline scenario is lower than in the Project scenario.
Litter	Excluded	Recommended only when significant
Soil organic carbon	Excluded	Recommended when forests are converted to cropland. Not to be measured in conversions to pasture grasses and perennial crop according to VCS Program Update of May 24th, 2010.

Table 16. Sources and GHG included or excluded within the boundary of the Jari/Amapá REDD+ Project (Table 4 of VM0015Methodology).

Source		Gas	Included?	Justification / Explanation
Baseline	Biomass burn	CO_2	No	Counted as carbon stock changes
		CH_4	No	Not a significant source according to item 9.1
		N_2O	No	Considered insignificant according to VCS Program Updtae of May 24th, 2010
	Livestock emissions	CO_2	No	Not a significant source
		CH_4	No	Does not apply to the Project.
		N_2O	No	Does not apply to the Project.

2.4 Baseline Scenario

(Step 2 VM0015) Analysis of historical land-use and land-cover change.

(2.1 VM0015) Collection of appropriate data sources.

Data from PRODES digital program available in shapefile format was used to map land-use and land-cover classes. A total of 28 different Landsat images (Table 17) were used by PRODES to map forest classes, non-forest vegetation, hydrography and anthropic vegetation (deforestation). These images cover the historical reference period (2000 to 2010) and can be located through three Landsat orbits/scene spots: (i) 226/60; (ii) 226/61; and (iii) 227/61. The evaluation of PRODES data classification was carried out using three Radar images of ALOS satellite and Google Earth high spatial resolution images.

Table 17. Satellite images used to identify and map land cover in the reference region of the Jari/Amapá REDD+ Project (Table 5 of Methodology VM0015).

Vector (satellite or airplane)	Sensor	Resolution		Coverage	Acquisition Date	Identifier	
		Spatial (m)	Spectral	(km2)	(DD/MM/YY)	Orbit	Point
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	23/09/03	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	11/10/04	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	14/10/05	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	01/10/06	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	02/09/07	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	19/08/08	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	25/10/09	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	12/10/10	226	60
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	17/09/01	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	23/09/03	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	11/10/04	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	14/10/05	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	02/11/06	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	16/07/07	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	19/08/08	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	21/07/09	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	28/10/10	226	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	07/10/00	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	16/09/01	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	05/10/02	227	61

Vector (satellite or airplane)	Sensor	Resolution		Coverage	Acquisition Date	Identifier	
		Spatial (m)	Spectral	(km2)	(DD/MM/YY)	Orbit	Point
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	16/10/03	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	31/08/04	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	21/10/05	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	24/10/06	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	09/09/07	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	27/09/08	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	29/08/09	227	61
Satellite	Landsat	30	0.45 – 2.35 µm	34,225	31/07/10	227	61
Satellite	Alos/PALSAR	12	23.5 cm	4,135	05/06/08	12588	
Satellite	Alos/PALSAR	12	23.5 cm	4,135	22/06/08	12836	
Satellite	Alos/PALSAR	12	23.5 cm	4,135	09/07/08	13084	
Satellite	Spot5	2.5	0.48 – 0.71 µm	3,600	29/07/2011	-0.5008	-52.5674
Satellite	Spot5	2.5	0.48 – 0.71 µm	3,600	05/09/2011	-1.0015	-52.1888
Satellite	Spot5	2.5	0.48 – 0.71 µm	3,600	22/01/2012	-0.501	-52.1114
Satellite	Spot5	2.5	0.48 – 0.71 µm	3,600	29/07/2011	-1.002	-52.6785

(2.2 VM0015) Definition of classes of land-use and land-cover

Land cover classes used in this Project are represented in Table 18. The description of the classes used in the Project and its area in the start of the historical period (2000) are presented below:

- **Forest** (1,056,472 ha): area of remnant forest belonging to different phytophysiognomies of the ombrophilous forest.
- **Non-forest vegetation** (117,237 ha): area composed by natural vegetation with a physiognomy different from the forest such as arboreal-shrubby savanna (cerrado), grassy-woody savanna (clear cerrado field), Campinarana, among others.
- **Hydrography** (16,302 ha): water bodies (rivers, lakes, creeks, among others).
- **Anthropic vegetation in equilibrium** (144,222 ha): area that used to be a forest but has been deforested by clear-cutting process (removal of forest cover). These areas are converted to other land uses, different from forest areas, formed by a mosaic of different types of vegetation which includes grazing area, farmland, secondary plantation and vegetation, according to Fearnside (1996).

Table 18. Land-use and land-cover classes existing in the Jari/Amapá REDD+ Project at the start date within reference region (Table 6 of Methodology VM0015).

Class Identifier		Trend in Carbon stock	Presence in [1]	Baseline Activity [2]			Description (Including criteria for unambiguous boundary definition)
ID_{cl}	Name			LG	FW	CP	
1	Forest	Constant	RR, LK, LM, PA	Yes	Yes	No	Forest remnant area
2	Non-forest vegetation	Constant	RR, PA	No	No	No	Non-forest formation area
3	Hydrography	Constant	RR	No	No	No	Areas containing water bodies
4	Anthropic vegetation	Constant	RR, LK, LM, PA	Yes	Yes	No	Area deforested through clear-cutting process and having vegetation different from Ombrophilous Forest

1. RR = Reference region, LK = Leakage Belt, LM = Leakage Management Areas, PA = Project Area.
2. LG = Logging, FW = Fuel-wood collection, CP = Charcoal Production.

(2.3. VM0015) Definition of categories of land-use and land-cover change

The transition of two land-use categories was designed in this Project: the change of forest cover areas to anthropic vegetation in equilibrium areas (Table 9).

Table 19. Definition of land-use and land-cover change categories (Table 7b of Methodology VM0015).

ID_{cl}	Name	Trend in Carbon stock	Present in	Activity in case of baseline			Name	Trend in Carbon stock	Present in	Activity in case of Project		
				LG	FW	CP				LG	FW	CP
I1/F1	Forest	Constant	PA	No	No	No	Anthropic vegetation	Constant	LM	Yes	Yes	No
I1/F1	Forest	Constant	LK	Yes	Yes	No	Anthropic vegetation	Constant	LM	Yes	Yes	No

(2.4 VM0015) Analysis of historical land-use and land-cover change

The main activities carried out by the PRODES Project to monitor the Brazilian Amazon forest cover are presented hereafter.

Pre-processing

Images pre-processing procedures carried out by PRODES consist of the following steps (Câmara et al, 2006):

- Selection of images with less cloud coverage, shooting date closer to Amazon dry season and adequate radiometric quality;
- Georeferencing of the images with spatial resolution of 30 meters with topographic charts in a 1: 100,000 scale and NASA images in MrSID orthorectified format.

Interpretation and classification

The satellite images classification method used by PRODES follows four main steps. The first is the generation of a spectral mixture model in which vegetation, soil and shadow components are identified; this technique is known as spectral linear mixture model and aims to estimate the percentage of vegetation, soil and shadow component for each pixel of the image. The second step is the application of the segmentation technique which identifies in the satellite image the spatially adjacent regions (segments) with similar spectral characteristics; after segmentation there is the individual classification of the segments to identify forest classes, non-forest vegetation and deforestation (anthropic vegetation). Finally, the classified segmentation result is submitted to an editing process, or classification audit, carried out by a specialist and finalizing with the creation of state mosaics.

Map accuracy assessment

PRODES mapping evaluation was carried out by comparison of each of the most recent class of the land-use and land-cover map (2010) with a set of 97 points randomly distributed over the reference region. Reference data used in this step come from the points obtained by visual interpretation of the Japanese satellite ALOS, sensor PALSAR, together with the spatial high resolution images available on Google Earth.

Having the reference points and the 2010 land-use and land-cover map, it was possible to evaluate the performance of the mapping by analyzing the confusion matrix (Table 20) as per Congalton (1999). The overall accuracy of the mapping for the different land use classes presented values above 90%.

Table 20. PRODES 2010 data evaluation confusion matrix.

		REFERENCE					
		Forest	Anthropic vegetation	Hydrography	Non-forest vegetation	Total	User accuracy
CLASSIFIED	Forest	39	2			41	95%
	Anthropic vegetation		28			28	100%
	Hydrography		1	9		10	90%
	Non-forest vegetation				18	18	100%
	Total	39	31	9	18	97	
	Producer accuracy	100%	90%	100%	100%		

Results of historical analysis of land-use and land-cover change

Using the data obtained in previous steps, it was carried out an analysis of the historical change in forest cover between 2000 and 2010 in the Project reference region. The map subtraction analysis resulted in an area of approximately 36,204 hectares of deforested area (3.5% of the forest remnant in 2000) between 2000 and 2010.

Table 21 shows the changes occurred between forest and anthropic vegetation classes. The graph in *Figure* 11 presents accumulated deforestation between 2000 and 2010 in the reference region where it is possible to observe a tendency of growth in the deforestation of approximately 3% a year.

Table 21. Land-use change matrix in the reference region between 2000 and 2010. (Table 7a of Methodology VM0015).

IDcl			Initial Class (2000)				Total (ha)
		Nome	Forest	Non-forest vegetation	Hydrography	Anthropic vegetation	
			I1	I2	I3	I4	
Final LULC class (2010)	F1	Forest	1,020,268	0	0	0	**1,020,268**
	F2	Non-forest vegetation	0	117,237	0	0	**117,237**
	F3	Hydrography	0	0	16,302	0	**16,302**
	F4	Anthropic vegetation	36,204	0	0	144,222	**180,426**
Total (ha)			**1,056,472**	**117,237**	**16,302**	**144,222**	**1,334,233**

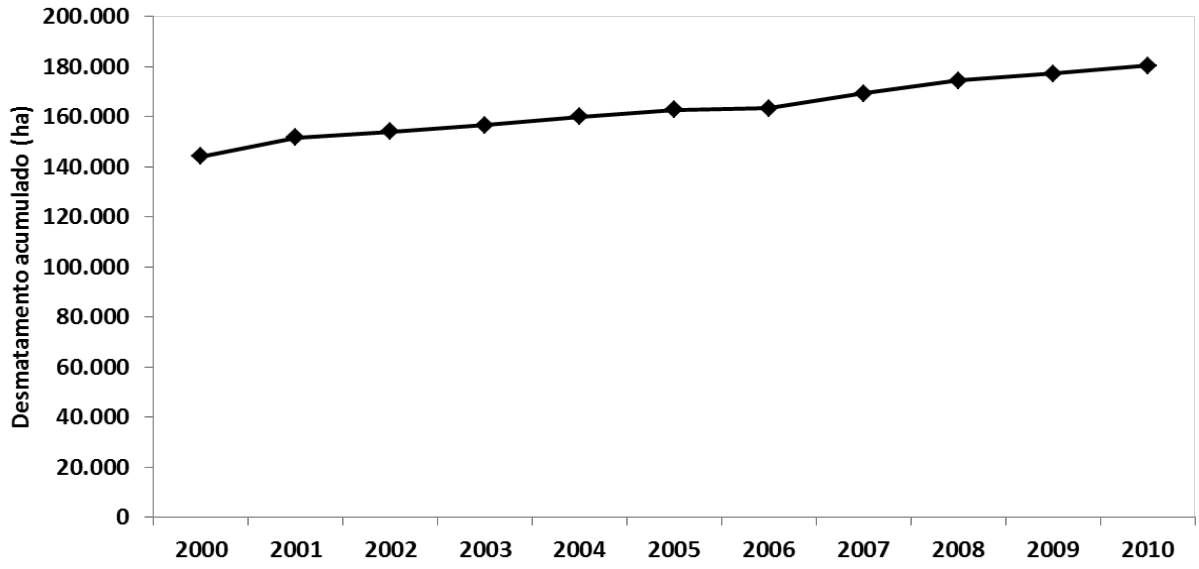

Figure 11. Cumulative deforestation in the reference region between 2000 and 2010.

Preparation of a methodology annex to the PD

a) **Data acquisition:** satellite images of optical sensor or radar shall be used. The optical images shall be multispectral with spectral resolution between 0.45 e 2.35 μm, and the radar images must be acquired in bands X (3 cm), C (5 cm) or L (23 cm). For the mapping of forest cover and land use should be used images with spatial resolution equal to or greater than 30 meters. The acquisition date should be during the lower incidence of clouds and rain in the region, between the months of August and November. For the monitoring of forest cover in the Project Area and Leakage Belt, the satellite image must cover the area between the following coordinates: 0° 26'22"S/52° 38'20"W and 1° 3'40"S/52° 8'12"W. Data from the Forest Satellite Monitoring Project (PRODES Digital) of the National Institute for Space Research (INPE) will be used to perform the monitoring. The information provided by PRODES Digital can be accessed at www.obt.inpe.br/prodes. Available data include maps in Shapefile and Geotiff format of the land use and land cover in the Brazilian Amazon for the base year 1997, increment of the deforestation occurred between 1997 and 2000 and annual increment for the years 2000 to 2012. PRODES Digital data is actualized annually between October and December of each year.

b) **Pre-processing:** the images should be geometrically corrected through georeferencing in the ArcGIS 10 software using as reference topographic charts in a 1:100,000 scale or NASA images in MrSID[10] orthorectified format. The RMS error must be smaller than one pixel for optical imaging and approximately 1.5 pixel for radar image. All data should be in the UTM coordinate system, Zone 22S and Datum SIRGAS 2000. The database in vector format provided by PRODES Digital must be converted to raster and resampled for pixel with 100 x 100 m (1 ha).

c) **Classification:** using the multispectral images to transform values from digital numbers to scene component (vegetation, soil and shadow) through spectral mixture algorithm, select the images of the component soil and shade then apply the segmentation technique using the region growing algorithm with the following parameters: similarity threshold 8 and area threshold 4. The classification is performed using the algorithm unsupervised ISOSEG with the acceptance threshold of 90% for the classes: forest, deforestation, non-forest vegetation, hydrography and cloud. These segmentation and classification algorithms can be applied using Spring 5 and TerraView 4 programs.

d) **Post-processing:** the classification results are submitted to audit carried out by GIS analyst. For analysis of areas with cloud cover is used visual interpretation of radar image and/or data collected in the field.

e) **Classification accuracy assessment:** performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix as Congalton (1999). At least 50 points distributed randomly from satellite images of high spatial resolution (≤5 meters) and/or data collected in the field are used. The minimum mapping accuracy of classification is 80%.

(Step 3 VM0015) Analysis of agents, drivers and underlying causes of deforestation and their likely future development

(3.1 VM0015) Identification of agents of deforestation

a) **Name of the agent**: squatters.

b) **Relative importance**: squatters in the reference region, Project area and leakage belt represent the only group of agents responsible for unplanned deforestation, therefore 100% of the deforestation occurring in these limits is attributed to such agents.

[10] https://zulu.ssc.nasa.gov/mrsid/

c) **Brief description**: the agents of deforestation on Valley of Jari region are migrants who come especially from the towns of Laranjal do Jari and Vitória do Jari and from the states of Pará and Maranhão. They invade land belonging to the Grupo Jari alleging they are in land that belongs to the state of Amapá or the federal government. They clear areas to take possession, build betterments, and start small crops and livestock on a small scale. It is through these activities, which end up on impacting the forest cover, that squatters seek the legitimization of their occupation (LIMA e POZZOBON, 2005). Squatters who have been in the region for over 10 years have as main characteristic the development of activities related to extractivism and agriculture of subsistence, being the production based on family workforce. Small farms with area up to 200 ha (POEMA, 2005) are formed through the sale of possession of lots among squatter communities. Squatters perform deforestation for temporary or permanent plantations and grazing areas in different states of degradation. According to data from the land-use and land-cover mapping of Amazon done by the TerraClass Project (INPE and EMBRAPA, 2011), 16% of the deforested area in the reference region as of 2008 was used for the establishment of grazing areas. Squatters in Valley of Jari region have a diffuse land occupation pattern (GAVLAK, 2011), which is characterized by the low density of properties, isolated occupation distributed along the main access roads to the region, such as the areas close to BR156, road branches (Ramal dos Maranhenses, Igarapé das Pacas, França Rocha, Fé em Deus, AC Diniz, Madejar and Água Azul), and along small rivers (Arapiranga e Marapi), as shown in Figure 12. Such agents develop small scale deforestation activities which start with the opening of paths (tracks or trails) often used to camp out and they end up causing clear-cut deforestation. Such deforestations caused mainly by squatters take place as a result of itinerant agriculture, whereas the deforestation dynamics caused by small farmers result from the opening of areas for small scale agricultural plantations and cattle grazing areas besides the deforestation done to demarcate property limits. These practices are responsible for most of the deforestation in the region in a process called “silent deforestation” which is very difficult to be detected from satellite images (GTPPCDAP, 2009).

d) **Brief assessment of the most likely development of the population size:** According to data flow of people surveyed by CIFOR (2012), in the last two years there was an increase in population size of approximately 3.7% in communities near the Project area.

e) **Statistics on historical deforestation attributable to agent**: between 2000 and 2010 29,628 hectares (Figure 13) were deforested in the reference region representing an annual average of 2,963 hectares, which were assigned to actions of squatters in the Valley of Jari.

Photo 1 – Camp house of a squatter. X: 346325 – Y: 9910182

Photo 2 – Area deforested by squatter for corn plantation. X: 352589 – Y: 9916296

Photo 3 – Area deforested for cassava plantation. X : 347197 – Y: 9923790

Photo 4 – Area deforested for cattle grazing. X:350055 – Y:9919682

Figure 12. Photographic record of deforestation agent's activities.

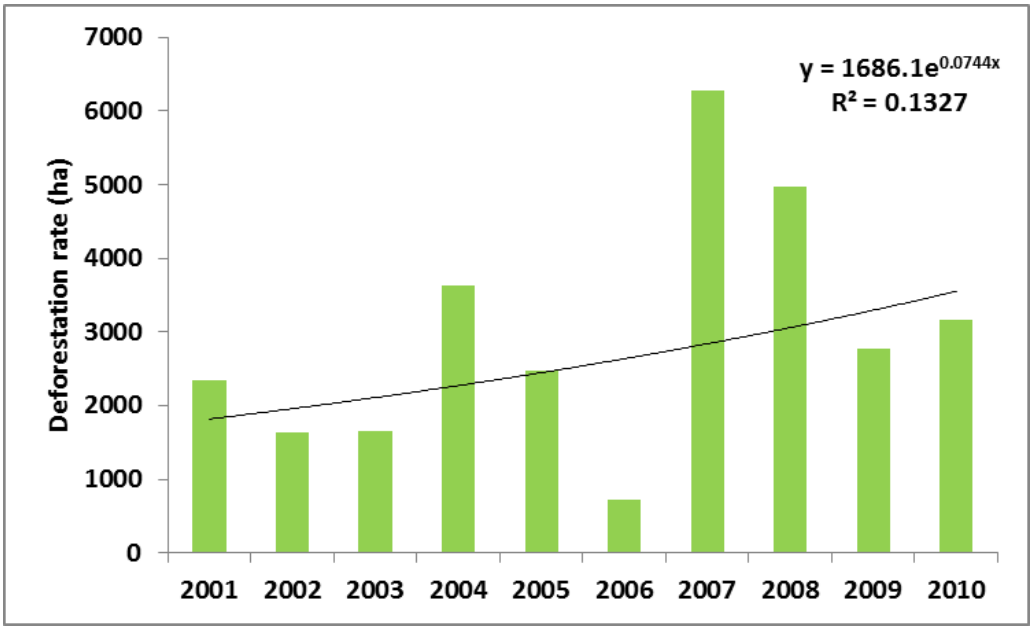

Figure 13. **Annual deforestation in the reference region between 2000 and 2010.**

(3.2 VM0015) Identification of deforestation drivers

The main drivers affecting the amount of deforestation in the reference region are:

a) Population migration: the development of new fronts of migration related to activities as agriculture, forest exploitation and infrastructure works causes large movement of people in search of jobs and areas for agriculture activities. As observed in PAS (2008) in the last decade there was a positive net migration balance in Amapá, which became a pole of attraction for people from other states. Field visits made it possible to identify that migration in the reference region come from the states of Maranhão and Pará. Commonly they come for temporary work and remain in the area becoming squatters or foremen in small ranches or farms.

b) Demand for new small scale agricultural and grazing areas: between 2000 and 2010 29,628 hectares were deforested in the reference region representing an annual average of 2,963 hectares. According to Poema (2005) until 2005, 2,348 rural families (squatters) lived in the Valley of Jari. According to data collected in the field, a rural family deforests on average 1.5 ha per year for plantations which can cause an impact on the forest of approximately 3,500 ha per year in the region.

Variables explaining the geographic location of deforestation

In this study a total of 17 spatial variables were analyzed to identify which ones have the most influence in deforestation location (Figure 14) by comparison with areas converted for deforestation between 2000 and 2010. The method used to estimate the importance of independent variables was developed by Sangermano et al (2010) comparing standard deviation of independent variables inside and outside deforestation areas. The result is a value that varies between 0 and 1 (Relevance Weight) in which the values closer to zero present low importance and the values closer to 1 present high importance. Analyzing Figure 14 one can notice that the deforestation location is more strongly associated with the old deforestation (accumulated deforestation), secondary roads and accessibility of village. The three least influent variables for deforestation are: water precipitation, accessibility to main roads and community. Further details on these variables will be presented in Section 4, Item 4.2.1.

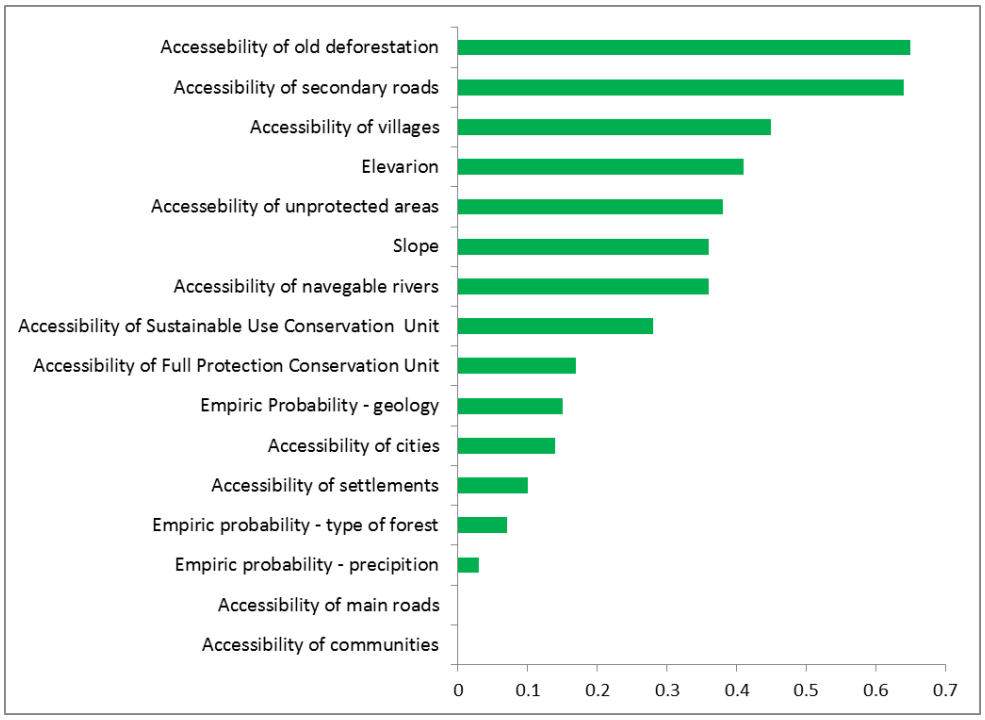

Figure 14. Relevance weight of independent variables analyzed regarding the location of new deforestation spots.

(3.3 VM0015) Identification of underlying causes of deforestation

As observed by Geist and Lambin (2002), deforestation of tropical forest in several regions of the planet is a complex phenomenon and its underlying causes stem from several factors acting directly and indirectly. In the Brazilian Amazon the initial causes of deforestation are connected to occupation policies and infrastructure investments started in the 60s. As a consequence of these policies, occurred what became known as the first phase of region colonization, which can be identified by the implementation of large projects subsidized by the Brazilian government with the opening of roadways, projects of colonization, cattle raising and agriculture, such as the Jari Project itself idealized by Daniel Ludwig in 1967. More recently it is possible to observe another phase in the use of the region resources where government incentives to occupation have been replaced by agriculture and cattle raising (CGEE, 2011). The main underlying cause of deforestation in the Valley of Jari is linked to actions associated to land speculation, invasion of land, lack of public policies and sustainable alternatives to these activities of exploitation and degradation of forest resources that significantly contributes to the deforestation scenario created by deforestation agents in the last years. The future trend of these underlying causes of deforestation tend to remain as observed in the historical period analyzed if it does not occur a greater performance of institutions such as Fundação Jari (to promote sustainable alternatives) or the Jari Celulose land surveillance and security team (to constrain land speculation and invasion of land).

(3.4 VM0015) Analysis of chain of events leading to deforestation

Most of the deforestation occurred in the Amazon region is related to the implementation of large infrastructure projects, population migration, settlements and activities related to agriculture and cattle raising. It is possible to notice that in recent years there has been an increase in diffuse deforestation, usually caused by squatters located in areas outside the "Deforestation Arc" as observed in the Valley of Jari. Throughout the years this diffuse deforestation pattern of the squatters can evolve to linear patterns (deforestation along roads and road branches) which will consolidate into large spots of deforested areas (Gavlak, 2011). The demand for more forest areas is mainly related to small scale agriculture and grazing areas. Together with these types of land use, the deforestation occurred in the last 10 years in the reference region are mainly connected with spatial characteristics such as accessibility to roads and road branches, and to consolidated old deforestation areas. Besides these drivers, several other subjacent causes related to political, economic and social issues determine the amount of pressure over the forest cover in the region, leading to an oscillation of the annual deforestation rates without a clear definition on how they determine such variation. Considering that the population in the reference region will increase, especially due to the construction of Santo Antônio hydroelectric station and the increase in BR 156 traffic flow, there will be increased pressure on the area forest cover. Such pressure process over the forest cover can already be observed in the deforestation taking place since 2000 (Figure 11).

(3.5 VM0015) Conclusion

Based on historical deforestation and its environmental and economic characteristics it is possible to find conclusive evidence that the relationship between agents, drivers and underlying causes of deforestation can explain the pressure over the forest cover in the Jari/Amapá REDD+ Project area and the reference region. The main hypothesis is that agents and drivers of deforestation may increase as a result of a possible population increase in the reference region due to migration processes, land speculation and invasion, intensifying the demand for forested areas in the region. Thus, future trend for baseline estimates is that deforestation rate in the reference region will increase. Therefore, the Jari/Amapá REDD+ Project is going to play a decisive role in the containment of deforestation in the area.

(Step 4 VM0015) Projection of future deforestation

The reference region has one single stratum with static limit as the characteristics of deforestation agents, drivers and causes are the same for the entire area analyzed.

(4.1.1 VM0015) Selection of baseline approach

The deforestation rates measured in historical period (Figure 13) did not reveal a clear trend (to decrease, remain constant or increase).

Additional analysis of agents and drivers were carried under Step 3 of the methodology VM0015 through literature review and experts consultation to find conclusive evidence that explain the different historical deforestation rates, as described below.

As shown in picture 13 of the PD historical deforestation rate does not reveal any clear trend (to decrease, remain constant or increase) to be used within future projections. Based on methodology VM0015 an additional analysis to explain the relationship of agents, drivers and underlying causes and different historical deforestation rates was necessary through literature review, experts consultation and further field surveys. Once a wide range of literature approaching those topics on the specific reference region was not fully available, several experts and people with "field knowledge" were consulted aiming to build the following, more complete, analysis (please, see the provided file "Documentation of the Interviews").

The relevant period begins in 2000 when Grupo Jari (former Grupo Orsa) acquired a relevant portion of the Valley of Jari restructuring it both economic and socially. More literature review (Claro, 2008; Greissing, 2010; Santos, 2010; SFB & IMAZON, 2010; ICCO, BOP & Grupo Orsa, 2010) confirmed that squatters generally coming from different communities settled in the Valley of Jari (Amapá and Pará) becoming deforestation agents. They had the most important role on the deforestation dynamics in the region since 1980 as better described in PD's sections 2.4 and 2.5. They formed new rural communities by cleaning forested areas for agriculture, cattle ranching or merely land speculation.

By comparing figure 13 with these new analyses, literature review and interviews it was not possible to explain the effect of agents and drivers on historical deforestation rates in every single year of the period. Instead, the analysis is more coherent when dividing the role period in following "sub-periods": 2000 to 2003, 2004 to 2006, 2007 to 2008 and 2009 to 2010, as better explained below:

- 2000 to 2003: Grupo Orsa takes control of the Jari Project in 2000 buying it from BNDES. The presence of Projeto Jari's new administration did not change the region's main economic activities in first moment (2000 and 2001) (ICCO, BOP & Grupo Orsa, 2010). *Eucalyptus*, "caulim" and pulp production were the three main economic activities. Deforestation rates remained the same since those activities were not strongly competing with the natural forest. When Grupo Orsa fully assumed control of the area (2002 to 2003) by consolidating their physical presence, improving management processes, and intensifying supervision and land monitoring, deforestation rates actually went down as can

be observed at that respective sub-period (Claro, 2008 and Praxedes, personal communication also provided).

- 2004 to 2006: In this sub-period Orsa Florestal starts its forest management activity in Pará and achieves FSC certification (Claro, 2008). However, this new activity altered the economic and land use dynamics in the area as migration increased. Opportunities were created through new employments causing more pressure on the natural resources as economic growth demanded more agriculture products. On top of that, land speculation increased as more people "cleaned" forest to prove "tenure" before "Orsa Florestal". Also, forest management requires opening routes and infrastructures facilities, easing access to squatters (one of the most typical scenarios of deforestation). All of these factors combined resulted in the first "boom" of deforestation rate in 2004. 2005 and 2006 it is observed a decrease of the deforestation rate that could be explained by the effectiveness of the implementation of the National Plan of Prevention and Control of Deforestation on the Legal Amazon (IMAZON & SFB, 2010; Fundo Amazônia, 2010).
- 2007 and 2008: The second "boom" of deforestation rate in the region occurred in 2007. In Amapá it was a reflection of the land tenure negotiation signed on the second semester of 2006 between Jari and Amapá Government, when land speculation and forest cleaning arouse from those who aimed to "concretize" tenure of their lands before de regularization (please, see the provided "Cooperation Term", "Commitment Term" and "Intentions Protoco"). In Pará, the intensification of grazing was the main driver of deforestation (Praxedes, personal communication also provided), specially observed within the region of "Estrada Nova" community (Greissing, 2010).
- 2009 to 2010: This sub period started with 48% decrease of deforestation in 2009 compared with 2008 for the whole Amazonia as a result of intense governmental oversight (Brasil Government, 2010; Costa, 2010; Froufe & Nossa, 2009). Additionally, 2009 reflects the global crises of 2008 strongly affecting Grupo Orsa's activities in the region and consequently decelerating the local economy, reducing the demand for new areas for agriculture and cattle (Amapá Government, 2011; Piteira, 2009). 2010 is the beginning of a new era of increased pressure on the forests led by governmental approval of new infrastructures projects in the region, e.g. Santo Antonio do Jari Hydroelectric Dam, Jurupari-Oriximiná transmission line and the pavement of highway BR-156 (ICCO, BOP, Grupo Orsa, 2010; please, see also documentation supporting NIR 2012.68). All these projects reheated local economy through employments opportunities putting more pressure over natural resources.

Therefore, conclusive evidences emerge from the analysis of agents and drivers explaining the different historical deforestation rates in different sub-periods in the analyzed historical period, as described above. Thus, as indicated in the Step 4.1.1, approach "a" (historical average) was selected, as no variables can be used to project the deforestation rate (approach "c" - modeling).

(4.1.2 VM0015) Quantitative Projection of future deforestation

(4.1.2.1 VM0015) Projection annual areas of baseline deforestation in the reference region

The historical average approach to project the annual areas of baseline deforestation in the reference region was used. The annual baseline deforestation area at year t within the reference region was calculated as indicated in the equation 3 of VM0015 version 1.1:

$$ABSLRR_{i,t} = ARR_{i,t-1} * RBSLRR_{i,t}$$

Where:

$ABSLRR_{i,t}$: Annual area of baseline deforestation in stratum i within the reference region at year t; ha yr^{-1};

$ARR_{i,t-1}$: Area with forest cover in stratum i within the reference region at year t-1: ha

$RBSLRR_{i,t}$: Deforestation rate applicable to stratum i within the reference region at year t %;

t: 1, 2, 3 … T, a year of the proposed project crediting period; dimensionless;

i: 1, 2, 3 … IRR, a stratum within the reference region; dimensionless.

The area with forest cover within the reference region at year 2010 (ARR) was 1,019,306 hectars. The deforestation rate measured between 2000 and 2010 (RBSLRR) was calculated as indicated by Puyravaud (2003), and a value of 0.269% was obtained.

Deforestation values projected for the period are presented in Table 22.

Table 22. Annual and cumulative deforestation for the reference region up to 2040.

Project year	$ABSLRR_{i,t}$	Cumulative ABSLRR	$ARR_{i,t-1}$
2011	2,742	2,742	1,016,564
2012	2,735	5,477	1,013,830
2013	2,727	8,204	1,011,102
2014	2,720	10,924	1,008,382
2015	2,713	13,636	1,005,670
2016	2,705	16,341	1,002,965
2017	2,698	19,039	1,000,267
2018	2,691	21,730	997,576
2019	2,683	24,414	994,892
2020	2,676	27,090	992,216
2021	2,669	29,759	989,547
2022	2,662	32,421	986,885
2023	2,655	35,076	984,231
2024	2,648	37,723	981,583
2025	2,640	40,364	978,942
2026	2,633	42,997	976,309
2027	2,626	45,623	973,683
2028	2,619	48,242	971,064
2029	2,612	50,855	968,451
2030	2,605	53,460	965,846
2031	2,598	56,058	963,248
2032	2,591	58,649	960,657
2033	2,584	61,233	958,073
2034	2,577	63,810	955,496
2035	2,570	66,381	952,925
2036	2,563	68,944	950,362
2037	2,556	71,501	947,805
2038	2,550	74,050	945,256
2039	2,543	76,593	942,713
2040	2,536	79,129	940,177

(4.1.2.2 VM0015) Projection of the annual areas of baseline deforestation in the Project area and leakage belt

For baseline estimate in the Project area and in the leakage belt it was used the spatially projected deforestation for the entire reference region produced in step 4.2.4 of Methodology VM0015.

(4.1.3.3 VM0015) Summary of step 4.1.3

In this section, values of projected future deforestation for the 2011-2040 period in the reference region (Table 23) in the Project area (Table 24) and leakage belt (Table 25) are presented.

Table 23. Baseline annual deforestation areas in the reference region. (Table 9.a of Methodology VM0015).

Project year t	Stratum *i* in the reference region 1 $ABSLRR_{i,t}$ ha	Total	
		annual $ABSLRR_t$ ha	cumulative ABSLRR ha
2011	2,742	2,742	2,742
2012	2,735	2,735	5,477
2013	2,727	2,727	8,204
2014	2,720	2,720	10,924
2015	2,713	2,713	13,636
2016	2,705	2,705	16,341
2017	2,698	2,698	19,039
2018	2,691	2,691	21,730
2019	2,683	2,683	24,414
2020	2,676	2,676	27,090
2021	2,669	2,669	29,759
2022	2,662	2,662	32,421
2023	2,655	2,655	35,076
2024	2,648	2,648	37,723
2025	2,640	2,640	40,364
2026	2,633	2,633	42,997
2027	2,626	2,626	45,623
2028	2,619	2,619	48,242
2029	2,612	2,612	50,855
2030	2,605	2,605	53,460
2031	2,598	2,598	56,058
2032	2,591	2,591	58,649
2033	2,584	2,584	61,233
2034	2,577	2,577	63,810
2035	2,570	2,570	66,381
2036	2,563	2,563	68,944
2037	2,556	2,556	71,501
2038	2,550	2,550	74,050
2039	2,543	2,543	76,593
2040	2,536	2,536	79,129

Table 24. Baseline annual deforestation areas in the Project area. (Table 9.b of Methodology VM0015).

Project year t	Stratum i of the reference region in the project area 1 $ABSLPA_{i,t}$ ha	Total	
		annual $ABSLPA_t$ ha	cumulative ABSLPA ha
2011	601	601	601
2012	570	570	1,171
2013	463	463	1,634
2014	608	608	2,242
2015	847	847	3,089
2016	724	724	3,813
2017	770	770	4,583
2018	747	747	5,330
2019	627	627	5,957
2020	570	570	6,527
2021	598	598	7,125
2022	437	437	7,562
2023	350	350	7,912
2024	310	310	8,222
2025	287	287	8,509
2026	247	247	8,756
2027	248	248	9,004
2028	234	234	9,238
2029	185	185	9,423
2030	177	177	9,600
2031	186	186	9,786
2032	146	146	9,932
2033	167	167	10,099
2034	136	136	10,235
2035	165	165	10,400
2036	143	143	10,543
2037	154	154	10,697
2038	137	137	10,834
2039	115	115	10,949
2040	121	121	11,070

Table 25. Baseline annual deforestation areas in the leakage belt. (Table 9.c of Methodology VM0015).

Project year t	Stratum i of the reference region in leakage belt 1 $ABSLLK_{i,t}$ ha	Total	
		annual $ABSLLK_t$ ha	cumulative ABSLLK ha
2011	772	772	772
2012	1,072	1,072	1,844
2013	763	763	2,607
2014	946	946	3,553
2015	795	795	4,348
2016	719	719	5,067
2017	685	685	5,752
2018	707	707	6,459
2019	747	747	7,206
2020	689	689	7,895
2021	655	655	8,550
2022	515	515	9,065
2023	423	423	9,488
2024	400	400	9,888
2025	347	347	10,235
2026	401	401	10,636
2027	371	371	11,007
2028	362	362	11,369
2029	339	339	11,708
2030	292	292	12,000
2031	307	307	12,307
2032	279	279	12,586
2033	281	281	12,867
2034	300	300	13,167
2035	188	188	13,355
2036	232	232	13,587
2037	228	228	13,815
2038	205	205	14,020
2039	203	203	14,223
2040	177	177	14,400

(4.2 VM0015) Projection of the location of future deforestation

For the determination of the locate of the deforestation in the baseline it was used the Land Change Modeler (LCM), an option of modeling land use and land cover available in the IDRISI Selva software. As indicated in the VM0015 (Step 4.2) the LCM is a model appropriate for modeling the baseline of REDD+ projects. Furthermore, the LCM model is peer-reviewed as the scientific publications of Eastman et al (2005), Fuller et al (2011) e Sangermano et al (2012); it has transparent process for inputs and outputs data and parameters used; it incorporates the use of appropriate data to explain the location of future deforestation as literature on the subject (Barreto et al, 2011; Sangermano et al 2012); and it is subject to statistical assessment of uncertainties (Pontius and Schneider 2001).

Figure 15 presents the flowchart used to spatially model the Jari/Amapá REDD+ Project deforestation. The main steps were: (i) definition of model assumptions; (ii) organization of spatial and non-spatial database; (iii) model calibration and validation; (iv) development of scenarios. In this Project it was used 100x100 meters pixel size, IDRISI format, with a total dimension of 1520 lines per 1679 columns.

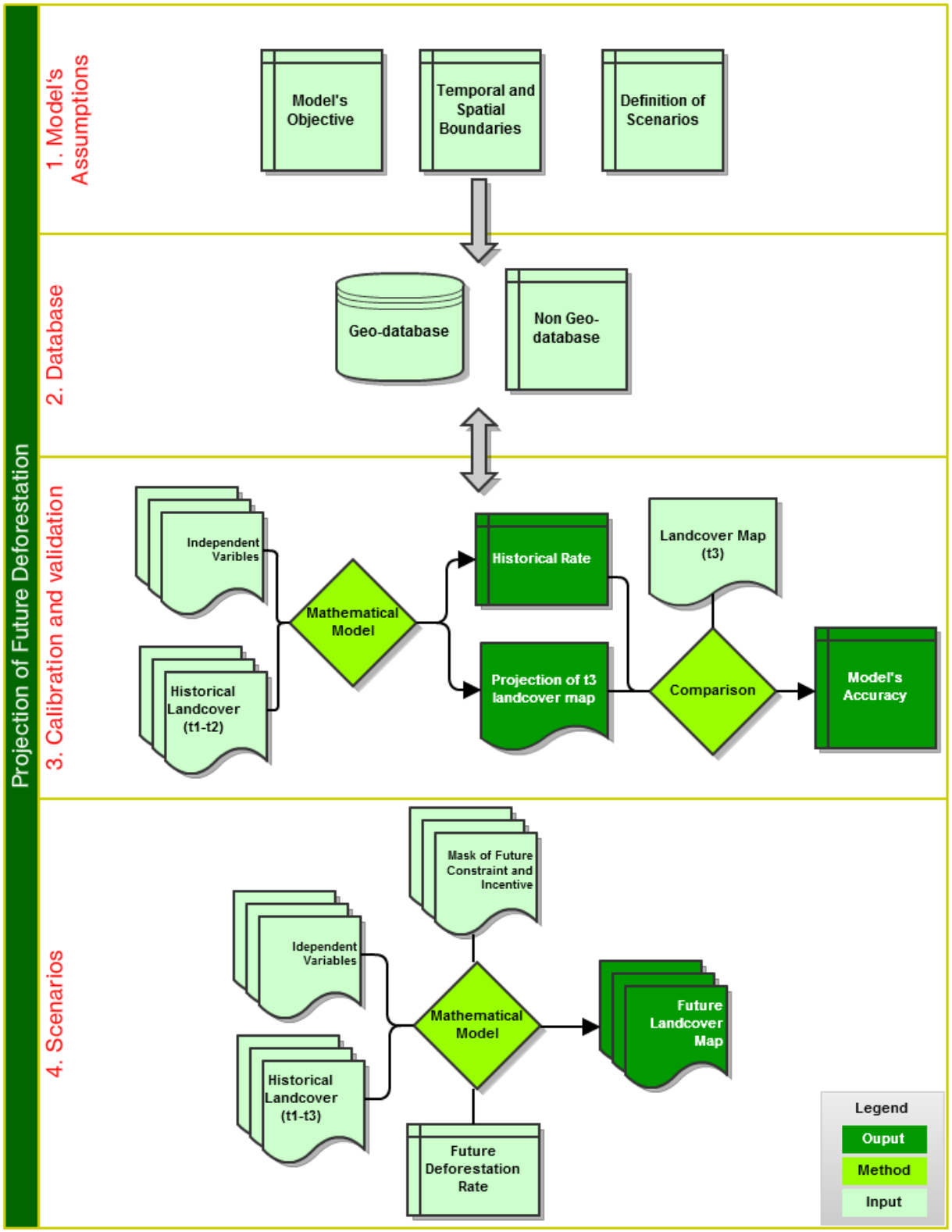

Figure 15. Deforestation projection model flowchart.

(4.2.1 VM0015) Preparation of factor maps

The empiric approach was used to prepare the distance-related factor maps. Several studies show that distance maps of landscape spatial attributes (roads, rivers, settlements, old deforestation, among others) can be used to identify the characteristics of deforestation occurrences. An approach that adapts the distance assumption to generate maps of accesses to the variables in Table 26 was used in the study. Using the COST module of IDRISI Selva software, the driver variable maps were combined with the elevation variance map. For example, the map of the road driver variable was used as point of origin and the elevation variance map as friction surface. The main assumption of this approach was that deforestation tends to occurs in more accessible areas and close to driver variables. For example, deforestations are more likely to happen in a region close to a road of low elevation variance than in a region close to a road on an extremely rugged and rough terrain. The data was organized in a standard IDRISI Selva software digital format.

Table 26. List of maps, variables and map of factors. (Table 10 of Methodology VM0015).

Factor Map		Source	Variable represented		Meaning of the categories or pixel values			Other maps and variables used to create the Factor Map		Algorithm or equation used	Comments
ID	File name		Unit	Description	Range		Meaning	ID	File Name		
1	Accessibility of secondary roads	Imazon	Meters	Accessibility from unofficial roads	0.00	3,652.99	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	Accessibility was calculated considering elevation variance as friction. The higher the variance the lower the accessibility
2	Accessibility of unprotected areas	Imazon	Meters	Accessibility from the limits of unprotected areas	0.00	688.15	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	
3	Accessibility of villages	IBGE	Meters	Accessibility from villages	0.00	5,126.21	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	
4	Elevation	SRTM	Meters	Average elevation from sea level	0.00	679.00	High values mean high elevation				
5	Elevation variance	SRTM	Dimensionless	Elevation standard deviation (3 x 3 window)	0.00	88.13	High values mean high topographic variability	5	Elevation	Filter (IDRISI Selva 17.00)	This map shows the roughness of the terrain.
6	Slope	SRTM	Degrees	Declivity	0.00	136.43	High values mean high declivity	5	Elevation	Surface (IDRISI Selva 17.00)	
7	Accessibility of navigable rivers	IBGE	Meters	Accessibility from navigable rivers	0.00	4.071,45	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	Accessibility was calculated considering elevation variance as friction. The higher the variance the lower the accessibility.
8	Accessibility of Sustainable use Conservation Unit	ICMBio	Meters	Accessibility from the limit of the Sustainable use Conservation Units	0.00	2,838.81	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	

Factor Map		Source	Variable represented		Meaning of the categories or pixel values			Other maps and variables used to create the Factor Map		Algorithm or equation used	Comments
ID	File name		Unit	Description	Range		Meaning	ID	File Name		
9	Accessibility of Full Protection Conservation Unit	ICMBio	Meters	Accessibility from the limit of the Full Protection Conservation Unit	0.00	4,621.63	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	
10	Empiric Probability – Geology	CPRM	Percentage	Empiric probability of deforestation occurrence	0.00	0.68	Values close to 1 mean high probability of deforestation occurrence		Map of change between 2000 and 2010	Map algebra	
11	Accessibility of cities	IBGE	Meters	Accessibility from municipal centers	0.00	5,417.91	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	
12	Accessibility of settlements	INCRA	Meters	Accessibility from the limits of INCRA settlements	0.00	7,746.75	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	
13	Empiric probability - type of forest	IBGE/Sipam	Percentage	Empiric probability of deforestation occurrence	0.00	0.37	Values close to 1 mean high probability of deforestation occurrence		Map of change between 2000 and 2010	Map algebra	
14	Empiric probability - precipitation	TRMM	Percentage	Empiric probability of deforestation occurrence	0.00	0.24	Values close to 1 mean high probability of deforestation occurrence		Map of change between 2000 and 2010	Map algebra	
15	Accessibility of main roads	Imazon	Meters	Accessibility from official roads	0.00	5,708.04	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	Accessibility was calculated considering elevation variance as friction. The higher the variance the lower the accessibility.
16	Accessibility of communities	IBGE	Meters	Accessibility from das communities	0.00	5,244.87	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	

Factor Map		Source	Variable represented		Meaning of the categories or pixel values			Other maps and variables used to create the Factor Map		Algorithm or equation used	Comments
ID	File name		Unit	Description	Range		Meaning	ID	File Name		
17	Accessibility of old deforestation	INPE	Meters	Accessibility from do old deforestation	0.00	3,313.98	Values close to zero mean high accessibility	6	Elevation variance	Cost push (IDRISI Selva 17.00)	

(4.2.2 VM0015) Preparation of deforestation risk maps

Deforestation risk maps show the regions with the minimum (risk = 1) or maximum (risk = 0) conditions for deforestation to occur. The risk maps were prepared using the Land Change Modeler (LCM) module available in the IDRISI Selva software considering all the variables presented in Table 27. The IDRISI Selva has an algorithm called SimWeight to calibrate the model (SANGERMANO et al. 2010). SimWeight stands for Similarity Weight and uses logic K of closer neighborhood to identify the relevance of each variable considered as a driver to forecast the locations with potential to change from forest to anthropic vegetation classes. The logic used by SimWeight consists initially of an analysis of the relevance of each variable for the occurrence of deforestation calculating the importance weight of the variable through the bellow.

Formula to calculate the importance weight of independent variables (PI):

$$PI=1-(DPmudança/DPAreaEstudo)$$

Where:

PI = Importance weight

DPmudança = Standard deviation of the variable driver in the cells/pixels of change

DPAreaEstudo = Standard deviation of the variable driver in the cells/pixels of the entire area of study

After that, SimWeight calculates the deforestation risk combined with the change and persistence cells. For such, only the information on variables above 0.1 were used. This information was combined by the following formula adapted from Sangermano et al. (2010):

Formula to calculate Deforestation Risk:

$$R\ RiscoDesm = \frac{\sum_{i=1}^{c}\left(1.0-\frac{1}{1+e^{\frac{1}{d_i}}}\right)}{k};\ (c\ \leq k)$$

Where:

RiscoDesm = value of risk of occurrence of change varying from 0 (low) to 1 (high)

c = number of cells/pixels of change

d = distance in cells/pixels between change pixels

i = change pixel identifier

k = distance in cells/pixels from the neighbors closer to the change pixel

The result of applying the equation to calculate the deforestation risk is a map of the transition potential that identifies the areas presenting conditions favorable to deforestation in areas classified as forest (Figure 16). This map is the start point for the allocation of future deforestation rates from which annual rates are allocated together with some dynamic variables (see sections 4.2.3 and 4.2.4). An example of dynamic variable is the map of old deforestation accessibility.

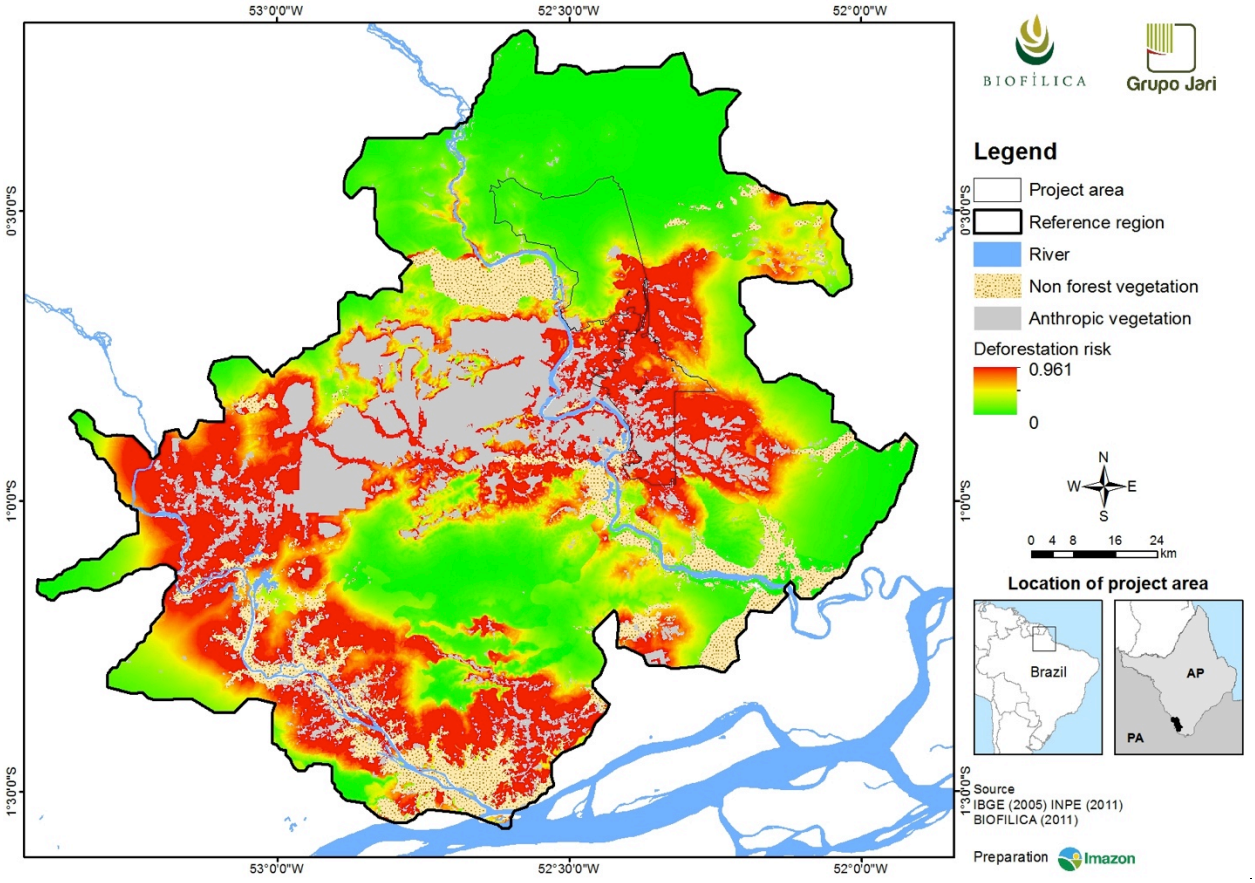

Figure 16. Map of the potential of change from forest to anthropic vegetation (deforestation risk) in the reference region.

(4.2.3 VM0015) Selection of the most accurate deforestation risk map

In order to confirm the quality of the model generated, Option A was chosen – calibration and confirmation using two historical sub-periods – available in the VCS approved methodology VM0015 version 1.1 (page 53). Historical deforestation data from the sub-period encompassing years 2000 to 2005 were used to calibrate the model, whereas 2010 was used for confirmation. In this process, a 2010 map was simulated from historical data of the period 2000 to 2005. Two simulated maps of 2010 were generated: a hard and a soft map (**Figure 1**). The hard map consisted of an estimate of the model to

project cells with more probability of being converted to anthropic vegetation in equilibrium class in 2010 (deforestation). The values in this map are categorical, where each one represents one class (for example, 1 = forest, 2 = non-forest vegetation, 3 = hydrography, 4 = anthropic vegetation in equilibrium). The soft map, is a deforestation risk map with continuous values indicating the areas a higher or lower risk of deforestation in the period, the values vary from 0 (lower risk) to 1 (higher risk).

The technique assessment - Figure of Merit (FOM) - was applied to assess the accuracy of map simulated in 2010. The FOM is a ratio of the intersection of the observed change (change between the reference maps in time 1 and time 2) and the predicted change (change between the reference map in time 1 and simulated map in time 2) to the union of the observed change and the predicted change, as defined in equation 9 of VM0015 version 1.1.

The VM0015 version 1.1 states that the minimum threshold for the best fit as measured by the FOM shall be defined by the net observed change in the reference region for the calibration period of the model. Net observed change shall be calculated as the total area of change being modeled in reference region during the calibration period as percentage of the total area of the reference region, and the FOM value shall be at least equivalent to this value. If the FOM value is below this threshold, the project proponent must demonstrate that at least three models have been tested (resulting at least in three risk maps), and that the one with the best FOM is used.

The threshold value of net observed change in the reference region was 0.01, and the FOM obtained applying the equation 9 of VM0015 version 1.1 was 0.06. As the FOM for the first risk map produced is above the minimum threshold, was not created other two models to execute the mapping of the locations of future deforestation (Step 4.2.4).

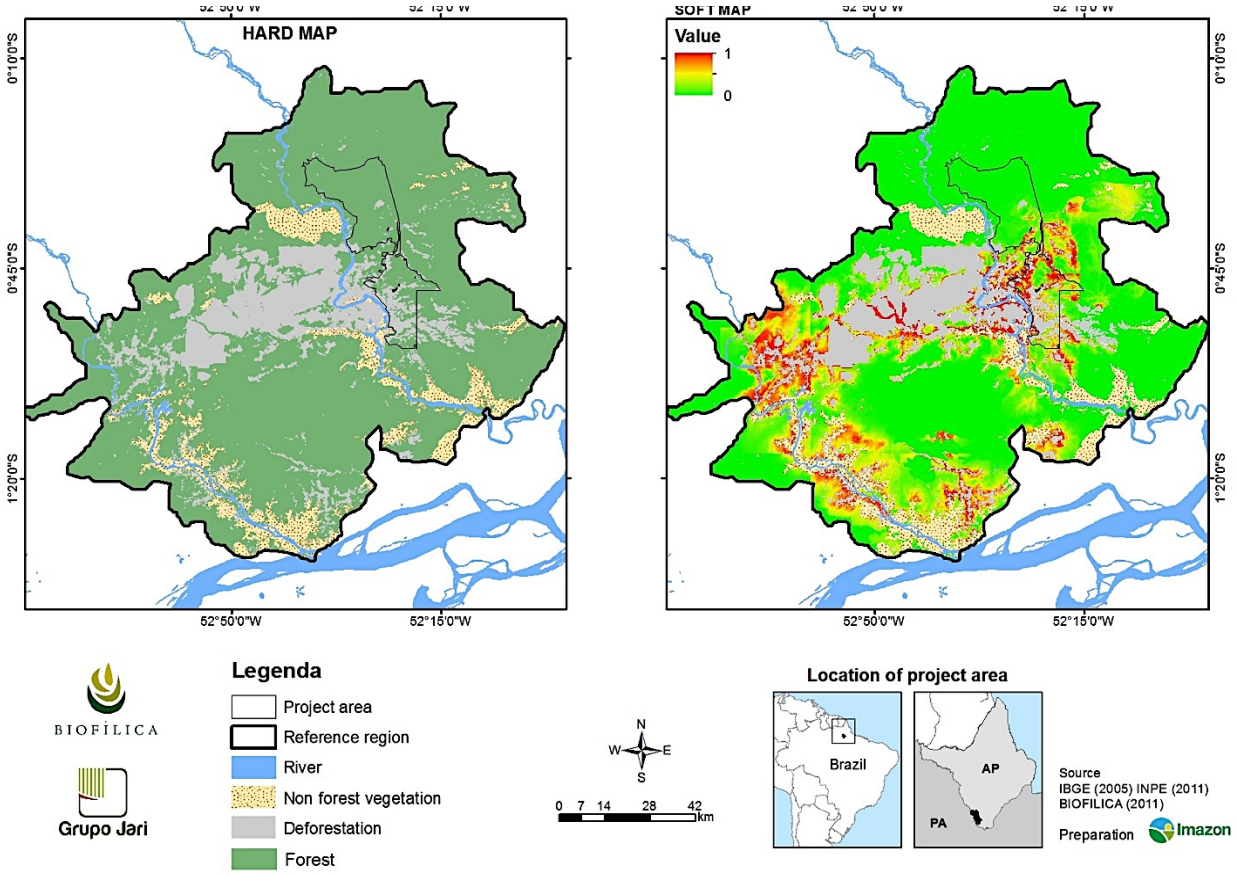

Figure 17. Simulated maps for the year 2010.

The deforestation risk model developed presented overall accuracy statistically acceptable to project the allocation of deforestation up to 2040 in the reference region of the Jari/Amapá REDD+ Project. This result indicates that the projected deforestation occurred in the high risk areas as observed in Figure 18.

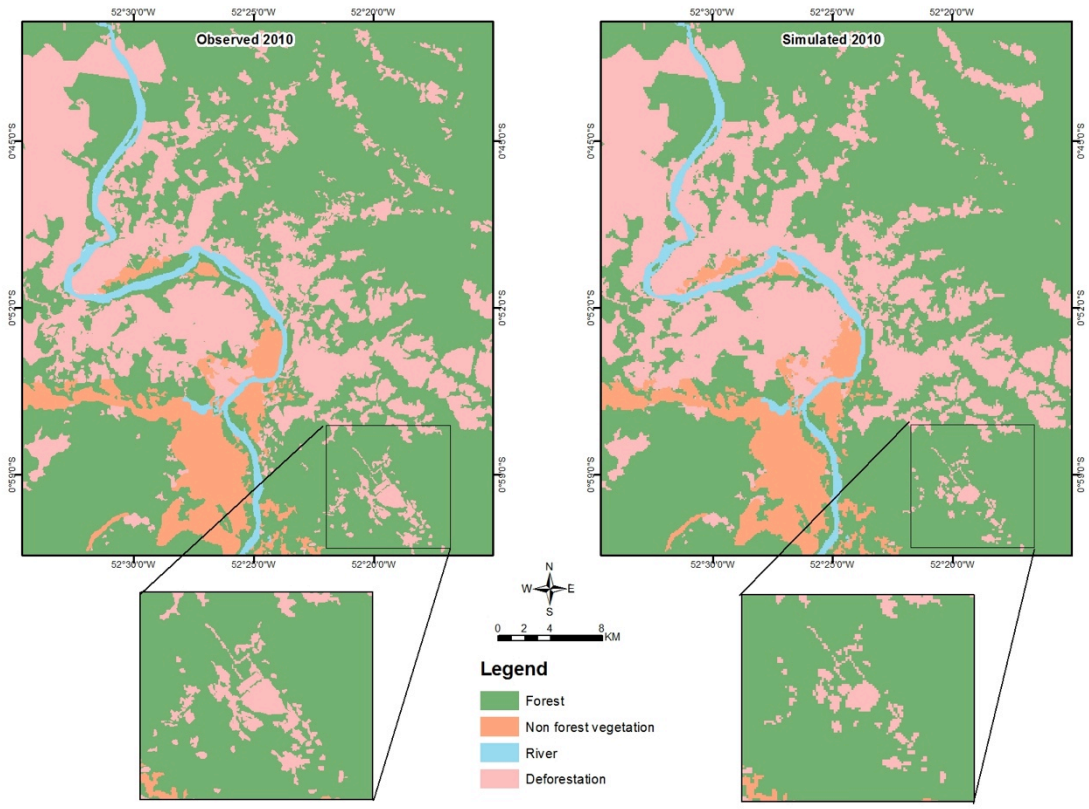

Figure 18. Details of the deforestation map observed and simulated in 2010.

(4.2.4 VM0015) Mapping of the locations of future deforestation

The procedure for selecting pixels with the highest risk of deforestation and the respective maps of baseline future deforestation, was performed automatically (programmed in IDRISI) by the LCM. Thus, using IDRISI Selva LCM module, the location of future deforestation up to 2040 was projected for the entire reference region (Figure19). After the completion the Step 4.2.4 the maps projecting future deforestation in Reference Region were overlaid in IDRISI with the limits of the Project area and leakage belt to quantify the deforestation (Tables 9b and 9c of VM0015). The figure 20 shows the deforestation in Project Area until 2040.

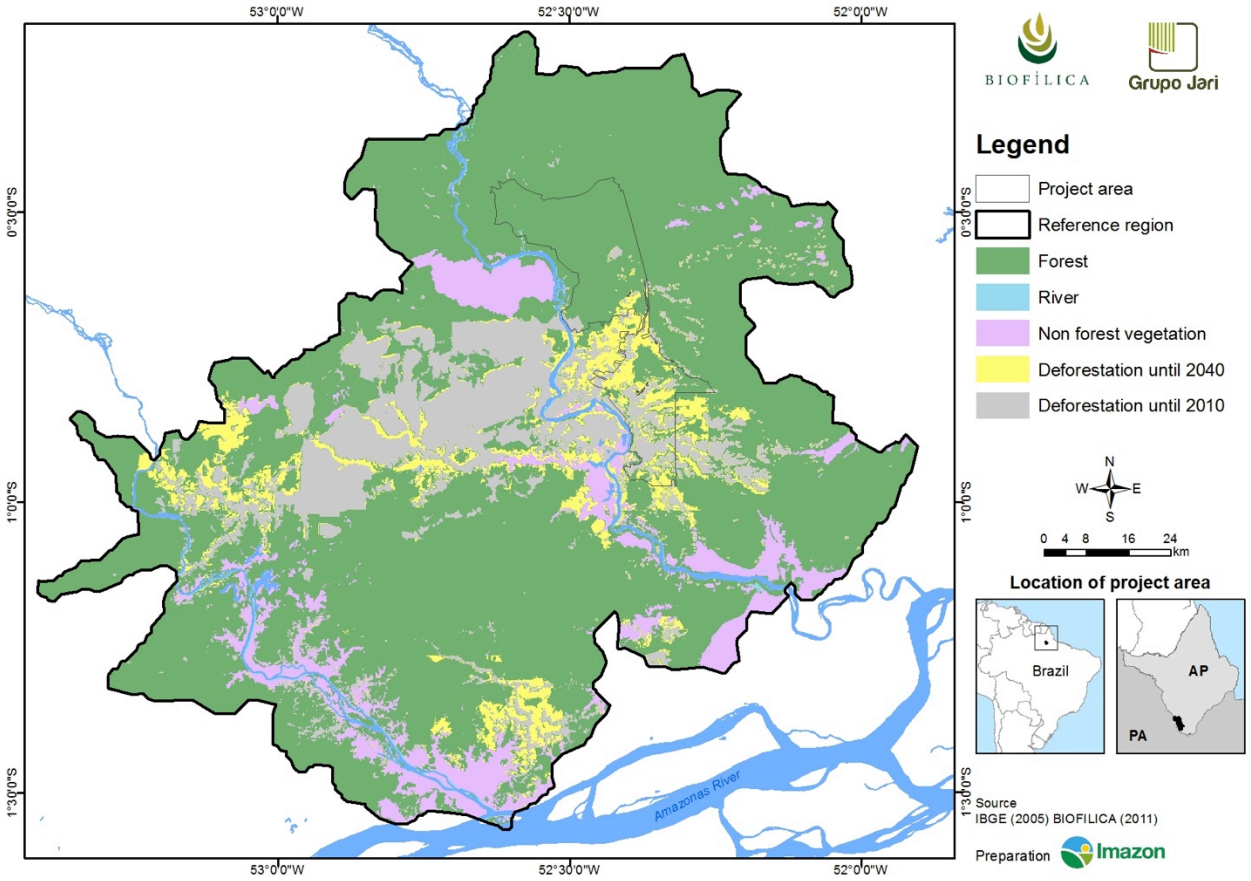

Figure 19. Map of deforestation projection in the Jari/Amapá REDD+ Project area for the year 2040.

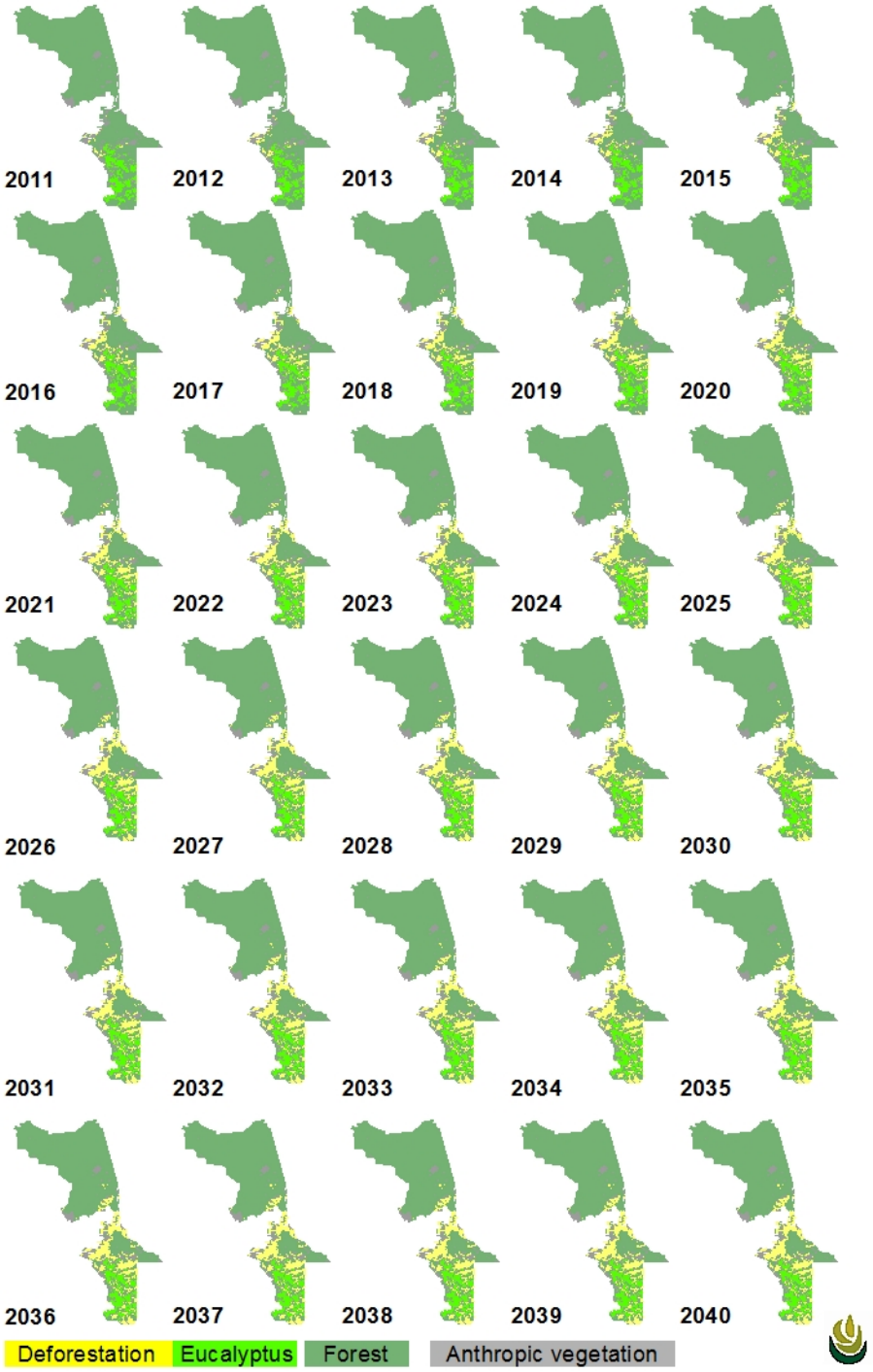

Figure20. Map of annual deforestation projection in the Jari/Amapá REDD+ Project area up to 2040[11].

[11] The Eucalyptus layer refers to the Jari Celulose operation area in the areas classified as anthropic vegetation in the land-use and land-cover mapping.

2.5 Additionality

The additionality of the Project has been analyzed in accordance with VCS-approved "*VT0001 – Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities*", version 3.0, of February 01, 2012.

Tool applicability conditions have been met as:

- The AFOLU activities equal or similar to the activities proposed in the Project, within their limits, certified or not as a VCS AFOLU Project, do not incur in the violation of any applicable law even if the law is not applied; and
- The VM0015 baseline methodology provides a stepwise approach to justify the definition of the determination of the most probable baseline scenario (see "Part 2 - Methodology steps for ex-ante estimation of GHG emissions decreases" of VM0015).

Step 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

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

Among the realistic and credible scenarios for the land use to take place within the limits of the Project, in the absence of the AFOLU Project activity registered in the VCS, the following have been considered:

i) Continuation of the land-use prior to the Project implementation (baseline scenario): deforestation caused by squatters (subsistence farming, small scale agricultural crops, pastures and demarcation of property boundaries). Between 2000 and 2010 36,204 hectares were deforested in the Project reference region for the implementation of these activities (see Section 2, Item 2.4, Step 3). For the next 30 years, a loss of 79,129 hectars has been projected in this scenario, of which 11,070 hectares are to be deforested within the Project area (see Section 2, Item 2.4, Part 2 – Step 4).

ii) Project activity not registered as a VCS AFOLU project: conducting activities of sustainable forest management with an FSC certification and complementary activities to contain and monitor the deforestation caused by the agents of the scenario (i), described in Section 0, and Section 6. For the Project to be effective regarding the deforestation containment and monitoring in the region and local socio economic development, specific investments for such activities will be necessary (specialized professionals, purchasing of satellite images, REDD+ specific technical studies, intensified surveillance and property

security, social activities and alternative income generation and environmental education with the communities located within the Project area or in the surrondings). These are unnecessary investments and usually not made by the certified forest management. Therefore, the economic viability of the management is reduced without the additional revenue from the trading of credits registered on the VCS.

iii) Sustainable Forest Management only, without additional REDD+ activities: conducting FSC-certified forest management activities **without** additional activities with the aim of reducing deforestation, such as, but not limited to, specialized professionals, satellite images acquisition, REDD+ specific technical studies, intensification of property security and land surveillance, social activities and alternative income generation and environmental education with the communities located within the Project area or in the surroundings. The Project area is bordered by one of the largest projects of FSC-certified forest management of native species in the world, also operated by Grupo Jari since 2004 (Figure 21).

The sustainable forest management, notably the certified one, is recognized by many specialists as a tool for forest preservation, forest carbon stock maintenance and decrease in the deforestation rates (PORTER-BOLLAND et al., 2012; UNCED, 1992; VERÍSSIMO et al., 1992; SILVA et al., 1997; UHL et al., 1997; BARRETO et al., 1998; HOLMES et al., 2002 apud SABOGAL et al., 2006; PUTZ et al., 2008; SPATHELF et al., 2004). This happens especially because of the use of low impact techniques, continuous monitoring of the forest and the social and environmental impacts of the operation, physical presence, organization of land ownership and generation of economic value for the forests.

However, the complexity and scale of the operation, added to factors such as bureaucratic constraints and fluctuation in the price of wood due to crisis in the buying markets and exchange rates may turn the activity into a costly and risky one. Thus, the investment in some practices additional to what is required by law and certifying agency is jeopardized or becomes secondary to the need of survival of the operation. Among them, there are activities that are complementary to the operation and specific to effectively contain deforestation and to monitor areas of forest management such as those listed in the scenario (ii).

This way, despite the certified forest management contribution to the forest preservation and carbon stock maintainance, the area is subject to unplanned deforestation and loss of carbon stock due to external agents, even if in smaller quantities and in a more timely manner in relation to areas without management. Besides that, the non-containment of deforestation stimulates local population to perform the expansion of agricultural activities with limited or absent planning and technology and low productivity, resulting in continuous necessity of cutting down the forest in order to maintain its production. On the

other hand, if supported through, e.g. the expansion of Fudanção Orsa activities (described in Section 6.2), the communities would have the opportunity to develop activities economically more feasible without needing to perform clearings in the forest.

Figure 21 illustrates this reality for the areas of certified forest management of Grupo Jari in the state of Pará, a Jari/Amapá REDD+ Project neighbor.

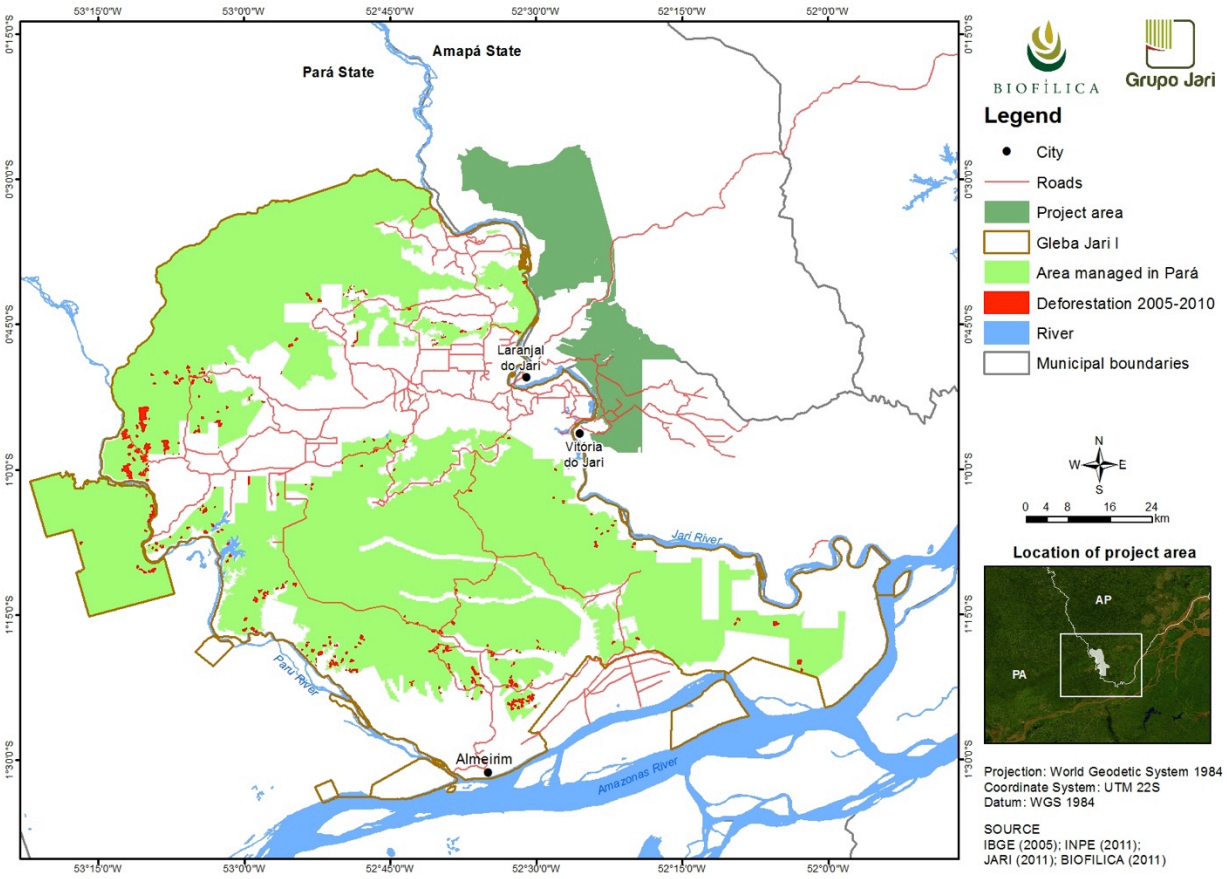

Figure 21. Jari/Amapá REDD+ Project area and its borders with the area managed by Grupo Jari and FSC-certified since 2004 in the state of Pará, with an emphasis on unplanned deforestations caused by external agents despite surveillance, special operations and the physical presence of the Group.

Sub-step 1b. – Credible scenarios of land use consistent with applicable laws and regulations

The practices of the scenario (i) are not in compliance with applicable mandatory legislation and regulations. Such practices occur in a systematic and spread way in the Project region, the Legal Amazon, as it can be seen in Figure 22 below.

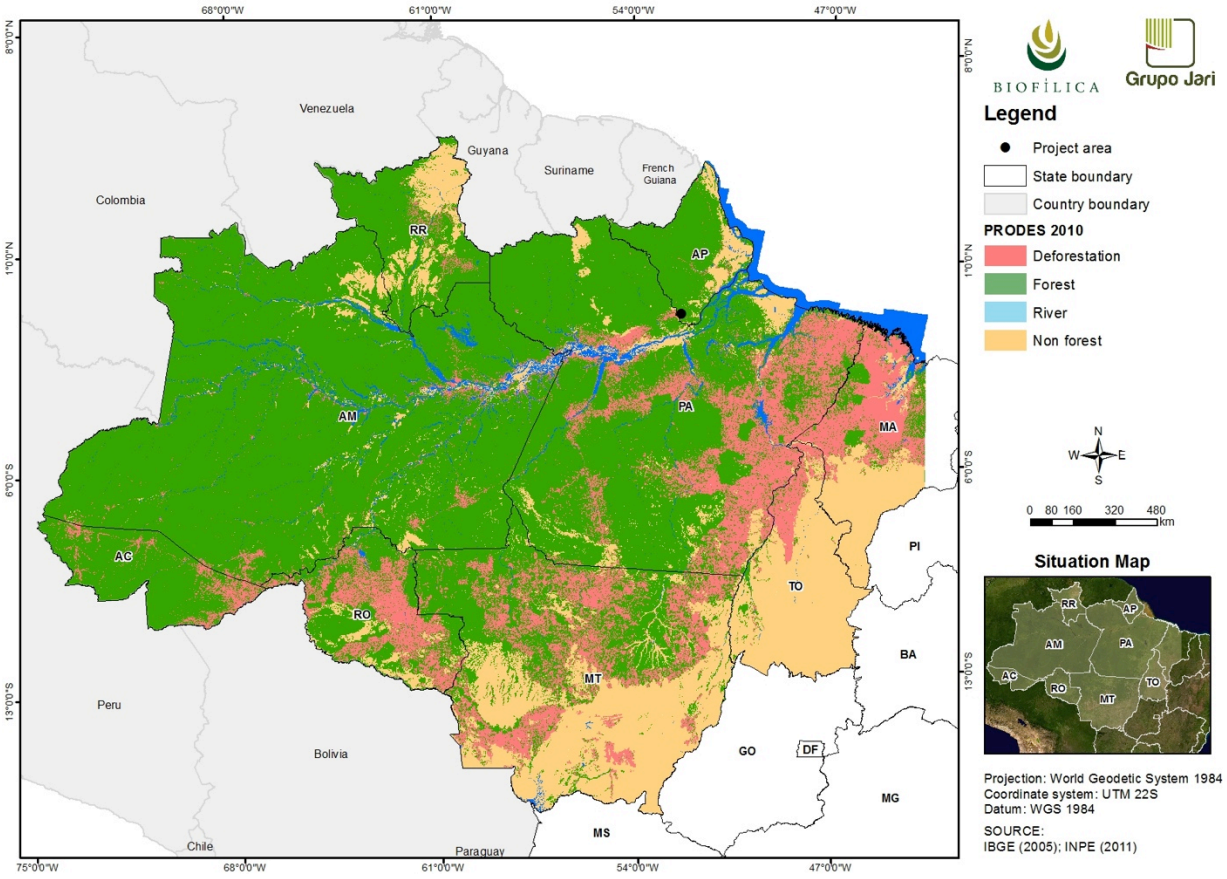

Figure 22. Detected deforestation in Legal Amazon accumulated up to 2010, occurred in a systematic and spread way throughout the region.

According to Higuchi et al. (2009) from 1997 to 2003 the authorized/unauthorized deforestation rate was 19%, that is, from all deforestation carried in the Brazilian Amazon, 81% was not authorized by Public entities.

Similar situation is also found in the state of Amapá, where illegal deforestation has occurred in all of its municipalities in the period between 2002 and 2009 as show in Figure 23.

In the specific municipalities that encompass the project area (Laranjal do Jari and Vitória do Jari) 100% of all deforestation monitored in the period was unauthorized.

Serrano and Souza (2012) state that such scenario is the reflection of the historic process of occupation of the state that remains until present, where unused lands belonging to the State (terras devolutas) were deforested and occupied by people aiming to establish possession, leading to a disorganized settling.

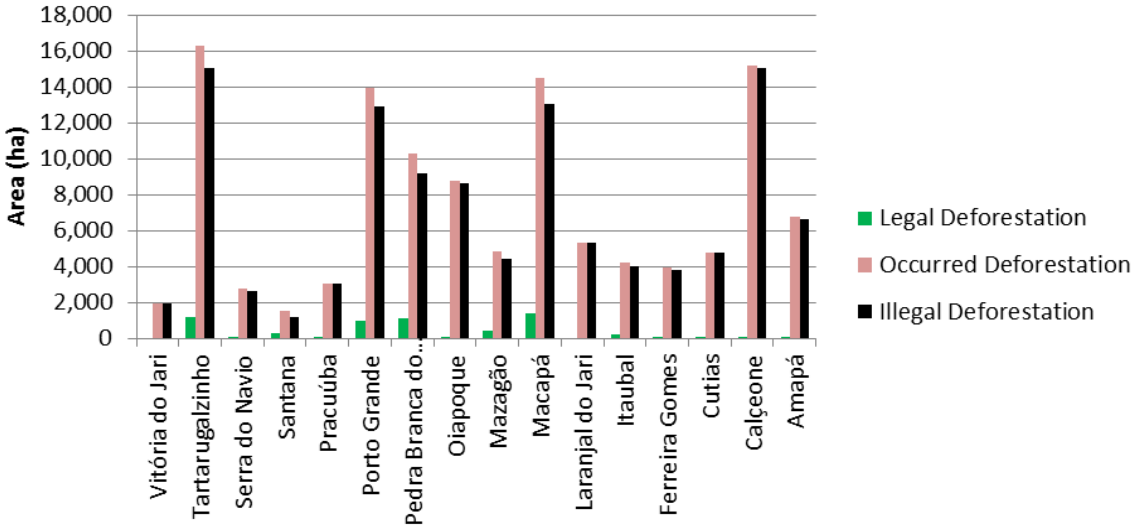

Figure 23. Authorized vs. Unauthorized deforestation in municipalities of Amapá between 2002 and 2009. Source: IBAMA apud GTPPCDAP (2010) and INPE (2011).

With the purpose of avoiding this contibued possession regimen and, at the same time, occupy unused public lands, the Brazilian State created the so-called Lands Law (Lei de Terras), Law # 601/1850, the first of several other regulations created with the same goal to either privatize lands or turning them into protected areas. However, not different from other Brazilian states, conflicts related to land concentration, poverty, misery and rural exodus took place (SERRANO E SOUZA, 2012). In addition, land tenure insecurity turned into a big issue, since squatters would invade private lands, alleging they belong to the state, situation commonly found in the Brazilian Amazon until present.

Table 27 shows the high percentage of lands in Amapá with uncertain use or ownership, as 42% are not registered in private ownership and not protected.

Table 27. Profile of land ownership in the Amazon, 2000.

	Type of Ownership			Type of Land Use (1996)		
State	Private	Protected	Other*	Pasture	Forest	Other
Acre	22%	36%	43%	19%	75%	6%
Amapá	5%	53%	42%	35%	59%	6%
Amazonas	2%	34%	64%	16%	72%	12%
Maranhão	38%	11%	51%	42%	39%	19%
Mato Grosso	55%	15%	30%	43%	46%	11%
Pará	18%	28%	54%	33%	58%	9%
Rondônia	38%	45%	17%	33%	60%	7%
Roraima	13%	51%	36%	52%	37%	11%
Tocantins	61%	12%	27%	66%	26%	8%

Source: Seneca e WRI, 2004 apud Lentini, et al., 2003

According to Imazon data, deforestation in the Amazon occurs mostly in the land category the Project area is inserted (private, squatter and unclaimed). Between February, 2011 and February, 2012, the monthly deforestation average in this category was of 63.7% in relation to the total deforestation occurred in the period (based on data by HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2011; HAYASHI et al., 2012).

Government agencies in both state and federal levels have limited options to enforce compliance with laws and regulations that were issued to prevent deforestation. According to Imazon (2009) using data from the Office of Attorney – General of National Treasury, only 26 out of 48 IBAMA's needed prosecutors within region were hired, indicating a deficit of 54%. This limited number of prosecutors and inefficient allocation of their time leads to inadequate identification and location of infractions by Sicafi[12], which then leads to non-compliance with deadlines[13].

More astonishing is the fact that when people or companies are incriminated of environmental crime impunity reigns. According to a report by the Brazilian Court of Audit (TCU), from all the fines issued by IBAMA for environmental crimes only than 0.6% was actually collected.

Scenarios (ii) and (iii) are in compliance with all applicable legal and regulatory requirements as shown in Section 0, Item 1.11.

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

Described in Section 2 – Application of Methodology, Item 2.4 Baseline Scenario.

Step 2. Investment Analysis

Sub-step 2a. – Determining appropriate analysis method

As the Project generates financial benefits besides the revenue related to credits registered in the VCS through the trade of FSC-certified tropical wood, an investment comparative analysis (Option II) of the alternative scenarios was used to determine the Project additionality. Scenarios (ii) and (iii) have been analyzed since this analysis does not apply to scenario (i).

[12] Sicafi – System of Cadastre, Collection and Fiscalization – is IBAMA's system for cadaster, collection and fiscalization of environmental crimes.

[13] If the State fails in complying the deadlines for enforcement of laws and regulations, the public powers loses the right of punishing the infractor, even if accused guilty (Art. 109 do Código Penal Brasileiro – Decreto-Lei nº. 2.848/1940).

Sub-step 2b. – Option II. Applying investment comparative analysis

The Net Present Value (NPV) has been selected as a financial indicator for the comparative analysis of alternative scenarios. The NPV is one of the methods mostly used by companies to assess projects and it has the following advantages over other indicators: (i) takes into consideration the time value of money; (ii) the NPV can be added; and (iii) they depend only on the cash flow and cost of capital (LEMES JÚNIOR et al., 2005).

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

A summary of the revenue and expenses sources considered in the analysis is presented in Table 28 and Table 29. See Section 1, item 0, for the description of forest management operation activities (FSC-certified Management activities) and additional activities that increase the effectiveness in containing deforestation in the Project area (REDD+ activities).

Table 28. A summary of the revenue and expenses sources considered in the Project investment comparative analysis.

Scenario	Expenses	Revenue
(ii) FSC-certified forest management, **with** complementary deforestation containment and monitoring activities	FSC Management + REDD Additional Activities	Trading of FSC-certified tropical wood
(iii) FSC-certified forest management **without** complementary deforestation containment and monitoring activities	FSC Management	Trading of FSC-certified tropical wood

Table 29. Assumptions considered to determine Project's cash flows.

Activity	Cash flow stream	Item	Values	Timeframe	Observations
FSC Management	Revenues	Logs volume (m3)	76.000	2015 - 2040	FSC management actually starts in 2014 with half of the estimated operational volume. From 2015 on it reaches maturity
		Price of logs (R$/m3)	225,00	2014 - 2040	
	Costs	Operational leasing (R$/m3)	37,00	2014 - 2040	Orsa Florestal manages the area owned by Jari under a Operational Leasing contract. The contracted price is regularly reviewed by a third party report on the asset's market value
		Production costs (R$/m3)	146,00	2014 - 2040	Sum up of the following costs: Inventories and Planning, Infrastructure and Handling Logs
	Expenses	Administrative (R$/ year)	600.000	2014 - 2040	Maintenance of office and administrative headcount
	Taxes	PIS e COFINS (% gross revenue)	9,25%	2014 - 2040	Taxation over gross revenues
		IR e CSSL (% earnings)	15%	2014 - 2040	Taxation over earnings before taxes
	Investments	Working capital (R$)	1.761.000	2013 only	Up front capital invested in order to start operations, before the first income stream
		Other (R$)	1.000.000	2013 only	Pre-operational assessments and diagnostics
REDD Activities	Costs	Project planning (R$)	20.053	2011 - 2012	Initial planning activities
		Socioeconomic & environmental assessment (R$)	138.404	2011	Initial social, economic and environmental diagnostic
		Carbon assessments (R$)	100.083	2011 - 2012	Initial social, economic and environmental assessment
		Socieconomic & environmental and Carbon monitoring (R$)	65.000 yearly plus 50.000 every 5 years	2011 - 2040	Recurrent social, economic and environmental monitoring
		Validation and verification (R$)	120.000 every 2 years	2011 - 2040	Recurrent auditing process
		Quality management and control (R$/ year)	43.650	2012 - 2040	Internal verification of ongoing activities and results
		Project planning and coordination (R$/ year)	84.000	2012 - 2040	Recurrent engagement of stakeholders to review planning and coordinate activities, including logistics expenses
		Stakeholder's engagement - logistics (R$)	10.052	2011	Kick-off meeting and workshop
		Social activities (R$/ year)	105.000	2013 - 2040	Social activities and engagement through Fundação Orsa's implementation
	Expenses	Selling, General & Administrative (R$ / year)	30.000	2011 - 2040	Biofílica's headcount and administrative expenses allocated to the Project

Each scenario free cash flow is composed considering the sources described on Table 28. The assumptions provided on Table 29 are valid to all scenarios, including a real discount rate of 20%. Such a discount rate reflects Orsa's and Biofilica's managerial critical parameter to determine the follow on with a new project/ investment.

The analysis revealed a negative NPV of R$ 802,000 for scenario (ii) and a positive NPV of R$1,025,000.00 for scenario (iii). Thus it becomes evident that the containment of deforestation and monitoring forest management additional activities jeopardize the financial viability of the Project if there is no additional revenue such as the one resulting from the trading of credits registered in the VCS.

The conclusion, therefore, is that scenario (iii) shows the better financial indicator and that the VCS AFOLU Project without the financial benefit of the credits registered in the VCS are not the most attractive financial scenario.

Sub-step 2d. Sensitivity Analysis

Table 30 shows critical assumptions of scenarios (ii) and (iii) as well as their variations considered reasonable, and used here in this sensitivity analysis (Perspective 1: pessimistic variations and Perspective 2: optimistic variations). The base values are those considered for the NPV found in Sub-step 2c.

Table 30. Critical premises for scenarios (ii) and (iii) and their variations used in the sensitivity analysis.

Scenario	Assumptions	Perspective	
		1 – Pessimistic	2 – Optimistic
(ii) FSC-certified forest management, **with** complementary deforestation containment and monitoring activities	a. Harvest Volume	60% of base value	100% of base value
	b. Log average price	80% of base value	120% of base value
	c. Cost of REDD+ activities	120% of base value	80% of base value
(iii) FSC-certified forest management **without** complementary deforestation containment and monitoring activities	a. Harvest Volume	60% of base value	100% of base value
	b. Log average price	80% of base value	120% of base value

For Perspective 1, both scenarios presented a negative NPV – scenario (ii) of R$6,939 million, and scenario (iii) of R$ 4,746 million, while for Perspective 2 NPVs were of R$ 6,457 million and R$ 7,919 million for scenarios (ii) and (iii) respectively. Thus, for both scenarios of critical assumptions variation, scenario (iii) presents better financial outcome.

Thus, the conclusion that the VCS AFOLU Project without the financial benefits of the credits registered in the VCS cannot be considered the most financially attractive scenario, even with reasonable variations of critical assumptions.

Financial models used in the analysis of Sub-steps 2c and 2d are available for the validation/verification bodies.

Step 4. Common Practice Analysis

Jari/Amapá REDD+ Project's activities implemented in Amapá are similar to those implemented by Grupo Jari in the neighboring state of Pará, for the following reasons:

- The ownership structure of lands in Pará is identical to the ownership structure of the Project Area, both were acquired at the same time.
- FSC-certified forest management is expected to be implemented in Amapá as it is currently happening in Pará;
- Fundação Jari is present and operational in both States.

However, there are five essential distinctions them:

1. Scale and scope of Grupo Jari's operations.

Jari Celulose, which belongs to the same economic group as Jari Florestal, owns 1.3 million hectares of continuous lands in the Valley of Jari encompassing areas in both Amapá and Pará States. Despite 19% of the area is located in the State of Amapá, the economic activities have an uneven distribution, where the vast majority of the operations are carried out in Pará area, which comprises *Eucalyptus* plantation, a pulp plant and sustainable forest management.

2. Institutional Landscape

Although 75% of the state of Amapá is constituted of forests with high valued logs, the participation of the state in the wood market is very timid, contributing with only 0,7% of total wood market and 0,5% of processed wood in the Legal Amazon. In 2009 all the 48 wood industries in the state consumed around 94,000 m^3 of logs (PINTO; AMARAL; AMARAL, 2011). In contrast, Pará state harvested in the same year 11,3 million cubic meters of logs, resulting in 4,25 million cubic meter of processed wood in the 534 sawmills in the state (VERÍSSIMO; LIMA; LENTINI, 2002).

Pará's positioning in relation to Amapá is not different when it comes to Sustainable Forest Management: in 2012 seven authorizations for Sustainabe Forest Management Plans (PMFS) were issued by Amapá's competent environmental body – IMAP –, totaling around 15 thousand cubic meters of wood amenable for harvesting (SEMA-AP, 2012), while in Pará the number of authorizations were as high as 226 for the same period, enabling over 4 million cubic meter of logs to be sustainably harvested (SEMA-PA, 2012). Similar scenario is observed for Communities Sustainable Forest Management Plans, where Pará has approved 48 plans against only four in Amapá (PINTO; AMARAL; AMARAL, 2011).

Amapá's low market share in the wood market is a result of several issues that individually or in conjunction underpin investments. According to Imazon (1998) and Consufor (2010) there are a number of actions and policies that could dramatically change this business environment encouraging investors, communities and other stakeholders to engage in the forestry sector boosting Amapá's industry in an organized and sustainable manner. They include:

1. Definition of a forestry zoning
2. Resolution of land tenure uncertainties
3. Strengthening of command and control agencies
4. Clarification of the roles and responsibilities of government bodies
5. Development and clarification of the yet existent regulation for the sector

Delays in the issuance of licenses, authorization and other required documents to operate legally, as well as unclear roles and responsibilitiesof the state bodies, who also lack of funds for processing such documents, lead investors, communities and families to disconsider sustainable forest management as a feasible option for their lands. For instance, such delays lead Jari Florestal to postpond the start of the sustainable forest management operations and replan the schedule for its lands in Amapá (see box below).

In addition, laws and regulations for the wood industry in Amapá are too complex, often overlapping powers and duties among several regulatory and command and control agencies result in counterproductive restrictions and inertia (IMAP, 2012). In the meanwhile, the neighboring state of Pará makes available information and publishes guidelines in order to ease and expedite such process (SEMA-PA, 2010), motivating the entrepreneurs and boosting its industry.

Jari Celulose has been attempting to register its lands in the so-called Rural and Environmetal Cadastre (Cadastro Ambiental Rural, CAR) in Amapá. However, the Istitute of Environment and Territorial Planning (IMAP) claimed lack of funds for proceeding with the request (see document AMAPA_Juridico_CAR_oficio_resposta.pdf), precluding the company to obtain other licenses and documents, and hindering obtaining financing from banks and other financial institutions.

In addition, Jari Florestal, seeking to obtain the Previous Authorization for the Sustainable Management Plan (APAT), essential for obtaining other authorizations for the operation of the Sustainable Forest Managemnt, was indicated by the competent body itself – the Environmental State Secretariat (SEMA) – that the entity was not able to proceed with such request (see document AMAPA_Juridico_APAT_DOC 077-11-ORSA-IBAMA-AP-APAT.pdf), what implies in the company's inability to start the forest management in its lands im Amapá.

On the other hand, the company has been operating the Sustainable Forest Management in Pará since 2003, evidencing smoother process for licensing the activity in that state.

3. Amapá's lack of Forest Management Tradition

Shortage of skilled labor in the industry, a reflection of a lack of forestry educational institutions, is also a challenge for the forest sector in the state of Amapá (AMAPÁ, 2009). While Pará state counts with five undergraduate Forestry courses (Universidade Federal do Pará, created in 2009, Universidade Federal Rural da Amazônia, create in 1977, Universidade do Estado do Pará, Universidade de Tecnologia da Amazônia and Universidade Federal do Oeste do Pará, as well as other important educational and research institutes on forestry, such as Instituto do Homem e Meio Ambiente da Amazônia (Imazon), Instituto Floresta Tropical (IFT), Embrapa Amazônia Oriental and others, Amapá has only two undergraduate courses: i) Instituto Macapaense do Melhor Ensino Superior, which was very recently created and, therefore, has not graduated any students yet; and ii) Universidade do Estado do Amapá. Veríssimo et al. (1999) pointed out that the need to develop new forestry schools and institutions as a way to overcome such lack of labor and develop the forest industry. Unfortunately, current situation remains the same if not worst.

Distance to consumer market is also pointed as a bottleneck for the sector in the Brazilian Amazon. While Pará consumed the majority amount of logs produced in the region, totaling over 6 million cubic meters (CONSUFOR, 2010) (Figure). Amapá was responsible for only 94,000 m^3 of logs (PINTO; AMARAL; AMARAL, 2011). Veríssimo et al. (1999) suggest that the supports from the government of Amapá for initiatives of manufacturing high-end furniture, which could represent an important source of resources for the region.

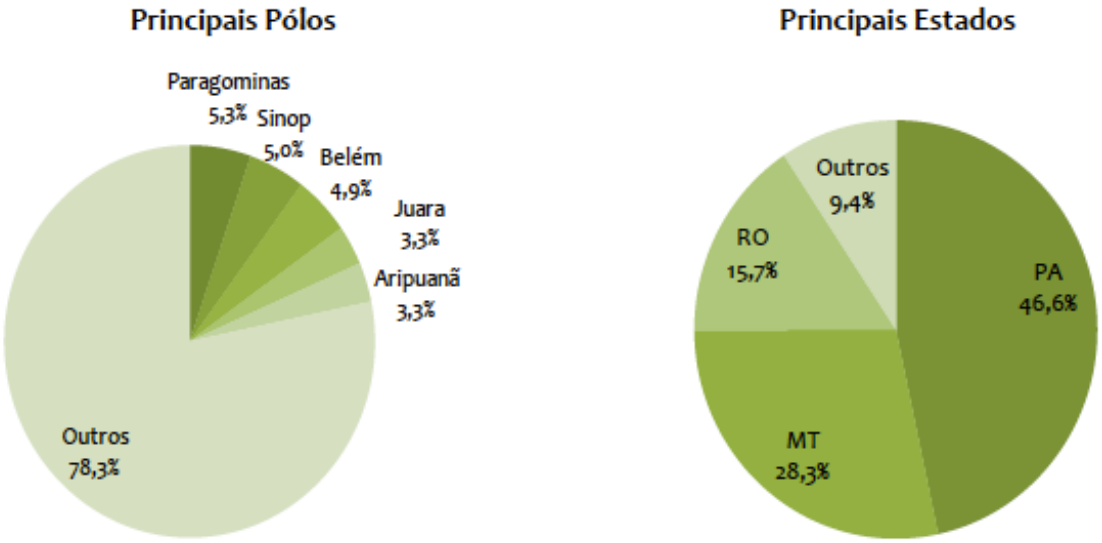

Figure 24. Main consumer centers and states of logs (2009)
Source: Consufor (2010) apud Imazon, SFB.

4. Fundação Jari's operational focus

Fundação Jari is the project's partner for the social activities. With its stated mission "to promote a comprehensive training of children and adolescents found at personal and social risk situation" (FUNDAÇÃO JARI, 2011), Fundação Jari is involved in promoting Valley of Jari's local population's welfare since the year of 2000.

Funding to Fundação is originated by Grupo Jari, which allocates 1% of its gross revenues to the Foundation. Other entities, such as GIZ, Banco do Brasil, SEBRAE, and others also contribute by investing in specific projects and programs implemented by the Foundation.

Althought Fundação Jari also takes into account the environmental benefits a project can bring to the region, its activities are designed with the focus on the "economic development, social development and management", objectives which were emphasized on Fundação Jari's technical restructuring in 2010 (FUNDAÇÃO JARI, 2011).

Nevertheless, with the establishement of a partnership between the Project proponents and Fundação Jari for the Jari/Amapá REDD+ Project, the experience of Fundação Jari on social activities gain a new purpose and are specifically applied to achieve the goal of reducing deforestation, which is driven by Biofilica´s coordination, expertise and effort, activities which count in fact with an earmarked budget. Hence, Jari/Amapá REDD+ Project activities have a different designed and approach from the ones already implemented by Fundação Jari in the state of Pará.

5. Fundação Jari's geographical focus

Fundação Jari has involved in the promotion of social and economic development in the Valley of Jari in the past thirteen years. But it's geographical focus is determined according to Group Orsa's operations, resulting in a far greater attention to Pará, in detriment of Amapa's severe social issues, as shown in Table 31 below.

The prioritization of Pará state over Amapá is regarded to Fundação Jari's criteria for selecting locations to receive investments (document called "Escopo de Atuação da Fundação Jari e o Projeto REDD+ Jari/Amapá", available to validation/verification body) which are in accordance with the National Policy for Social Assistance that typify users and establishes criteria and procedures, services and ways of accessing and attending users, as follows:

- Regions with greater number of communities and more inhabited communities: when implementing a project or program in a more populated location, Fundação Jari optimizes its financial and human resources reaching greater number of people. Furthermore, involving more people from a location for participating in the same projects or programs is a strategy for stablishing social coesion for guaranteed results.

- Local population's social condition: Valley of Jari is a poor region where the population faces difficulties related to access to basic services, such as housing, food, water, sewerage, electricity, education and others. Although such conditions are widespread throughout the region, they are more pronounced in the state of Pará. As per per Projeto de Eletrificação Rural no Vale do Jari, available to validation/verification body, the monthly average income in Pará is lower (R$ 460) than in Amapá (R$ 662) and opportunities for education is also lower in Pará state, since schools in such state only attend elementary level. Because supporting people found in conditions of higher vulnerability is a premise adopted by Fundação Jari, Pará is high priority in receiving social assistance. However, with the partnership between Project proponents and Fundação Jari, rural communities from Amapá, who are also in need for assistance, can be benefited from Project activities.

Table 31. Number of families benefited by Fundação Jari's projects in Pará and Amapá.

	COMMUNITY	ESTATE	TOTAL OF FARMERS ADVISED	DISTANCE FROM MONTE DOURADO TO COMMUNITY (KM)	TIME OF DISPLACEMENT
1	BANANAL	PARÁ	6	25	30 MINUTOS
2	BANDEIRA	PARÁ	18	45	01 HORA
3	BITUBA	PARÁ	3	80	01 HORA E 30 MINUTOS
4	BRAÇO	PARÁ	42	32	30 MINUTOS
5	ENCRUZO	PARÁ	6	88	02 HORAS
6	ESTRADA NOVA	PARÁ	7	75	01 HORA E 30 MINUTOS
7	FREGUESIA	PARÁ	22	80	01 HORA E 30 MINUTOS
8	GOELA	PARÁ	6	85	02 HORAS
9	GUETE	PARÁ	14	98	02 HORAS E 20 MINUTOS
10	KM 22	PARÁ	4	105	02 HORAS E 40 MINUTOS
11	KM 25	PARÁ	6	102	02 HORAS E 30 MINUTOS
12	KM 30	PARÁ	12	97	03 HORAS
13	MONTE SIÃO	PARÁ	9	15	20 MINUTOS
14	NOVA VIDA	PARÁ	5	58	01 HORA E 30 MINUTOS
15	PEDRAL-	PARÁ	14	42	01 HORA
16	PIMENTAL	PARÁ	17	80	01 HORA E 30 MINUTOS
17	RECREIO	PARÁ	4	100	02 HORAS
18	REPARTIMENTO	PARÁ	17	62	01 HORA E 30 MINUTOS
19	SÃO MILITÃO	PARÁ	5	25	30 MINUTOS
20	SERRA GRANDE	PARÁ	6	98	02 HORAS
21	VILA DOS GATO	PARÁ	13	25	40 MINUTOS
22	VILA NOVA	PARÁ	7	60	01 HORA E 20 MINUTOS
23	ARUMANDUBA	PARÁ	42	125	03 HORAS E 30 MINUTOS
24	CAFEZAL	PARÁ	20	120	02 HORAS e 30 minutos (Carro e Rabeta)
25	CATABAÚ	PARÁ	5	124	02 horas E 40 minutos (carro e rabeta)
26	PEDRA BRANCA	PARÁ	5	130	02 horas E 50 minutos (carro e rabeta)
27	BARREIRAS	PARÁ	15	200	06 HORAS (Carro e Voadeira)
28	BURITIZAL	PARÁ	3	90	02 HORAS
29	MAPAÚ	PARÁ	5	95	02 horas e 10 minutos (carro/ voadeira)
30	TINGUELINGUE(SÃO JOÃO)	PARÁ	9	25	40 minutos
31	SANTA MARIA	PARÁ	8	25	01 hora e 30 minutos (carro e rabeta)
32	PANAMINHA	PARÁ	6	90	02 horas e 30 minutos
33	LORAL	PARÁ	8	30	40 minutos

COMMUNITY		ESTATE	TOTAL OF FARMERS ADVISED	DISTANCE FROM MONTE DOURADO TO COMMUNITY (KM)	TIME OF DISPLACEMENT
34	ITANINGA	PARÁ	13	100	03 HORAS (Carro e Rabeta)
35	PADARIA (Laranjal do Jari)	AMAPÁ	24	20	20 MINUTOS (VOADEIRA)
36	ATERRO DO MURIACÁ (Vitoria do Jarì)	AMAPÁ	18	84 KM	01 HORA E MEIA DE CARRO
37	SANTO ANTÔNIO (Laranjal do Jari)	AMAPÁ	16	25	30 MINUTOS (VOADEIRA)
38	TIRA COURO (Laranjal do Jari)-	AMAPÁ	10	15	MEIA HORA CARRO
39	PA CASULO (Laranjal do Jari)	AMAPÁ	12	6	MEIA HORA CARRO
40	ARAPIRANGA (Laranjal do Jari)	AMAPÁ	5	5	01 HORA CARRO
41	RAMAL DO VALDOMIRO (Laranjal do Jari)	AMAPÁ	5	8	MEIA HORA CARRO
42	RAMAL DO JAUARÍ (Laranjal do Jari)	AMAPÁ	5	19	01 HORA CARRO
	TOTAL		**477**		

The analysis of the distinct scenarios between Pará and Amapá states brings the understanding about the barriers Grupo Jari's faces on implementing activities in Amapá, and makes evident the importance of a REDD+ Project for the containement of deforestation and social development in such state.

2.6 Methodology Deviations

The Reference Region does not include a stratum containing an infrastructure similar to Santo Antônio hydroelectric power plant because there is no other similar infrastructure built in the past near to Project Area. This approach is conservative because it does not include in the modeling of the future deforestation the environmental impacts associated to build of hydroelectric dam in the Brazilian Amazon, as per indicated in studies of Barreto et al., (2011) and Fearnside, P.M (2001). The environmental impacts of Santo Antônio hydroelectric power plant in the forest cover of the Reference Region will be checked during the revisiting the baseline projections for future fixed baseline period.

For the execution of the Step 4.2.1 the variables related to distances maps were generated using the Euclidean distance. Categorical variables such as forest type, rainfall and geology were inserted in the LCM using the respective empirical probability (evidence likelihood). This set of factor maps enters in the LCM's processing as a continuous data, and during the generation of risk maps (Step 4.2.2) the LCM model uses this set of continuous data for automatically create classes based on the observed correlations between the deforestation that occurred and the factor maps.This methodology deviation will

result in increased accuracy of the prediction of deforestation because the maps created by the Project are more precise than use predefined classes.

The deforestation risk map, used to implement Step 4.2.4 of the methodology, was modified through analysis of constraint (elevation and units of conservation) and incentive (proximity to hydroelectric dam) for the allocation of further deforestations. The use of incentive and constrains masks represents a deviation from the procedures relating to the way future deforestation are located and results in increased accuracy of the quantification of GHG emission reduction or removals. The use of the incentive mask related to the installation of the Santo Antonio do Jari hydroelectric power plant is a realist approach of how the construction of dams increase the likelihood of deforestation in its surroundings in the Amazon region.

According to Fearnside (1999), Fearnside (2001), Fearnside (2006) and Barreto et. al (2011) the deforestation related to a hydroelectric dam goes widely besides the direct impacts, like the forest loss caused by the area flooded and new areas required to support the project, e.g. access routes, infrastructures and other facilities. But also the dams installed within tropical forests usually drive a consequent deforestation coming from the increase of the economic activity around it, mostly due to the attraction of immigrants, first whom work at the project and land speculators, and later by the demand for rural products and the settlement of farms and ranches. Moreover, there is an additional land demand resulting from the people displaced by the reservoir, that generally will get installed in new areas, close to the dam, and driving more forest loss.

An important highlight is that all the mentioned papers refer to hydroelectric dams in the Brazilian Amazon and to areas with similar characteristics to the reference region, e.g. Belo Monte Dam and Tucuruí Dam. Those two cases are located in Pará state in Brazil, that is the neighboring state of Amapá, where Santo Antonio do Jari is being built, and which includes part of the reference region. Furthermore, all of them have similar land use and land cover, are close to important access routes, for instance highways and waterways, and represent areas with increasing occupation.

The use of the restriction mask related to the location of Conservation Units in the surroundings of the Project Area is a realistic approach on how they decrease the likelihood of occurrence of deforestation in its boundaries. Historic deforestation rate of each of the conservation units were taken into account in order to obtain the most accurate approach.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline emissions

(Step 5 VM0015) Definition of the land-use and land-cover change component of the baseline

(Step 5.1 VM0015) Calculation of baseline activity data per forest class

The result of baseline Projections of the Jari/Amapá REDD+ Project indicates deforestation in approximately 11,070 hectars for Project area between 2011 and 2040 (Table 32) and 14,400 hectars in for the Leakage belt (Table 33) .

Table 32. Annual areas deforested per forest class icl within the project area in the baseline case (baseline activity data per forest class) (Table 11b of Methodology VM0015).

Area deforested per forest class *icl* within the project area		Total baseline deforestation in the project area	
ID_{icl}>	icl1	$ABSLPA_t$	ABSLPA
Name>	Forest	annual	cumulative
Project $year_t$	ha	ha	ha
2011	601	601	601
2012	570	570	1,171
2013	463	463	1,634
2014	608	608	2,242
2015	847	847	3,089
2016	724	724	3,813
2017	770	770	4,583
2018	747	747	5,330
2019	627	627	5,957
2020	570	570	6,527
2021	598	598	7,125
2022	437	437	7,562
2023	350	350	7,912
2024	310	310	8,222
2025	287	287	8,509
2026	247	247	8,756
2027	248	248	9,004
2028	234	234	9,238
2029	185	185	9,423
2030	177	177	9,600
2031	186	186	9,786
2032	146	146	9,932
2033	167	167	10,099
2034	136	136	10,235
2035	165	165	10,400
2036	143	143	10,543
2037	154	154	10,697
2038	137	137	10,834
2039	115	115	10,949
2040	121	121	11,070

Table 33. Annual areas deforested per forest class icl within the leakage belt area in the baseline case (baseline activity data per forest class) (Table 11c of Methodology VM0015).

Area deforested per forest class *icl* within the leakage belt area		Total baseline deforestation in the project area	
ID_{icl}>	icl1	$ABSLPA_t$	ABSLPA
Name>	Forest	annual	cumulative
Project $year_t$	ha	ha	ha
2011	772	772	772
2012	1,072	1,072	1,844
2013	763	763	2,607
2014	946	946	3,553
2015	795	795	4,348
2016	719	719	5,067
2017	685	685	5,752
2018	707	707	6,459
2019	747	747	7,206
2020	689	689	7,895
2021	655	655	8,550
2022	515	515	9,065
2023	423	423	9,488
2024	400	400	9,888
2025	347	347	10,235
2026	401	401	10,636
2027	371	371	11,007
2028	362	362	11,369
2029	339	339	11,708
2030	292	292	12,000
2031	307	307	12,307
2032	279	279	12,586
2033	281	281	12,867
2034	300	300	13,167
2035	188	188	13,355
2036	232	232	13,587
2037	228	228	13,815
2038	205	205	14,020
2039	203	203	14,223
2040	177	177	14,400

(Step 5.2 VM0015) Calculation of baseline activity data per post-deforestation class.

Method 1 available in Methodology VM0015 was used to define the class that will replace the forest cover in the Project baseline (anthropic vegetation in equilibrium). **Table 34** shows the area of zone 1, that encompasses the project area, leakage belt and leakage management areas, and the correspondent area of each post-deforestation LU/LC class.

Table 34. Zone of the reference region encompassing potential post-deforestation LU/LC class.

Zone		Name		Total of all other LU/LC classes presentes in the zone		Total area of each Zone	
		Zona 1					
		ID_{fcl}	1				
IDz	Name	Area ha	% of Zone %	Area ha	% of Zone %	Area ha	% of Zone %
1	Zone 1	124,084	100	25,470	20.53%	124,084	100
Total area of each class *fcl*		124,084	100	25,470	20.53%	124,084	100

The area projected to be deforested is reported in table 13.b (for the project area) and 13.c (for the leakage belt).

Table 35. Annual areas deforested in each zone within the project area in the baseline case. (Table 13b of Methodology VM0015).

Area establiseh after deforestation per zone within the project area		Total baseline deforestation in the project area	
IDz>	1		
Name>	Zone 1	$ABSLPA_t$	ABSLPA
Project year$_t$	ha	ha	ha
2011	601	601	601
2012	570	570	1,171
2013	463	463	1,634
2014	608	608	2,242
2015	847	847	3,089
2016	724	724	3,813
2017	770	770	4,583
2018	747	747	5,330
2019	627	627	5,957
2020	570	570	6,527
2021	598	598	7,125
2022	437	437	7,562
2023	350	350	7,912
2024	310	310	8,222
2025	287	287	8,509
2026	247	247	8,756
2027	248	248	9,004
2028	234	234	9,238
2029	185	185	9,423
2030	177	177	9,600
2031	186	186	9,786
2032	146	146	9,932
2033	167	167	10,099
2034	136	136	10,235
2035	165	165	10,400
2036	143	143	10,543
2037	154	154	10,697
2038	137	137	10,834
2039	115	115	10,949
2040	121	121	11,070

Table 36. Annual areas deforested in each zone within the leakage belt in the baseline case (Table 12c of Methodology VM0015).

Area establiseh after deforestation per zone within the leakage belt		Total baseline deforestation in the leakage belt	
IDz>	1		
Name>	Zone 1	$ABSLLK_t$	ABSLLK
Project year$_t$	ha	ha	ha
2011	772	772	772
2012	1,072	1,072	1,844
2013	763	763	2,607
2014	946	946	3,553
2015	795	795	4,348
2016	719	719	5,067
2017	685	685	5,752
2018	707	707	6,459
2019	747	747	7,206
2020	689	689	7,895
2021	655	655	8,550
2022	515	515	9,065
2023	423	423	9,488
2024	400	400	9,888
2025	347	347	10,235
2026	401	401	10,636
2027	371	371	11,007
2028	362	362	11,369
2029	339	339	11,708
2030	292	292	12,000
2031	307	307	12,307
2032	279	279	12,586
2033	281	281	12,867
2034	300	300	13,167
2035	188	188	13,355
2036	232	232	13,587
2037	228	228	13,815
2038	205	205	14,020
2039	203	203	14,223
2040	177	177	14,400

(Step 5.3 VM0015) Calculation of baseline activity per land-use and land-cover change category

Does not apply as method 02 (Section 5.2) was not carried out.

(Step 6 VM0015) Estimation of baseline carbon stock changes and non-CO_2 emissions

(Step 6.1 VM0015) Estimation of baseline carbon stock changes

Forest class carbon stock estimate was obtained from data from Jari Florestal forest inventory carried out between 2008 and 2010 over a 200 thousand ha area. See below the main carbon stock estimate results (further information in the documents *PMFS– Amapá* and *Estimativa do Estoque de Carbono Florestal na Área do Projeto REDD+ Jari/Amapá*).

(6.1.1 VM0015) Estimation of the average carbon stocks of each land- use and land-cover class

- **Forest class existing within project area and leakage belt:**

The cluster sampling method was used for the forest inventory data collection. The inventory was carried out in 24 cluster distributed over the Project area and reference region (Figure 25).

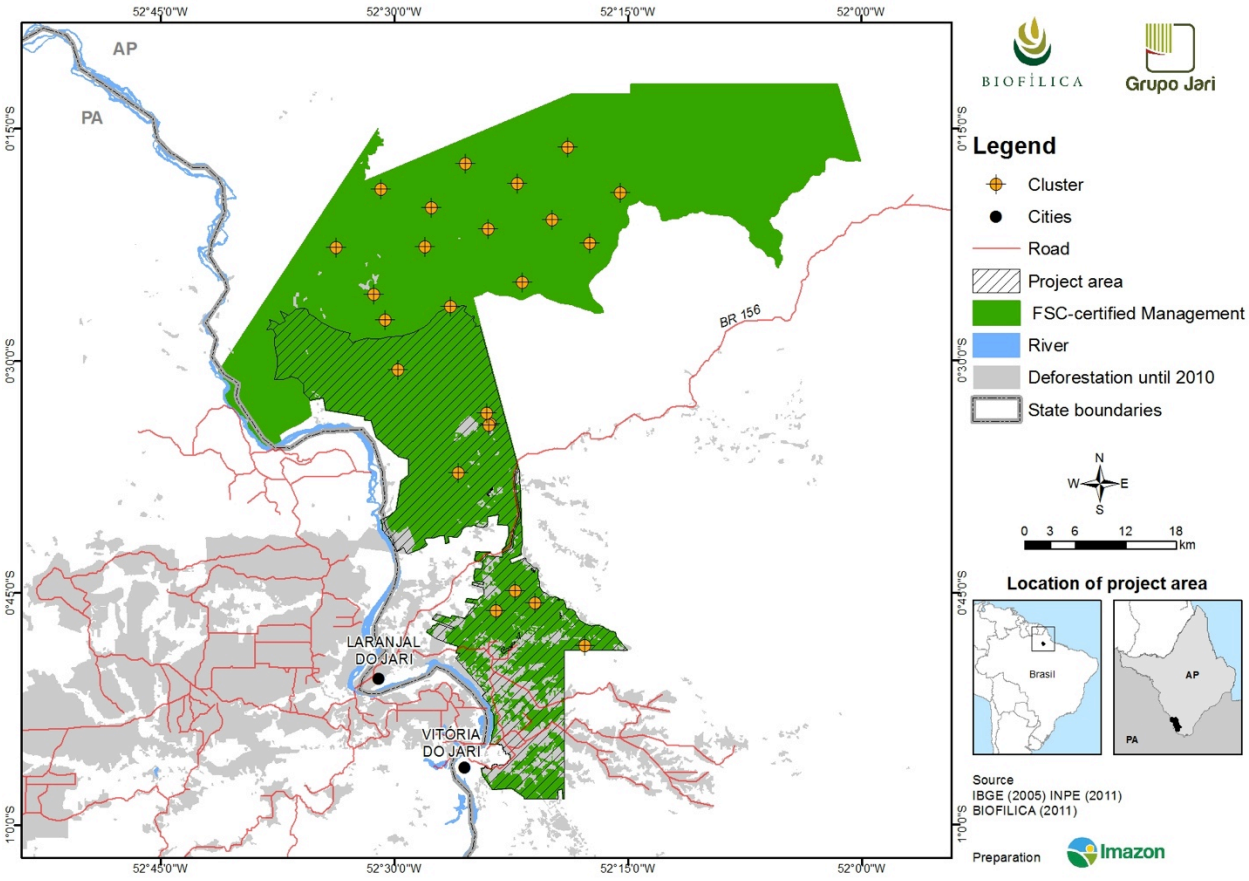

Figure 25. Distribution of forest inventory sampling spots.

Each cluster has a rectangular shape of approximately 6 km x 6 km, with approximately 16 plots disposed in crossed lines from the cluster central coordinate towards north, south, east and west. The plots measure 40 m x 250 m and are located 250 m apart from each other as shown in Figure 26 below.

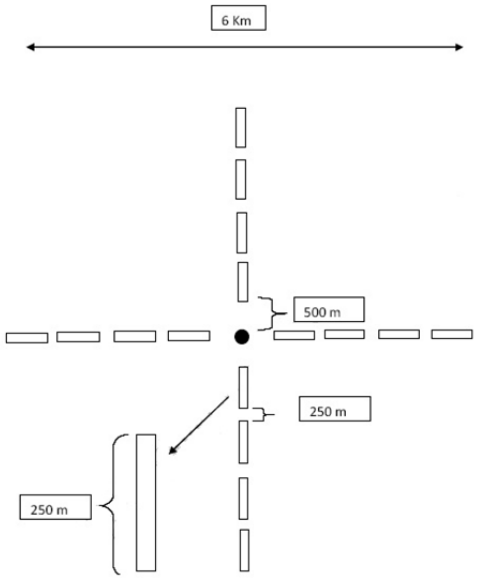

Figure 26. Sketch of the sampling units used in the forest inventory.

All individuals with diameter at breast height (DBH) higher than or equal to 15 cm were measured in each plot. For each registered individual the following variables were identified: species common name, CBH (circumference at breast height – 1.3 m from ground), height and trunk quality class.

The allometric equation $\ln(\mathrm{Pi}) = -1.497 + 2.548 \ln(\mathrm{DBH})$ (HIGUCHI et al., 1998) was used to convert the DBH of individual trees into above-ground fresh biomass of such trees. Dry biomass was obtained by multiplying fresh biomass by 0.5997, obtained by the average of dry/fresh ratio for the crown and bole weighted by the percentage contribution of bole and crown weight to total biomass (HIGUCHI et al., 1998). The below-ground biomass was obtained by adding 25.8% to above-ground biomass of trees with DBH equal to or higher than 15 cm (NOGUEIRA et al., 2008).

The allometric equation developed by Higuchi et al (1998) is appropriate to the Project circumstances because:

- It was obtained from scientific paper published in a recognized peer-reviewed journal (Acta Amazonica);
- The predictor variable used (DAP) is the most commonly used variable for predicting biomass in tree allometric studies in the Amazon forest;
- The model was calibrated using destructive samples and presented an R^2 >0.9, showing good adjustment to tree fresh biomass;
- It has been developed for the Brazilian Amazon, same biome where the Project is located;

- It is appropriate to trees with DBH equal to or higher than 5 cm, that is, it encompasses data collected from forest inventory in the Project Area (DBH equal to or higher than 15 cm);
- It has been used by a recognized research institution to estimate above ground biomass of trees in the National Forest of Caxiuna – FLONA Caxiuana – a Conservation Unit located close to the Project Area (CHAGAS et al, no date).

The default factor of 0.5997 used to convert fresh biomass into dry biomass, is appropriate to the Project circumstances and complies with the requirements of Section 4.5.6 of the VCS Standard because:

- The default factor was obtained by the average of dry/fresh ratio for the crown and bole weighed by the percentage contribution of bole and crown weight to total biomass (HIGUCHI et al., 1998); data were obtained from scientific paper published in a recognized peer-reviewed journal (Acta Amazonica);
- Fresh biomass is broadly used as variable for predicting dry biomass;
- Data were obtained from destructive samples in the the Brazilian Amazon, same biome where the Project is located;

The default factor of 25.8%, as used to estimate belowground biomass, is appropriate to the Project circumstances and complies with the requirements of Section 4.5.6 of the VCS Standard, as follows:

- The factor is publicly available from a reputable and recognized source, as Nogueira et. al, are recognized experts on the subject, and Forest Ecology and Management is a recognized peer reviewed scientific journal.
- The parameter “above-ground biomass” is used to estimate below ground biomass four different studies by appropriately qualified experts who identify the parameter as important driver of the model output variable, as stated in Nogueira et al (2008). Moreover, such parameter is broadly used to estimate below ground biomass.
- Data were obtained from destructive samples in the the Brazilian Amazon, same biome where the Project is located.

Expansion factors were used to include the biomass of trees with DBH lower than 10 cm, palm trees, vines, dead above-ground biomass and non-tree components (NOGUEIRA et al., 2008), as observed in Table 37.

All mentioned expansion factors are appropriate to the Project because:

- Factors were obtained from data published on Forest Ecology and Management, a respected journal;
- Factors were developed based on empirical studies throughout the Amazon, same biome where the Project is located.

Table 37 presents expansion factors adequate to each forest type, as per Nogueira et al. (2008). Biomass values were converted into carbon applying a conversion factor of 48.5% (NOGUEIRA, et al. 2008).

Table 37. Biomass expansion factors per forest type (NOGUEIRA et al., 2008).

Forest Type	*Trees DBH<10cm*	*Palm trees*	*Vines*	*Dead biomass*	*Non-trees components*	*Belowground*	*Total*
Dense Forest	0,065	0,019	0,031	0,137	0,002	0,258	0,512
Non-dense forests	0,040	0,086	0,031	0,137	0,002	0,258	0,554

Carbon content in dry biomass was obtained by multiplying dry biomass per 0.485 (NOGUEIRA et al. 2008). This expansion factor is appropriate to the Project because it was obtained from published paper on Forest Ecology and Management, a recognized journal.

Carbon stock spatial estimate was obtained by geostatistics (SALES et al., 2007) with the use of auxiliary variables such as elevation, type of soil and forest. Carbon stock per hectare varied between 148.7 and 1007 tCO_2e/ha in the Reference Region. Areas with higher biomass values are located to the north of the reference region. Methodological details for the construction of the biomass map can be found in the report: *Estimativa do Estoque de Carbono Florestal na Área do Projeto REDD+ Jari/Amapá.* Table 38 presents average carbon stock values per hectare of all land-use and land-cover classes in the baseline scenario, present in the Project area, leakage belt and leakage management areas.

Table 38. Carbon stocks per hectare of initial forest class icl existing in the project area and leakage belt (Table 15a of Methodology VM0015).

Initial forest class *icl* Name: Forest ID_{icl} 1 Average carbon stock per hectare + 90% CI							
Cab_{icl}		Cbb_{icl}		Cdw_{icl}		$Ctot_{icl}$	
C stock $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 90% CI $tCO_2e\ ha^{-1}$
419.1	9.1	96.0	8.9	51.0	4.7	566.0	17.9

- **Post-deforestation classes projected to exist in the project area and leakage belt in the baseline case and the non-forest classes existing in leakage management areas:**

The methodology VM0015 allows estimates from local studies, and therefore the value of 61.2 tCO2e ha-1 was taken as reference for the carbon stock of the anthropic vegetation in equilibrium class, the class that was projected to exist in the project area and leakage belt in the baseline case. This estimate of carbon stock was obtained by Fearnside (1996) long term study and corresponds to a matrix with the average vegetation composition and its respective carbon stock for deforested forest areas in the Brazilian Amazon. This value is conservative because it represents the average in a landscape at age of equilibrium structure augmented by 30% of the mean value presented in Fearnside (1996)[14].

Fearnside (1996) is a peer-reviewed scientific literature, and represents the only study for the Brazilian Amazon about carbon stock on deforested areas, meeting the requirements of Section 4.5.6 of the VCS Standard:

1. The data not was collected directly from primary sources;

2. The data was collected from secondary sources, produced by INPA's researcher (INPA is a reference institution in Brazil for such subject), published by a recognized and credible international journal (Forest Ecology and Management);

3. Data are from a time period that accurately reflects available current practice in determination carbon stock. This data was accepted by a international journal to estimate the recent emissions of deforestation in peer-reviewed scientific literature (Yanai et al 2012 and Fearnside et al 2009);

4. No samples were applied in these data;

5. The data are publicly available in website: http://philip.inpa.gov.br/publ_livres/LISTAS%20POR%20ASSUNTO-L.htm . Access in January 16, 2013;

6. The data are available for independent evaluation by VCSA and VVB;

7. The data are appropriate to the methodology's geographic scope, since they were developed for the Brazilian Amazon region;

8. Expert judgment was not necessary;

9. The data are not maintained in a central repository.

(6.1.2 VM0015) Calculation of carbon stock change factors

In the baseline scenario the Project considers the change in carbon stock from forest cover replacing for a type of vegetation that can be grazing areas, small scale agricultural plantations or plantations (temporary or permanent). The AFOLU Requirements requires that the decay of carbon stock in soil carbon, below-ground biomass, dead wood and harvested wood products in the baseline case is

[14] Table 4 of peer-reviewed scientific literature Fearnside P.M. (1996)

considered. To calculate this decay of carbon stock, the VM0015 version 1.1 apply a default linear functions to account for the decay of carbon stock in initial forest classes (icl) and increase in carbon stock in post-deforestation classes. Table 39 and Table 40 summarize how carbon stock change factor was calculated.

Table 39. Carbon stock change factors for initial forest classes icl (Method 1) (Table 20a of Methodology VM0015).

Year after deforestation		$\Delta Cab_{icl,t}$	$\Delta Cbb_{icl,t}$	$\Delta Cdw_{icl,t}$	$\Delta Ctot_{cl,t}$
1	t*	419.1	9.6	5.1	433.8
2	t*+1	0	9.6	5.1	14.7
3	t*+2	0	9.6	5.1	14.7
4	t*+3	0	9.6	5.1	14.7
5	t*+4	0	9.6	5.1	14.7
6	t*+5	0	9.6	5.1	14.7
7	t*+6	0	9.6	5.1	14.7
8	t*+7	0	9.6	5.1	14.7
9	t*+8	0	9.6	5.1	14.7
10	t*+9	0	9.6	5.1	14.7
11	t*+10				
12	t*+11				
13	t*+12				
14	t*+13				
15	t*+14				
16	t*+15				
17	t*+16				
18	t*+17				
19	t*+18				
20	t*+19				
21-T	t*+20...				

Table 40. Carbon stock change factors for final classes fcl or zones z (Method 1) (Table 20b of Methodology VM0015).

Year after deforestation		$\Delta Ctot_{fcl,t}$
1	t*	6.1
2	t*+1	6.1
3	t*+2	6.1
4	t*+3	6.1
5	t*+4	6.1
6	t*+5	6.1
7	t*+6	6.1
8	t*+7	6.1
9	t*+8	6.1
10	t*+9	6.1
11	t*+10	0
12	t*+11	0
13	t*+12	0
14	t*+13	0
15	t*+14	0
16	t*+15	0
17	t*+16	0
18	t*+17	0
19	t*+18	0
20	t*+19	0
21-T	t*+20...	

(6.1.3 VM0015) Calculation of baseline carbon stock changes

The Method 1 (activity data are available for classes) was used to calculation the total baseline carbon stock change in the project area (Tables 41) and in the leakage belt (Table 46) at year t following the equation 10 in page 72 of VM0015 version 1.1

Tables 41. Baseline carbon stock change in the project area (Table 21b of Methodology VM0015).

Carbon stock changes per initial forest class *icl*		Total carbon stock change of initial forest class in the project area	
ID_{icl}>	1	$\Delta CBSLPA_{icl,t}$	$\Delta CBSLPA_{icl}$
Name>	Forest	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e
2011	260,731.0	260,731.0	260,731.0
2012	256,111.5	256,111.5	516,842.6
2013	218,065.7	218,065.7	734,908.2
2014	287,772.7	287,772.7	1,022,680.9
2015	400,389.8	400,389.8	1,423,070.7
2016	359,472.0	359,472.0	1,782,542.8
2017	390,064.3	390,064.3	2,172,607.1
2018	391,398.2	391,398.2	2,564,005.3
2019	350,312.9	350,312.9	2,914,318.2
2020	334,795.8	334,795.8	3,249,114.0
2021	346,487.6	346,487.6	3,595,601.6
2022	277,052.5	277,052.5	3,872,654.2
2023	238,927.5	238,927.5	4,111,581.6
2024	217,784.1	217,784.1	4,329,365.7
2025	199,917.0	199,917.0	4,529,282.8
2026	176,144.0	176,144.0	4,705,426.7
2027	168,894.5	168,894.5	4,874,321.2
2028	155,490.1	155,490.1	5,029,811.4
2029	128,459.0	128,459.0	5,158,270.4
2030	119,332.4	119,332.4	5,277,602.8
2031	117,052.0	117,052.0	5,394,654.8
2032	96,011.5	96,011.5	5,490,666.3
2033	102,124.9	102,124.9	5,592,791.2
2034	86,575.5	86,575.5	5,679,366.7
2035	96,938.2	96,938.2	5,776,304.9
2036	86,189.3	86,189.3	5,862,494.1
2037	89,418.9	89,418.9	5,951,913.0
2038	80,868.5	80,868.5	6,032,781.5
2039	70,619.1	70,619.1	6,103,400.6
2040	72,311.2	72,311.2	6,175,711.8

Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in the project area	
ID_{iz}>	1	$\Delta CBSLPA_{z,t}$	$\Delta CBSLPA_{z}$
Name>	Zone 1	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e
2011	3,676.3	3,676.3	3,676.3
2012	7,162.9	7,162.9	10,839.2
2013	9,995.0	9,995.0	20,834.2
2014	13,714.1	13,714.1	34,548.4
2015	18,895.2	18,895.2	53,443.5
2016	23,323.8	23,323.8	76,767.3
2017	28,033.8	28,033.8	104,801.2
2018	32,603.2	32,603.2	137,404.3
2019	36,438.5	36,438.5	173,842.8
2020	39,925.1	39,925.1	213,767.9
2021	39,906.8	39,906.8	253,674.7
2022	39,093.2	39,093.2	292,767.9
2023	38,402.0	38,402.0	331,169.9
2024	36,579.2	36,579.2	367,749.1
2025	33,153.7	33,153.7	400,902.8
2026	30,235.9	30,235.9	431,138.7
2027	27,042.9	27,042.9	458,181.6
2028	23,904.9	23,904.9	482,086.5
2029	21,201.2	21,201.2	503,287.8
2030	18,797.3	18,797.3	522,085.1
2031	16,277.1	16,277.1	538,362.2
2032	14,497.1	14,497.1	552,859.3
2033	13,377.7	13,377.7	566,237.0
2034	12,313.4	12,313.4	578,550.3
2035	11,567.1	11,567.1	590,117.4
2036	10,930.9	10,930.9	601,048.4
2037	10,355.9	10,355.9	611,404.3
2038	9,762.6	9,762.6	621,166.9
2039	9,334.4	9,334.4	630,501.3
2040	8,991.9	8,991.9	639,493.2

Total net carbon stock change of the project area	
$\Delta CBSLPA_{t}$	$\Delta CBSLPA$
annual	cumulative
tCO_2-e	tCO_2-e
257,054.8	257,054.8
248,948.6	506,003.4
208,070.6	714,074.0
274,058.6	988,132.6
381,494.6	1,369,627.2
336,148.2	1,705,775.4
362,030.5	2,067,805.9
358,795.1	2,426,601.0
313,874.4	2,740,475.4
294,870.7	3,035,346.1
306,580.8	3,341,926.9
237,959.3	3,579,886.2
200,525.5	3,780,411.7
181,204.9	3,961,616.6
166,763.3	4,128,380.0
145,908.1	4,274,288.0
141,851.6	4,416,139.6
131,585.2	4,547,724.8
107,257.8	4,654,982.6
100,535.1	4,755,517.8
100,774.9	4,856,292.7
81,514.4	4,937,807.0
88,747.2	5,026,554.3
74,262.1	5,100,816.4
85,371.1	5,186,187.4
75,258.3	5,261,445.8
79,062.9	5,340,508.7
71,105.9	5,411,614.6
61,284.7	5,472,899.3
63,319.4	5,536,218.6

Table 42. Baseline carbon stock change in the leakage belt area (Table 21c of Methodology VM0015).

Carbon stock changes per initial forest class *icl*		Total carbon stock change of initial forest class in the leakage belt area		Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in leakage belt area		Total net carbon stock change of the leakage belt area	
ID_{icl}>	1	$\Delta CBSLLK_{icl,t}$	$\Delta CBSLLK_{icl}$	ID_{iz}>	1	$\Delta CBSLLK_{z,t}$	$\Delta CBSLLK_{z}$	$\Delta CBSLLK_{t}$	$\Delta CBSLLK$
Name>	Forest	annual	cumulative	Name>	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2011	334,915.7	334,915.7	334,915.7	2011	4,722.3	4,722.3	4,722.3	330,193.5	330,193.5
2012	476,405.7	476,405.7	811,321.4	2012	11,279.6	11,279.6	16,001.9	465,126.1	795,319.5
2013	358,101.2	358,101.2	1,169,422.6	2013	15,946.8	15,946.8	31,948.7	342,154.4	1,137,473.9
2014	448,701.0	448,701.0	1,618,123.6	2014	21,733.4	21,733.4	53,682.1	426,967.6	1,564,441.5
2015	397,090.4	397,090.4	2,015,214.0	2015	26,596.4	26,596.4	80,278.4	370,494.1	1,934,935.6
2016	375,798.7	375,798.7	2,391,012.7	2016	30,994.4	30,994.4	111,272.9	344,804.3	2,279,739.9
2017	371,611.2	371,611.2	2,762,624.0	2017	35,184.5	35,184.5	146,457.4	336,426.7	2,616,166.6
2018	391,218.7	391,218.7	3,153,842.7	2018	39,509.2	39,509.2	185,966.5	351,709.5	2,967,876.1
2019	418,958.3	418,958.3	3,572,801.0	2019	44,078.5	44,078.5	230,045.1	374,879.8	3,342,755.9
2020	404,770.3	404,770.3	3,977,571.3	2020	48,293.1	48,293.1	278,338.1	356,477.3	3,699,233.2
2021	388,800.8	388,800.8	4,366,372.1	2021	47,577.4	47,577.4	325,915.5	341,223.4	4,040,456.6
2022	321,938.7	321,938.7	4,688,310.8	2022	44,170.3	44,170.3	370,085.8	277,768.4	4,318,225.0
2023	278,383.1	278,383.1	4,966,693.9	2023	42,090.5	42,090.5	412,176.3	236,292.6	4,554,517.6
2024	260,721.7	260,721.7	5,227,415.7	2024	38,750.7	38,750.7	450,927.0	221,971.1	4,776,488.7
2025	231,925.9	231,925.9	5,459,341.6	2025	36,010.3	36,010.3	486,937.3	195,915.6	4,972,404.4
2026	249,887.7	249,887.7	5,709,229.3	2026	34,065.1	34,065.1	521,002.4	215,822.6	5,188,226.9
2027	232,700.6	232,700.6	5,941,929.9	2027	32,144.4	32,144.4	553,146.8	200,556.2	5,388,783.1
2028	223,860.0	223,860.0	6,165,789.9	2028	30,034.1	30,034.1	583,180.8	193,826.0	5,582,609.1
2029	208,226.0	208,226.0	6,374,015.9	2029	27,538.4	27,538.4	610,719.2	180,687.6	5,763,296.7
2030	182,694.2	182,694.2	6,556,710.2	2030	25,109.9	25,109.9	635,829.2	157,584.3	5,920,881.0
2031	183,868.9	183,868.9	6,740,579.0	2031	22,981.3	22,981.3	658,810.4	160,887.6	6,081,768.6
2032	168,666.0	168,666.0	6,909,245.0	2032	21,537.7	21,537.7	680,348.1	147,128.3	6,228,896.9
2033	167,418.2	167,418.2	7,076,663.2	2033	20,669.1	20,669.1	701,017.1	146,749.1	6,375,646.0
2034	173,912.7	173,912.7	7,250,575.9	2034	20,057.4	20,057.4	721,074.5	153,855.3	6,529,501.3
2035	124,633.4	124,633.4	7,375,209.3	2035	19,084.8	19,084.8	740,159.3	105,548.6	6,635,049.9
2036	140,592.7	140,592.7	7,515,802.0	2036	18,051.0	18,051.0	758,210.3	122,541.7	6,757,591.6
2037	136,815.4	136,815.4	7,652,617.3	2037	17,176.3	17,176.3	775,386.6	119,639.1	6,877,230.7
2038	124,868.7	124,868.7	7,777,486.1	2038	16,215.9	16,215.9	791,602.6	108,652.8	6,985,883.5
2039	122,032.5	122,032.5	7,899,518.6	2039	15,384.0	15,384.0	806,986.6	106,648.4	7,092,531.9
2040	109,445.5	109,445.5	8,008,964.0	2040	14,680.6	14,680.6	821,667.2	94,764.9	7,187,296.8

(Step 6.2 VM0015) Baseline non-CO_2 emissions from forest fires

Non-CO_2 emissions have not been taken into consideration and accounted for in this Project.

3.2 Project Emissions

(Step 7 VM0015) *Ex ante* estimation of actual carbon stock changes and non-CO_2 emissions in the Project area

(Step 7.1 VM0015) *Ex ante* estimation of actual carbon stock changes

(Step 7.1.1 VM0015) *Ex ante* estimation of actual carbon stock changes due to planned activities

Low impact logging for timber activities are planned for the Project area and are to be developed by Jari Florestal; as they follow FCS principles and criteria they do not create large clearings in the forest. As observed by Holmes et al. (2002) less than 10% of skidding trails from reduced impact forest management systems as the FSC-certified forest management caused soil degradation and consequently clearings in the forest canopy. However, there is an estimation of carbon stock decrease due to deforestation for the implementation of infrastructure such as opening of roads or skidding trails and forest patios in each annual production unit (UPA) in the Project area. Table 43 presents an estimate of planned deforestation and the impact on carbon stock in the Project area. Figure 27 presents the location of each UPA in the Jari/Amapá REDD+ Project area and Table 44 contains the deforestation estimate forecast for each UPA. Further information on the estimate of open areas per UPA can be found in the document *Estimativa de abertura de áreas nas UPAs do PMFS do Amapá* made available by the validation body.

Table 43. *Ex ante* estimate of stock decrease due to planned deforestation in the Project area (Table 25a of Methodology VM0015).

Project Year *t*	Areas of planned deforestation x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned deforestation	
	ID_{cl} =	1	annual	cummulative
	$APDPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CPDdPA_t$	$\Delta CPDdPA$
	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2011	0	566.0	0.0	0.0
2012	0	566.0	0.0	0.0
2013	0	566.0	0.0	0.0
2014	49	566.0	27,640.0	27,640.0
2015	87	566.0	49,387.6	77,027.6
2016	83	566.0	47,004.5	124,032.1
2017	88	566.0	49,795.1	173,827.2
2018	73	566.0	41,372.3	215,199.5
2019	77	566.0	43,846.0	259,045.5
2020	82	566.0	46,285.6	305,331.1
2021	0	566.0	0.0	305,331.1
2022	80	566.0	45,436.5	350,767.7
2023	84	566.0	47,406.4	398,174.0
2024	0	566.0	0.0	398,174.0
2025	0	566.0	0.0	398,174.0
2026	0	566.0	0.0	398,174.0
2027	0	566.0	0.0	398,174.0
2028	0	566.0	0.0	398,174.0
2029	0	566.0	0.0	398,174.0
2030	0	566.0	0.0	398,174.0
2031	0	566.0	0.0	398,174.0
2032	0	566.0	0.0	398,174.0
2033	0	566.0	0.0	398,174.0
2034	0	566.0	0.0	398,174.0
2035	0	566.0	0.0	398,174.0
2036	0	566.0	0.0	398,174.0
2037	0	566.0	0.0	398,174.0
2038	0	566.0	0.0	398,174.0
2039	0	566.0	0.0	398,174.0
2040	0	566.0	0.0	398,174.0

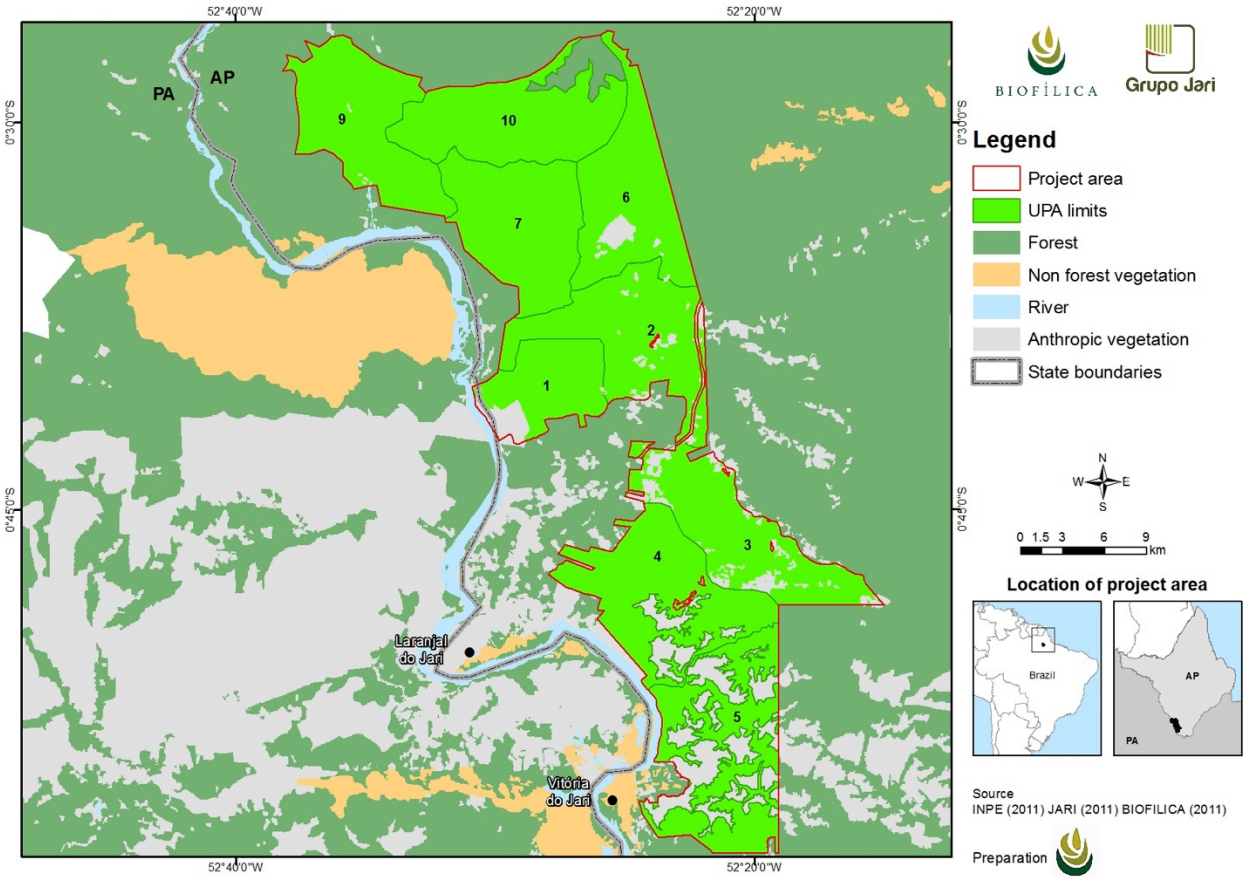

Figure 27. Location of the areas to undergo planned deforestation for the implementation of FSC-certified Management infrastructure.

Table 44. Estimate of forecast deforestation for each UPA.

Year	UPA	Total area (ha)	Open Area Estimate (ha)
2014	1	4,934	49
2015	2	8,816	87
2016	3	8,391	83
2017	4	8,888	88
2018	5	7,385	73
2019	6	7,827	77
2020	7	8,262	82
2022	9	8,111	80
2023	10	8,463	84
Total		**71,078**	**703**

Logging (FSC Management)

FSC Managemnet activities planned by Jari Florestal will be monitored and reported for each verification event. If it is observed a reduction in the carbono stock due to timber removal, Table 25b of the methodology will be filled ex post.

Charcoal production and fuel-wood colection

It is not expected the production of carchoal and fuel-wood colection. If the reduction of carbon stock due to this kind of activity is observed, Table 25c of Methodology VM0015 will be filled up ex post.

Table 45 presents an ex ante estimative of carbon stock decrease due to Jari/Amapá REDD+ Project planned activities.

Table 45. Ex ante estimation of stock decrease due to planned activities in the Project area (Table 25d of Methodology VM0015).

Project Year t	Total carbon stock decrease due to planned deforestation		Total carbon stock decrease due to planned logging activities		Total carbon stock decrease due to planned fuel-wood and charcoal activities		Total carbon stock decrease due to planned activities	
	annual $\Delta CPDdPA_t$ tCO_2e	cumulative $\Delta CPDdPA$ tCO_2e	annual $\Delta CPLdPA_t$ tCO_2e	cumulative $\Delta CPLdPA$ tCO_2e	annual $\Delta CPFdPA_t$ tCO_2e	cumulative $\Delta CPFdPA$ tCO_2e	annual $\Delta CPAdPA_t$ tCO_2e	cumulative $\Delta CPAdPA$ tCO_2e
2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2014	27,640.0	27,640.0	0.0	0.0	0.0	0.0	27,640.0	27,640.0
2015	49,387.6	77,027.6	0.0	0.0	0.0	0.0	49,387.6	77,027.6
2016	47,004.5	124,032.1	0.0	0.0	0.0	0.0	47,004.5	124,032.1
2017	49,795.1	173,827.2	0.0	0.0	0.0	0.0	49,795.1	173,827.2
2018	41,372.3	215,199.5	0.0	0.0	0.0	0.0	41,372.3	215,199.5
2019	43,846.0	259,045.5	0.0	0.0	0.0	0.0	43,846.0	259,045.5
2020	46,285.6	305,331.1	0.0	0.0	0.0	0.0	46,285.6	305,331.1
2021	0.0	305,331.1	0.0	0.0	0.0	0.0	0.0	305,331.1
2022	45,436.5	350,767.7	0.0	0.0	0.0	0.0	45,436.5	350,767.7
2023	47,406.4	398,174.0	0.0	0.0	0.0	0.0	47,406.4	398,174.0
2024	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2025	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2026	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2027	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2028	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2029	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2030	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2031	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2032	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2033	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2034	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2035	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2036	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2037	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2038	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2039	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0
2040	0.0	398,174.0	0.0	0.0	0.0	0.0	0.0	398,174.0

Optional accounting of significant carbon stock increase

Ex ante estimation of carbon stock increase due to regeneration after the FSC-certified management was conservatively omitted.

(Step 7.1.2 VM0015) *Ex ante* estimation of carbon stock changes due to unavoidable unplanned deforestation within the Project area.

Aiming at being conservative, it was assumed that the Project will be able to reduce 50% of the baseline emissions in the first 4 years of the Project implementation (2011, 2012, 2013 and 2014). After this period, considering the start of the FSC Management, an increase in patrolling land surveillance and the implementation of social activities in the local communities, it is expected that the Effectiveness Index

will gradually increase during the following 8 years of the Project, until reaching the value of 90% in year 2022.

(Step 7.1.3 VM0015) *Ex ante* estimated net actual carbon stock changes in the Project area.

Table 46 presents the changes in carbon stock related to planned activities and Project effectiveness.

Table 46. Ex ante estimated net carbon stock change in the project area under the project scenario (Table 27 of Methodology VM0015).

Project Year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual $\Delta CPAdPA_t$ tCO_2e	cumulative $\Delta CPAdPA$ tCO_2e	annual $\Delta CPAiPA_t$ tCO_2e	cumulative $\Delta CPAiPA$ tCO_2e	annual $\Delta CUDdPA_t$ tCO_2e	cumulative $\Delta CUDdPA$ tCO_2e	annual $\Delta CPSPA_t$ tCO_2e	cumulative $\Delta CPSPA$ tCO_2e
2011	0.0	0.0	0.0	0.0	128,527.4	128,527.4	128,527.4	128,527.4
2012	0.0	0.0	0.0	0.0	124,474.3	253,001.7	124,474.3	253,001.7
2013	0.0	0.0	0.0	0.0	104,035.3	357,037.0	104,035.3	357,037.0
2014	27,640.0	27,640.0	0.0	0.0	137,029.3	494,066.3	164,669.3	521,706.3
2015	49,387.6	77,027.6	0.0	0.0	171,672.6	665,738.9	221,060.1	742,766.5
2016	47,004.5	124,032.1	0.0	0.0	134,459.3	800,198.2	181,463.8	924,230.3
2017	49,795.1	173,827.2	0.0	0.0	126,710.7	926,908.8	176,505.8	1,100,736.0
2018	41,372.3	215,199.5	0.0	0.0	107,638.5	1,034,547.4	149,010.9	1,249,746.9
2019	43,846.0	259,045.5	0.0	0.0	78,468.6	1,113,016.0	122,314.6	1,372,061.5
2020	46,285.6	305,331.1	0.0	0.0	58,974.1	1,171,990.1	105,259.8	1,477,321.2
2021	0.0	305,331.1	0.0	0.0	45,987.1	1,217,977.2	45,987.1	1,523,308.3
2022	45,436.5	350,767.7	0.0	0.0	23,795.9	1,241,773.2	69,232.5	1,592,540.8
2023	47,406.4	398,174.0	0.0	0.0	20,052.5	1,261,825.7	67,458.9	1,659,999.7
2024	0.0	398,174.0	0.0	0.0	18,120.5	1,279,946.2	18,120.5	1,678,120.2
2025	0.0	398,174.0	0.0	0.0	16,676.3	1,296,622.5	16,676.3	1,694,796.6
2026	0.0	398,174.0	0.0	0.0	14,590.8	1,311,213.3	14,590.8	1,709,387.4
2027	0.0	398,174.0	0.0	0.0	14,185.2	1,325,398.5	14,185.2	1,723,572.5
2028	0.0	398,174.0	0.0	0.0	13,158.5	1,338,557.0	13,158.5	1,736,731.1
2029	0.0	398,174.0	0.0	0.0	10,725.8	1,349,282.8	10,725.8	1,747,456.8
2030	0.0	398,174.0	0.0	0.0	10,053.5	1,359,336.3	10,053.5	1,757,510.4
2031	0.0	398,174.0	0.0	0.0	10,077.5	1,369,413.8	10,077.5	1,767,587.8
2032	0.0	398,174.0	0.0	0.0	8,151.4	1,377,565.2	8,151.4	1,775,739.3
2033	0.0	398,174.0	0.0	0.0	8,874.7	1,386,440.0	8,874.7	1,784,614.0
2034	0.0	398,174.0	0.0	0.0	7,426.2	1,393,866.2	7,426.2	1,792,040.2
2035	0.0	398,174.0	0.0	0.0	8,537.1	1,402,403.3	8,537.1	1,800,577.3
2036	0.0	398,174.0	0.0	0.0	7,525.8	1,409,929.1	7,525.8	1,808,103.2
2037	0.0	398,174.0	0.0	0.0	7,906.3	1,417,835.4	7,906.3	1,816,009.4
2038	0.0	398,174.0	0.0	0.0	7,110.6	1,424,946.0	7,110.6	1,823,120.0
2039	0.0	398,174.0	0.0	0.0	6,128.5	1,431,074.5	6,128.5	1,829,248.5
2040	0.0	398,174.0	0.0	0.0	6,331.9	1,437,406.4	6,331.9	1,835,580.4

(Step 7.2 VM0015) Ex ante estimation of actual non-CO2 emissions from forest fires

Non-CO_2 emissions from forest fire were not accounted for in the baseline scenario.

(Step 7.3 VM0015) Total ex ante estimations for the Project area

Table 47 shows expected net changes and non-CO_2 emissions in the Project area. Emissions occurred during the development of Project activities will be monitored and reported to check if there will be increase in projected emissions in the Project scenario.

Table 47. Total ex ante estimated net carbon stock changes and emissions of non-CO2 gasses in the Project area (Table 29 of Methodology VM0015).

Project Year t	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO_2 emissions from forest fires in the project area	
	annual $\Delta CPAdPA_t$ tCO_2e	cumulative $\Delta CPAdPA$ tCO_2e	annual $\Delta CPAiPA_t$ tCO_2e	cumulative $\Delta CPAiPA$ tCO_2e	annual $\Delta CUDdPA_t$ tCO_2e	cumulative $\Delta CUDdPA$ tCO_2e	annual $\Delta CPSPA_t$ tCO_2e	cumulative $\Delta CPSPA$ tCO_2e	annual $EBBPSPA_t$ tCO_2e	cumulative $EBBPSPA$ tCO_2e
2011	0.0	0.0	0.0	0.0	128,527.4	128,527.4	128,527.4	128,527.4	0.0	0.0
2012	0.0	0.0	0.0	0.0	124,474.3	253,001.7	124,474.3	253,001.7	0.0	0.0
2013	0.0	0.0	0.0	0.0	104,035.3	357,037.0	104,035.3	357,037.0	0.0	0.0
2014	27,640.0	27,640.0	0.0	0.0	137,029.3	494,066.3	164,669.3	521,706.3	0.0	0.0
2015	49,387.6	77,027.6	0.0	0.0	171,672.6	665,738.9	221,060.1	742,766.5	0.0	0.0
2016	47,004.5	124,032.1	0.0	0.0	134,459.3	800,198.2	181,463.8	924,230.3	0.0	0.0
2017	49,795.1	173,827.2	0.0	0.0	126,710.7	926,908.8	176,505.8	1,100,736.0	0.0	0.0
2018	41,372.3	215,199.5	0.0	0.0	107,638.5	1,034,547.4	149,010.9	1,249,746.9	0.0	0.0
2019	43,846.0	259,045.5	0.0	0.0	78,468.6	1,113,016.0	122,314.6	1,372,061.5	0.0	0.0
2020	46,285.6	305,331.1	0.0	0.0	58,974.1	1,171,990.1	105,259.8	1,477,321.2	0.0	0.0
2021	0.0	305,331.1	0.0	0.0	45,987.1	1,217,977.2	45,987.1	1,523,308.3	0.0	0.0
2022	45,436.5	350,767.7	0.0	0.0	23,795.9	1,241,773.2	69,232.5	1,592,540.8	0.0	0.0
2023	47,406.4	398,174.0	0.0	0.0	20,052.5	1,261,825.7	67,458.9	1,659,999.7	0.0	0.0
2024	0.0	398,174.0	0.0	0.0	18,120.5	1,279,946.2	18,120.5	1,678,120.2	0.0	0.0
2025	0.0	398,174.0	0.0	0.0	16,676.3	1,296,622.5	16,676.3	1,694,796.6	0.0	0.0
2026	0.0	398,174.0	0.0	0.0	14,590.8	1,311,213.3	14,590.8	1,709,387.4	0.0	0.0
2027	0.0	398,174.0	0.0	0.0	14,185.2	1,325,398.5	14,185.2	1,723,572.5	0.0	0.0
2028	0.0	398,174.0	0.0	0.0	13,158.5	1,338,557.0	13,158.5	1,736,731.1	0.0	0.0
2029	0.0	398,174.0	0.0	0.0	10,725.8	1,349,282.8	10,725.8	1,747,456.8	0.0	0.0
2030	0.0	398,174.0	0.0	0.0	10,053.5	1,359,336.3	10,053.5	1,757,510.4	0.0	0.0
2031	0.0	398,174.0	0.0	0.0	10,077.5	1,369,413.8	10,077.5	1,767,587.8	0.0	0.0
2032	0.0	398,174.0	0.0	0.0	8,151.4	1,377,565.2	8,151.4	1,775,739.3	0.0	0.0
2033	0.0	398,174.0	0.0	0.0	8,874.7	1,386,440.0	8,874.7	1,784,614.0	0.0	0.0
2034	0.0	398,174.0	0.0	0.0	7,426.2	1,393,866.2	7,426.2	1,792,040.2	0.0	0.0
2035	0.0	398,174.0	0.0	0.0	8,537.1	1,402,403.3	8,537.1	1,800,577.3	0.0	0.0
2036	0.0	398,174.0	0.0	0.0	7,525.8	1,409,929.1	7,525.8	1,808,103.2	0.0	0.0
2037	0.0	398,174.0	0.0	0.0	7,906.3	1,417,835.4	7,906.3	1,816,009.4	0.0	0.0
2038	0.0	398,174.0	0.0	0.0	7,110.6	1,424,946.0	7,110.6	1,823,120.0	0.0	0.0
2039	0.0	398,174.0	0.0	0.0	6,128.5	1,431,074.5	6,128.5	1,829,248.5	0.0	0.0
2040	0.0	398,174.0	0.0	0.0	6,331.9	1,437,406.4	6,331.9	1,835,580.4	0.0	0.0

3.3 Leakage

(Step 8 VM0015) *Ex ante* estimation of leakage

(Step 8.1 VM0015) *Ex ante* estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures

Leakage prevention measures will take place in the boundaries of the leakage management areas. These areas are located near the communities directed affected by the Project. As described in Section 6 of this document, activities of agricultural or grazing management improvement, or fodder production or

any other activities that reduce carbon stocks and increase GHG emission in comparison with baseline scenario are not expected. However, if such activities are implemented, changes in carbon stock wil be monitored and if significant will be accounted.

On the other hand, there will be promoted sustainable agriculture techniques and non-wood products collection.

(Step 8.1.1 VM0015) Carbon stock changes due to activities implemented in leakage management areas

Tables 30c of VM0015 are not applicable as decrease in carbon stocks due to activities implemented in leakage management areas are not expected.

(Step 8.1.2 VM0015) *Ex ante* estimation of CH_4 and N_2O emissions from grazing animals

As previously observed (item 8.1) the development of activities that create a significant increase in CH_4 and N_2O emissions from grazing animals will not take place. Therefore, tables 31 and 32 of VM0015 are not applicable.

(Step 8.1.3 VM0015) Total *ex ante* estimated carbon stock changes and increases in GHG emissions due to leakage prevention measures

Table 33 of VM0015 does not apply (justification in 8.1.1 and 8.1.2).

(Step 8.2 VM0015) *Ex ante* estimation of the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage

As described in step 3, deforestation agents are squatters living inside or close to the Project area (communities in the Project area of operation). Some of these communities are already involved in social activities to prevent leakage together with Fundação Jari, and the others will be involved throughout the Project duration. The communities in the Project area of operation will be invited to participate in the leakage prevention measures and Project activities (Section 6 – Social Impacts). Thus, a Leakage Displacement Factor of 10% was conservatively applied for the first 4 years and decreases until reaching 0% in the end of the fixed baseline period. It is expected that the Project will succeed in the effective control of possible deforestation displacement. Table 48 presented the ex ante estimated leakage due to activity displacement.

Table 48. Ex ante estimated leakage due to activity displacement (Table 34 of Methodology VM0015 version 1.1)

Project Year t	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
	annual $\Delta CADLK_t$ tCO_2e	cumulative $\Delta CADLK$ tCO_2e	annual $EADLK_t$ tCO_2e	cumulative $EADLK$ tCO_2e
2011	25,705.5	25,705.5	0.0	0.0
2012	24,894.9	50,600.3	0.0	0.0
2013	20,807.1	71,407.4	0.0	0.0
2014	27,405.9	98,813.3	0.0	0.0
2015	34,334.5	133,147.8	0.0	0.0
2016	26,891.9	160,039.6	0.0	0.0
2017	25,342.1	185,381.8	0.0	0.0
2018	21,527.7	206,909.5	0.0	0.0
2019	15,693.7	222,603.2	0.0	0.0
2020	11,794.8	234,398.0	0.0	0.0
2021	9,197.4	243,595.4	0.0	0.0
2022	4,759.2	248,354.6	0.0	0.0
2023	2,005.3	250,359.9	0.0	0.0
2024	0.0	250,359.9	0.0	0.0
2025	0.0	250,359.9	0.0	0.0
2026	0.0	250,359.9	0.0	0.0
2027	0.0	250,359.9	0.0	0.0
2028	0.0	250,359.9	0.0	0.0
2029	0.0	250,359.9	0.0	0.0
2030	0.0	250,359.9	0.0	0.0
2031	0.0	250,359.9	0.0	0.0
2032	0.0	250,359.9	0.0	0.0
2033	0.0	250,359.9	0.0	0.0
2034	0.0	250,359.9	0.0	0.0
2035	0.0	250,359.9	0.0	0.0
2036	0.0	250,359.9	0.0	0.0
2037	0.0	250,359.9	0.0	0.0
2038	0.0	250,359.9	0.0	0.0
2039	0.0	250,359.9	0.0	0.0
2040	0.0	250,359.9	0.0	0.0

(Step 8.3 VM0015) *Ex ante* estimation of total leakage

Table 49. Ex ante estimated total leakage (Table 35 of Methodology VM0015 version 1)

Project Year *t*	Total ex ante GHG emissions from increased grazing activities		Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Carbon stock decrease due to leakage prevention measures		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	annual $EgLK_t$ tCO_2e	cumulative EgLK tCO_2e	annual $EADLK_t$ tCO_2e	cumulative EADLK tCO_2e	annual $\Delta CADLK_t$ tCO_2e	cumulative ΔCADLK tCO_2e	annual $\Delta CLPMLK_t$ tCO_2e	cumulative ΔCLPMLK tCO_2e	annual ΔCLK_t tCO_2e	cumulative ΔCLK tCO_2e	annual ELK_t tCO_2e	cumulative ELK tCO_2e
2011	0.0	0.0	0.0	0.0	25,705.5	25,705.5	0.0	0.0	25,705.5	25,705.5	0.0	0.0
2012	0.0	0.0	0.0	0.0	24,894.9	50,600.3	0.0	0.0	24,894.9	50,600.3	0.0	0.0
2013	0.0	0.0	0.0	0.0	20,807.1	71,407.4	0.0	0.0	20,807.1	71,407.4	0.0	0.0
2014	0.0	0.0	0.0	0.0	27,405.9	98,813.3	0.0	0.0	27,405.9	98,813.3	0.0	0.0
2015	0.0	0.0	0.0	0.0	34,334.5	133,147.8	0.0	0.0	34,334.5	133,147.8	0.0	0.0
2016	0.0	0.0	0.0	0.0	26,891.9	160,039.6	0.0	0.0	26,891.9	160,039.6	0.0	0.0
2017	0.0	0.0	0.0	0.0	25,342.1	185,381.8	0.0	0.0	25,342.1	185,381.8	0.0	0.0
2018	0.0	0.0	0.0	0.0	21,527.7	206,909.5	0.0	0.0	21,527.7	206,909.5	0.0	0.0
2019	0.0	0.0	0.0	0.0	15,693.7	222,603.2	0.0	0.0	15,693.7	222,603.2	0.0	0.0
2020	0.0	0.0	0.0	0.0	11,794.8	234,398.0	0.0	0.0	11,794.8	234,398.0	0.0	0.0
2021	0.0	0.0	0.0	0.0	9,197.4	243,595.4	0.0	0.0	9,197.4	243,595.4	0.0	0.0
2022	0.0	0.0	0.0	0.0	4,759.2	248,354.6	0.0	0.0	4,759.2	248,354.6	0.0	0.0
2023	0.0	0.0	0.0	0.0	2,005.3	250,359.9	0.0	0.0	2,005.3	250,359.9	0.0	0.0
2024	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2026	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2027	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2028	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2029	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2031	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2033	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2034	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2035	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2036	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2037	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2038	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2039	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0
2040	0.0	0.0	0.0	0.0	0.0	250,359.9	0.0	0.0	0.0	250,359.9	0.0	0.0

3.4 Summary of GHG Emission Reductions and Removals

(Step 9 VM0015) *Ex ante* total net anthropogenic GHG emission reductions

(Step 9.1 VM0015) Significance assessment

Carbon pools

Using the latest EB-CDM approved *"Tool for testing significance of GHG emissions in A/R CDM Project activities*" it was possible to verify that above-ground biomass will contribute to 74% of expected emissions in the baseline scenario. Whereas, below-ground biomass contributes to 17% and dead-wood contribute with 9%. Therefore, they all represent significant emission sources (above 5%).

Activities in the baseline scenario lead to a very small production of wood products, as described in the box below, and stock from this pool was estimated for baseline and project scenario. Carbon stock of wood products is higher in the project case than in the baseline, that is, more timber is harvested and transformed in wood products in the project scenario when compared to the baseline scenario. Therefore, carbon stock from this pool was conservativelly omited (Please refere to "AMAPA_baseline_VVB_2013" and "Tabela Estoque TDR4_2013").

Despite Amapá's forests are rich in commercially valued species, the logging industry is not traditional in the state and this activity represents a small portion of the local economy (VERÍSSIMO et al., 1999). Compared to different states, including its neighbor Pará, Amapá represents only 1% of wood harvest volume in Legal Amazon, which does not characterize it as a timber zone (IMAZON; SFB, 2010).

Verissimo et al. (1999) states that Amapá's economy is based on non-wood products, forestry, fishing, mining and sales. Not different, such as described in Section 2.5 of the PD, agents of deforestation clear lands to take possession and develop small scale agriculture and pastures. Therefore, the conversion of forest into non-forest lands in the baseline scenario leads to a lower production of wood products when compared to the project scenario, where the forest is managed with the purpose of wood products production.

3.5 Distribution of log production native forests in the main Brazilian states (2005).

States	Number of Companies	Log consumption (Thousand m^3)	Processed production (Thousand m^3)	Jobs (direct and indirect)	Gross Revenue (Million R$)
Acre	24	422	193	4,641	181.96
Amapá[1]	48	94	41	1,516	32.10
Amazonas	58	367	142	6,525	115.19
Maranhão	54	254	90	3,975	59.00
Mato Grosso	592	4,004	1,795	56,932	1,598.36
Pará	1,067	6,599	2,550	92,423	2,177.61
Rondônia	346	2,220	925	34,825	713.49
Roraima	37	188	70	2,865	62.66
Legal Amazon	**2,226**	**14,148**	**5,806**	**203,702**	**4,940.39**

Source: IMAZON e SFB, 2010.

[1] *Includes Macapá, Laranjal do Jari, Santana, Mazagão, Porto Grande e Pedra Branca do Amapari*

(Step 9.2 VM0015) Calculation of *ex ante* estimation of total net GHG emissions reductions

Equation 19 was used as suggested by Methodology VM0015 version 1.1 to estimate ex ante net decrease in Project emissions. Result is presented in Table 50 (Table 36 of Methodology VM0015 version 1.1).

(Step 9.3 VM0015) Calculation of *ex ante* Verified Carbon Units (VCUs)

Equation 20 of Methodology VM0015 was used to estimate the number of VCUs. Risk Factor parameter was estimated through the VCS AFOLU Non-Permanence Risk Tool, resulting in 17%. The result is presented in Table 50 below (Table 36 of Methodology VM0015 version 1.1).

Table 50. Ex ante estimated net anthropogenic GHG emission reductions (ΔREDDt) and Verified Carbon Units (VCUt) (Table 36 of Methodology VM0015).

Project Year t	Baseline carbon stock changes		Baseline GHG emissions		Ex ante project carbon stock changes		Ex ante project GHG emissions		Ex ante leakage carbon stock changes		Ex ante leakage GHG emissions		Ex ante net anthropogenic GHG emission reductions		Ex ante VCUs tradable		Ex ante buffer credits	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLPA_t$	ΔCBSLPA	$\Delta EBBBSLPA_t$	ΔEBBBSLPA	$\Delta CPSPA_t$	ΔCPSPA	$EBBPSPA_t$	EBBPSPA	ΔCLK_t	ΔCLK	ELK_t	ELK	$\Delta REDD_t$	ΔREDD	VCU_t	VCU	VCB_t	VCB
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2011	257,054.8	257,054.8	0.0	0.0	128,527.4	128,527.4	0.0	0.0	25,705.5	25,705.5	0.0	0.0	102,821.9	102,821.9	80,972.2	80,972.2	21,849.7	21,849.7
2012	248,948.6	506,003.4	0.0	0.0	124,474.3	253,001.7	0.0	0.0	24,894.9	50,600.3	0.0	0.0	99,579.5	202,401.4	78,418.8	159,391.1	21,160.6	43,010.3
2013	208,070.6	714,074.0	0.0	0.0	104,035.3	357,037.0	0.0	0.0	20,807.1	71,407.4	0.0	0.0	83,228.3	285,629.6	65,542.2	224,933.3	17,686.0	60,696.3
2014	274,058.6	988,132.6	0.0	0.0	164,669.3	521,706.3	0.0	0.0	27,405.9	98,813.3	0.0	0.0	81,983.4	367,613.0	63,387.2	288,320.5	18,596.2	79,292.5
2015	381,494.6	1,369,627.2	0.0	0.0	221,060.1	742,766.5	0.0	0.0	34,334.5	133,147.8	0.0	0.0	126,100.0	493,713.0	98,826.1	387,146.6	27,273.9	106,566.3
2016	336,148.2	1,705,775.4	0.0	0.0	181,463.8	924,230.3	0.0	0.0	26,891.9	160,039.6	0.0	0.0	127,792.6	621,505.5	101,496.2	488,642.9	26,296.4	132,862.7
2017	362,030.5	2,067,805.9	0.0	0.0	176,505.8	1,100,736.0	0.0	0.0	25,342.1	185,381.8	0.0	0.0	160,182.6	781,688.1	128,643.4	617,286.2	31,539.2	164,401.9
2018	358,795.1	2,426,601.0	0.0	0.0	149,010.9	1,249,746.9	0.0	0.0	21,527.7	206,909.5	0.0	0.0	188,256.5	969,944.6	152,593.2	769,879.4	35,663.3	200,065.2
2019	313,874.4	2,740,475.4	0.0	0.0	122,314.6	1,372,061.5	0.0	0.0	15,693.7	222,603.2	0.0	0.0	175,866.1	1,145,810.8	143,300.9	913,180.4	32,565.2	232,630.4
2020	294,870.7	3,035,346.1	0.0	0.0	105,259.8	1,477,321.2	0.0	0.0	11,794.8	234,398.0	0.0	0.0	177,816.1	1,323,626.9	145,582.3	1,058,762.6	32,233.9	264,864.2
2021	306,580.8	3,341,926.9	0.0	0.0	45,987.1	1,523,308.3	0.0	0.0	9,197.4	243,595.4	0.0	0.0	251,396.3	1,575,023.1	207,095.4	1,265,858.0	44,300.9	309,165.2
2022	237,959.3	3,579,886.2	0.0	0.0	69,232.5	1,592,540.8	0.0	0.0	4,759.2	248,354.6	0.0	0.0	163,967.6	1,738,990.8	135,284.1	1,401,142.1	28,683.6	337,848.7
2023	200,525.5	3,780,411.7	0.0	0.0	67,458.9	1,659,999.7	0.0	0.0	2,005.3	250,359.9	0.0	0.0	131,061.3	1,870,052.1	108,440.0	1,509,582.0	22,621.3	360,470.0
2024	181,204.9	3,961,616.6	0.0	0.0	18,120.5	1,678,120.2	0.0	0.0	0.0	250,359.9	0.0	0.0	163,084.4	2,033,136.5	135,360.1	1,644,942.1	27,724.4	388,194.4
2025	166,763.3	4,128,380.0	0.0	0.0	16,676.3	1,694,796.6	0.0	0.0	0.0	250,359.9	0.0	0.0	150,087.0	2,183,223.5	124,572.2	1,769,514.3	25,514.8	413,709.2
2026	145,908.1	4,274,288.0	0.0	0.0	14,590.8	1,709,387.4	0.0	0.0	0.0	250,359.9	0.0	0.0	131,317.2	2,314,540.7	108,993.3	1,878,507.6	22,323.9	436,033.1
2027	141,851.6	4,416,139.6	0.0	0.0	14,185.2	1,723,572.5	0.0	0.0	0.0	250,359.9	0.0	0.0	127,666.4	2,442,207.2	105,963.1	1,984,470.8	21,703.3	457,736.4
2028	131,585.2	4,547,724.8	0.0	0.0	13,158.5	1,736,731.1	0.0	0.0	0.0	250,359.9	0.0	0.0	118,426.7	2,560,633.9	98,294.2	2,082,764.9	20,132.5	477,868.9
2029	107,257.8	4,654,982.6	0.0	0.0	10,725.8	1,747,456.8	0.0	0.0	0.0	250,359.9	0.0	0.0	96,532.0	2,657,165.9	80,121.6	2,162,886.5	16,410.4	494,279.4
2030	100,535.1	4,755,517.8	0.0	0.0	10,053.5	1,757,510.4	0.0	0.0	0.0	250,359.9	0.0	0.0	90,481.6	2,747,647.5	75,099.7	2,237,986.3	15,381.9	509,661.3
2031	100,774.9	4,856,292.7	0.0	0.0	10,077.5	1,767,587.8	0.0	0.0	0.0	250,359.9	0.0	0.0	90,697.4	2,838,344.9	75,278.9	2,313,265.1	15,418.6	525,079.8
2032	81,514.4	4,937,807.0	0.0	0.0	8,151.4	1,775,739.3	0.0	0.0	0.0	250,359.9	0.0	0.0	73,362.9	2,911,707.9	60,891.2	2,374,156.3	12,471.7	537,551.5
2033	88,747.2	5,026,554.3	0.0	0.0	8,874.7	1,784,614.0	0.0	0.0	0.0	250,359.9	0.0	0.0	79,872.5	2,991,580.4	66,294.2	2,440,450.5	13,578.3	551,129.8
2034	74,262.1	5,100,816.4	0.0	0.0	7,426.2	1,792,040.2	0.0	0.0	0.0	250,359.9	0.0	0.0	66,835.9	3,058,416.3	55,473.8	2,495,924.3	11,362.1	562,491.9
2035	85,371.1	5,186,187.4	0.0	0.0	8,537.1	1,800,577.3	0.0	0.0	0.0	250,359.9	0.0	0.0	76,834.0	3,135,250.2	63,772.2	2,559,696.5	13,061.8	575,553.7
2036	75,258.3	5,261,445.8	0.0	0.0	7,525.8	1,808,103.2	0.0	0.0	0.0	250,359.9	0.0	0.0	67,732.5	3,202,982.7	56,218.0	2,615,914.5	11,514.5	587,068.2
2037	79,062.9	5,340,508.7	0.0	0.0	7,906.3	1,816,009.4	0.0	0.0	0.0	250,359.9	0.0	0.0	71,156.6	3,274,139.4	59,060.0	2,674,974.5	12,096.6	599,164.9
2038	71,105.9	5,411,614.6	0.0	0.0	7,110.6	1,823,120.0	0.0	0.0	0.0	250,359.9	0.0	0.0	63,995.3	3,338,134.7	53,116.1	2,728,090.6	10,879.2	610,044.1
2039	61,284.7	5,472,899.3	0.0	0.0	6,128.5	1,829,248.5	0.0	0.0	0.0	250,359.9	0.0	0.0	55,156.2	3,393,290.9	45,779.7	2,773,870.3	9,376.6	619,420.6
2040	63,319.4	5,536,218.6	0.0	0.0	6,331.9	1,835,580.4	0.0	0.0	0.0	250,359.9	0.0	0.0	56,987.4	3,450,278.3	47,299.6	2,821,169.8	9,687.9	629,108.5

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	**Deforestation**
Data unit:	Hectare (ha)
Description:	Maps of forest cover areas converted into non-forest areas.
Source of data:	Measured through data from PRODES/INPE project.
Value applied:	0.269% /year on average (2000-2010).
Justification of choice of data or description of measurement methods and procedures applied:	For deforestation mapping and production of the Forest Cover Benchmark Map data from PRODES Digital (official Brazilian Amazon Forest deforestation satellite mapping) program were used. A total of 28 Landsat images were used during the analyzed period. The ISOSEG non-supervised classification method was used in the classification of the images to map forest classes, non-forest vegetation, hydrography and deforestation.
Any comment:	See documents: • Câmara *et al*. 2006. *Metodologia para o cálculo da taxa anual de desmatamento na Amazônia Legal* • *Determinação da Linha de Base e Dinâmica de Desmatamento para o Projeto Jari/Amapá.*

Data Unit / Parameter:	***Ctot***
Data unit:	$tCO_2e\ ha^{-1}$
Description:	Average carbon stock per hectare in all carbon pools in the forest class used in the baseline scenario.
Source of data:	Calculated by allometric equations, expansion factors from literature and Jari Florestal field measured data.
Value applied:	566 $tCO_2e\ ha^{-1}$
Justification of choice of data or description of measurement methods and procedures applied:	Above-ground biomass estimate was carried out using forest inventory data, allometric equations developed in areas similar to the project area (HIGUCHI, 1998). And expansion factors developed by Nogueira *et al*. (2008) in sites of the Brazilian Amazon to estimate biomass of trees with DBH lower than 10 cm, palm trees, vines, non-tree components and dead above-ground biomass . Below-ground biomass was obtained using root-shoot ratio of 25.8% biomass of trees DBH> 10cm. Total biomass spatial estimate was obtained applying geostatistics techniques developed by Sales et al. (2007).
Any comment:	See documents: • Estimativa do Estoque de Carbono Florestal para o Projeto Jari/Amapá. • PMFS – Amapá • Section 3.1 of the Project Description •Tabela_Estoque_TDR4_2013.xlsx

Data Unit / Parameter:	**DBH**
Data unit:	cm
Description:	Diameter at Breast Height (130 cm) for each tree with DBH equal or higher than 15 cm in each plot of the forest inventory.
Source of data:	Measured in the field by Jari Florestal.
Value applied:	See field measurements spreadsheet.
Justification of choice of data or description of measurement methods and procedures applied:	VCS Methodology VM0015 requirement. Data from forest inventory collected less than 10 years ago from multiple plots at wide spatial distribution.
Any comment:	Jari/Amapá REDD+ Project's main variable for carbon stock estimate.

Data Unit / Parameter:	**ln(Pi) = -1.497+2.548 x ln(DBH)**
Data unit:	Ln kg (fresh weight)
Description:	Equation to convert DBH into biomass for trees with DBH equal to or higher than 5 cm.
Source of data:	Higuchi et al (1998) Biomassa da parte aérea da vegetaçãoo da floresta tropical úmida de terra-firme da Amazônia brasileira. Acta Amazonica 28(2): 153-166. 1998
Value applied:	$\ln(\mathrm{Pi}) = -1.497 + 2.548 \ln(\mathrm{DBH})$
Justification of choice of data or description of measurement methods and procedures applied:	Equation developed for forest with characteristics similar to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**R_j**
Data unit:	Dimensionless
Description:	Above-ground to below-ground biomass conversion factor using root-shoot ratio.
Source of data:	VCS Methodology VM0015
Value applied:	25.8%
Justification of choice of data or description of measurement methods and procedures applied:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256(11), pp.1853-1867
Any comment:	

Data Unit / Parameter:	**Expansion factor to convert fresh weight biomass into dry weight biomass**
Data unit:	Dimensionless
Description:	Expansion factor to convert fresh weight biomass into dry weight biomass
Source of data:	The value was obtained by the average of dry/fresh ratio for the crown and bole weighted by the percentage contribution of bole and crown weight to total biomass. HIGUCHI, N., DOS SANTOS, J., RIBEIRO, R. J., MINETTE, L., BIOT, Y.

	Biomassa da parte aérea da vegetaçãoo da floresta tropical úmida de terra-firme da Amazônia brasileira. Acta Amazonica 28(2): 153-166. 1998.
Value applied:	0.5997
Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**Expansion factor to estimate palm trees biomass for dense forest**
Data unit:	Dimensionless
Description:	Expansion factor to convert biomass of trees DBH > 10cm into biomass of palm trees for dense forest
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256(11), pp.1853-1867
Value applied:	0.019
Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**Expansion factor to estimate palm trees biomass for non-dense forest**
Data unit:	Dimensionless
Description:	Expansion factor to convert biomass of trees DBH > 10cm into biomass of palm trees for non-dense forest
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256(11), pp.1853-1867
Value applied:	0.086
Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**Expansion factor to estimate biomass of trees with DBH<10 cm for dense forest**
Data unit:	Dimensionless
Description:	Expansion factor to convert biomass of trees DBH > 10cm into biomass of tress <10 cm in DBH for dense forest
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256(11), pp.1853-1867
Value applied:	0.065

Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**Expansion factor to estimate biomass of trees with DBH<10 cm for non-dense forest**
Data unit:	Dimensionless
Description:	Expansion factor to convert biomass of trees DBH > 10cm into biomass of tress <10 cm in DBH for non-dense forest
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256(11), pp.1853-1867
Value applied:	0.040
Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**Expansion factor to estimate biomass of vines**
Data unit:	Dimensionless
Description:	Expansion factor to convert biomass of trees DBH > 10 cm into biomass of palm trees into vine.
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256(11), pp.1853-1867
Value applied:	0.031
Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**Expansion factor to estimate dead wood biomass**
Data unit:	Dimensionless
Description:	Expansion factor to convert biomass of trees DBH > 10 cm into biomass of dead wood
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256 (11), pp.1853-1867
Value applied:	0.137
Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**Expansion factor to estimate non-tree components biomass**
Data unit:	Dimensionless
Description:	Expansion factor to convert biomass of trees DBH > 10 cm into biomass of non-tree components
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256 (11), pp.1853-1867
Value applied:	0.002
Justification of choice of data or description of measurement methods and procedures applied:	Values calculated in forests with similar characteristics to the forests in the reference region.
Any comment:	

Data Unit / Parameter:	**IC**
Data unit:	m^3
Description:	FSC-certified forest management expected harvest intensity.
Source of data:	*Plano de Manejo Florestal Sustentável-Amapá*
Value applied:	20 m^3
Justification of choice of data or description of measurement methods and procedures applied:	Average intensity of the harvest for timber Expected in each UPA of the Sustainable Forest Management Plan -AP.
Any comment:	

Data Unit / Parameter:	**CF**
Data unit:	t
Description:	Carbon content in dry biomass
Source of data:	Nogueira, E.; Fearnside, P.; Nelson, B., et al., 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management, 256 (11), pp.1853-1867
Value applied:	0.485
Justification of choice of data or description of measurement methods and procedures applied:	Value found in scientific literature.
Any comment:	

Data Unit / Parameter:	**44/12**
Data unit:	tCO_2e
Description:	Carbon mass to CO_2e mass conversion factor.
Source of data:	From scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU.
Value applied:	44/12
Justification of choice of data or description of measurement methods and procedures applied:	IPCC standard value
Any comment:	

4.2 Data and Parameters Monitored

Data Unit / Parameter:	**Deforestation in the project area and leakage belt**
Data unit:	Hectare (ha)
Description:	Forest cover areas converted into non-forest areas inside the Jari/Amapá REDD+ Project area and leakage belt.
Source of data:	Calculated through remote sensing images together with GPS data collected in the field.
Description of measurement methods and procedures to be applied:	The monitoring of the forest cover in the project area and leakage belt will be done through satellite image analysis. When data from the PRODES system are not available, the forest cover monitoring will be carried out by automatic classification and visual interpretation of images from other optical sensors or SAR data.
Frequency of monitoring/recording:	Annual
Value applied:	N/A
Monitoring equipment:	Remote sensing images digital processing program, geographic information systems and navigation GPS.
QA/QC procedures to be applied:	Images with spatial resolution of 30 m or more will be used in the mapping. The minimum mapping unit is 1 ha. The assessment of the classifications will be carried out through data collected in the field using GPS navigation. The minimum accuracy of the classification for the land use and land cover map is 80%.
Calculation method:	In case unplanned deforestation areas are detected, the Forest Cover Benchmark Map will be update by map algebra.
Any comment:	-

Data Unit / Parameter:	***Ctot***
Data unit:	$tCO_2e\ ha^{-1}$
Description:	Average carbon stock per hectare in all carbon pools in the Forest class used at baseline scenario.
Source of data:	Calculated by allometric equations, expansion factors from scientific literature, and data measured in the field by Jari Florestal.
Description of measurement methods and procedures to be applied:	Above-ground biomass estimate will be carried out using forest inventory data, allometric equations developed in areas similar to the project area (HIGUCHI, 1998). Expansion factors developed by Nogueira *et al*. (2008) in sites of the Brazilian Amazon will be used to estimate biomass of trees with DBH lower than 10 cm, palm trees, vines, non-tree components and dead above-ground biomass. Below-ground biomass will be obtained using root-shoot ratio of 25.8% biomass of trees DBH> 10cm. Total biomass spatial estimate was obtained applying geostatistics techniques developed by Sales et al. (2007).
Frequency of monitoring/recording:	One year before harvest. At one, three and five-year intervals after the UPA harvesting.
Value applied:	N/A

Monitoring equipment:	N/A
QA/QC procedures to be applied:	Further information on QA/QC available in: • PMFS – Amapá; • PA – Gestão e Certificação Florestal - Implantação e Mapeamento de Parcelas; • PA – Gestão e Certificação Florestal – Seleção e distribuição das parcelas; • PA – Gestão e Certificação Florestal – Parcelas Permanentes; • PA – Gestão e Certificação Florestal – Monitoramento do inventário florestal 100
Calculation method:	Comparison between total carbon stock average value contained in forest class used in the baseline scenario, according to *Estimativa do Estoque de Carbono Florestal para o Projeto REDD+ Jari/Amapá* and measures analyzed after the UPA harvesting.
Any comment:	Methodology VM0015 mandatory requirement for areas with logging.

Data Unit / Parameter:	**DBH**
Data unit:	cm
Description:	Diameter at Breast Height (130 cm) for each tree with DBH equal or higher than 15cm in each plot of the forest inventory.
Source of data:	Calculated from the circumference at breast height measured in the field by Jari Florestal.
Description of measurement methods and procedures to be applied:	DBH is calculated from the circumference at breast height (CBH) data of each monitored tree measured in the field.
Frequency of monitoring/recording:	One year before harvest. In intervals of one, three and five years after the UPA harvest.
Value applied:	N/A
Monitoring equipment:	Calculated from the circumference at breast height data measured in the field using a measuring tape.
QA/QC procedures to be applied:	Mandatory monitoring according to Methodology VM0015. Data coming from forest inventory collected in periods of up to 10 years from multiple plots. Further information on QA/QC available in: • PMFS – Amapá; • PA – Gestão e Certificação Florestal - Implantação e Mapeamento de Parcelas; • PA – Gestão e Certificação Florestal – Seleção e distribuição das parcelas; • PA – Gestão e Certificação Florestal – Parcelas Permanentes; • PA – Gestão e Certificação Florestal – Monitoramento do inventário florestal 100%.
Calculation method:	DBH is calculated from the circumference at breast height (CBH) data of each tree monitored measured in the field.
Any comment:	Main variable used to estimate changes in carbon stock on the Jari/Amapá REDD+ Project.

Data Unit / Parameter:	**Planned deforestation to build the FSC-certified Forest Management infrastructure**
Data unit:	Hectare (ha)
Description:	Map of forest cover areas converted into non-forest areas due to the construction of FSC-certified forest management roads, trails and forest patios.
Source of data:	Remote sensing images, technical maps, and specific field cards to monitor the construction of FSC-certified forest management roads, trails and forest patios.
Description of measurement methods and procedures to be applied:	The monitoring of forest cover areas in the FSC-certified forest management area will be done by satellite images analysis, road, trails and forest patio construction maps, and field verification. In case planned deforestation occurs, the Forest Cover Benchmark Map will be updated by map algebra. The reduction in carbon stock in the project area will be reported in the verification processes.
Frequency of monitoring/recording:	During the year of management of each UPA.
Value applied:	N/A
Monitoring equipment:	Field card and geographic information system.
QA/QC procedures to be applied:	Further information on QA/QC available in: • PMFS – Amapá; • PA-MFS - Planejamento de trilhas de Arraste; • PA-MFS - Formação de Grandes Clareiras; • PA - Planejamento, Abertura e Manutenção de Estradas Florestais; • PA MFS - Monitoramento da Abertura de Estradas de Colheita.
Calculation method:	In case planned deforestation areas are detected the Forest Cover Benchmark Map will be updated by map algebra.
Any comment:	N/A

Data Unit / Parameter:	**Δ CabBSLLKt**
Data unit:	tCO2-e
Description:	Total carbon stock changes in the leakage belt area
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	• leakage prevention activities will be listed; • a map showing areas of intervention and type of intervention will be prepared; • areas where leakage prevention activities impact carbon stock will be identified; • non-forest classes existing within these areas in the baseline case will be identified; • carbon stocks will be measured on the identified classes or conservative literature estimates will be used; • carbon stock changes in the leakage management areas under the project scenario will be reported

	using table 30b of the VM0015; • net carbon stock changes that the leakage prevention measures cause during the fixed baseline period and, optionally, the project crediting period will be calculated; • results of the calculations will be reported in table 30.c of the VM0015.
Frequency of monitoring/recording:	To be determined depending on the activity
Value applied:	0
Monitoring equipment:	To be determined depending on the activity
QA/QC procedures to be applied:	To be determined depending on the activity
Calculation method:	To be determined depending on the activity
Any comment:	N/A

Data Unit / Parameter:	**Methane (CH4) and nitrous oxidate (N_2O) emissions from livestock**
Data unit:	tCO_2-e yr^{-1}
Description:	Emissions from grazing animals in leakage management areas at year t
Source of data:	Reports from Fundação Jari and geographic information system
Description of measurement methods and procedures to be applied:	• annual areas that have grazing activities in the leakage management areas will be specified; • types of animal, forage and manure managemen will be briefely described. Table 31 of VM0015 will be used to report the key parameters required to perform the calculation of GHG emissions; • the number of animals in the baseline case and under the project scenario will be determined based on available areas and forage. The difference will be considered for the calculation of the increase in GHG emissions; • methods described in appendix 4 of the VM0015 will be used to estimate emissions from enteric fermentation and manure management; final calculations will be done using equation 18 of the VM0015 and reults will be reported in table 32 of the VM0015.
Frequency of monitoring/recording:	Annually
Value applied:	0
Monitoring equipment:	Field spreadsheets
QA/QC procedures to be applied:	N/A
Calculation method:	Equation 18 of the VM0015 will be used.
Any comment:	N/A

4.3 Description of Monitoring Plan

TASK 1: MONITORING OF CARBON STOCK CHANGES AND GHG EMISSIONS FOR PERIODICAL VERIFICATIONS

1. Monitoring of actual carbon stock changes and GHG emissions within the Project area

a) Technical description of the monitoring tasks

Monitoring of carbon stock changes and GHG emissions within the Project Area will be done through the monitoring of forest cover areas

The Project encompasses two components of activities that will be monitored:

i) the continuous monitoring of FSC-certified forest management activities prior to, during and after the FSC-certified forest management operations will be done by Jari Florestal specialized team, assessing the activities regarding operational, environmental and occupational safety aspects.

ii) the monitoring of the complimentary REDD+ activities aimed at avoiding unplanned deforestation through the intensification of premises, security and surveillance activities (increase in the frequency and comprehensiveness), the monitoring of the forest cover with satellite images and field survey, and social inclusion of the communities in the Jari/Amapá REDD+ Project area of influence.

b) Data to be collected

4.3.1.1 Component	4.3.1.2 Data/Parameter	4.3.1.3 Description	4.3.1.4 Unit	4.3.1.5 Source	4.3.1.6 Frequency
FSC-certified Management	Training and qualification of workers	Training courses to qualify workers on the operational and environmental procedures related to their area of work, as well as other subjects such as Sustainable Management, Certification and Safety at Work.	Number of trained staff	Orsa Florestal	Annual
	Permanent plots	Register of the implementation of the activity.	Status of implementation	Orsa Florestal	Annual
	100% pre-harvest inventory or forest census	Register of the implementation of the activity.	Status of implementation	Orsa Florestal	Annual
	DBH	Diameter at Breast Height (130 cm) for each tree with DBH equal or higher than 15cm in each of the forest inventory plot.	cm	Calculated from the circumference at breast height measured in the field by Orsa Florestal.	One year before harvest. In intervals of one, three and five years after the UPA harvest.

	Storage patios and forest roads opening	Register of the implementation of the activity.	Status of implementation	Orsa Florestal	Annual
	Felling of trees	Register of the implementation of the activity.	Status of implementation	Orsa Florestal	Annual
	Logging, measurement and marking of the logs.	Register of the implementation of the activity.	Status of implementation	Orsa Florestal	Annual
	Log skidding to storage yards	Register of the implementation of the activity.	Status of implementation	Orsa Florestal	Annual
REDD+ activities	Income and expenses spreadsheet	Project's budget follow up	R$	Biofilica Investimentos Ambientais	Annual
	Social activities	Social activities developed together with the communities in the Jari/Amapá REDD+ Project area of influence.	Number of benefited families	Fundação Orsa	Annual
	$AUDPA_{icl,t}$	Areas of unplanned deforestation in forest class *icl* at year *t* in the project area	ha	Calculated through remote sensing images.	Annual
	$APDPA_{icl,t}$	Areas of planned deforestation in forest class *icl* at year *t* in the project area	ha	Calculated through remote sensing images, technical maps, and specific field cards.	Annual
	$\Delta CPLdPA_t$	Total decrease in carbon stock due to planned logging activities at year *t* in the Project Area	tCO_2-e	Calculated	Annual
	$ACPA_{icl,t}$	*4.3.1.7* Annual area within the Project Area affected by catastrophic events in class *icl* at year *t*	ha	Calculated through remote sensing images.	Each time a catastrophic event occurs
	$\Delta CUCdPA_t$	Total decrease in carbon stock due to catastrophic events at year *t* in the Project Area	tCO_2-e	Calculated	Each time a catastrophic event occurs
	4.3.1.8 Δ ach ti_t	4.3.1.9 Total carbon stock decrease due to unavoided unplanned deforestation within the project area at year t.	4.3.1.10 t CO2-e	4.3.1.11 Calculated	4.3.1.12 Annual

c) Overview of data collection procedures

Monitoring of land-use and land-cover change:

The main activities carried out by the project to collection and process data are:

- Selection of optical satellite images with less cloud coverage, shooting date closer to Amazon dry season and adequate radiometric quality;
- Georeferencing of the satellite images with topographic charts in a 1:100,000 scale or NASA images in MrSID orthorectified format;
- Generation of a spectral mixture model to estimate the percentage of vegetation, soil and shadow component for each pixel of the image;

- Application of the segmentation technique which identifies in the satellite image the spatially adjacent regions (segments) with similar spectral characteristics;
- Classification the segments to identify forest classes, non-forest vegetation and deforestation.

Monitoring of carbon stocks and non-CO2 emissions:

Monitoring changes (reduction) in carbon stock will be done through forest inventory, measurement of Diameter at Breast Height (130 cm), for each tree with DBH equal or higher than 15 cm in each plot of the forest inventory. DBH is the main variable used to estimate carbon stock and changes in carbon stock on the Jari/Amapá REDD+ Project. The monitoring of carbon stock for FSC-certified forest management areas will be carried out through the installation and measurement of pre-harvest forest inventory permanent plots in each UPA. Each monitored plot will be measured after harvest at one, three and five-year intervals.

d) Quality control and quality assurance procedures

Monitoring of land-use and land-cover change:

In order to validate the information obtained from satellite images, the mapped data on deforestation occurrences will be carried out through data collected in the field using GPS navigation. The minimum accuracy of the classification for the land use and land cover map is 80%. For cloud-covered areas, images from SAR sensors, such as RADARSAT-2, Cosmo SkyMed or TerraSAR-X will be used.

The original (raster) and processed (vector) digital data from satellite images, coordinates, technical maps, field photos and cards will be stored by Biofílica Investimentos Ambientais throughout the project. Maps of infrastructure installation, satellite images and annual deforested areas reports will be made available to the verification body at each verification event.

Monitoring of carbon stocks and non-CO2 emissions:

Information about QA/QC is available in the following documents:

- PMFS – Amapá;
- PA – Gestão e Certificação Florestal - Implantação e Mapeamento de Parcelas;
- PA – Gestão e Certificação Florestal – Seleção e distribuição das parcelas;
- PA – Gestão e Certificação Florestal – Parcelas Permanentes;
- PA – Gestão e Certificação Florestal – Monitoramento do inventário florestal 100%.

The original reports and field cards will be stored by Jari Florestal. Biofílica Investimentos Ambientais will keep a copy of these documents filed in digital format throughout the project. Spreadsheets, forest inventory and monitoring reports of the plots will be made available to the verification body at each verification event.

e) Data archiving

All data and reports of the Jari/Amapá REDD+ Project will be stored by Biofílica Investimentos Ambientais in digital files throughout the project.

The original reports and field cards collected for the FSC-certified forest management activities will be stored by Jari Florestal. Biofílica Investimentos Ambientais will keep a copy of these documents filed in digital format throughout the project.

The compilation and announcement of the results of social activities will be done through Fundação Jari Activities Report and Impacts Report periodically prepared and made available in digital format.

All documents related to the monitoring of Jari/Amapá REDD+ Project will be put together in hard and/or virtual files, and made available to the verification body at each verification event.

f) Organization and responsibilities of the parties involved in all the above

All activities of monitoring are a responsibility of Biofílica Investimentos Ambientais, Jari Florestal, Jari Celulose and Fundação Jari.

1.1 Monitoring of Project Implementation

The monitoring of the implementation and execution of the FSC-certified forest management activities will be done according to Jari Florestal's procedures throughout all its phases and in all the aspects – operational, environmental and social – so as to meet FSC principles and criteria. The implementation of REDD+ activities will be monitored through physical-financial schedules, follow-up of performance and quality reports, social management reports, maps of forest cover, meeting reports, land invasion police reports and other actions to control illegal deforestation, and other relevant documents.

1.2 Monitoring of land-use and land-cover changes within the Project area

The monitoring of planned and unplanned deforestation will be done through project area forest cover mapping using 30-meter or higher spatial resolution satellite images. The monitoring of the deforestation for implementation of FSC-certified forest management infrastructure will be carried out

through specific field cards for the construction of roads, trails and forest patios inside the project area, and the maps and satellite images containing information on forest cover areas converted into non-forest areas. In order to have more flexibility in the deforestation mapping process, different techniques of automatic classification and visual interpretation of SAR images using field data and cartographic quality standards may be used.

Data on deforestation events will be compared to baseline scenario. Emission reduction values for the monitored period will be based on the comparison between forecasted and real deforestation.

1.3 Monitoring of carbon stock changes and non-CO2 emissions from forest fires

Monitoring changes in carbon stocks

Within the project area:

It is expected that ex ante carbon stock estimate for forest class does not change during baseline period. However, VCS Methodology VM0015 requires the monitoring of carbon stock in project area subjected to significant carbon stock decrease in the project scenario according to the ex ante assessment due to controlled deforestation and planned harvest activities, or areas subjected to unplanned and significant carbon stock decrease in the project scenario.

Total carbon stock change due to unavoided unplanned deforestation within the project area is calculates the following way:

$$\Delta \mathrm{CUDdPA}_t = \sum_{y=1}^{t} \left(\sum_{icl=1}^{icl} AUDPA_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDPA_{fcl,y} * \Delta Ctot_{fcl,t-y} \right)$$

Where:

Δ CUDdPAt Total carbon stock change due to unavoided unplanned deforestation within the project area at year t.

AUDPAicl,y Area of unplanned deforestation in the initial forest class icl at year t within the project area in the project scenario.

Δ Ctoticl,Ac Carbon stock loss in the initial forest class icl at age of change Ac (# of years after LU/LC change).

AUDPAfcl,y Area of non-forest class fcl at time t within the project area post-unplanned deforestation in the project scenario.

Δ Ctotfcl,Ac Carbon stock gain in the final non-forest class fcl at Age of change Ac (# of years after LU/LC change).

In case there is significant reduction in carbon stock due to FSC-certified forest management activities, such reduction will be reported in the verification processes using Tables 29 of the VCS approved methodology VM0015 version 1.1.

Within leakage management areas:

No areas will be subject to planned carbon stock decrease in the leakage management areas in the project scenario.

Monitoring of non-CO2 emissions from forest fires

Emissions due to biomass burning are not accounted in this project.

1.4 Monitoring of impacts of natural disturbances and other catastrophic events

Decreases in carbon stocks and increases in GHG emissions due to natural disturbances or catastrophic events will be done through monitoring of forest cover by satellite using the same methods applied to monitoring forest cover in the project area (section 1.1.2).

The main activities carried out to collection and process data are:

- Selection of optical satellite images with less cloud coverage, shooting date closer to Amazon dry season and adequate radiometric quality;
- Georeferencing of the satellite images with topographic charts in a 1:100,000 scale or NASA images in MrSID orthorectified format;
- Mapping the affected forest cover areas.

Emissions due to natural disturbance or catastrophic events will be estimated by multiplying area of forest loss mapped by average forest carbon stock. In case there is significant reduction in carbon stock due to natural disturbance or catastrophic events, such reduction will be reported in the verification processes using Tables 25e, 25f and 25g of the VCS approved methodology VM0015 version 1.1.

2 Monitoring of Leakage

a) Technical description of the monitoring tasks

The Jari/Amapá REDD+ Project will involve two monitoring activities of sources of leakage:

i) Monitoring of decrease in carbon stocks and/or increase in GHG emissions associated with leakage prevention measure if the project proponents implement activities such as tree planting, agricultural intensification, fertilization, fodder production and/or other measures to enhance cropland and grazing land areas. If these activities cause reductions in carbon stocks and/or increase in GHG emissions in leakage management areas, such carbon stock changes and/or GHG emissions will be estimated by Fundação Jari and Biofílica Investimentos Ambientais technical staff.

ii) Monitoring of forest cover in leakage belt through satellite images to be performed by Biofílica Investimentos Ambientais and Jari Celulose technical staff.

b) Data to be collected

Data	Description	Unit	Source	Frequency
Δ CLPMLK$_t$	Carbon stock decrease due to leakage prevention measures	tCO_2-e	Calculated	Annual
EgLK$_t$	Emissions from grazing animals in leakage management area at year *t*	tCO_2-e	Calculated	Annual
ELPMLK$_t$	Annual total increase in GHG emissions due to leakage prevention measures at year *t*	tCO_2-e	Calculated	Annual
Δ CabBSLLK$_t$	Total carbon stock changes in the leakage belt area	tCO_2-e	Calculated	Annual

c) Overview of data collection procedures

Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities:

The main activities carried out to collection and process data for monitoring of Carbon stock changes due to activities implemented in leakage management areas are:

- leakage prevention activities will be listed;
- a map showing areas of intervention and type of intervention will be prepared;
- areas where leakage prevention activities impact carbon stock will be identified;
- non-forest classes existing within these areas in the baseline case will be identified;
- carbon stocks will be measured on the identified classes or conservative literature estimates will be used;
- carbon stock changes in the leakage management areas under the project scenario will be reported using table 30b of the VM0015;
- net carbon stock changes that the leakage prevention measures cause during the fixed baseline period and, optionally, the project crediting period will be calculated;

- results of the calculations will be reported in table 30.c of the VM0015.

The main activities carried out to collection and process data for monitoring of Methane (CH4) and nitrous oxide (N2O) emissions from livestock are:

- annual areas that have grazing activities in the leakage management areas will be specified;
- types of animal, forage and manure managemen will be briefely described. Table 31 of VM0015 will be used to report the key parameters required to perform the calculation of GHG emissions;
- the number of animals in the baseline case and under the project scenario will be determined based on available areas and forage. The difference will be considered for the calculation of the increase in GHG emissions;
- methods described in appendix 4 of the VM0015 will be used to estimate emissions from enteric fermentation and manure management; final calculations will be done using equation 18 of the VM0015 and reults will be reported in table 32 of the VM0015.

Monitoring of carbon stock decrease and increases in GHG emissions due to activity displacement leakage:

Monitoring of carbon stock changes

Procedures for collection data will be done using the same methods applied to monitoring deforestation in the project area (section 1.2).

Monitoring of increases in GHG emissions

Emissions due to forest fires are not accounted in the baseline.

d) Quality control and quality assurance procedures

Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities:

To be determined depending on the activity, if implemented.

Monitoring of carbon stock decrease and increases in GHG emissions due to activity displacement leakage:

Procedures for quality control and quality assurance will be done using the same methods applied to monitoring deforestation in the project area (section 1.2).

e) Data archiving

The original reports and field cards will be stored by Fundação Jari. Biofílica Investimentos Ambientais will keep a copy of these documents filed in digital format throughout the project. The original (raster) and processed (vector) digital data from satellite images, coordinates, technical maps, field photos and cards will be stored by Biofílica Investimentos Ambientais throughout the project. Maps of annual deforested areas, satellite images and reports will be made available to the verification body at each verification event.

f) Organization and responsibilities of the parties involved in all the above

The all activities of monitoring of leakage are a responsibility of Biofílica Investimentos Ambientais, Jari Celulose and Fundação Jari.

2.1 Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities

A reduction in carbon stocks due to activities carried out in leakage management areas is not expected as no activities of agricultural improvement or management of grazing areas able to alter carbon stocks and increase GHG emissions as compared with baseline scenario in leakage management areas is planned to be implemented. However, if it is decided that such activities are necessary, then the ex ante carbon stock changes and GHG emissions associated to such activities will be estimated as per step 8 of the methodology VM0015, and if significant they will be monitored and data will be made available to the verification body at each verification event using Tables 30b, 30c, 31, 32 and 33 of methodology VM0015 version 1.1.

The following activities in leakage management areas could occasion a decrease in carbon stocks or an increase in GHG emissions:

- Carbon stock changes due to activities implemented in leakage management areas;
- Methane (CH_4) and nitrous oxide (N_2O) emissions from livestock intensification (involving a change in the animal diet and/or animal numbers).

According to the most recent version of the VCS Standard nitrous oxide (N2O) emissions from nitrogen fertilization are always considered insignificant. Consumption of fossil fuels is considered always insignificant in AUD project activities and must not be considered.

2.2 Monitoring of carbon stock decrease and increases in GHG emissions due to activity displacement leakage

Monitoring of carbon stock changes

Activity data for the leakage belt area will be determined using the same methods applied to monitoring deforestation in the project area (section 1.2). If during the monitoring process a deforestation event higher than the expected for baseline scenario is identified in the leakage belt, and such deforestation is attributed to deforestation agents from the project area, the losses in carbon stock will be accounted for and reported using Table 22c and 21d of VM0015 approved methodology version 1.1.

Total carbon stock change due to unavoided unplanned deforestation within the leakage belt area is calculates the following way:

$$\Delta \text{CBSLLK}_t = \sum_{y=1}^{t} \left(\sum_{icl=1}^{icl} AUDLK_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDLK_{fcl,y} * \Delta Ctot_{fcl,t-y} \right)$$

Where:

Δ CBSLLKt Total carbon stock change due to unavoided unplanned deforestation within the leakage belt area at year t.

AUDLKicl,y Area of unplanned deforestation in forest class icl at year t within the leakage belt area in the project scenario.

Δ Ctoticl,Ac Carbon stock loss in the initial forest class icl at age of change Ac (# of years after LU/LC change).

AUDLKfcl,y Area of non-forest class fcl at time t within the leakage belt area post-unplanned deforestation in the project scenario.

Δ Ctotfcl,Ac Carbon stock gain in the final non-forest class fcl at Age of change Ac (# of years after LU/LC change).

2.3 Total ex post estimated leakage

The results will be presented to the verification body at each verification event using the Table 35 of VM0015 approved methodology version 1.1

3 Ex post net anthropogenic GHG emission reductions

a) Technical description of the monitoring tasks

In the verification processes the results will be presented using the Table 36 of VM0015 approved methodology version 1.1 together with spatial data (deforestation maps, when available).

b) Data to be collected

Data	Description	Unit	Source	Frequency
Δ REDD$_t$	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t*	tCO_2-e	Calculated	Annual
VCU$_t$	Number of Verified Carbon Units (VCUs) to be made available for trade at time *t*	tCO_2-e	Calculated	Annual

c) Overview of data collection procedures

The number of Verified Carbon Units (VCUs) to be generated by the activities of Jari/Amapá REDD+ Project at year t will be calculated using equation 19 and 20 of VM0015 approved methodology version 1.1.

d) Quality control and quality assurance procedures

All tasks and tools indicated in part 2 of VM0015 approved methodology version 1.1 will be used to ensure that the data are adequate for verification process and number of VCUs are reliable.

e) Data archiving

All data and reports of the Jari/Amapá REDD+ Project will be stored by Biofílica Investimentos Ambientais in digital files throughout the project. All documents related to the monitoring of Jari/Amapá REDD+ Project will be put together in hard and/or virtual files, and made available to the verification body at each verification event.

f) Organization and responsibilities of the parties involved in all the above

This activity is a responsibility of Biofílica Investimentos Ambientais.

TASK 2: REVISITING THE BASELINE PROJECTIONS FOR FUTURE FIXED BASELINE PERIOD

1. Update information on agents, drivers and underlying causes of deforestation

Statistical and spatial data, studies and information about the agents, drivers and underlying causes of deforestation necessary to perform steps 2 and 3 of VCS Methodology VM0015 version 1.1 will be updated and used in the review of baseline projections after a fixed period of 10 years. When available, data from the monitoring of FSC-certified forest management and other activities developed in the project area will be used.

2. Adjustment of the land-use and land-cover change component of the baseline

In case a national or subnational baseline becomes available during the next fixed baseline period, it will be applied to the following period. In case there is no national or subnational baseline available, step 4 of Methodology VM0015 will be redone considering the 10-year period (2011-2020) using updated variables on agents, drivers and underlying causes of deforestation in the reference region. The two main components to be revisited are annual deforestation area and location of deforestation in the baseline.

The assumptions and hypothesis considered in the modeling of future deforestation dynamic component (population data), as well as the data used in the spatial projection (updating of roads, locations and distance of new deforestations) will be reviewed and updated.

3. Adjustment of the carbon component of the baseline

The spatial estimate of the carbon component may be reviewed according to the results obtained during the changes in carbon stocks monitoring processes as stated in Methodology VM0015 version 1.1, Part 3, item 1.1.3. Throughout the project new techniques and technologies may be analyzed for biomass spatial estimate, as, for example, LIDAR or interferometric SAR data.

5 ENVIRONMENTAL IMPACT

This Section includes the proponents' actions regarding the environmental aspects of the Project. It involves an environmental and quality management strategy consisting in a company's commitment to the society in reducing the negative impacts of the Project activities and promoting positive impacts through complementary activities to the Project.

In this regard the Jari/Amapá REDD+ Project proposes the responsible use of forest resources in tandem with its conservation, the fostering of applied scientific research especially focused on biodiversity and environmental services, a more effective monitoring of the area in order to prevent future deforestation and generate local knowledge.

5.1 Jari/Amapá REDD+ Project environmental management

Grupo Jari, represented by Jari Florestal and Jari Celulose, is the main responsible for the Project environmental management activities with the support of Biofílica Investimentos Ambientais. Biofílica is in charge of monitoring activities described in Section 4 - Monitoring and for triggering Grupo Jari for directing attention towards land protection and surveillance, social activities with local communities as well as co-management of all other Project activities.

Current scenario shows that the Project area is susceptible to forest conversion into agricultural and grazing areas and is surrounded by settlements and roads. The vulnerability increases due to construction of infrastructure projects in neighboring areas such as Santo Antônio hydroelectric power plant, which shall attract a significant number of people, and the Tucuruí power line connecting the state of Amapá to the National Power Grid (SNE). Besides these, there is also the paving of the south stretch of BR 156, which is under environmental licensing process, and other mineralogy-related projects.

In general, the Project activities will be carried out respecting the Reduced Impact Management criteria and technical regulations, which make it possible to conciliate the use of forest resources with its conservation (see Section 1 – Item 1.8 Description of Project Activities). Once the technique is implemented, it is evident that ecological impacts will be reduced, productivity will increase and the risk of work-related accidents will decrease (VIDAL, 2004).

The Project implementation is also important regarding protection and supervision of the area itself through coercion of illegal activities and land invasion and through the development of social activities and creation of economically feasible activities alternative to the deforestation, resulting in the improvement os people's wellbeing and reduction of deforestation.

As part of the Project, the FSC-certified forest management existing in Pará since 2004 was extended to Amapá in 2012 where the Jari/Amapá REDD+ Project is located. The compliance with FSC principles and criteria makes evident the commitment of Project proponents to respecting the forest and

its attributes. From all FSC principles, Principles 5 to 9 can be highlighted for the environmental management, as described in Section 1, Item 1.8.

5.1.1 Grupo Jari

Founded in 1981 and present in the Valley of Jari since 2000, when it bought the former Jari Project, Grupo Jari works through an integrated structure formed by the following companies: Ouro Verde Amazônia, Jari Celulose and Jari Florestal, supported by Fundação Jari.

The 3P concept (People, Profit and Planet) is part of the companies' action models, which are economically viable, socially equitable and environmentally correct and support the guiding principles of the investments or the creation of new businesses. The volume of resources invested in the environmental area by Grupo Jari in 2010 was R$7.1 million distributed among improvement actions and people for environmental management activities in all units of the Group.

Among the Project proponents are Jari Florestal and Jari Celulose. Jari Florestal is responsible for the management of 745 thousand hectares in the Amazon and produces 100% FSC-certified sawn and processed tropical wood, tracked by FSC chain of custody. Jari Celulose produces bleached eucalyptus pulp and it is the first company in the world to receive the FSC certification for the whole chain of custody and it is one of the only companies to receive the ISO 14001 certification for the whole planted area.

The use of the Reduced Impact Logging technique in the Valley of Jari is a milestone in the sustainable development approach for the Amazon Forest due to its pioneering aspect and the extension of the area of application, and it meant large investments and a continuous search for improvement by Grupo Jari.

The sustainable forest management carried out by Jari Florestal was recognized by the United Nations Food and Agriculture Organization (FAO) for its excellence and contribution to the sustainability of the forest. The company is listed among 25 exemplary companies in the book "Standing Tall: Exemplary cases of sustainable forest management in Latin America and the Caribbean" published in 2010. The selected cases represent examples of companies that apply the concept to their practices and are reflected in the conditions of the forest and the benefits they are capable of generating not only to their owners but also to the society as a whole. Jari Florestal's prominent position is supported by the direct envolvement of the communities from Valley of Jari on the forest management. Such envolvement is done through Fundação Jari and is decisive in the strengthening of relationships between small producers cooperatives and Jari Florestal (more details in Section 6).

The organizational view of Grupo Jari is described in the *Política Integrada do Sistema de Gestão* (Management System Integrated Policy) and more specifically in the several applicable environmental procedures included on the *Plano de Manejo Florestal Sustentável – Amapá* (Sustainable Forest Management Plan – Amapá), both available to validation/verification bodies.

5.1.2 Project Environmental Activities

Reducing negative impacts

Grupo Jari has mechanisms and procedures applicable to the several aspects of the Project activities that may cause changes and bring negative impacts.

Using the NBR ISO 14001:2004 regulation concepts, the environmental procedures available to the validation/verification bodies are part of Grupo Jari Environmental Management System (EMS) and, as a consequence, to the Jari/Amapá REDD+ Project; such procedures are already consolidated as they are applied to the management area in Pará and are going to be continuously adjusted to the Jari/Amapá REDD+ Project environmental management strategy. The main EMS procedures are described below and their documents are integrally available to the validation/verification bodies.

Table 51. **Environmental procedures**

Environmental procedure – Residues Management	
Objective	To establish the criteria to classify, dispose of and transport the residues generated by the Project activities.
General conditions	Classifications: • Hazard of the residue; • Area of intermediary disposal;
Specific conditions	• Classification of residues; • Disposal of residues; • Transportation de residues; • Operation of the area of intermediary disposal; • Packing of residues.
Records	• Residues control spreadsheet.
Environmental procedure – Conservation of Fauna and Flora	
Objective	To establish the necessary conditions for the conservation and protection of the flora, fauna and the preservation of areas endemic to the reproduction of wild species as a result of Project activities.
General conditions	• Recovery of vegetation; • Action against predatory hunters, invaders, and/or illegal extraction of wood in areas of the company; • Use of pesticide; • Forest fires; • Announcement to partners; • Areas of conservation.

Specific conditions	• Flora conservation; • Fauna conservation.
Records	• Wild Animals Sighting Spreadsheet.
Environmental procedure - Plan to attend to emergency	
Objective	To describe the conditions to respond to emergencies from accidents such as: spills, leakages or fires.
Environmental procedure – Monitoring and controlling erosions and slates	
Objective	To establish the necessary conditions to monitor and control erosions and slates in the areas of forest management operation as part of the Project.
General conditions	• Classification of erosions; • Monitoring, control and erosion recovery; • Recovery of slates; • Preventive actions.
Records	• Erosion Sighting Spreadsheet; • Erosions and Slates Inspection Report; • Degraded Areas Recovery Plan.
Environmental procedure – Monitoring of smoke	
Objective	To establish the conditions for the monitoring, assessment, determination and control of the black smoke level from road and rail loads and passenger transportation vehicles/equipment, fixed or stationary sources, fueled by diesel in operation in the Project area.
General conditions	• Monitoring of black smoke; • Necessary conditions; • Operation of vehicle/equipment during measurement; • Measurement and results.
Records	• Black smoke monitoring spreadsheet.
Environmental procedure – Monitoring and control of effluents	
Objective	To establish the system to monitor and control the effluents generated from forest activities with the potential to cause environmental impact.
General conditions	All generation of effluent in a fixed area of the forest shall be monitored and controlled by the means described in the operational procedure according to their nature and origin.
Specific conditions	• Monitoring and control of effluents during the production of seedlings and mechanical maintenance; • Control of effluents in the workshops; • Control of effluents in the parts washing activities; • Monitoring and inspection of separation boxes.
Records	• Inspection forms.

Environmental procedure – Prevention and control of forest fires	
Objective s	To establish the criteria for the prevention and control of forest fires.
General conditions	Conditions: • Classification of forest fires; • Weather conditions; • Topography; • Type of forest; • Causes of forest fires; • Damage from forest fires. Prevention methodology • Surveillance; • Prevention techniques; • Necessary equipment; • Firefighting methods; • Other important points; • Safety measures after firefighting.
Records	• Forest fire report.

Besides applying Reduced Impact Logging Techniques which can be seen in more details in Section 1 – Item 1.8 Description of Project Activities, some mechanisms have been developed in order to minimize the changes caused by Project activities as described below:

Soil erosion and deterioration

Procedures to guide the control of soil erosion:

- Low impact management;
- Forest protection areas on the margins of water bodies or at risk of erosion (30-100 m wide) will be marked and protected;
- No management will take place on steep slopes;
- Construction of minimum size roads and other support areas;
- Reducing skidding trails to a minimum by careful planning;
- Road construction will always follow the crest of the hills;
- Skidding trails and roads perpendicular to slopes;
- Leveling areas to make outflow easier;
- Using landfills transversally to water bodies will be avoided;
- Management in periods of heavy rain will be controlled;
- Complementary plantation using species that rapidly cover exposed soil due to forest operations may be done, as necessary;
- Construction of channels around large logging for timber areas.

Noise

The highest intensity noise found in Project-related activities is related to specific activities of the forest management, caused by chainsaws during the felling, logging, skidding and transportation activities. In order to soften the noise to the people directly involved in such operations, the use of safety equipment and hearing protection will be mandatory. Regarding the effects to the fauna, the intention is to reduce it through a strict control over the use of the equipment, ensuring it is used exclusively during operating hours, which is medium in duration and moderate in magnitude.

Water Quality

The assessment of water consumption and quality, erosion, and nutrients cycling make it possible to obtain hydrological indicators of the Project activities linked to the forest management. Thus, this assessment consists in monitoring precipitation, flow, loss of soil and nutrients and water quality.

The water quality is a thermometer to measure the ecological effectiveness of the forest management techniques adopted; however, it is necessary to assess the data using scientific criteria. The implementation of a micro basin monitoring spillway in the forest management area to provide continuous data regarding the impacts from the operation is under way, as part of the Project activities. The monitoring of the data will be carried out by the Micro Basin Environmental Monitoring Network in partnership with ESALQ/USP/IPEF and other companies in the country.

Predatory Hunting

Predatory hunting will be prevented by premises security specialized teams that will watch the area. The inspectors will have vehicles to circulate the area (ground and water) and will be trained to record infractions that will be later on informed to the governmental agency in charge (further details in “Generation of Positive Impacts”).

Impacts on the Communities (garbage, fire and hunting)

The communities generate several types of residues and these residues most of the time are not properly treated. In order to prevent soil and water pollution in the communities located in the area of influence of the Project, some types of hazardous residues, such as batteries, will be collected. Besides that, Grupo Jari environmental education program brings information to the communities regarding the generation of garbage, consumption of water, use of fire and prevention of fires, hunting and other environmental issues – further detail in Section 6 – Social Impacts.

Intact Forest Landscape

It is a non-operational area kept untouched, with no connections with the sustainable forest management and kept in order to represent the forests of the area and monitor the impacts from Project operations. The intact area has over 27 thousand hectares and was marked in the area surrounding the EEJari (Jari Florestal Sustainable Forest Management Plan surrounding area Conservation Unit) forming an ecological protection barrier for the Unit.

Generation of Positive Impacts

Besides reducing the negative impacts, positive impacts will be created through activities complementary to Project operational activities. Thus, the proponents can go beyond the common measures to reduce negative impacts and bring extra benefits to the environment and the society.

Land Inspection

Land inspection is one of the most important environmental monitoring activities in the area as it prevents deforestation, the extraction of vegetation species and the hunting of wild animals by third parties. As the land and environmental inspection are already in operation in the Project area, such procedure, summarized in the table below, is in operation and the reports on the occurrences and patrol activities are being generated (the documents are available to validation/verification bodies).

Table 52. Summary of Land Inspection Procedure.

Inspection of the land	
Objective	To establish the conditions for the inspection of Jari Celulose S.A. properties by road and river.
General conditions	Patrolling: • To carry out regular patrols in order to ensure the protection of Jari premises; • To prevent deforestation, forest fires, or other acts of aggression against the environment; • To prevent the extraction and illegal trading of wood and other forest products and predatory hunting and fishing; • To keep a good relationship with squatters and existing communities; • To promote social actions; • To render support to police and inspection authorities whenever necessary; • River patrolling will be carried out by speedboats covering the main river basins in the area; • Road patrolling will be carried out in two regions of Jari Celulose: Dourado and Miguel. •

	How to proceed: • Sending team to the place of occurrence to check and apply the necessary measures; • Asking the judicial department area to take the necessary measures; • Registering the occurrence in the police station by the Premises Security Coordinator in cases involving invasion and damages to the property and illegal extraction of forest products; • Occurrences involving aggressions to the environment shall be informed to the environmental agencies (IBAMA, Environmental policy, etc.) by the Premises Security Coordinator; • Confrontation of the parties shall be avoided in all situations that involve conflicts over land, respecting country laws.
Specific conditions	• Patrolling itinerary is prepared according to the Monthly Inspection Plan; • Jari receives daily information generated by NOAA-12 satellite from the IBAMA Monitoring Management and Risk Assessment; • Occurrences not detected by road or river patrol may be detected by the aerial inspection.
Records	• Events recording protocol at IBAMA; • Police report; • Photographic record of events; • Monthly inspection program; • Land inspection activity report.

Vegetation and Genetic Diversity

In the planning of FSC-certified Management activities the sizing and qualification of the selected area took into consideration the existing diversity so as to safeguard ecosystems with higher genetic potential by classifying them as areas of permanent protection. In terms of genetic conservation the following procedures shall be used:

- Checking the existence and classification of genetic sites for conservation;
- Placing the forest Project in the regional or national context based on herbaria and book references;

To contribute to this activity Grupo Jari has a nursery of native tree species, which seedlings are used to restore degraded areas in the region. The seedlings are also donated to local population to recover their own properties. Grupo Jari has also an experimental project together with Embrapa (Brazilian Agricultural and Livestock Research Agency) to study the yield performance of Amazon tree species via natural and artifitial regeneration in gaps opened due to forest exploitation, aiming at the generation of subsides for future forest restoration programs.

Buffer zone

The Project area contributes to the protection of the Rio Cajari Forest Management Reserve (Resex Cajari) Buffer Zone located on the east side and the Rio Iratapuru Sustainable Development Reserve (RDS Iratapuru) located on the north, besides being a key factor for the conservation and maintenance of water resources as there are three important river basins located in the area – Jari, Cajari

and Maracá. With the implementation of the Project, areas that are not effectively protected right now, will receive less deforestation and degradation pressure.

Monitoring the Fauna

Jari Florestal keeps a project in partnership with the Lancaster and Cambridge Universities (England) to monitor the fauna in the Project forest management areas and aims to assess the maintenance of the forest ecological values in terms of animal diversity and the key services of these ecosystems as indicators of fauna biodiversity. Thus, the intention is to have more subsidies to establish more effective strategies to complete the knowledge gaps on some subjects subsidize the decision making process.

Jari Xylotheque (Wood Collection)

In order to preserve and increase knowledge on the Amazon forest heritage, the Jari Xyotheque was created in 1968. It has 620 samples of wood from the area, a herbarium with 3,513 botanical samples and a collection of insects with 2,322 samples, which makes the Jari Xylotheque one of the largest in the world. The samples are collected by the botanical species identifiers and later catalogued under their common and scientific names and including some specifications such as density and size.

It is possible that the Project makes this knowledge available to the society as an action to complement the cycle of benefits brought by the Project.

6 SOCIAL IMPACT

In order to present the positive net impacts on the communities in the Project area of influence, the social aspects of the Project will be presented so as to inform the communities about what has been done and what will be improved, and more specifically the activities carried out and to be implemented, and their impacts on the Project area of influence.

The main objectives of the Jari/Amapá REDD+ Project social activities are:

- To generate positive net impacts in the communities in the Project area of influence throughout the Project duration;
- To support the development of activities profitable to social wellbeing and economic alternatives to deforestation as a way to do sustainable business; and to avoid leakage from activities displacement.

Communities in the area of influence have the opportunity to take part in the Project activities led by Fundação Jari, and their participation in the Social Activities is voluntary. Also, families who already carry activities in the region will not be coerced by the Project, but the agricultural expansion will become

unnecessary. Therefore, it is not considered as a negative impact the reduction of the expansion of agriculture in the Project Area.

6.1 Communities in the Project area of influence

The criteria defining the communities in the Project area of influence:

- **Geographic location:** communities that are located inside the Project area or in the Project neighboring area at easy access, preferably by land. It does not include the area of influence of the Santo Antônio hydroelectric power plant under construction in the region as they are going to undergo specific impact mitigation action from the new enterprise, and the communities in the Rio Cajari Forest Management Reserve, which are areas of influence of specific policies for Conservation Units and have their own management plan;

- **Relation with natural resources and the Project area:** communities that have developed subsistence or low scale commercial agriculture maintaining continuous and integral presence in the area, dependent on the Project area for such ends. It is not included in this category medium and large producer residents of urban areas and having commercial scale agricultural/cattle raising activities in areas adjacent to the Project area;

- **Predisposal for social organization:** communities with initiatives or interest in establishing community organizations, associations, cooperatives or other social centers;

- **Existence of institutional intervention initiatives:** communities connected to public and/or public-related institutions such as Rural Development Institute (RURAP), Environment Secretariat, Public Ministry and others;

- **Production Potential:** communities developing economic activities related to the sustainable use of the land focused on extrativism and agriculture, or that have the interest and potential to develop them.

According to the *Plano de Desenvolvimento Humano e Sustentável do Vale do Jari* (Valle of Jari Human and Sustainable Development Plan) the region of the Jari/Amapá REDD+ Project known as Valley of Jari encompasses a population of approximately 100,000 people whose majority is concentrated in the urban area of the three neighboring municipalities and the rural population distributed in 180 small rural communities according to the survey carried out by POEMA – *Programa Pobreza e Meio Ambiente da Universidade Federal do Pará (UFPA)* (Pará Federal University Environment and Poverty Program),

and CEATS – *Centro de Estudos em Administração do Terceiro Setor da Universidade de São Paulo* (São Paulo University Third Sector Center of Management Studies) (document called "*Diagnóstico Socioambiental das Comunidades Rurais do Vale do Jari*" available to validation/verification body). The results of this study show that the communities' gratest weaknesses are related to education, health, citizenship, technical assistance to improve production and transportation logistics for their products.

98 out of 180 rural communities live inside Grupo Jari area. From these communities, the following have been chosen as communities influenced by the Jari/Amapá REDD+ Project, according to the previously mentioned criteria:

- Communities in the Laranjal do Jari rural area:
  - Tira Couro
  - Sombra da Mata
  - Valdomiro/Barbudo
  - França Rocha
  - Fé em Deus
  - Igarapé das Pacas

- Communities in the Vitória do Jari rural area:
  - Nova Conquista
  - Água Azul

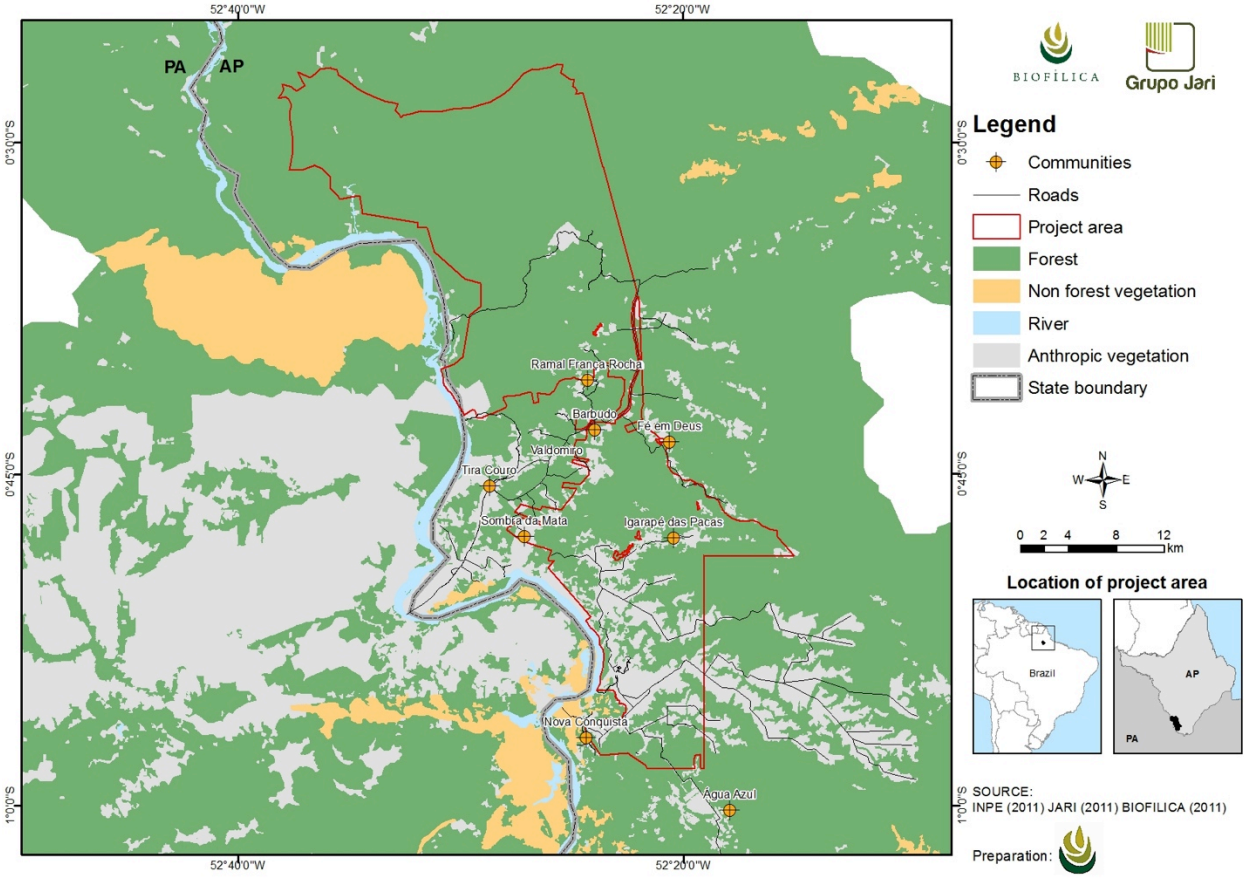

Figure 28. Location of the communities in the Project area of influence.

6.2 Jari/Amapá REDD+ Project Social Management

The social management and the implementation of the Jari/Amapá REDD+ Project social activities are the responsibility of the Fundação Jari, a non-profit organization considered Grupo Jari social entity, specifically mandated to run these activities on behalf of the Project proponents.

In order to design the Jari/Amapá REDD+ Project activities, project proponents attempted to analyze the positive and negative impacts on the communities. It is intended by the Project proponents to consider the reduction of deforestation as a condition for the benefits sharing. However such possibility is under study, taking into consideration the objectives listed above.

Foreseen negative impacts caused by the Programs and Activities described in section 1.2.2 – Project Activities, as well as measures taken to mitigate them are listed below:

I. Increase in number of local population with the success of the Project: Grupo Jari has proceedings of patrolling and land surveillance for avoiding land invasions (Item 5 – Environmental Impacts). Also squatter who enter the area after Project start date will not be involved in the benefit sharing.

II. Impacts caused by the low impact forest management, such as smoke from vehicles and equipment, noise from chainsaw, machines and vehicles, production of residues: For the impacts caused by the low impact forest management, Jari Florestal has environmental proceedings with the goal to mitigate and monitor such impacts (Item 5 - Environmental Impacts).

Foreseen Positive Impacts caused by the Programs and Activities described in section 1.2.2 – Project Activities, as well as measures taken to potentialize them are listed below:

I. Generation of income to the communities;

II. Improvements in agricultural production and facilitating sales of products as a result of technical assistance and inputs and technical capacitation of the communities;

III. Avoiding rural exodus and marginalization of people in the cities because communities will have conditions to remain in the rural area with good life quality;

IV. Reducing risks of extreme weather events duo to climate change by reducing forest deforestation.

Therefore, the Jari/Amapá Redd+ Project will promote net positive impacts on the communities as well as mitigate negative impacts and potentialize the activities that generate positive impacts.

The social work scenario in the communities in the Project area of influence is extremely challenging as there is a complete lack of public policies, and the issues related to land tenure and illegal exploitation of natural resources force the communities to migrate to urban centers or to stay in the area developing low productivity agricultural activities, suffering deprivations of resources and basic public services such as health, education and sanitation. Based on these aspects, it will be shown how the social activities of the Jari/Amapá REDD+ Project are decisive to contain deforestation in the Project area and foster the wellbeing of the local populations. In complement to these activities the Project will support the implementation of alternative economic activities in already degraded areas (Project leakage management area) in order to promote an improvement in the quality of life of these communities by introducing profitable and sustainable economic alternatives.

As part of the Project Social management strategy, the communities in the area of influence have the opportunity to take part in the Project activities led by Fundação Jari, which maintains communication channels open and carry out the community relations process, understanding their demands and interests and finding applicable social and economic alternatives. The beginning of this relationship is described in *Procedimento Comunicação com Partes Interessadas (*Communication with Stakeholders Procedure) created by Grupo Jari Quality and Environment Management area and recorded in the form *Comunicação com a Comunidade* (Communication with the Community), made available to validation/verification body). As described in the mentioned procedure, the forms are analyzed and forwarded to make provisions, and later return to the communities.

The FSC forest management certification requirements, which 10 principles aim to ensure advantages and benefits for all in the production chain, including the communities affected by the Project, are used in the preparation and consolidation of the activities. Among all the principles, we can highlight Principle 4, as it is especially directed to Community Relations and Worker's Rights and complying with it means that "Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities." Thus, FSC-certified companies area putting into actions their commitment to social responsibility (FSC, 2012).

The extension of FSC certification from the managed areas in Pará to Amapá, as mentioned in Item 1.11, make clear that the Project proponents are committed to respecting the criteria to supply job opportunities and training to the communities, consulting the groups directly affected by Project activities, as well as continuously generating positive impacts throughout the duration of the Project.

A partnership with CIFOR (Center for International Forestry Research) was established in parallel with the Project in order to update the social-economic information on the area and independently and comparatively monitor the impacts of the Project on the communities in the area of influence. The Jari/Amapá REDD+ Project will be part of the REDD+ Global Comparative Study (GCS), which objectives are: (i) to supply to groups interested in REDD+ information, analysis and tools to reduce carbon emissions effectively, efficiently and equally to the co-benefits ("3Es+"); (ii) to make information available to partners and the REDD+ global community; and (iii) to influence the preparation and implementation of REDD+ in three scales: global, national, and local.

Social-economic information will come from interviews with the communities in the Project area of influence conducted by CIFOR without the participation or interference of Project proponents so that it becomes an independents analysis without biased or influenced information. The results of the study will be made available to proponents and integrated into the Project social management strategy. A full description of the partnership and the study can be found in Section 7 – Comments from Stakeholders.

6.2.1 Fundação Jari

Fundação Jari aims to create, through integrated social development, sustainable models that can be replicated multiplying their reach and impact on the society.

As described in its *2011 Activities Report* the Foundation is present in five Brazilian states (Amazonas, Goiás, São Paulo, Amapá and Pará); it started operations in 1994 helping the development of children and teenagers through education, health and citizenship rights assurance.

According to Grupo Jari's Amapá Sustainable Forest Management Plan, most of the resources come from the 1% of Orsa's Group gross revenue that comes to the foundation regardless of the financial result of the group. By 2009 these investments had totaled R$150 million.

Fundação Jari has been operating in the Valley of Jari since 2000 when it started its activities with children and teenagers. After the change of focus in 2008, the development of sustainable business and

the partnership community-company became the priority in order to make feasible and integrate public polices, social mobilization and sustainable businesses based on the strengthening of local communities enterprises. For such, Fundação Jari places itself as a facilitating and fostering agent of sustainable development by surveying the needs and opportunities of the region and constructing action plans together with government, companies and organizations from the civil society.

The constant work of Fundação Jari is widely recognized; in 2008 Fundação Jari was awarded the "*Prêmio Brasil de Meio Ambiente*" by the JB Ecologico/Editora JB, chosen as the best Project in a municipal scale regarding the FSC certification obtained by Jari Florestal and its forest management. Another award was given by the Sustainable Agricultural and Forest Business Increment Program which acknowledged as Social Technology by Banco do Brasil Foundation Social Technology Award – 2011 edition.

Based on social demands from the communities in the Valley of Jari, Fundação Jari operation model was organized in three areas (see *Plano de Desenvolvimento Humano e Sustentável do Vale do Jari* document available to validation/verification bodies) as described below and it is the model applied to the Jari/Amapá REDD+ Project Social Management strategy.

a) Social management:

Initiatives for social inclusion and participation are part of this category consolidated in the strengthening of social organizations, more specifically in the participation in Councils and technical assistance to community organizations. Education and qualification for work are also important factors taken into consideration by Fundação Jari Social Management area.

b) Business Management:

Considering the assumptions of Sustainable Agriculture and Forest Management, Fundação Jari's activities related to these lines of work encompass technical assistance to agriculturists and forest management workers in the area consolidating commercial partnerships, that is, ensuring they have a market. For the development of new businesses Self-Sustainable Schools were created in order to qualify students who are able to manage, plan, produce and trade in a sustainable way.

Continuing the chain of production and the search for self-sustainability of community businesses, the Eco-businesses Incubator has been fulfilling its role as mediators by providing assistance, technical monitoring and the articulation of partnerships, even commercial ones.

c) Environmental Management:

In this category are included the actions of mobilizing community leaderships to guide the communities regarding the social and environmental rights and responsibilities so they can orderly react to any violation of such rights and the illegal exploitation of natural resources. The Social-environmental

Agents Project represents an action of this category.

6.2.2 Project's Social Activities

Currently Fundação Jari acts in part of the communities in the Project area of influence, being them Tiracouro and Valdomiro/Barbudo. The communities that are not yet benefited will be involved in social management activities and the impacts generated will be monitored throughout the duration of the Project. Also, other communities not yet included in Project design can be target by Project activities in the future, as carbon credits generation and negotiation succeed.

The first step of this gradual development was a meeting held with the members of the communities in the Project area of influence and the Project proponents in July 2012 (attendance list available to validation/verification bodies), moment in which it was given an understanding of the Project activities to the communities and made it possible for them to express their demands, interests and suggestions to integrate the social management strategy of the Jari/Amapá REDD+ Project (see Section 7 – Comments from the Stakeholders). This relationship will last throughout the Project duration. It is important to highlight the constructive characteristic of this process as the involvement of the communities with the Project is conditioned to the interest and demand of each one of them and it is the responsibility of the proponents to provide them with the opportunity to participate and express themselves regarding the implementation, development and actions of the Project. In this respect, a Technical Chamber on REDD+ was created among Project proponents and the stakeholders, including a representative of each community involved in the Project. One of the objectives of such Chamber is to envolve stakeholders, in order for them to understand REDD+ related concepts and to assess the proposed activities. The first meeting had already been held, as described in Setion 7, Item 7.2.

Below is a list of the programs that are part of the large areas of work of Fundação Jari and its respective Projects developed in the Jari/Amapá REDD+ Project region (see *Relatório de Atividades 2011* and *Relatórios de Impactos 2000 a 2010 da Fundação Jari,* available to validation/verification bodies). It shall be highlighted that, despite Fundação Jari's operations cover part of the area in the Project region, including urban and rural territories, its current structure and available fundings limits its action to the maintainance of the existent programs and projects. However, with Jari/Amapá REDD+ Project, such activities will be expanded to other not yet benefited communities.

Table 53. Programs, Projects and social impacts – Social Management Category.

Rights Assurance Defense Program and Social Organizations Assistance Program	
Description: Support and assistance to councils and social entities regarding social education, health and professional qualification of young people. **N. of assisted people**: over 45 thousand children and teenagers, and over 20 thousand families.	
***Atleta Solidário* Project**	**Description**: sport and pedagogical activities of several types respecting the physical and cognitive limitations of the participants; it aims at the social inclusion of people with or without special needs and their families who live in situations of social vulnerability, and also at improving the quality of life and the development of physical skills and capabilities. **Location**: Laranjal do Jari and Monte Dourado (urban area). **Resources**: R$ 175,782.00 **Target audience**: Children, adolescents and people with special needs. **Number of beneficiaries in 2011**: 7,800 people **Impacts**: To increase access to sectorial public policies for people with special needs; to reduce social isolation; to increase social protection and individual care related to handicapped people and their families. **Tools for project record and follow-up**: registration card, reports, attendance lists and copies of users' documentation.
***Estação Social* Project**	**Description**: Technical support to social organizations to help them to attract resources and manage them in a responsible and independent way. **Location**: Almeirim, Laranjal do Jari and Vitória do Jari (urban area). **Resources**: R$ 88,275.00 **Target audience**: Adults, families and social organizations. **Number of beneficiaries in 2011**: 40 organizations. **Impacts**: Organizations that have strategic view, attracting public and private resources and investing them efficiently. Around 780 families are assisted by the organizations.
***Garantia de Direitos* Project**	**Description**: To foster the formation of leaderships and to act in network with family social protection services. **Location**: Almeirim, Monte Dourado, Laranjal do Jari and Vitória do Jari (urban area). **Resources**: R$ 136,072.00 **Target audience**: Adults and Councils. **Number of beneficiaries**: 03 Municipalities, 03 Councils and 01 Against Exploration Network. **Impacts**: To have permanent dialog between the actors in the social protection services; to increase the efficiency of rights assurance policies, especially regarding violence confrontation.
***Magia de Tupã* Project**	**Description**: It is based on art and culture strengthening artistic and cultural skills and aims to contribute to strengthen family ties and cultural identity of children and youths in situations of social vulnerability and risk. **Location**: Laranjal do Jari (urban area).

	Resources: R$ 89,828.00 **Target audience**: Children, adolescents and young adults. **Number of people assisted**: 29 people. **Impacts**: Children and adolescents participating and developing cultural actions; significant improvement in the quality of life of the participants and their families. **Tools to record Project follow-up**: registration card, reports, attendance lists and copies of users' documentation.

Education and Qualification for Work Program – Social Value

Description: Qualification courses in information technology, clerical work and electrical, mechanical and agriculture techniques. Grupo Jari companies and contractors hire part of this workforce as apprentices and personnel.

N. of people assisted: 1,300

Results from 2000 to 2010: Increase in local economy of R$ 1,600,000.00

***Canteiro Escola* Project**	**Description**: The Project is done in partnership with the Jari Celulose infrastructure area and provides education to the youth in civil construction, electrical, hydraulic and masonry maintenance. It makes it possible for the youth to get professional and entrepreneurial qualification for the infrastructure and services sectors. **Location**: Almeirim, Monte Dourado, Laranjal do Jari and Vitória do Jari (urban and rural areas). **Resources**: R$ 33,730.00 **Target audience**: youths and adults. **Number of people assisted**: 151 people. **Impacts**: Improvement in people's quality of life through the generation of jobs and income; improvement in the offer and quality of infrastructure and accommodation services in the area; increment to local economy. **Tools for project record and follow-up**: registration card, reports, attendance lists and copies of users' documentation.

***Interação Digital* Project**	**Description**: It makes access to information and general education for the work market possible through information technology. **Location**: Almeirim, Monte Dourado, Laranjal do Jari and Vitória do Jari. **Target audience**: Adolescents, elderlies, adults and people with special needs. **Number of people assisted**: 1,009 people. **Impacts**: To raise youths who a more informed and qualified to search their spaces in the work market; community leaders and social organizations using information technology as a work tool. **Tools for project record and follow-up**: registration card, reports, attendance lists and copies of users' documentation.

Table 54. Programs, Projects and respective impacts – Business Management Category

Sustainable Agricultural and Forest Business Increment Program	
Description: Efforts guided towards the strengthening of agricultural production and forest management in rural communities as well as the development of innovative businesses in order to make the partnership Community-Company stronger. The Foundation believes that having a sustainable-use plan allied with support actions and market makes it possible to generate an increase in productivity and family income which in the long run will make the families become economically independent aligning sustainability with quality of life. **Number of land and forest workers' families assisted**: 800 **Results from 2000 to 2010**: Increase in local economy of over R$ 7,600,000.00 in 4 years	
***Extrativismo Sustentável Jari* Project**	**Description**: It ensures technical assistance to forest work communities in order to implement good practices that will add value to the Brazilian nut production chain and assisted the communities in the financing and trading processes. **Location**: Almeirim and Laranjal do Jari (rural area). **Resources**: R$ 160,347.00. **Target audience**: Families and communities on the river banks and dry land. **Number of people assisted**: 120 **Impacts**: Preservation of Brazilian nuts plantations and dissemination of good harvesting practices; access to credit lines; breaking of the chain supply and more independence to the forest worker in the relationship with the market; reduction in rural flight and increment of R$1,000,000.00 in the local economy in 3 years for 100 families.

***Fomento de Negócios Agrícolas e Florestais* Project**	**Description**: In order to contribute to the sustainable development of rural communites and the generation of income by fomenting family agriculture, Fundação Jari provides assistance to the families to help the sustainable production of agricultural/forest products and the search for financing and trading. The methodology used in this Project was reocgnised and cretifes by thr Banco do Brasil Foundation Award for Social Technology – 2011 edition. **Location**: Almeirim, Laranjal do Jari and Vitória do Jari (rural area). **Resources**: R$ 347,505.00. **Target audience**: Adults and communities. **Number of people assisted**: 400. **Impacts**: The plantation of curauá (Ananás Erectifolius) in association with the traditional production systems or eucalyptus plantation has brought income and certainty of food to the communities. Five financining projects (DRS Curauá) were made available for the involved municipalities totaling R$58,646.00. Regarding the production of greens R$ 2,916.40 were traded with Sodexo. The average income in the period of the 175 producers assisted was R$900.00 totaling an increase in the local economy of approximately R$ 157,000.00.

New Business Development Program

Description: To complement the strategy of strengthening land and forest workers' families' production, the Foundation develops a program of new businesses which provides technical and management assistance, articulation of institutional and trading partnerships.

Assisted enterprises: COOPNHARIN (wood crafts); AMARTE (bio jewelry); AGULHAS VERSÁTEIS (workers uniforms).

Cumulative gross revenue in 5 years: COOPNHARIN – R$ 509,546.00; AMARTE – R$ 244,782.00; AGULHAS VERSÁTEIS – R$ 1,359,591.68.

Total increment to regional economy: R$ 2,113,919.00

***Incubadora de Negócios* Project**	**Description**: Strengthening of popular enterprises having a solidary profile and emphasis on eco-businesses through an incubation environment. The assistance is related to the attraction and management of resources and the development of a market. **Location**: Laranjal do Jari, Vitória do Jari an Almeirim. **Resources**: R$ 327,168.00 **Target audience**: Associations and Cooperatives. **Number of people assisted**: 08 associations and 03 cooperatives. **Impacts**: The *Agulhas Versáteis* Cooperative closed the first quarter of 2011 with gross revenue of R$ 101,854.85 with an average income per associate of R$1,400.00 (highest amount reached since its creation). The Cooperative closed the quarter with gross revenue of R$ 58,808.00 and the average income of $ 600.00 per member, especially due to delivery of "*garden tiles*" to Leroi Merlin, arbitrated by Jari Florestal. AMARTE has been discussing new strategies together with the Foundation and Sebrae to develop new products.

Table 55. Programs, Projects and respective impacts – Environmental Management Category

Environmental Education Program	
Description: The Foundation promotes the formation of community leaders working in the sustainable use of the forest and the natural resources. **N. of people assisted**: 50 community leaders educated as Forest Defense Leaders; 835 forest workers producing and preserving the Legal Reserves and the Permanent Preservation Areas (PPA). **Results from 2000 to 2010**: At least 4,000 hectares recovered through the Agro-forest Systems; and a minimum of 40,000 hectares of forest area preserved (Legal Reserves and PPA).	
***Agentes Socioambientais* Project**	**Description**: Contributing to the formation of rural community leaders as agents of transformation working to assuring citizenship rights and the sustainable use of natural resources. Among the activities developed are: lectures to reduce the use of fire, fight against forest deforestation and illegal harvesting, forest conservation, basic health assistance, and qualification of community agents. **Location**: Almeirim, Laranjal do Jari and Vitória do Jari (rural area). **Resources**: R$ 82,398.00 **Target audience**: Family and Communities (on river banks and dry land). **Number of people assisted**: 58 communities assisted and 35 social-environmental qualified agents. **Impacts**: Communities acting in network to defend their rights; reduction in the oncast of diseases transmitted by water contamination; reduction in the number of forest fires, deforestation, predatory hunting and fishing, and other forms of illegal use of natural resources.

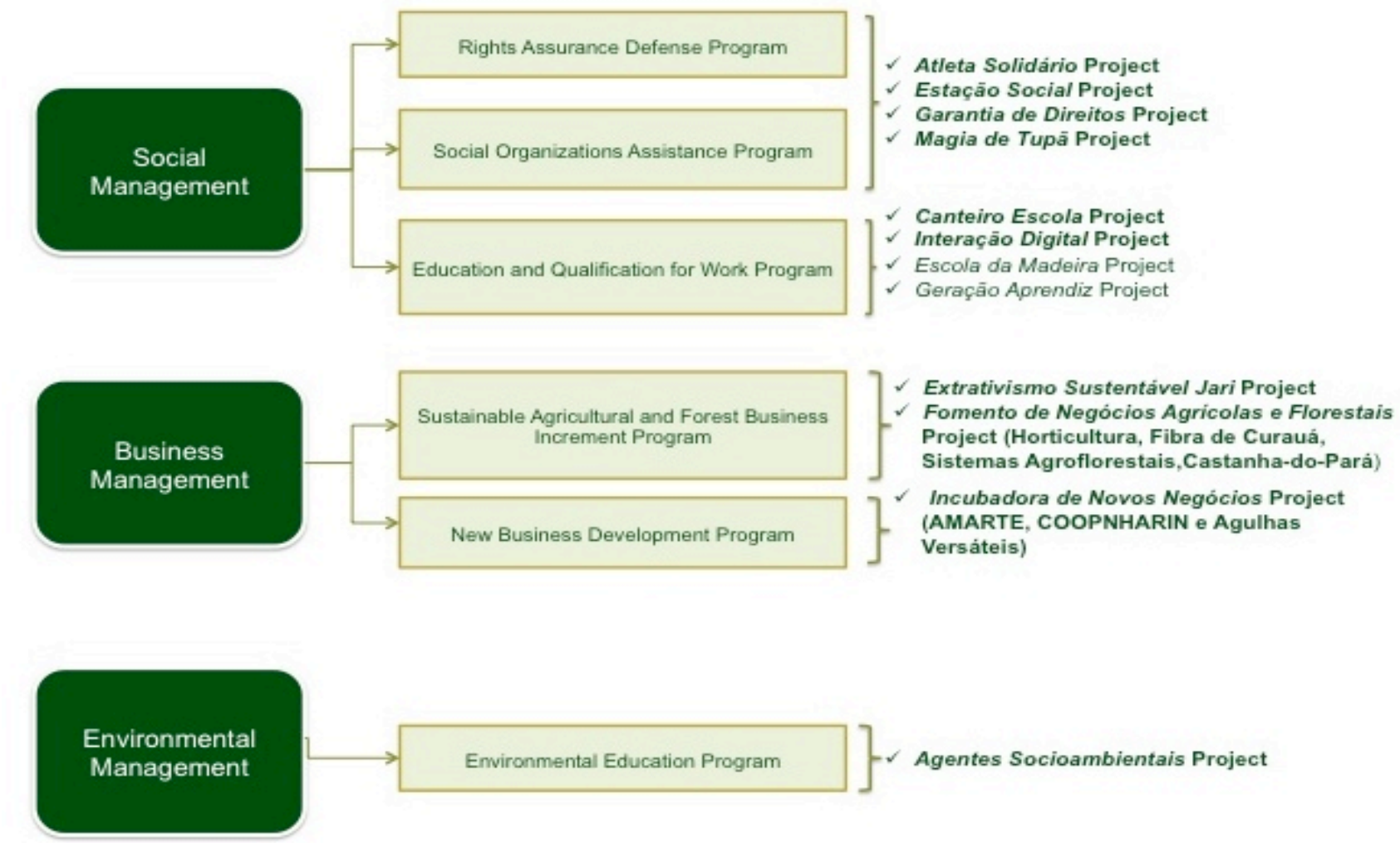

Figure 29. Flowchart of the Jari/Amapá REDD+ Project Programs and Projects developed by the Fundação Jari (in bold the projects carried out in the Jari/Amapá REDD+ Project area and/or area of influence).

6.3 Work Team, Occupational Health and Safety

In the social management of the Project, the relationship with the workers involved in the activities is also a component to be permanently observed as most of the workforce comes from neighboring municipalities, which generates significant social-economic impacts on the region.

Grupo Jari currently employs 5,644 people among who 2,713 are located in the North Region of Brazil, which includes Manaus and the Valley of Jari. The Project proponents express their respect for the workers through actions that promote personal and professional growth and the improvement of work conditions.

6.3.1 Work Team

For the Project activities related to FSC-certified forest management it is estimated a technical team of 85 direct members and 42 third-parties working in the operational steps.

Table 56. Estimated technical team for the Project activities related to FSC forest management

Size of the Technical team	
Own management team/ Jari Florestal	01 Operational Manager 01 Forest Management Coordinator
Own operational team	01 Operational Supervisor
Operational Team – Guided felling of the trees	01 Field Foreman 12 Chainsaw Operators 12 Assistants 01 Mechanic
Operational Team – Logging	01 Field Foreman 06 Chainaw Operators 06 Field 01 Mechanic
Skidding trail planning team	01 Field Foreman 04 Planners 04 Aides
Road planning, opening and maintenance Team	01 Field Foreman

	02 Planners 02 Aides 02 Machine Operators
Skidding of Logs Team	01 Field Foreman 04 Field Aides (Control and Measurement) 06 Chainsaw Operators; 04 Aides
Forest Residues Preparation Team	01 Field Foreman 03 Equipment Operators 04 Chainsaw Operators
Occupational Safety and Medicine Team	02 Safety Technicians 01 Nurse 01 Safety Engineer
Size of Outsourced Technical Team	
Skidding of Logs	04 Specialized Machine Operators 01 Supervisor
Road	04 Machine Operators 02 Truck Drivers
Transportation	24 Truck Drivers 02 Machine Operators
Mechanical Maintenance	01 Lubricator 02 Mechanics 02 Welders

6.3.2 Occupational Health and Safety Guidelines

Strict control of workers' safety represents an important factor of the Project due to FSC certification principles and criteria and the official regulations issued by the state and federal governments.

For such, Project proponents keep an occupational safety team formed by a safety engineer, safety technicians and a physician. This team will be supported by the Accident Prevention Internal Committee (CIPA).

In order to carry out the operations, besides safety-related training, entire workforce receive, for mandatory use, personal protection equipment (hard hats, leg protection, hearing protection, safety gloves, and other equipment) and also collective protection equipment (tents, when necessary). The team has two satellite phone to contact headquarter in Monte Dourado and a vehicle in the work front to provide support and for emergency situations.

These and other safety-related actions not mentioned above are part of the occupational health and safety regulations kept in the following procedures:

- Handling and Transportation of Hazardous Products
- Emergency Response Plan
- Task Risk Assessment (TRA)
- Integrated Accident Prevention Internal Committee
- Planned Observation of Unsafe Actions
- Safety Inspection
- Safety Dialog
- Hazards and Risks
- Safety Meeting
- Emergency Response Procedure
- Moving and Semi-moving vehicles and equipment
- Occupational Health and Safety Management Plan
- Chainsaw operation
- Rural workers transportation
- Equipment calibration
- Risk Management
- Occupational Rehabilitation Program
- Work at heights
- Occupational Health Medical Control Program – OHMCP
- Common Areas

6.4 Monitoring Project social impacts

The monitoring of social activities impact is considered as a management tool and describes which Social Management Programs are successful as described before. It is important to notice that this monitoring is already done Fundação Jari programs and projects and when the Jari/Amapá REDD+ Project starts, such activity will have the support of the other proponents. External audits led by the accreditation agency accredited by the FSC will also provide performance results of the Project social activities.

The large theme areas to be continuously monitored are:

- **Comprehensiveness:** number of benefited people and locations;
- **Local economy increment:** variable related to the management of sustainable businesses through the generation of work and income;
- **Satisfaction of the population:** measurement of the level of satisfaction of the people assisted by Fundação Jari Projects at all levels;
- **Recovered and preserved Areas:** measuring of hectares recovered and/or preserved by the environmental education activities and activities related to creation of economically feasible alternatives to deforestation.
- **Strengthening of the institutions:** observation of the performance of social organizations and entities assisted by Fundação Jari.

The monitoring can be divided into three steps. As the initial recording of the impacts generated by the Project, there is a form called *"Instrumental Familia (Family Tools)"*, available to the validation/verification bodies, used for the initial identification of the families, way of life, sources of income, level of education, participation in organizations and potentials. The attendance to meetings and activities also represent a monitoring recording. During the Project, the assistance list *Fomento de Negócios Agrícolas e Florestais – Monitoramento de Sub-Projetos,* presented to the validation/verification bodies, is a monitoring tool used in each technical visit to observe the development of the aspects related to the technical assistance provided in several categories.

Table 57. Steps of social activities monitoring

	Step 1	Step 2	Step 3
Description	Visit to the communities and collection of family data	Monitored visits throughout the Project	Data compilation and announcement
Records	Instrumental Familia (Family Tools) Spreadsheet	Attendance to training course and attendance list of the "Fomenting Agricultural and Forest Businesses – Monitoring of Sub-Projects"	Fundação Jari Activities Report and Impacts Report

The analysis of the continuous improvement of the Project attributes will start from the monitoring of representative variables; such results will be announced according to the Fundação Jari practices.

One of the possible increments to the social monitoring system is the preparation of a complete monitoring plan including more specific indictors for each community in the Project area of influence. This process is being analyzed by the Project proponents and will be implemented in case it is necessary and viable according to the Project social management strategy.

7 STAKEHOLDERS COMMENTS

Aiming at assuring the participation of stakeholders who act in the area of the Jari/Amapá REDD+ Project, the Project proponents held meetings with representatives from state and local government agencies, communities influenced by the Project and local class organizations. In these meetings the stakeholders showed interest in knowing more about REDD+, thus creating the REDD+ Theme Chamber.

Below are described the meeting conducted for the presentation of the Project to the stakeholders, as well as the first meeting of the REDD+ Theme Chamber.

7.1 Consultation meetings with stakeholders

The specific common goals of the meetings were:

- Presentation of the Project design;
- Presentation of the Project activities and expected impacts;
- Alignment of expectations;
- Opening of a communication channel between the Project proponents and stakeholders;
- Recognition of the Project by the stakeholders; and
- Presentation of the Global Comparative Study on REDD+ to be developed in the Jari/Amapá REDD+ Project by the CIFOR (Center for International Forestry Research) (Table 58).

Table 58. Description of the CIFOR Global Comparative Study on REDD+.

Global Comparative Study on REDD+
The CIFOR Global Comparative Study on REDD+ aims at contributing to the success of "first generation" REDD+ Projects so that they become more efficient, effective and equitable, and that they generate co-benefits such as reduction of poverty and preservation of biodiversity. For that CIFOR analyses policies, practices and implementation of REDD+ Projects, and shares lessons learned among local, national and global players. The Study is divided into four components: **Component 1**: analyses REDD+ policies and processes; **Component 2**: observes and documents the implementation of Project activities and its impacts; **Component 3**: develops reference levels and monitoring systems; and **Component 4**: broadly shares the results of the research. The Jari/Amapá REDD+ Project is being studied under Component 2. This component is conducted in approximately 24 REDD+ Projects in six countries that include Brazil, Peru, Cameroon, Tanzania, Indonesia and Vietnam. This research involves data collection before and after the implementation of the Project activities, so as to show the impacts on human welfare, forest carbon stock and other relevant results. In the Jari/Amapá REDD+ Project, three different questionnaires are going to be used with the communities influenced by the Project – one aimed at the families, another to the communities and, a third to the women – and one to the proponents to the Project. Thus the presence of CIFOR will comply with the objectives presented in the Global Comparative Study on REDD+, as well as work as a monitoring tool of social and environmental impacts of the Project.

The meetings occurred on separate occasions, and participating agencies and main results of each one will be presented here.

State of Amapá government agencies

Venue: State Forests Institute, Macapá – AP

Date: June 27 2012

Agencies represented:

- Grupo Jari
- Biofílica Investimentos Ambientais
- Instituto Estadual de Florestas – IEF (Forests State Institute)
- Secretaria de Estado do Meio Ambiente – SEMA (State Department of Environment Conservation)
- Instituto de Desenvolvimento Rural do Amapá – RURAP (Rural Development Agency for the state of Amapá)
- Secretaria de Estado da Indústria, Comércio e Mineração – SEICOM (State Department of Industry, Commerce and Mining)

Main results:

The agencies represented in the meeting recognize the Jari/Amapá REDD+ Project as an important tool to decrease deforestation and forest degradation, carbon stock conservation, sustainable use of forest resources through best practices in forest management, as well as its importance for the local social-economic development. Thus, they offer institutional support for the development and maintenance of the Project activities. As support from the state government to REDD+ Projects in the private sector, a legal milestone to regulate public-private relationship in this kind of business is under construction by the State Attorney General, according to the IEF director.

Project proponents, in turn, provide support to other initiatives in the State of Amapá that, similarly to the Jari/Amapá REDD+ Project, seek socioeconomic and environmental development.

Figure 30. Project proponents, partners and government agencies from the state of Amapá meet to discuss the Project.

Regional government agencies

Venue: Fundação Jari, Monte Dourado - PA

Date: July 09 2012

Agencies represented:

- Fundação Jari
- Jari Florestal
- Biofílica Investimentos Ambientais
- Center for International Forestry Research – CIFOR
- Secretaria Municipal de Agricultura de Vitória do Jari – (Vitória do Jari Municipal Agricultural Department)

- Instituto de Desenvolvimento Rural – RURAP (Laranjal do Jari Unit) (Rural Development Agency)
- Instituto de Desenvolvimento Rural - RURAP (Vitória do Jari Unit (Rural Development Agency)
- Secretaria Municipal de Meio Ambiente e Turismo – SEMMATUR (Tourism and Environment Municipal Department)
- Instituto Federal do Amapá - IFAP (Amapá Federal Agency - environment coordination)
- Community representatives

Main results:

The institutions represented in the meeting recognize the Jari/Amapá REDD+ Project as an important tool to decrease deforestation and forest degradation, as well as its importance for the local social-economic development. Thus, they offer institutional support for development and maintenance of Project activities.

In order to broaden their knowledge on REDD+ Project, discuss concepts and increment institutional synergies for the implementation of the Project, a Theme Chamber on REDD+ was created to occasionally gather together the Project proponents, government agencies and community representatives.

Figure 31. Project proponents, partners and local government agencies representatives meet to discuss the Project.

Communities in the Project area of influence

Consultations in the communities in the Project area of influence were carried out in four different meetings so as to group neighboring communities. Invitations were made by Fundação Jari to all residents through local radio announcements and letters delivered personally to one or more residents.

Meeting 1

Venue: Balneário do Hiara

Date: 10/07/2012

Agencies represented:

- Fundação Jari
- Biofílica Investimentos Ambientais
- Center for International Forestry Research – CIFOR
- Secretaria Municipal de Agricultura e Abastecimento de Laranjal do Jari Municipal Department of Agriculture and Supply
- Fé em Deus Community
- França Rocha Community

Figure 32. Project proponents, partners and Fé em Deus and França Rocha community residents meet to discuss the Project.

Meeting 2

Venue: Residência da Senhora Socorro – Tira Couro Community

Date: 11/07/2012

Agencies represented:

- Fundação Jari
- Biofílica Investimentos Ambientais
- Center for International Forestry Research – CIFOR
- Secretaria Municipal de Meio Ambiente e Turismo de Laranjal do Jari Tourism and Environment Municipal Department)
- Tira Couro Community
- Sombra da Mata Community
- Valdomiro/Barbudo Residents

Figure 33. Project proponents, partners and Tira Couro, Sombra da Mata and Valdomiro / Barbudo residents.

Meeting 3

Venue: Ms. Antônia's home –Nova Conquista Community

Date: 12/07/2012

Agencies represented:

- Fundação Jari
- Biofílica Investimentos Ambientais
- Center for International Forestry Research – CIFOR
- Instituto de Desenvolvimento Rural - RURAP (Unidade de Vitória do Jari) Rural Development Institute
- Nova Conquista Community
- Igarapé das Pacas Community

Figure 34. Project proponents, partners and Nova Conquista and Igarapé das Pacas Communities residents meet to discuss the Project.

Meeting 4

Venue: Água Azul Community school

Date: 12/07/2012

Agencies represented:

- Fundação Jari
- Biofílica Investimentos Ambientais
- Center for International Forestry Research – CIFOR
- Instituto de Desenvolvimento Rural - RURAP (Unidade de Vitória do Jari) Rural Development Institute
- Água Azul Community

Figure 35. Project proponents, partners and Água Azul Community residents meet to discuss the Project.

Main results:

The residents of the communities exposed the challenges to keep quality of life together with the preservation of the forests and see the Jari/Amapá REDD+ Project as a tool to reduce deforestation and forest degradation, and to bring social, economic and environmental development to their communities.

A representative of each community was also sent to compose the Theme Chamber on REDD+ so as to bring to the community knowledge on the subject or increase the knowledge they may have on that, as well as to keep an open dialog about REDD+ and the Jari/Amapá REDD+ Project with the Project proponents. They also accept to take part in the Global Comparative Study on REDD+ made by CIFOR.

7.2 Technical Chamber on REDD+

Venue: Fundação Jari, Monte Dourado – PA

Date: 07 August, 2012

Agencies represented:

- Grupo Jari
- Fundação Jari
- Biofílica Investimentos Ambientais
- Sindicato dos Trabalhadores e Trabalhadoras Rurais de Laranjal do Jari (STTR) Workers and Rural Workers Union
- Sindicato dos Trabalhadores e Trabalhadoras Rurais de Vitória do Jari (STTR) Workers and Rural Workers Union
- Instituto do Meio Ambiente e de Ordenamento Territorial do Estado do Amapá (IMAP) Environment and Land Use Planning in the State of Amapá
- Secretaria Municipal de Agricultura de Vitória do Jari (SEMA) Municipal Agriculture Department
- Secretaria Municipal de Agricultura de Laranjal do Jari (SEMA) Municipal Agriculture Department
- Instituto de Desenvolvimento Rural – RURAP (Unidade de Laranjal do Jari) Rural Development Agency
- Instituto de Desenvolvimento Rural – RURAP (Unidade de Vitória do Jari) Rural Development Agency
- Secretaria Municipal de Meio Ambiente e Turismo de Laranjal do Jari (SEMMATUR) Tourism and Environment Municipal Department)
- Instituto Federal do Amapá (IFAP) Amapá Federal Agency
- Community representatives

The specific goals of the meetings were to discuss the following topics:

- Climate changes – concept, causes and consequences
- The importance of forests in the climate changes context
- Ways to mitigate climate changes
- Amazon deforestation agents
- How to decrease Amazon deforestation
- REDD+ – concept and working mechanism, types of projects, examples from other Projects and challenges
- Jari/Amapá REDD+ Project

Main results:

Besides the debate on the items in the agenda, the participants discussed ways to contribute to the decrease in the deforestation of the Project area, especially in regard to the strengthening of relationship between governmental agencies, non-governmental organizations, communities and Project proponents.

Figure 36. Technical Chamber on REDD+ first meeting

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APPENDIX

APPENDIX A: Jari/Amapá REDD+ Project Technical Team

Biofílica Investimentos Ambientais Team

Name	Responsibilities in the project	Function	Contact
Plínio Ribeiro	Project management	President Director	plinio@biofilica.com.br
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Mariama Vendramini	Financial management	Financial and Commercial Manager	mariama@biofilica.com.br
Rogério Marinho	GIS analysis and carbon emissions accounting	GIS analyst and Land Use Modeling	rogerio@biofilica.com.br
Thaís Hiramoto	Coordination support and social relations	Administrative Staff and Project Analist	thais.hiramoto@biofilica.com.br

Grupo Jari Team

Name	Responsibilities in the project	Function	Contact
João Prestes	Project and business management	Director of Natural Resources and Forestry Business	jprestes@grupoorsa.com.br
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Jorge Rafael de Almeida	Development of social programs	Social management	jralmeida@fundacaoorsa.org.br
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APPENDIX B: Other entities involved

IPÊ-ARVORAR Team

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Marcelo Wigman	Coordination of the development of social, economic and environmental assessment	Executive Director	marcelo@arvorar.com
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Other partners involved

Name	Responsibilities in the project	Function	Contact
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