REDD+ JARI/PARÁ PROJECT

Document prepared by Biofílica Investimentos Ambientais S.A.

Project Title	REDD+ Jari/Pará Project
Version	1.0
Date of issue	DD-Month-YYYY this version of the document issued
Prepared by	Biofílica Investimentos Ambientais S.A.
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Project Title	REDD+ Jari/Pará Project
Version	1.0
Date of issue	DD-Month-YYYY this version of the document issued
Project Location	Brazil, State of Pará, Municipality of Almeirim
Project Proponents	• Biofílica Investimentos Ambientais Plínio Ribeiro, plinio@biofilica.com.br, +55 11 3073-0430; • Jari Celulose: Patrick Nagem Nogueira, patrick.nogueira@grupojari.com.br, +55 11 4689-8753; • Jari Foundation: Jorge Rafael Almeida, jralmeida@fundacaojari.com.br, +55 93 3735-1140.
Prepared by	Biofílica Investimentos Ambientais S.A.
Validation Body	Organization and contact name with email address and phone number
Project Lifecycle	July 8, 2014 through July 7, 2044 - 30 years
GHG Accounting Period	July 8, 2014 through July 7, 2044 - 30 years
History of CCB Status	First validation attempt
Golden Level Criteria	The Project meets the criterion of the *GL3* Gold Level. – *Exceptional Benefits to Biodiversity*, according to the vulnerability criterion described by CCBS for presenting critically endangered or threatened species (according to the IUCN Red List). The REDD+ Jari/Pará Project area has an important role in conserving the biodiversity of the site and the activities proposed in the Project, as monitoring the biodiversity and incentives to carry out scientific research, have the purpose of helping to maintain this conservation.
Expected Schedule of Verification	First Verification in CCBS every two years after validation/verification and thereafter every two years throughout the Project life cycle. VCS checks are expected every three years.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 SUMMARY OF PROJECT BENEFITS

1.1 Project Benefits

The results or summary impacts of expected benefits in the REDD+ Jari/Pará Project are reported in Table 1 below.

Table 1. Summary of expected benefits in the REDD+ Jari/Pará Project.

Estimated Result or Impact until the End of Project Lifecycle	Reference Section
1) Expected Climate Benefits: with the REDD+ Jari/Pará Project, it is expected to assist in the mitigation of climate change with a total avoided emissions of 15,759,440.1 tCO_2eq. The avoided deforestation in the scenario with the Project is 51.985 hectares during the project's life cycle and an average of 525,314.7 tCO_2eq of reduced emissions.	3
2) Expected benefits to the Community: the benefits to the local community and other actors will be focused on the aspects of associative strengthening, improvement of family farming, provision of technical assistance and improvement in energy and communication systems. With this, it is intended to influence the social issues and the living conditions of the communities around the Project area, reducing social vulnerability and rural exodus, increasing the level of socioeconomic conditions and the life quality of the families, helping to obtain goods and services that promote economic and social well-being.	4
3) Expected Benefits to Biodiversity: the REDD+ Jari/Pará Project provides for the maintenance and monitoring of the forest cover in the Project area, in conjunction with the development of sustainable forest management, ensuring the protection and conservation of habitats and local biodiversity, including species with some degree of threat according to IUCN. In addition, the Project area plays an "ecological corridor" role, which connects several Conservation Units and assists in the generation of knowledge through the development of scientific research related to the theme.	5

1.2 Standardized Benefits Metrics

Various metrics are shown below with an estimate of the net benefit that the REDD+ Jari/Pará Project aims to achieve over the Project Lifecycle (Table 2).

Table 2. Estimates of the net benefit for different metrics during the lifecycle of the REDD+ Jari/Pará Project.

Categories	Metrics	Estimated until the end of the Project Lifecycle	Reference Section
Reductions or removals of GHG emissions	Estimated net emissions removals in the Project area compared to the non-Project scenario	Not applied	3
	Estimated net emission reductions in the Project area, compared to the non-Project scenario	15,759,440.1	3
Forest Cover	For REDD+ Projects: Estimated number of hectares of forest loss reduced in the Project area, compared to the non-Project scenario	51,985	3
	For ARR projects: Estimated number of hectares of forest cover increased in the Project area, compared to the non-Project scenario	Not applied	-
Improvement in Land Management	Number of hectares of forest land under production in which Improved Forest Management (IFM) practices are expected to occur as a result of Project activities as measured against the non-Project scenario	491,788	3
	Number of hectares of non-forest land where improvements in land management practices are expected to occur as a result of Project activities as measured against the non-Project scenario	Does not apply	-
Training	Total number of community members who must have improved skills and/or knowledge resulting from the training provided as part of Project activities	272 people	4
	Number of female community members who should have improved skills and/or knowledge resulting from the training provided as part of Project activities	50 people	4
Employment	Total number of people expected to be employed in the Project activities, expressed as number of full-time employees	Not applied	-
	Number of women expected to be employed as a result of Project activities, expressed as number of full-time employees	Not applied	-
Livelihoods	Total number of people who must have improved livelihoods or income generated as a result of Project activities	80 people	4
	Number of women who must have improved livelihoods or income generated as a result of Project activities	10 people	4
Health	Total number of people for whom health services are expected to improve as a result of the Project activities, as measured against the non-Project scenario	Not applied	-
	Number of women for whom health services are expected to improve as a result of the Project activities, as measured against the non-Project scenario	Not applied	-

Categories	Metrics	Estimated until the end of the Project Lifecycle	Reference Section
Education	Total number of people to who access to or quality of education should improve as a result of Project activities, as measured against the non-Project scenario	136 people	4
	Number of women and girls to who access to or quality of education should improve as a result of Project activities, as measured against the non-Project scenario	25 people	4
Water	Total number of people who should experience increased water quality and/or improved access to drinking water as a result of Project activities, as measured against the non-Project scenario	Not applied	-
	Number of women who should experience increased water quality and/or improved access to drinking water as a result of Project activities, measured against the non-Project scenario	Not applied	-
Well-being	Total number of community members whose well-being should improve as a result of Project activities	320 people	4
	Number of women whose well-being should improve as a result of Project activities	60 people	4
Biodiversity Conservation	Expected change in the number of hectares managed significantly better by the Biodiversity Conservation Project, measured in comparison to the non-Project scenario	491,788	5
	Expected number of critically endangered or threatened species (according to IUCN list of endangered species) which benefit from the reduction of threats as a result of Project activities, as measured against the non-Project scenario	6 species	5

2 GENERAL

2.1 Project Objectives, Conception and Long-Term Feasibility

2.1.1 Summarized Project Description (G1.2)

The REDD+ Jari/Pará Project is a partnership between Biofílica Investimentos Ambientais S.A. and Jari Celulose, belonging to the Jari Group, with the purpose of promoting forest conservation and reducing potential greenhouse gas emissions (GHG) based on a model of local economic development that values the “standing forest” through the integration of Sustainable Forest Management activities and the commercialization of environmental services.

The Project is located in the municipality of Almeirim, in the State of Pará, and borders the State of Amapá to the North. There is a very important role in this region as it serves as a home for many rural families and as an ecological corridor, with several Conservation Units (CUs) in its vicinity. There are several communities directly or indirectly influenced by the Project, either because they are

geographically within the Project area or because they provide manpower, some of them being: Nova Vida, Braço, Cafezal, Recreio & Serra Grande.

It has a very rich biodiversity, its vegetation includes ten forest and non-forest formations, the most representative being the Lowland Dense Ombrophilous Forest and species of extreme ecological importance (27 species of flora and fauna have some degree of threat according to the IUCN Red List) and social (extractive communities have diverse flora as a source of income and food). The main rivers are the Tueré River, the Jari River (state border Pará/Amapá), the Paru River and the Amazon River (to the south).

Based on the studies developed, it is noted that the main agents that threaten the integrity of the Project region are squatters and small farmers through agriculture and livestock activities and major infrastructure works. Therefore, the components of this Project have been developed and aligned to minimize and avoid deforestation, as well as to promote benefits for the climate, communities and biodiversity. The main components of the Project relate to forest protection and monitoring; activities aimed at reducing the risks of deforestation and conserving biodiversity; the promotion of applied scientific research focused on biodiversity and the efficient use of natural resources; and the inclusion of communities in the Project, seeking greater integrity among the parties involved as well as focusing on sustainable business chains and generating income and well-being for local communities.

All of these activities will become economically viable by combining the activities of Sustainable Forest Management with the commercialization of carbon credits through REDD+ mechanisms.

2.1.2 Project Scale

Table 3. Project Scale.

Project Scale	
Project	x
Mega Project	

2.1.3 Project Proponents (G1.1)

Project proponents and their respective contacts are described below (Table 4). The main proponent of this project is Biofílica Investimentos Ambientais S.A.

Table 4. Identification, contact and responsibility of the proponents of the REDD+ Jari/Pará Project.

ORGANIZATION	DESCRIPTION
Biofílica Investimentos Ambientais S.A.	Biofílica Investimentos Ambientais is a Brazilian company focused on the management and conservation of forest areas in the Amazon biome. Created in 2008 with the objective of creating pioneering alternatives and making environmental conservation an economically interesting activity for forest owners, communities and investors. Biofílica's mission is to reduce deforestation and carbon emissions into the atmosphere, conserve biodiversity and water resources, and promote the social inclusion and development of communities living in the Amazon biome through commercialization of credits for environmental services, promotion and financing of scientific research activities and development of sustainable business chains. **Project Responsibilities:** general coordination of socioeconomic and environmental diagnostics (DSEA) and baseline and carbon stock studies; development and financing of the PDD (Project Design Document); remote monitoring of forest cover and implementation/coordination of additional actions aimed at reducing/mitigating greenhouse gas emissions (GHG); validation/verification and commercialization of credits; co-management of the Project throughout its duration. **Contact:** Plínio Ribeiro – Executive Director Phone: +55 11 3073-0430 E-mail: plinio@biofilica.com.br Website: www.biofilica.com.br

Jari Celulose S.A.	Jari Celulose S.A. is a company of the Jari Group that has two divisions: the Cellulose Division, which produces bleached eucalyptus pulp and is the only company in Brazil, and first in the world, to have FSC Pure Label certification for its entire custody chain. The Paper and Packaging Division is the second largest integrated industry serving almost all economic segments. **Project Responsibilities:** owner of the land and responsible for land security and patrimonial surveillance. **Contact:** Patrick Nagem Nogueira – Executive Director Phone: +55 11 4689-8753 E-mail: patrick.nogueira@grupojari.com.br Website: www.grupojari.com.br
Jari Foundation	The Jari Foundation is the social enterprise of the Jari Group which, together with a vast network of partners, develops programs and projects in the areas of education, health, human rights, environment, culture and employment and income generation. Its main financing source is a fixed contribution of 1% of the gross annual revenue of the Jari Group. Since 1994, it has assisted more than 6.8 million people in Brazil. **Project Responsibilities:** responsible for the Project co-management, for the operation of sustainable forest management, as well as all related activities such as environmental and social management of the Project to reduce negative impacts and to generate positive ones. In addition to being responsible for the development of social activities and for the social management of the Project. **Contact:** Jorge Rafael Almeida – General Coordinator Phone: +55 93 3735-1140 E-mail: jralmeida@fundacaojari.com.br Website: www.fundacaojari.org.br

2.1.4 Other Entities Involved in the Project

Other entities involved in the REDD+ Jari/Pará Project and their respective contacts are described in Table 5 below.

Table 5. Identification, contact and responsibility of other entities involved in the REDD+ Jari/Pará Project.

ORGANIZATION	DESCRIPTION
Agregue	**Project Responsibilities:** **Contact:** Marcos Antonio Tiecher – Executive Director Phone: +55 91 4006-8400 E-mail: marcos.tiecher@agregue.com.br Website: www.agregue.com.br
Casa da Floresta Assessoria Ambiental	Casa da Floresta Assessoria Ambiental is a company specialized in biodiversity and sustainability studies. With 18 years of experience in the area of environmental consulting, Casa da Floresta is nationally recognized for performing high level works. It has a dynamic and qualified team of researchers and experts from the environmental and social area able to carry out activities and environmental assessments in the various biomes and terrestrial and aquatic ecosystems of Brazil. **Project Responsibilities:** development of characterization studies of physical environment and evaluation of region biodiversity, as well as development of socioeconomic data of the REDD+ Jari/Pará Project **Contact:** Klaus D. Barreto and Mônica Cabello de Brito – Directors Phone: +55 19 3433-7422 E-mail: casadafloresta@casadafloresta.com.br Website: www.casadafloresta.com.br

ORGANIZATION	DESCRIPTION
Harmonia Socioambiental	Harmonia Socioambiental is a company in the field of socio-environmental consulting with a multidisciplinary vision, which proposes to advise and implement projects that consolidate the adoption of sustainable practices, including socioeconomic and environmental aspects. Specialized in environmental education, diagnosis and socio-environmental studies, involving fauna, flora, and indigenous and non-indigenous traditional peoples, aiming at the development and promotion of sustainable economic chains. It has a solid theoretical and practical background through proven experience in the field of biodiversity conservation, socio-environmental responsibility, training of community-based leaderships and development of socio-environmental financial mechanisms. **Responsibilities in Project:** social consultation for socioeconomic and environmental diagnosis and socioeconomic module. **Contact:** Nicia Coutinho Phone: +55 93 99159-8911 E-mail: hconsultoriasocioambiental@gmail.com

2.1.5 Physical Parameters (G1.3)

Location of the Project Zone

The REDD+ Jari/Pará Project is located in the northern region of the state of Pará, and to the north is the Conservation Station "Jari Ecological Station" and is on the right bank of the lower Jari river, limiting with the state of Amapá in the municipality of Almeirim (Figure 1), between the parallels 0º 20" 00" S & 1º 40" 00" S, meridians 51º 50" 00" W & 53º 20" 00" W. The surrounding area is characterized by the presence of several Conservation Units (Comprehensive Protection and Sustainable Use), as well as Agrarian Reform Settlements of the National Institute of Colonization and Agrarian Reform (INCRA). The Project area comprises the entire area of Pará property, Gleba Jari I, totaling an area of 909,461 hectares.

Accesses to the Project area take the following forms:

- By land: through BR-156, from Macapá (AP), in the southwest direction, heading towards Laranjal do Jari (AP). Upon arrival at the headquarters in Almeirim (PA), it follows by PA-473, already inside the property of Jari Celulose S/A, with a duration of approximately 8 hours;

- By waterway: from Belém (PA) by the Amazonas rivers or Jari, trip lasting approximately 36 hours, considering the boats that make this route;

- By air: scheduled flights departing from Belém (PA) with a duration of approximately 40 minutes or departing from Macapá (AP) with a duration of approximately 30 minutes.

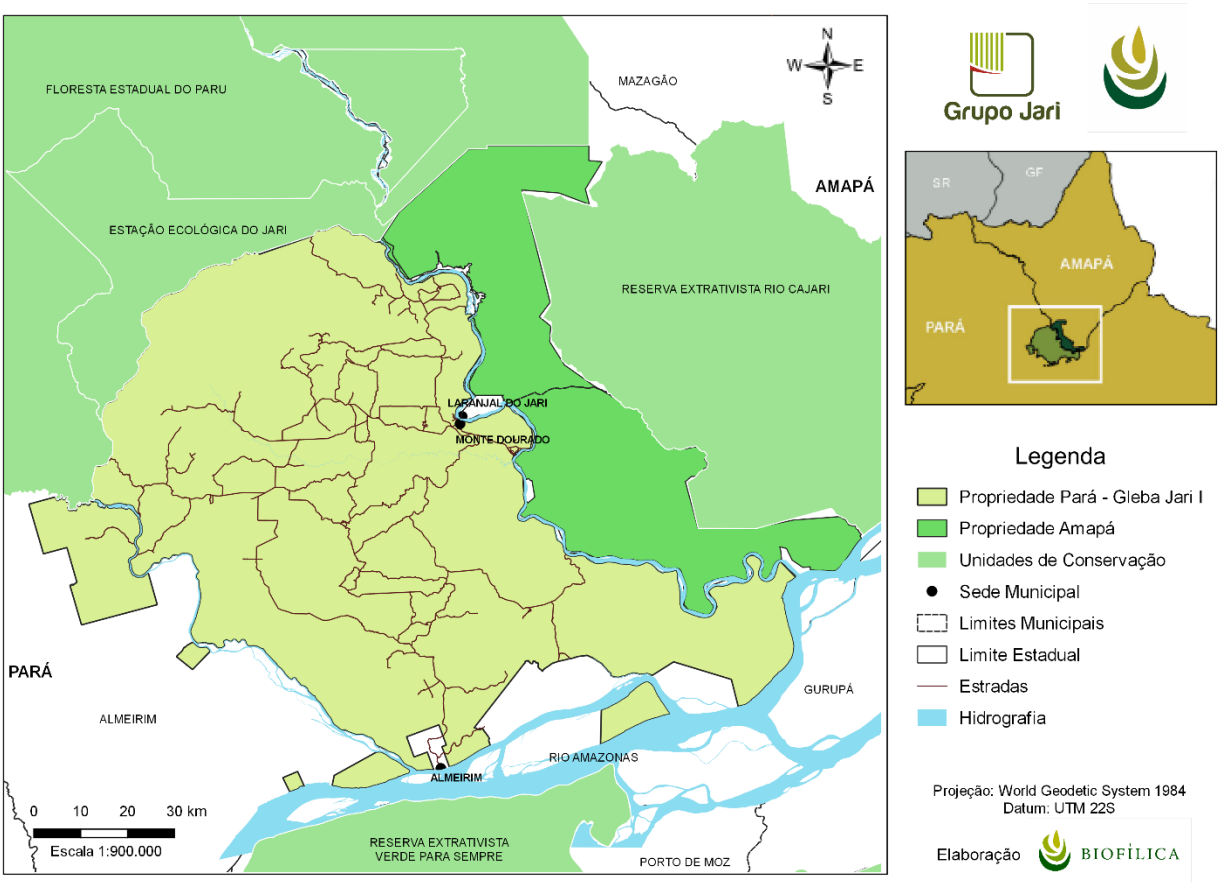


Figure 1. Location of the REDD+ Jari/Pará Project.

Geological Aspects

The reference region and the Project zone present a differentiated geology, but with a large predominance of sedimentary formations. The Project zone comprises the following Lithostratigraphic Units: Formation Alter do Chão (fine to medium sandstones, interspersed with layers of pelites and in smaller scale conglomerates), Formation Curuá (shales with intercalations of siltstones, clayey pebbles and blocks of quartz, feldspar, granite and other rocks), Fluvial Floods (uncontaminated clastic sediments present in the main watercourses. Sandy to clayey nature, with levels of gravel and organic matter, consolidated to semi-consolidated), Formation Ererê (siltstones and sandstones. They can be silicified, fossiliferous, medium granulometry, silt-like shales, laminates, showing wavy marks), Trombetas Group (sandstones, siltstones and various shales), Formation Maecuru (sandstones, siltstones and various shales), Paleogenic detritus-lateritic cover (sands, silts and various clays arranged in pale, clayey, bauxite and/or phosphate and ferruginous crust horizons) and Barreiras Group (fine sandstones, siltstones and kaolinitic argillites with conglomerate lenses and poorly consolidated sandstones) (ISSLER et al., 1974; VASQUEZ et al., 2008; JOÃO et al., 2013).

Geomorphological Aspects

In the Project area the following geomorphological units were identified: Depression of the Middle-Low Amazon River, Marginal Plateaus to the Amazon River, Marine Plains, Fluvial-marine and/or Fluvial-lacustrine.

The altitudes observed in the South and Southeastern regions of the Marine Plains and Fluvial-marine and/or Fluvial-lacustrine show little variation, with altitudes close to sea level, between 0 and 100 meters of altitude and correspond to 3.44% of the Project zone. Altitude values close to 200 meters are found in the central portion corresponding to the Mid-Low Amazon River Depression, making up most of the Project area (60.4%). Finally, the highest altitudes (200 to 600 meters) are found on the marginal plateaus of the Amazon River, north of the Project zone (corresponding to 35.83% of the area), being more susceptible to erosion.

Pedological Aspects

The pedological survey consists of the spatial distribution of the soil types of a given area, this spatialization being denominated in mapping units (sets of soil areas with positions and relationships defined in the landscape). For the Project area, eight mapping units and fifteen units were evaluated in the reference region. Among all of these units, the most present in the Project area is the LA10 whose main component is the Yellow Dystrophic Latosol (41.12%). It is still verified the presence in more than 22% of the PVA31 unit, composed mainly of the soil Red-Yellow Dystrophic Argisol. The other units found within the Project area and their main components were: RL1 - Dystrophic Litholic Neosol (14.02%), LVA14 - Dystrophic Red-Yellow Latosol (12.94%), GX23 - Eutrophic Ta Haplic Gleysol (4.13%), NV14 - Eutrophic Red Nitosol (3,31%) and GX22 – Eutrophic Ta Haplic Gleysol (1.44%).

In general, there is a great variety of soils, mainly due to the diversity of materials of sedimentary origin (for the most part), as well as to the region presenting fluvial and fluvial-lacustrine plains. Following the characteristics of regions where the climate is hot and humid, most soils are acidic and dystrophic, with the exception of some eutrophic soils, in the unit NV14 and Fluvial Gleisols and Neosols, associated with fluvial sedimentation. These soils often present, besides eutrophication, high activity clay (clay minerals 2:1), characterized by the denomination "Ta". This eutrophism combined with the presence of this type of clay, unusual in the tropical region, is restricted to the vicinity of major rivers such as the Amazon River and the Jari River. Considered poorly drained, these soils occur mainly to the south of the Project zone and the reference region, associated to the lower parts. In the higher areas, located in the central and northern portions, soils with greater drainage capacity predominate.

Climate Aspects

The state of Pará is defined as a humid equatorial climate, guided by the displacement of the Intertropical Convergence Zone (ITCZ) and by the Continental Equatorial Mass (cEm), both with summer and autumn of marked characteristics. Therefore, there is a short dry period during the winter and part of the spring, which vary from two to four months.

The ITCZ is formed in low latitude areas, where is located the region of convergence of the trade winds originated in the Southeast region with those originated in the Northeast region of the country, creating ascending masses of normally humid air. Dynamically, the ITCZ is associated with a low pressure range and flow convergence in the low levels of the atmosphere, favoring the upward movement and consequent presence of cloudiness and precipitation. It is also known as Meteorological Equator (ME), Tropical Discontinuity (TD), Intertropical Convergence Zone (ITCZ), Intertropical Front (ITF), among others (EIA) (DANTAS, TEIXEIRA, 2013).

In the state of Pará, the mean annual rainfall distribution presents the northeasterly region as the most rainy region, reaching 3,000 mm annually, which is higher than the average for the state, which is 2,214 mm (MORAES, et al., 2005) On the other hand, the Project zone presents a tendency of increase of the precipitation in the west-east direction, with precipitation reaching 1,600 mm in the western portion, in the municipality of Monte Alegre and 2,500 mm in the eastern portion, in the municipalities of Laranjal do Jari and Vitória do Jari In order to verify the precipitated average annual total in the Project area, the Jari Group provided historical data for the years 1968 to 2014, collected by a meteorological base installed in the district of Monte Dourado, in the municipality of Almeirim – PA. With these data it was possible to verify that the annual average, for the observed period, corresponds to approximately 2,270 mm.

A more detailed analysis based on data from the BHBRASIL project shows that for the municipalities of Monte Alegre and Porto de Moz, the period of lower precipitation is between August and November, with precipitations below 50 mm in Monte Alegre and 100 mm in Porto de Moz. On the other hand, between March and May, the monthly precipitation exceeds 300 mm in Porto de Moz and, in the case of Monte Alegre, values above 250 mm.

From the historical data obtained in the information collection by the Monte Dourado meteorological station, from 1968 to 2014, it was possible to perform an analysis of the average/monthly precipitation that occurs in the Project zone. Thus, it was observed that the months between March and June are those with the highest precipitation (considering months with precipitation above 250 mm), with the month of May being the one with the highest monthly volume, reaching approximately 350 mm. The months between August and November present precipitation less than 100 mm, which is the period of drought in the region, corroborating with the data obtained for Porto de Moz and Monte Alegre (Figure 2).

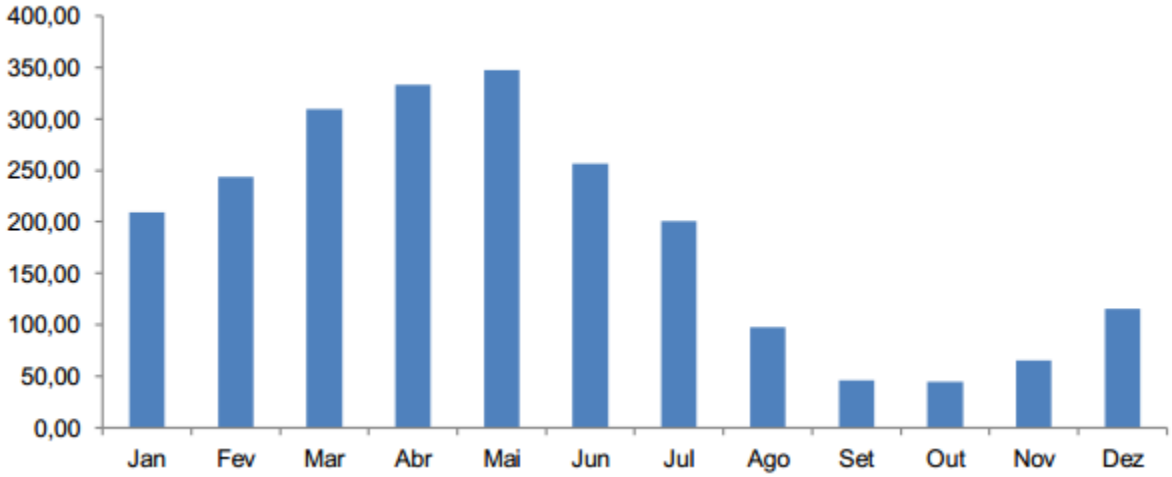


Figure 2. Monthly average precipitated based on data provided by the Jari Group, whose meteorological station is located in the district of Monte Dourado, municipality of Almeirim/PA.

According to the classification of Köppen adapted by Álvares et al. (2013), the region has a type Am climate, consistent with rainy tropical climate, where in the coldest month the temperature is above 18°C (megathermal), high annual precipitation exceeding 1,500 mm/year, being greater than evapotranspiration; and superhumid, where in the driest month precipitation exceeds 60 mm (SILVEIRA, 2014).

Hydrography

The Project zone is part of the Amazon Hydrographic Region, the most extensive hydrographic network of the world, the region being divided into ten subregions, named according to the name of the main tributary that composes it. The reference region, as well as the Project zone, is located in two of these subregions, Mouth of the Amazon and Paru River Basin (Figure 3). The main rivers are the Tueré River, the Jari River (Border of States Pará/Amapá) and the Amazon River (to the south) (Figure 4).

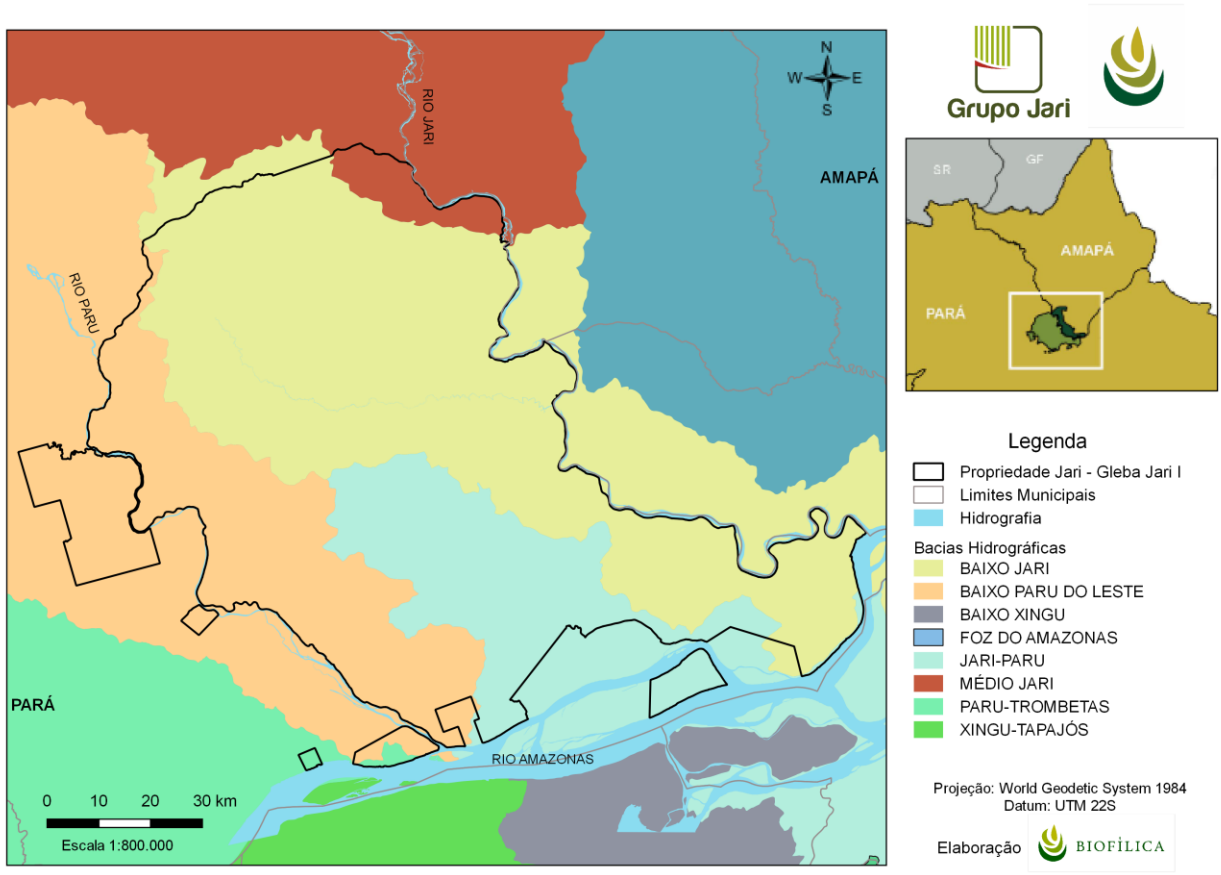


Figure 3. River basins in the region of the REDD+ Jari/Pará Project.

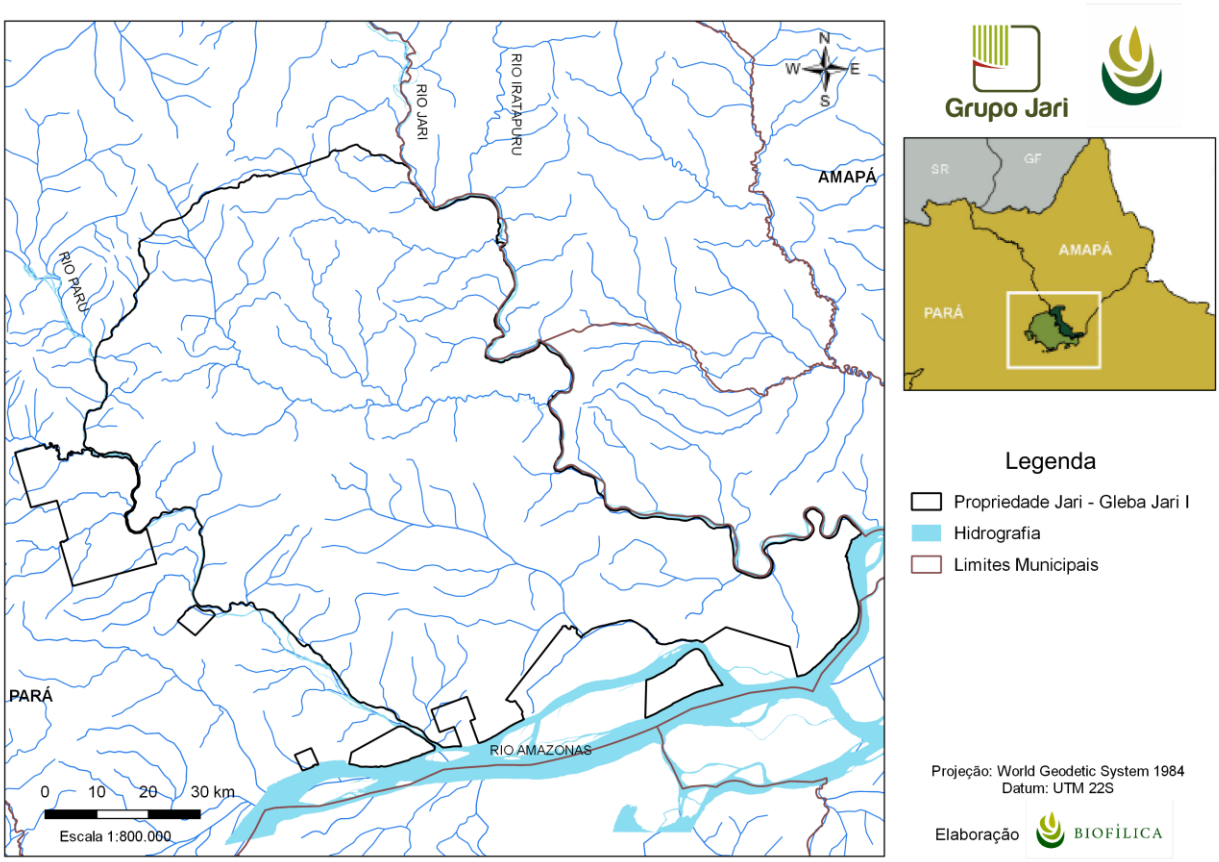


Figure 4. Map of the hydrographic network in the region of the REDD+ Jari/Pará Project zone.

Among the rivers that occur in the region, the Jari River, besides being an important contributor to the Amazon River, is also the natural divisor of the states of Pará and Amapá. With an extension of about 780 km, it develops from the northwest to the southeast and flows into the left bank of the Amazon River, with a basin of about 57,000 km², which occupy areas of the municipalities of Almeirim in the state of Pará and Laranjal do Jari, Vitória do Jari and Mazagão, in the State of Amapá. Its hydrographic network is relatively dense, presenting several waterfalls, which concentrate in the upper course of the river, aspect responsible for limiting the navigation to the south of the basin. Among them, we highlight the Santo Antônio Waterfall, with a drop of 28 meters, which also constitutes a biogeographic barrier for some species of the local ichthyofauna (EPE, 2010).

Vegetation and flora

The Amazon biome comprises a huge range of forest formations, totaling 82 different typologies of vegetation, according to IBGE (2012) definitions. The vegetation in the Project area is composed of different physiognomies, including ten forest and non-forest formations. Among the phytophysiognomies present in the Project area, the most representative are the Lowland Dense Ombrophilous Forests and the Submontane Dense Ombrophilous Forests, which together represent almost 78% of the area. (Figure

5). In Table 6 shows the phytophysiognomies with their respective values in the area (ha) for the referred Project region.

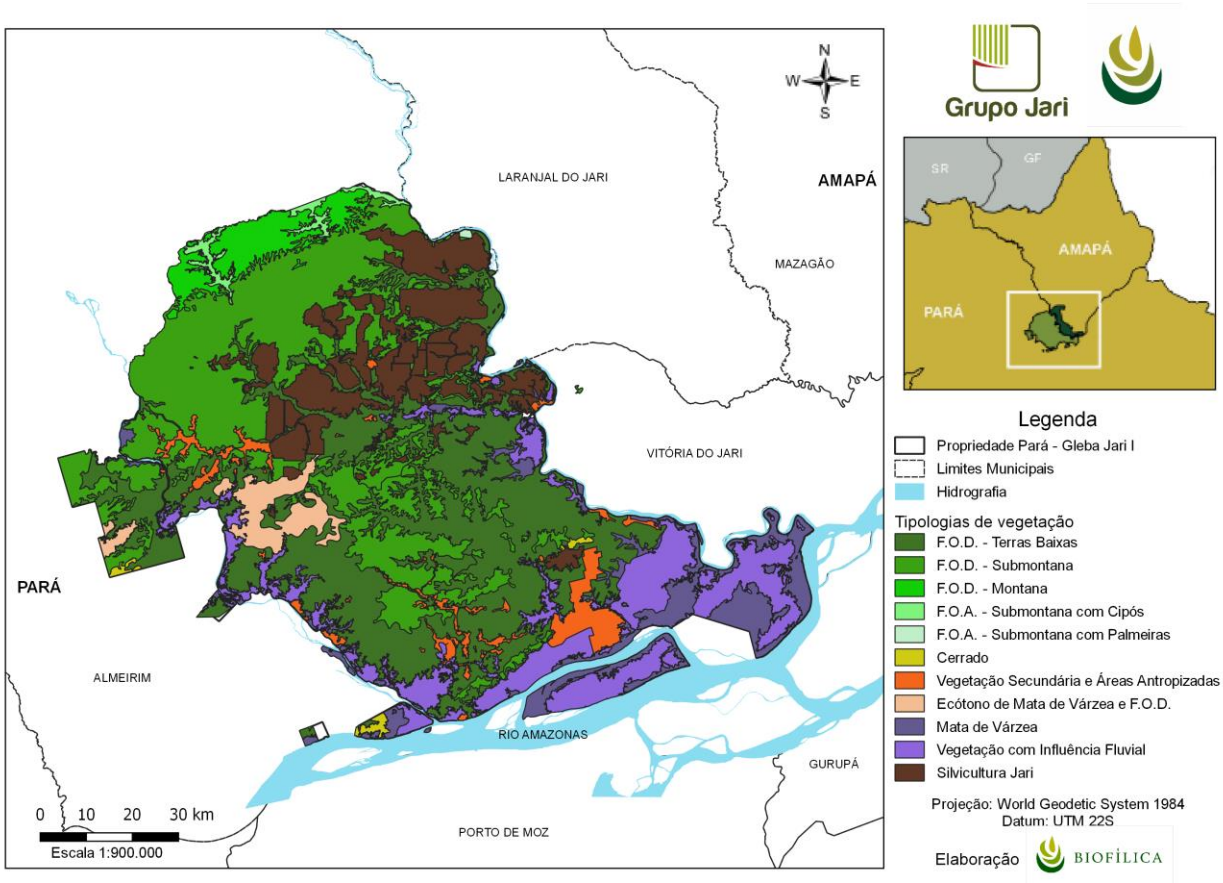


Figure 5. Types of vegetation registered in the REDD+ Jari/Pará Project area.

Table 6. Forest typologies registered in the REDD+ Jari/Pará Project area, based on Brazilian vegetation classification (IBGE, 2012).

CLASS OF VEGETATION	AREA (ha)	AREA (%)
Lowland Dense Ombrophilous Forest	214,055.5	39.4%
Submontane Dense Ombrophilous Forest	209,185.5	38.5%
Montane Dense Ombrophilous Forest	33,186.75	6.1%
Vegetation with Fluvial Influence	25,663.05	4.7%
Ecotone of Meadow Forest and Dense Ombrophilous Forest	25,257.97	4.6%
Meadow Forest	18,836.41	3.5%
Secondary Vegetation and Anthropized Areas	7,984.56	1.5%
Submontane Open Ombrophilous Forest with Vines	7,828.45	1.4%
Cerrado	1,854.37	0.3%
Submontane Open Ombrophilous Forest with Palm Trees	48.55	0.01%
TOTAL	**543,901.1**	**100%**

Dense ombrophilous forests (DOF) are characterized by climatic factors such as high temperature and rainfall, well distributed throughout the year, which generates an environment with little water seasonality (less than sixty dry days per year). On the other hand, the formation of open ombrophilous forest (OOF) presents areas of clearings and climatic gradients with more than sixty dry days (VELOSO et al., 1991). In the areas of lowland dense ombrophilous forest there are large species of commercially important species, such as Brazil nut tree (*Bertholletia excelsa*), angelim (*Dinizia excelsa*) and cedrorana (*Cedrelinga cateniformis*), and in the upper arboreal stratum, representatives of species such as maçaranduba (*Manilkara sp.*), breu (*Protium sp.*) and abiurana (*Pouteria sp.)*.

With regard to endangered species, eleven species occurring in the Project area and with some degree of threat were catalogued, based on lists created by IBAMA (Brazilian Institute for the Environment and Renewable Natural Resources) and IUCN (*International Union for Conservation of Nature*), which are used as an instrumental basis for controlling the exploitation of endangered species.

According to IBAMA, two species (Louro-rosa - *Aniba rosaeodora* and acapu - *Vouacapoua americana*) are in the EN category (endangered) and four species (Brazil Nut - *Bertholletia excelsa*, angelim-da-mata - *Hymenolobium excelsum*, itaúba - *Mezilaurus itauba* and ucuúba-da-várzea – *Virola surinamensis*) fall into the VU category (vulnerable). In relation to the IUCN list, three species (maçaranduba - *Manilkara elata*, guarajá-amarelo - *Pouteria amapaensis* and ucuúba-da-várzea – *Virola surinamensis*) are in the EN category (endangered), four species (Brazil Nut - *Bertholletia excelsa*, cutieira – *Joannesia princeps*, abiurana-vermelha – *Pouteria krukovii* and abiu-ucuubarana – *Pouteria oppositifolia*) are vulnerable (VU category) and one species (acapu - *Vouacapoua americana*) falls into the CR category (critically endangered).

Fauna

The fauna of the region contemplated by the REDD+ Jari/Pará Project is quite rich, with 1,245 species registered. In studies conducted by proponents based on a broad bibliographical search in the Socioeconomic and Environmental Diagnosis 578 species of native birds have been raised to date, of which 7.6% are considered endemic.

In relation to the mammals, 116 species (flying and non-flying) were registered, being:

- 54 bats;
- 32 small mammals;
- 30 medium and large mammals.

The zone in which the Project is inserted also counts on a great diversity of species of amphibians and reptiles, distributed in:

- 86 species of amphibians (order Anura - toads, frogs and tree frogs and Gymnophiona - blind snakes);
- 41 species of snakes (reptiles - order Squamata);

- 33 species of lizards (reptiles - order Squamata);
- 7 species of turtles, tortoises and terrapins (reptiles - order Testudines);
- 3 species of alligators (reptiles – order Crocodylia).

Economically important for communities, the fish are evaluated in 356 species for the region, according to the EIA/RIMA (Studies and Reports of Ambiental Impact) of the HEP (Hydroelectric Plant) Santo Antônio do Jari and also through the Santo Antônio HEP monitoring program.

Of all the species registered in the study area, 25 are present in the list of species threatened by the lists made available by IBAMA or IUCN. In the list provided by IBAMA, in all fourteen species present some degree of threat, being classified as follows: one species of mammal is considered endangered (category EN), three species of birds and nine species of mammals fall into the category VU (vulnerable) and one species of mammal is critically endangered (category CR).

In the IUCN list, a mammal species is in the EN category (endangered), seven species of birds, six species of mammals, two species of amphibians and two species of reptiles fall within the VU category (vulnerable) and one mammal species is in CR category (critically endangered).

2.1.6 Social Parameters (G1.3)

The Jari Project began in the late 1960s when US entrepreneur Daniel Keith Ludwig acquired extensive land areas in the Jari River Valley region of Amazonas, between the states of Pará and Amapá, planning the implementation of an agroindustrial pole in the Amazon. The daring project involved the construction of a cellulose plant in Japan, which was transported by ship to the region and commenced operations in 1979. The total area occupied for the various activities demanded by the project was 1,632,121 hectares, distributed mainly for forest production, livestock, agriculture, mineral exploration and environmental reserve. In addition to economic activities, investments in infrastructure such as highways, ports, airports and even entire urban centers were created to house the company's employees, such as the Monte Dourado District (LINS, 1994).

In view of the structural complexity and the inherent difficulties in leveraging the enterprise, including the lack of timber for factory supply, energy constraints, legal issues regarding land legality and the decline in international cellulose prices, Ludwig accumulated massive losses and began the process of nationalization of the Jari Project in the early 1980s (LINS, 1994). In 2000, the project was managed by the Orsa Group, and after processes of modernization of the production chain, acquisition of new technologies and planning of native forest management, became economically viable and in 2004 received the *Forest Stewardship Concil* certification – FSC.

In the year 2015, the REDD+ Jari/Pará Project begins, which continues an existing project in areas of Amapá (called REDD+ Jari/Pará Project). The two projects are promoted by the same proponents, based on a partnership between the Jari Group and Biofílica Investimentos Ambientais. The REDD+ Jari/Pará Project is an opportunity to improve sustainable forest management in approximately

545,000 hectares of forest in the Amazon region, in the State of Pará, contributing to the reduction of emissions from deforestation and forest degradation, combining biodiversity conservation objectives with socially, economically and environmentally responsible development, as proposed by the Social and Environmental Standards REDD+ (REDD+ PSA) and the Climate, Community and Biodiversity (CCBS) Standards (CCBA, 2013; SILLS et al., 2014). The main municipalities under direct influence of the Jari Project are: Almeirim, mainly the district of Monte Dourado, in the State of Pará, Laranjal do Jari and Vitória do Jari, in the State of Amapá.

The historical origin of the municipality of Almeirim presents two different versions. The first indicates as a historical landmark the construction of a fort by the Dutch in a village called Paru and the second attributes the origin of the municipality to the Capuchin Friars of Santo Antônio who built the village of Paru as a catechesis area for the Indians of the region (IBGE, 2005; SEPOF, 2008). In 1758, the village acquired category of Town, being called Almeirim. However, in the period of Independence, it became extinct (IBGE, 2005). According to the territorial division of the State of Pará, in 1936, Almeirim was subdivided into four districts: Almeirim, Boca do Braço, Santana do Cajari and Santo Antônio do Caracuru. However, in a territorial division dated 1988, the municipality was constituted of the districts of Almeirim, Arumanduba and Monte Dourado, remaining in this way from that date (IBGE, 2005; SEPOF, 2008). About 90% of the municipal territory is covered by forests, and 1800 km² (2.47% of the territory) were deforested from 2000 to 2014, according to data available from the PRODES Project – Monitoring of the Amazon Forest by Satellite (INPE, 2014).

Within the Jari Group area, there are 98 communities located in riverside and dry land areas in the region's forests. The REDD+ Jari/Pará Project focuses mainly on the rural area of the Municipality of Almeirim, encompassing communities considered traditional by the Group, for having established themselves before the enterprises in the region. These communities number approximately 15,000 people, whose socioeconomic bases are marked by agro-extractivist activities, with emphasis on the cultivation of cassava and its processing in flour and the collection of castanha-do-brasil (brazil nuts).

In addition, the presence of two Indigenous Lands (TI) was identified, being: TI Rio Paru d'Este, which is home to the Apalaí and Wayana ethnicities, north of the municipality of Almeirim and the Tumucumaque Indigenous Park, Apalaí and Wayana ethnicities, located in the municipalities of Almeirim and Laranjal do Jari (FUNAI, 2015, ISA, 2015). As for the rural settlements of agrarian reform there are no projects inserted in the municipal limit of Almeirim (INCRA, 2015). However, none of the indigenous and quilombo communities, nor the rural settlements, are in the reference region of the REDD+ Jari/Pará Project and, therefore, were not selected for the subsequent diagnosis.

The main economic activities of the region are linked to agriculture, cattle raising, extractivism and forestry, especially when dealing with rural communities. According to the municipal agricultural production data (IBGE, 2013), orange, banana, papaya and passion fruit production are predominant in permanent crops for the municipality of Almeirim (PA) and sugarcane, pineapple, watermelon and

cassava are more common in temporary crops. In relation to livestock production, buffalo and cattle predominate in the municipality, being the only region where honey bee production was recorded.

Plant extraction and forestry play an important role in the region's economy and mainly as a source of livelihood for families. Chestnut production is one of the main sources of income for families in the region, and is also a source of cultural reproduction for communities. There are some public policies and access to credits for the exploration and sale of chestnut, usually carried out for state industries (AMORIM et al., 2010). The plant extraction of the municipalities counts mainly with açaí, Brazil nut, charcoal, firewood and log wood.

Regarding the characterization of the study region (Almeirim municipality) and socio-cultural information, it can be said that the municipality of Almeirim occupies an area corresponding to 5.85% of the total state of Pará and is 453 km from the capital (Belém/PA). There was a slight population growth between 1991 and 2014, maintaining between 30,000 and 34,000 inhabitants, with the rural population still very significant (40.6% in 2010). The age pyramid of the municipality indicates an expanding population in the pre-reproductive phase, i.e., birth rates are higher than mortality rates. The most populous age group is 10 to 14 years and the majority of the male and female population is less than 30 years old. The number of men and women by age group is similar in all cases.

The city of Almeirim was already populated before the project was completed, with 90.4% of the total population coming from the North. Among the migrants from other regions, the Northeastern stand out, representing 7.2% of the total population. Regarding the health of the municipality, there is a private facility, 23 municipal facilities and no state facility. There are 42 doctors attending for the Unified Health System (SUS), but there is not any speech therapist or social worker. The greatest cause of death is related to diseases of the respiratory system.

Regarding education, there was a fall in the illiteracy rate between 2000 and 2010 of 7.2%. There was a significant increase in the percentage of schooling in all age groups and per level as well. In 2010, more than half of the population between 18 to 24 years of age had elementary education, and the lowest increase in schooling was in relation to full tertiary education. Almeirim registers a total of 114 schools, divided into 4 high schools, 72 elementary schools and 38 preschools (IBGE, 2012).

Almeirim had 45% of adequate basic sanitation in 2000, reducing to 33.6% in 2010, with semi-adequate increase, categories defined by IBGE. Most of the water (52%) is not treated and 86% of the homes have electricity. However, there are rural communities still without access to the energy from the municipal network.

Regarding to the per capita income of the population of Almeirim, there is a rise from 1991 to 2010 of R$ 187.17 (63%), with income in 2010 of R$ 484.16. Compared to Brazil, in 2010, Almeirim's per capita income is 39% lower, and it is important to note that Almeirim presents a large inequality index for income distribution.

2.1.7 Map of the Project Area (G1.4-7, G1.13, CM1.2, B1.2)

The Project zone is defined as "the region that encompasses the project area in which activities that directly affect land and associated resources, including activities related to the provision of livelihood alternatives and community development, are implemented" (CCBA), making up the entire area of Pará property, Gleba Jari I, with an area of 909,461 hectares.

The figure below determines the boundary of the Project zone, the high conservation value area (AAVC) and the existing conservation units around the property (Figure 6).

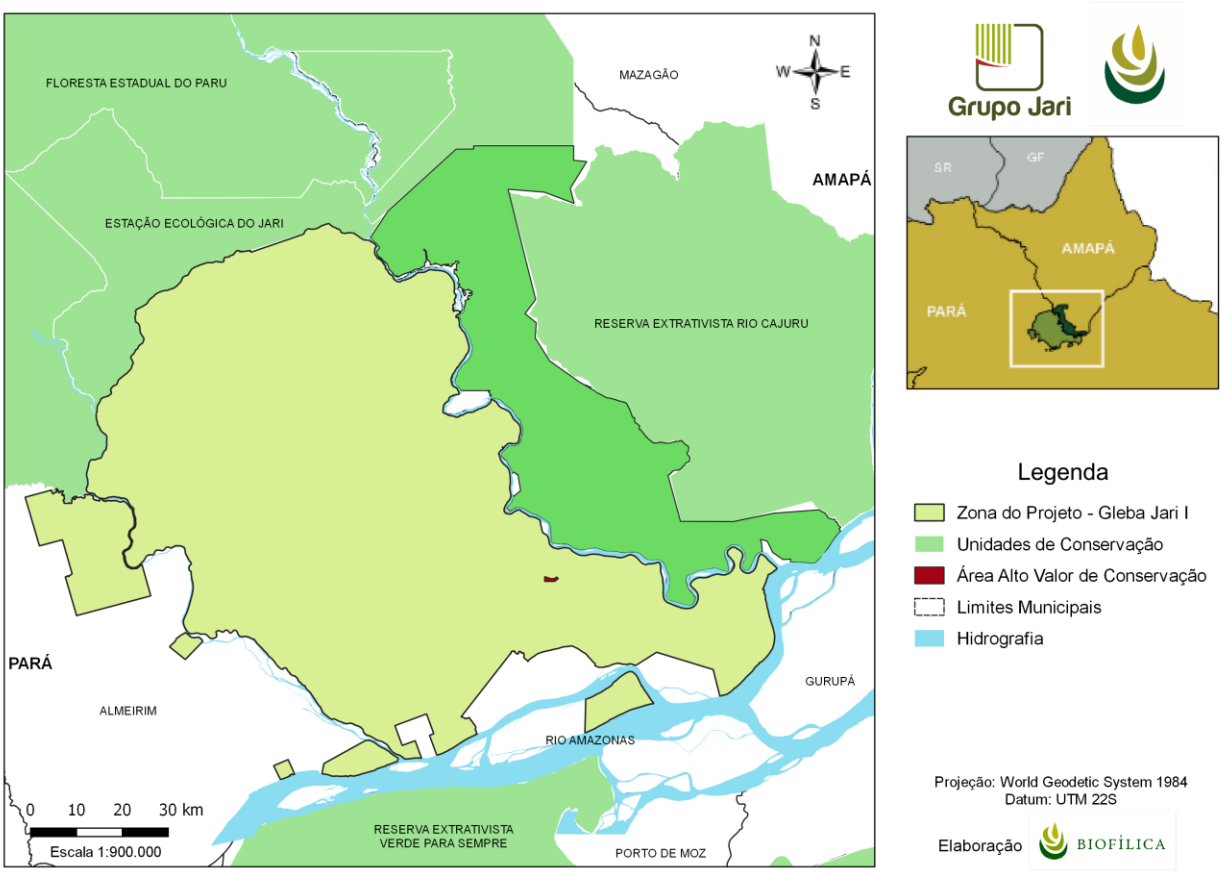


Figure 6. Map of the REDD+ Jari/Pará Project area.

2.1.8 Identification of actors (G1.5)

The identification and analysis process used in the selection of communities for the REDD+ Jari/Pará Project was based on the following criteria:

I. **Productive Potential:** communities that develop economic activities related to the sustainable use of land focused on the extraction of chestnuts and açaí, agriculture, cassava cultivation and other genres and horticulture, or that have interest and potential in developing them.

II. Geographic location: communities that are within the Project area or in the immediate surroundings and with easy access by waterway and land and have good logistic conditions for work;

III. Relationship with natural resources and with the Project area: communities that develop subsistence agriculture or small-scale commercial agriculture and extractivism and maintain a continuous and integral presence in the area, being dependent on the Project area for these purposes. Medium and large producers living in urban centers and with agropastoral production of commercial scale are excluded from this category in the vicinity of the Project area. Special attention was paid to the extractivists who live on the chestnut trees and who have a strong concern with the conservation of the forests;

IV. Predisposition for social organization: communities with initiative or interest in establishing community organizations, associations, cooperatives and other social groups;

These communities were consulted and introduced to the Project, in one of the first activities carried out, DRP (Fast Participatory Diagnostic) workshops, in which the qualified information about the REDD+ Jari/Pará Project was passed on and raised the demands for improving the social and economic well-being of families.

2.1.9 Description of the actors (G1.6, G1.13)

The communities are located in riverside and dry land areas in the region's forests, of which 98 communities live within the Jari Group area, others located within or around the protected areas that surround the region (Figure 7). All of these communities located in the Project zone are listed in Table 7.

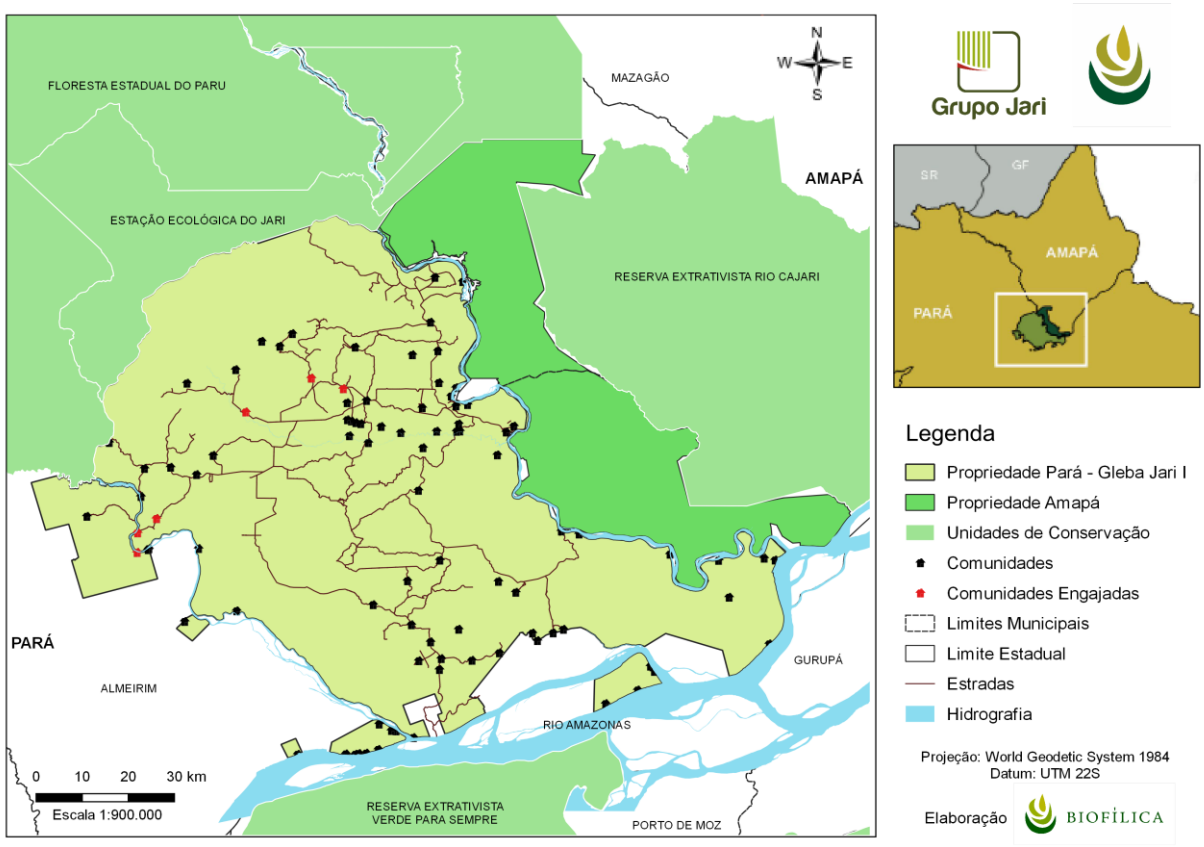


Figure 7. REDD+ Jari/Pará Project Area with emphasis on the communities selected for the field diagnosis.

Table 7. Communities located in the REDD+ Jari/Pará Project zone.

Communities	Communities	Communities	Communities	Communities
Açaizal	Bitubinha	Iratapuru	Panaicá	Santarém
Açaizal-Resex	Boa Fé	Itaboca	Panama	Santo Antônio
Acapumun I e II	Boca do Braço	Itanduba	Papudo	São José
Água Azul	Bom Jardim	Itaninga	Paraguai	São Militão
Água Branca do Cajari	Botafogo	Itucumanduba I e II	Paricatuba	São Paulo
Alto Bonito	Braço	Jaburu	Pedra Branca	São Sebastião
Arapiranga	Buritizal	Jarilândia	Pedral	Saracura
Arapiranga	Cafezal	Loral	Peniel	Serra Pelada
Araticum I e II	Comandaí Grande	Maicá	Ponção	Sombra da Mata
Areas 127 and 60	Comércio Muriacá	Mangueiro	Pouso Alegre ou Ponta Alegre	Tapereira
Ariramba	Conceição do Muriacá	Marajó	Praia Verde	Terra Preta
Arumanduba	Dona Maria	Marapí	Ramal do Muriacá	Tira-Couro
Assentamento Marapi	Estrada Nova	Margarida	Ramal Fé em Deus	Tuchaua
Aterro Muriacá	Fé em Deus	Marinho	Ramal França Rocha	Vera Cruz
Bacabal	Freguesia	Martins	Recreio	Vila Nova
Bacia Branca	Furo do Maracujá	Nova Conquista	Repartimento	Vila Nova
Bananal	Gatos	Nova Jerusalém	Retiro	Vista Alegre
Bandeira	Goela da Morte	Nova Vida	Santa Helena	Zé da Anta
Bela Vista	Goiabal	Padaria	Santa Maria	-
Bituba	Igarapé do Meio	Paga-Dívida	Santa Maria do Base	-

Source: Orsa Group, 2006.

For the scenario of the local communities in the scope area of the Project, according to the Communities Section, Standard CCB (CCBA, 2013), seven of these 98 rural agroextractivist communities in the municipality of Almeirim (ORSA GROUP, 2006; 2010) were selected, concentrated in three cores of action (Table 8).

Table 8. Cores, communities and number of families working in the REDD+ Jari/Pará Project.

Core	Communities	Number of Families
Core 1	Nova Vida	12
	Areas 127 and 60	02
Core 2	Braço	120
	Bandeira	65
Core 3	Cafezal	31
	Recreio	30
	Serra Grande*	12

Note:
* Because it is small, this community is considered a member of the Recreio community.

In addition to the identified rural communities, the other identified stakeholders are:

- Jari Celulose
- Jari Foundation
- Biofílica Investimentos Ambientais
- Emater
- STTR – Union of Rural Workers
- Financing Agents
- Embrapa of Amapá

These institutions should be invited to participate in REDD+ Jari/Pará Project discussions, in the REDD+ technical chamber, together with the community council. The Community Council is the space of articulation and communication between the Foundation and the communities involved in the Project. The evaluation of the rights, interests and relevance of each group of actors was carried out in relation to the Project, together with the technicians of the Jari Foundation and is specified in the table below (Table 9).

Table 9. Description of the actors involved in the REDD+ Jari/Pará Project.

Actors Group Involved in the Project	Rights in Relation to the Project	Interests in your Participation in the Project	Relevance in Participation
Jari Foundation (Third sector)	Credit right holder, responsible for investments, development and implementation of the Project. Execution and local management of social activities. It is also the organization responsible for managing the resources of the Social and Environmental Fund.	Ensure the inclusion of communities in the Project activities and that the activities of Technical Assistance and Rural Extension (ATER) also incorporate a look at issues such as education, health, human rights, environment, culture and employment and income generation.	**High** - Due to its history of action in the region and expertise in the design and implementation of socioeconomic development activities.
Communities – Recreio, Cafezal, Serra Grande, Nova Vida, Area 127 and 60, Braço & Bandeira	Beneficiaries of social activities and participants in the distribution of benefits of the Social and Environmental Fund of the Project.	Access alternatives of rural and socioeconomic technical assistance services to improve their living conditions.	**High -** These are essential components of social activities, to control deforestation and to develop a model of local economy based on sustainable and harmonic practices with the forest.
Public agencies Managers – SEMMA and Monte Dourado District Municipality	Articulate with the other actors in order to improve the implementation and permeability of public policies.	Bring public power closer to community demands and strengthen government relations, which are currently fragile. Participate in monitoring the development of private and voluntary REDD+ initiatives.	**Average -** They are the actors officially responsible for developing and implementing socio-environmental and economic public policies.
Unions	Articulate with the other actors and especially the community members to expose and defend their rights.	Understand, expose and defend the rights of community members and rural workers and an equal dialogue between the parties.	**Average -** They are not executors or policy makers. Considering an extreme scenario in which they did not participate, with the Technical Chamber, it would still be possible to develop mechanisms that would guarantee an egalitarian dialogue between the parties.
Technical Assistance Agency - Emater	Support in the complementary actions for the Project implementation, such as DCH and ATER emission.	Strengthen the capacity to carry out rural technical assistance, cooperate with the development of public policy.	**Average** - It is not an executor of the Project, but is a partner of the Jari Foundation, in the implementation of Rural Technical Assistance.
Public Institutions of Research – Embrapa of Amapá	Carry out studies and research regarding the interventions of the Project and sustainable forest management, and their impacts. Provided that these studies are processed and their results are returned to the local/regional society and the actors involved.	Produce and disseminate knowledge. Develop and publish scientific papers. Possess a rich socio-economic and environmental context to produce long-term studies and bring students to classes and practical experiences.	**Average** - it is important, in view of the technological knowledge, to have a term of cooperation with the municipality, being able to support with the sending of researchers related to the control of clearings.

2.1.10 Sector Scope and Type of Project

- Sector Scope: 14 – Agriculture, Forestry and Other Uses of the Land (AFOLU);
- Reducing Emissions from Deforestation and Forest Degradation (REDD);
- Methodology for Avoided Unplanned Deforestation (AUD);
- This is not a clustered project.

2.1.11 Project Activities and Theory of Change (G1.8)

The REDD+ Jari/Pará Project pretends to promote joint actions aimed at reducing greenhouse gas emissions (REDD+) resulting from unplanned deforestation and forest degradation, acting through activities such as intensification of land security and patrimonial surveillance, remote monitoring of changes in land use and cover, low impact forest management and monitoring of biodiversity in conjunction with social activities, aiming to promote the incentive to local socioeconomic development on a sustainable basis.

Through the responsible and sustainable use of resources provided by the environment, the Project aims to generate net benefits for the climate, local populations and biodiversity. Therefore, through these objectives, the activities of the Project were outlined and some of them already implemented. The actions proposed by the Project guarantee the conservation and protection of biodiversity and natural resources, reduction of deforestation and emission of greenhouse gases, local socioeconomic development, social inclusion and the incentive to applied science.

This set of interlinked actions allows the generation of financial resources, mainly through the sale of REDD+ credits registered in the VCS (*Verified Carbon Standard*), associated with social development and the conservation of natural resources and, finally, seeking to ensure adequate financing for the accomplishment of the objectives mentioned above, as well as to allow their maintenance throughout the life cycle of the REDD+ Jari/Pará Project.

Table 10 *provides a summary description of the activities and their outcomes and impacts, which will contribute to achieving the anticipated benefits of the Project ti the Climate, Community and Biodiversity.*

Activities for the Climate:

Activities related to climate-related benefits have goals defined as the significant decrease in the occurrence of unplanned deforestation in the Project area and the consequent reduction of greenhouse gas emissions from these practices. In addition, the objective is the monitoring of forest cover and changes in land use, and support to enable the improvement of land management with respect to land security, patrimonial surveillance and sustainable forest management.

According to the description of the Project, the objective of the Project for the climate component is to avoid the emission of 15,759,440.1 tons of CO_2, corresponding to the deforestation of 51,985 hectares, which will be avoided through the following activities:

- Monitoring of deforestation and forest degradation by satellite images: The project aims to finance the acquisition of high-resolution satellite imagery to increase the efficiency of remote monitoring already conducted annually. Additional monitoring tools will include monthly land use assessments and changes in land use in the Project Area, improving the efficiency of the environmental monitoring. The outcomes will be reports containing the points of deforestation identified in the analyzed period and indication of risk areas, which will be sent to the proponents and other stakeholders. This activity is directly related to the control of deforestation and invasions, maintenance of forest cover and biodiversity and, consequently, maintenance of the benefits for the Climate provided by the scenario with the Project;

- Inspection of the area: the surveillance, and patrol activities of the area will be managed by the Jari Group team. The Project aims to intensify and improve the efficiency of patrolling through the provision of resources for logistics of the patrimonial surveillance team, acquisition of equipment to support the planning of actions, as well as to combine the patrolling activity with the remote monitoring via satellite imagery in order to elaborate unified strategies that provide greater efficiency in surveillance, reduction of costs in the field and the strengthening of security in the area's borders.

- Sustainable forest management: Under the responsibility of Jari Celulose and currently conducted by the company Agregue, the management follows the FSC certification guidelines, aiming at the sustainable exploitation of the forest resources present in the Jari Group's property in a rational way using the "Reduced Impact Harvesting" system, which according to the legislation provisions, has as its main characteristic the detailed planning of forest harvesting activities and is associated with the maintenance of the ecological balance of the forest, socio-environmental responsibility and economic-financial efficiency. Forest areas suitable for management are exploited in cycles of 30 (thirty) years, being allowed to operate only one Production Unit per year (called UPAs), ensuring the perpetuation of forest cover. All UPAs have procedures for the activities carried out, having as reference the forest inventory that constitutes the main management tool allowing the extraction does not exceed the natural capacity of the forest recomposition. For management planning, technical managers discuss operational procedures and possible change needs in light of local operational difficulties that may be encountered. This methodology is in line with the requirements of FSC certification and all relevant regulations, standards, rules and legislation.

Activities for Communities and other Actors:

The communities present in the Project Area are also responsible for the sustainable use of the soil and the forest resources, since they live from subsistence agriculture and the exploitation of products originating from extractivism. However, these communities have great difficulties in maintaining

productivity at levels capable of guaranteeing adequate socioeconomic conditions for families, as well as guaranteeing a responsible exploitation of natural resources.

These conditions were evidenced during the elaboration of the socioeconomic diagnosis, where in the final phase, interviews and meetings were held with the participating communities, which had, among their objectives, to know the local reality and the expectations of the target public demands. In addition, from the participatory workshops, was carried out a survey of the communities' needs and weaknesses, which aligned and related to their potentialities and opportunities, resulted in the proposal of actions for each evaluated nucleus. The combination of two main tools, interviews and participatory workshops, resulted in the definition of the central axes of action that are included in the actions of the Project (Table 10) and whose purpose is to provide the strengthening of communities in different aspects, besides acting directly and indirectly in the containment and mitigation of the negative impacts generated by the agents and vectors of deforestation present in the region.

Thus, the four main axes of action identified for the social scope are:

1) Social Organization

It is necessary to create and strengthen local organizations, so that they have better capacities to seek access to public policies and programs that have been presented as a latent demand of the communities, especially for actions focused on basic structural issues, such as health, education and improvements in access to communities.

The strengthening of organizations is related, in some main lines of action such as training in associativism and cooperativism, to the training of community leaders and the elaboration and implementation of action plan for organizations. In this regard, activities were developed jointly with the Jari Foundation in order to attend to this theme.

The action in strengthening associativism and cooperativism will aim to contribute directly to mitigation of the main vectors of deforestation as it enhances the organized performance of the communities through the quest to improve the quality of life.

2) Technical Assistance and Rural Extension – ATER

In this aspect, increasing productivity, insertion of new techniques and production technologies, such as implementation of agroforestry systems, and the search for a greater efficiency of current productive systems is very important for a transition from a conventional productive system that is been applied, with cutting and burning, to a low carbon agriculture, with more efficient and profitable production systems and with lower GHG emissions rates. A key factor for this change to occur is the access to a qualified ATER and directed to the needs and vocation of each community.

Ensuring this access will allow an advance in the development of the local productive chains, with gains in scale and quality, resulting in an increase in family income and consequently better living conditions.

It is also observed that communities do not see the importance of the ATER, only the issues related to productivity. Support for institutional and political articulations to gain access to basic infrastructure and rights, the effort to discuss land regularization, and the implementation of environmental education actions are also demands of the communities that recognize in ATER the task in support to the implementation of these activities.

In this context, in order to reach the goals set, some axes were related to ATER's activities, such as diversification of production through implementation of SAFs and/or insertion of new production techniques according to the vocation of communities, support to marketing and access to new markets, land regulation, support to institutional articulations, and environmental education.

3) Jari Foundation Strengthening

In the Jari valley, the Jari Foundation is certified as the main agent of ATER, for this, in order to ensure continuity and improvement of family assistance, as required, it is imperative that efforts are invested in the organization.

There was a need for some changes aimed at strengthening and maintaining the Foundation, as well as improving institutional skills to perform activities focused on business development with social impact, increase in the number of staff, qualification of personnel and actions aimed at the institution sustainability, in this way were included activities to address these deficiencies to ensure the success of the Project.

4) Community Infrastructure (Energy and Communication)

Communication and energy are central axes for generating socioeconomic well-being in the lives of families in rural communities.

Communication from a social point of view helps to remove communities from the isolation and lack of information from the outside world and favors other issues, such as health and education, which can facilitate the lives of rural people, from the economic point of view, communicating with the external market is fundamental to guarantee access to better marketing conditions.

In the communities involved in the Project only one has better access to the communication networks, and yet they are incipient, in this sense, it is imperative that improvements in community communication systems be implemented, either through actions that articulate with the public power the deployment of public telephony systems or through independent systems from the installation of rural and/or Internet telephony antennas in the communities.

As for electric energy, only one nucleus of the communities involved in the project has the supply of electric energy through the public system, the other two nuclei have electric power from diesel engines, which in addition to limited and high cost contributes to the emission of gases into the atmosphere.

Therefore, efforts will be made to resolve this issue with a view to improving production processes and increasing production capacity in a wide range of areas: improving food, storing food in a

refrigerated environment, and facilitating access to information through the use of cellular devices and televisions, which may make it easier to access information and events in the world.

Activities for Biodiversity:

The incentive to reduce deforestation is mainly related to the mitigation of global climate change. However, to provide the generation of consistent positive impacts, conservation initiatives should act comprehensively. Acting not only in relation to the reduction of greenhouse gas emissions and the generation of positive social impacts, but also in the monitoring and mitigation of impacts related to biodiversity, maintenance of gene flow, regulation of water flows and water quality, nutrient cycling, protection of the soil, shelter to the fauna, food supply, fibers and other products to local communities, scenic beauty, maintenance of ecological corridors, among others.

In conjunction with low impact forest management practices, the REDD+ Jari/Pará Project aims to monitor and provide for the maintenance of forest cover in the Project area, ensuring the conservation and protection of habitats and species present on the site and thus generating positive net benefits foreseen to biodiversity for the scenario with the Project.

The detailed and detailed diagnosis in section 5.1 – *Biodiversity Scenario in the Absence of the Project* demonstrated that the Project area covers a diverse and rich biodiversity, in addition to having species of flora and fauna present in national and international lists of threatened species, which demand great attention. In addition, the area plays an important role as an ecological corridor connecting several Conservation Units in the region.

The biodiversity-related activities projected for this Project relate to biodiversity monitoring, including the monitoring of sensitive species, i.e. with some degree of threat according to the list of IUCN threatened species found in the region (details section 5.4.1 - *Biodiversity Monitoring Plan*) and the achievement and encouragement of scientific research in the Project area. In addition, constant monitoring is planned in areas of high conservation value.

These activities include the elaboration of a long-term monitoring plan for the impacts of the Project and sustainable forest management on regional biodiversity. It is intended that the monitoring be anchored, preferably, through agreements with local teaching and research institutions, in order to encourage the research and dissemination of scientific and environmental knowledge to the local society.

In general, the REDD+ Jari/Pará Project is intended to generate a number of positive impacts on biodiversity, such as conservation of species already diagnosed and conservation of local habitats, conservation of AAVCs, generation and dissemination of scientific knowledge on biodiversity, dissemination of scientific studies in the area and results and indicators related to this theme, maintenance of ecosystem services, mapping of new areas of great relevance for conservation and maintenance of connectivity in the landscape.

Table 10. Description of the activities and their respective results and impacts of the REDD+ Jari/Pará Project, which will contribute to achieving the expected benefits for the climate, community and biodiversity.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result — Short Term (*Output*)	Process/Result — Medium Term (*Outcomes*)	Results (*Impacts*)	
X	X	X	**Initial Articulation**	Signing of the contract addendum between proponents	- Holding of meetings between the proponents; - Presentation of a proposal for the expansion of the REDD+ Jari Project for the areas of Pará.	- Formalization of agreement among the proponents for the development of the REDD+ Jari Pará Project	- Conservation of carbon stocks in the Project Area; - Consolidation of the territorial management model with a view to reducing social and environmental impacts.	Held in July/2014.
X	X	X		Identification of actors and partnerships and choice of Research Institutions	- Holding of meetings; - Contracting and forming of partnerships.	- Institutions and actors initially aligned on the Project; - Diversification and integration of a multidisciplinary team.	- Maintenance of relations throughout the Project; - Generation of knowledge on issues related to conservation and REDD+.	Held in the 2nd semester/2014.
X	X	X		Meetings with Researchers and Proponents	- Holding workshops with the involved Actors to present results and design activities.	- Sharing knowledge; - Alignment of core issues of the Project; - Design of the scope of activities and causal relationships.	- Continuity of partnerships throughout the Project; - Deepening scientific knowledge in the area.	Conducted between May/2015 and September/2015.
X			**Initial Studies**	Carbon Stock Estimate	- Carrying out the Forestry Carbon Stock Estimation Study; - Generation of technical report.	- Generation of knowledge about the carbon stock, including the differentiation between managed and unmanaged areas; - Contribution to the accounting of reduced emissions.	- Generation of inputs for monitoring; - Support for timber forest management; - Identification of priority areas for stock conservation.	Conducted between May/2015 and March/2016.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
X			Initial Studies	Baseline Determination	- Conducting the Study for Baseline Determination of Deforestation; - Generation of technical report; - Modeling of future deforestation.	- Generation of knowledge on the dynamics of deforestation in the region; - Contribution to the accounting of reduced emissions.	- Generation of inputs for future monitoring; - Tool for the prevention and containment of deforestation in the Project area.	Conducted between May/2015 and August/2016 and revised between February/2018 & June/2018.
	X	X		Socioeconomic and Environmental Studies	- Realization of the Socioeconomic and Environmental Study; - Generation of technical report.	- Generation of knowledge about the socio-environmental dynamics of the region; - Providing inputs for the design of interventions and impacts.	- Improvement of social conditions; - Prevention of deforestation in the Project area; - Deepening scientific knowledge in the area.	Held between June 2015 and April/2016.
	X			Consultation with involved Communities	- Conducting interviews and workshops with the communities involved to present and design the activities of the Project; - Informed stakeholders about the REDD+ Project; - Generation of technical report.	- Definition of Measurement Parameters for benefits and Project impacts in the communities; - Adaptive management of the Project to incorporate the families' wishes; - Facilitating community access to existing public policies.	- Strengthening communication among stakeholders; - Improvement of life quality and socioeconomic aspects of the community; - Empowering communities about the activities of the Project, their rights and duties.	Held between February and June/2018.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
X			**Forest Monitoring Intelligence**	Deforestation Monitoring via Satellite Imagery	- Evaluation of new deforestation points and areas through satellite imagery; - Generation of Annual Deforestation Bulletins based on official PRODES/INPE Project data.	- Greater understanding of deforestation dynamics and adaptive management of control activities; - Mitigation and prevention of deforestation.	- Maintenance and increase of vegetal cover; - Reducing emissions from deforestation and forest degradation; - Mitigation of global climate change.	Started in 2014. Continuous throughout the Project.
X				Patrimonial Surveillance	- Carrying out patrimonial surveillance rounds; - Identification of points sensitive to external invasions; - Field check of the points sampled by monitoring deforestation.	- Greater understanding of deforestation dynamics and adaptive management of control activities; - Mitigation and prevention of deforestation. - Prevention of deforestation and degradation.	- Maintenance and increase of vegetal cover; - Reducing emissions from deforestation and forest degradation; - Mitigation of global climate change.	Started in 2003. Continuous throughout the Project.
X				Improvement of the techniques of forest monitoring and patrimonial surveillance	- Acquisition of high resolution images of Planet System and field support equipment; - Generation of Monthly Deforestation Bulletins and PRODES mapping validation; - Systematization and strategic alignment in the field next to the remote monitoring activity.	- Streamline the process of determining areas of risk and decision making; - Increase the effectiveness of the fight against invasions and illegal activities in the Project Area and environment; - Refinement of remote monitoring by field check.	- Maintenance and increase of vegetal cover; - Reducing emissions from deforestation and forest degradation; - Mitigation of global climate change.	Start expected in 2014. Continuous throughout the Project.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
X		X	**Management of Natural Resources**	Low Impact Forest Management	- Design, implementation and monitoring of low-impact tropical timber extraction activities; - Marketing of wood.	- Generation of revenue from the sale of wood; - Generation of income and jobs, directly influencing the regional economy; - Inhibit illegal deforestation in the region; - Consolidation of the company's physical presence in the property.	- Plant cover maintenance; - Preservation of biodiversity and carbon stocks; - Support for the Project's long-term financial sustainability; - Generation of positive impact on the region's economy.	Started in 2003. Continuous throughout the Project.
X	X	X		Timber Community Forest Management	- Survey of environmental adequacy and land tenure of family farms; - Elaboration and formalization of commercial agreements between the communities and the Jari Group; - Forest inventory to identify exploration potential of the areas; - Offering training aimed at the areas of timber forest management.	- Diversification of family income generation; - Strengthening the relationship between the company and communities; - Inhibit illegal deforestation in the region;	- Plant cover maintenance; - Preservation of biodiversity and carbon stocks; - Reduction of rural exodus in the region; - Empowering communities - Generation of diverse income, jobs and technical knowledge.	Started in 2018. Continuous throughout the Project.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
X	X	X	**Management of Natural Resources**	Community Forest Management of Extractive Products	- Capacities within the productive lines defined by the Project; - Analysis of the technical and economic feasibility of production chains; - Construction or improvement of processing and logistics structures in communities; - Forest inventory to identify exploration potential of the areas; - Offering training focused on extractive areas; - Acquisition of equipment for field surveys.	- Strengthening the chain of extractive products; - Provide access to credit lines for associations/cooperatives; - Aggregation of value to products; - Diversification of family income generation; - Inhibit illegal deforestation in the region;	- Plant cover maintenance; - Preservation of biodiversity and carbon stocks; - Reduction of rural exodus in the region; - Empowering communities - Generation of diverse income, jobs and technical knowledge.	Start expected in 2019. Continuous throughout the Project.
	X		**Technical Assistance and Rural Extension (ATER)**	Engagement of Actors and Stakeholders	- Definition of number of families directly involved in the Project within the selected communities; - Constitution of the Technical Chamber REDD+ Jari/Pará; - Holding of at least two annual meetings of the Technical Chamber; - Definition of investment, assistance and communication guidelines for engaged families.	- Greater confidence of all stakeholders in the actions taken by the Project; - Adaptive management of the Project to incorporate the wishes of the different stakeholders; - Consolidation of communication channels between stakeholders and other local entities.	- Creation of a culture of communication between the engaged parties; - Guarantee of empowerment by the communities in the activities carried out by the Project.	Start expected in 2019. Continue Along the Project

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
	X		**Technical Assistance and Rural Extension (ATER)**	Strengthening Family Agriculture	- Holding of seminars and training; - Promotion of actions aimed at the land regularity of the engaged families; - Implantation of nurseries to supply seedlings; - Investment in basic infrastructure of production and inputs; - Technical assistance for the preparation of growing areas; - Analysis of the economic viability of the productive systems	- Provide access to credit lines for associations and cooperatives; - Recovery of degraded areas through Agroforestry Systems (SAFs); - Diversification of family agricultural production; - Diversification of family income generation;	- Increased productivity in family production units; - Recovery of degraded areas; - Reduction of rural exodus in the region; - Guarantee of food security for families; - Reduction of non-productive areas expansion and maintenance of forest cover.	Start expected in 2019. Continue Along the Project
	X			Environmental Education Program	- Lectures, campaigns and workshops with the theme of environmental education on environmental degradation, recovery of degraded areas, prevention of fires, adaptation to environmental legislation, among others; - Implementation of the Environmental Recovery Program for small farms in the project area communities.	- Survey of community demands; - Evaluation of the productive systems' impacts of the families involved; - Reduction of productive techniques aggressive to the environment; - Development of a reverse logistics procedure for the collection and disposal of household waste.	- Reduction of impacts generated by environmental degradation in the Project area; - Reduction of waste accumulation and misallocation; - Increased environmental awareness and knowledge of environmental laws.	Start expected in 2019. Continue Along the Project.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
	X		**Social Organization**	Strengthening of Associativism and Cooperativism in Communities	- Holding of seminars and informative courses on the topic of cooperativism; - Formation of leaders with the residents of the communities; - Identification of the main demands of the communities; - Preparation for the development of income generation collective projects; - Promotion of gender diversity and youth involvement.	- Generation of a better understanding of the community about the aspirations of their community with a view to solving possible problems; - Enable a better understanding of the communities' potential; - Greater involvement of all community representatives in discussions and decision-making processes; - Increased participation of women and young people in decision-making processes.	- Increased social empowerment in communities; - Residents with different skills and abilities generating an increase in the self-esteem and confidence of the producers; - Decrease and management of social conflicts.	Start expected in 2019. Continue Along the Project.
	X			Structuring of Community Nuclei	- Formalization of groups with cooperatives; - Preparation for the development of income generation collective projects; - Sensitization about the importance of social organizations' role in the communities' development.	- Generation of opportunity to participate in cooperative projects; - Generation of access to new markets for community production; - Possibility to exchange experiences between communities through cooperatives; - Possibility of access to courses and training provided and/or financed by the REDD+ Project and by cooperatives; - Greater joint action force for community referrals and demands in the public spheres.	- Strengthening of cooperative nuclei; - Access to new business opportunities in the community; - Increased social empowerment in communities; - Implantation of best productive practices; - Increase of agricultural productivity and efficiency, and, consequently, of agricultural production in cooperatives; - Residents with different skills and abilities generating an increase in the self-esteem and confidence of the producers; - Decrease and management of social conflicts.	Start expected in 2020. Continue Along the Project.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
	X		**Social Organization**	Access to credit and market	- Identification of opportunities for rural credit lines for cooperatives; - Strengthening of actions aimed at the land regularization of engaged families; - Identification of market demand and opportunities for partnerships for cooperatives; - Articulation with communities, Jari Foundation and governmental and non-governmental organizations.	- Social organizations able to facilitate access to existing public policies; - Organizations focused on production, with better performance capabilities and access to facilitated markets; - Organizations with a plan of objectives and goals in phase of continuous implementation; - Improvements in conditions of disposal and marketing of products; - Improved management of resources generated by cooperatives.	- Access to new business opportunities in the community; - Increased social empowerment in communities; - Better access to public policies to improve the social well-being of communities; - Residents with different skills and abilities managing community-based benefits.	Start expected in 2020. Continue Along the Project.
X	X	X	**Strengthening of Jari Foundation**	Strengthening of the ATER team	- Survey of qualification needs and number of personnel to work in the communities; - Strengthening of the technical staff of foundation (qualification and hiring of new professionals); - Acquisition of equipment for the team.	- Potentialization of impacts' results generated by the Foundation; - Formation of qualified team to act in the demands of economic and social development in the communities; - Improvement of financial autonomy for continuity of Foundation's actions.	- Guarantee of permanence of Foundation's actions in the territory; - Improvement in the communication process between the Foundation and other actors involved in the project; - Sustainability of project interventions; - Decrease of rural exodus and reduction of deforestation.	Start expected in 2019. Continue Along the Project.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
X	X	X	**Strengthening of Jari Foundation**	Strengthening of institutional partnerships and search for new partnerships	- Institutional improvement focused on the adaptation of a business model with social impact; - Strengthening of the technical staff of foundation (qualification and hiring of new professionals); - Elaboration of institutional strategies to reach new partnerships.	- Increase in the number of businesses generated from the marketing of products; - Potentialization of impacts' results generated by the Foundation; - Improvement of financial autonomy for continuity of Foundation's actions.	- Guarantee of permanence of Foundation's actions in the territory; - Greater recognition and prominence in the spheres of action; - Sustainability of project interventions;	Start expected in 2020. Continue Along the Project.
	X		**Community Infrastructure (Energy and Communication)**	Installation of electricity in communities	- Definition of electric power generation alternative for families; - Mapping for extension of the electric network in the communities; - Articulation with public agencies to make feasible projects to provide energy to communities.	- Increased community engagement with the REDD+ Project; - Community centers engaged to provide energy access projects.	- Improvement in community infrastructure; - Improvement in the life quality of residents; - Improved access to markets.	Start expected in 2019. Continue Along the Project.
	X			Installation of communication infrastructure for communities	- Articulation with public agencies to make feasible communication projects; - Development of projects for installation of communication antennas and community telephony stations.	- Increased community engagement with the REDD+ Project; - Community centers engaged to make communication access projects viable.	- Improvement in community infrastructure; - Improvement in the communication process between communities and other actors involved in the project; - Improvement in the life quality of residents; - Improved access to markets. - Greater access to information; - Greater autonomy for access to knowledge.	Start expected in 2019. Continue Along the Project.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
X	X	X	**Efficient management and transparency**	Creation of the REDD+ Jari Social-Environmental Agreement	- Creation of a transparent financial mechanism that will allow direct investments in social and environmental activities; - Transparent management of the revenue generated by the sale of credits from REDD+ Jari Projects; - Appointment of Jari Foundation as responsible for managing the resources generated by the Projects; - Presentation of planning and investments foreseen by the Project in the Technical Chambers.	- Potentialization of Project actions; - Investments in socioeconomic development of engaged families; - Investments in research and socio-environmental monitoring; - Encouraging of initiatives that promote the sustainable and efficient management of forest resources and other ecosystem services.	- Conservation of forest cover through the responsible exploitation of natural resources; - Preservation of biodiversity and carbon stocks; - Reduction of rural exodus in the region; - Empowering communities - Generation of diverse income, jobs and technical knowledge. - Dissemination of scientific knowledge.	Start expected in 2018. Continue Along the Project.
		X	**Environmental Monitoring and Scientific Research**	Conducting scientific research with a focus on Biodiversity and Environmental Impacts	- Long-term monitoring of project impacts and sustainable forest management in regional biodiversity, its dynamics and changes over time; - Building partnerships with universities and research institutions.	- Production of scientific papers and research; - Establishment of adaptive measures and adjustments in the activities of the Project; - Production and dissemination of knowledge on regional biodiversity; - Measurement of impacts of project activities and sustainable forest management.	- Mitigation of impacts on regional biodiversity; - Mitigation of impacts of project activities and sustainable forest management; - Greater knowledge and dissemination to society about the biodiversity of the Jari Valley.	Start expected in 2020. Continue Along the Project
		X		Flora Monitoring	- Long-term monitoring of flora biodiversity present in the Project area; - Conduct a systematic field campaign every five years.	- Generation of knowledge on local wealth; - Generation of knowledge for the management of economic interest species for the communities.	- Mitigation of impacts on regional biodiversity; - Greater knowledge and dissemination to society about the biodiversity of the Jari Valley.	Start expected in 2020. Continue Along the Project.

Climate	Community	Biodiversity	Theme	Description of the Activity	Expected for climate, community and biodiversity			Implementation Period
					Process/Result – Short Term (*Output*)	Process/Result – Medium Term (*Outcomes*)	Results (*Impacts*)	
		X	**Environmental Monitoring and Scientific Research**	Monitoring of Avifauna	- Long-term monitoring of avifauna biodiversity present in the Project area; - Carry out an annual systematic campaign.	- Generation of knowledge on local wealth;	- Mitigation of impacts on regional biodiversity; - Greater knowledge and dissemination to society about the biodiversity of the Jari Valley.	Start expected in 2020. Continue Along the Project.
		X		Monitoring of Mastofauna	- Long-term monitoring of the biodiversity of mastofauna present in the Project area; - Carry out an annual systematic campaign.	- Generation of knowledge on local wealth;	- Mitigation of impacts on regional biodiversity; - Greater knowledge and dissemination to society about the biodiversity of the Jari Valley.	Start expected in 2020. Continue Along the Project.
		X		Threatened Species Monitoring	- Long-term monitoring of species considered endangered (vulnerable, endangered or critically endangered) by the IUCN Red List; - Carry out an annual systematic campaign.	- Knowledge generation on key species (examples: Satanas Chiropotes, Black Monkey (Macaco-preto); Pteronura brasiliensis, Ariranha).	- Mitigation of impacts on regional biodiversity; - Greater knowledge and dissemination to society about the biodiversity of the Jari Valley. - Maintenance of the Gold seal.	Start expected in 2020. Continue Along the Project.
		X		Monitoring of AAVC	- Monitoring of the high value attributes for the conservation present in the Cerrado fragment in the Project area; - Conduct a systematic field campaign every five years for flora; - Carry out an annual systematic wildlife campaign; - Evaluation of other potential AAVC's in the Project area.	- Maintenance of the AAVC; - Generation of knowledge on local wealth;	- Mitigation of impacts on regional biodiversity; - Greater knowledge and dissemination to society about the biodiversity of the Jari Valley. - Maintenance of the Gold seal.	Start expected in 2020. Continue Along the Project.

2.1.12 Sustainable development

The REDD+ Jari/Pará Project has as one of its objectives to promote sustainable development in the region, and the Jari Foundation is considered a facilitating and encouraging agent for this sustainable development. The Foundation works in the Jari region on the integral formation of children and adolescents in the areas of education, health and rights assurance and aims to develop sustainable business and community-enterprise partnership in order to make feasible and integrate public policies, social mobilization and business.

All this work, through the survey of needs and opportunities in the region and the construction of action plans jointly with governments, companies and civil society organizations, has been recognized. In 2008, sponsored by JB Ecológico/Editora JB, the Foundation received the Brazil Environment Award as the best Project in the municipal sphere, as well as received the Banco do Brasil Foundation Social Technology Award – 2011 edition by the Agricultural Business Development Program.

According to NDC (Nationally Determined Contribution) submitted by Brazil in September 2015 to the United Nations Framework Convention on Climate Change, which has a global target of reducing Brazilian emissions from 2005 levels in 37% by 2025, reduction of 43% by 2030 (BRAZIL, 2015), the REDD+ Project Jari/Pará collaborates directly with this NDC promoting the reduction of deforestation in the Project area and thus, the reduction of greenhouse gases.

The Jari Group has the concept of sustainability as the axis of its business strategy and as a factor of transformation of society, applying in its scope an Integrated Management System Policy. With this policy, the Group undertakes commitments with the environment seeking to reduce the environmental effects of the life cycles of its products; to contribute to the improvement of the human condition, articulating actions related to economy, education, environment, health, transportation, housing and government, through actions that bring mutual benefits to the company and the community; to continuously foster sustainable development through the application of management principles, performance indicators and risk and environmental impact assessments; and to promote studies, research and investments to improve the impact of industrial activity on emissions.

The Jari Foundation's performance model is organized into three integrated areas of activity: social management, business management and environmental management (see Jari Vale Human and Sustainable Development Plan, available to validators/verifiers) and are described below:

- **Social Management:** which includes the promotion of initiatives for inclusion and social participation with the strengthening of associativism and cooperativism, as well as the strengthening of social organizations, specifically participation in councils and technical advice to community organizations. Another important factor is education and qualification for work;

- **Business Management:** the activities of the Foundation consist of the premises of Sustainable Agriculture and Extractivism and include technical advice to farmers and extractivists in the region with the consolidation of commercial partnerships. There is also the Autosustainable Schools project applied

to the development of new businesses, aimed at training young people, women and adults in order to enable them to manage, plan, produce and market in a sustainable way;

- **Environmental Management:** it includes mobilizing community leaders to provide communities with more information about their social and environmental rights and responsibilities, encouraging good practices for the sustainable use of biodiversity, and monitoring social and environmental impacts.

2.1.13 Implementation Schedule (G1.9)

The schedule with the main dates and main milestones for the development of the REDD+ Jari/Pará Project have already been presented above and can be visualized in Table 10. The summary schedule of these activities related to the main REDD+ Jari/Pará Project activities are shown in the table below (Table 11).

Table 11. Detailed implementation schedule of the main activities related to the REDD+ Jari/Pará Project.

1 TO 1.5 YEARS BEFORE VALIDATION AND FIRST VERIFICATION
Sustainable Forest Management - Annual Pre-exploratory, Exploratory and Post-Exploratory Phases
Activity planning meeting
Articulation of institutions and identification of partnerships
Consolidation of the activities schedule
Realization of the Socioeconomic and Environmental Diagnosis
Estimate of carbon stock
Determination of the baseline and the potential for generating credits
Project Planning and Design Workshop
Stakeholder consultation meetings
Consolidation of design, management plan and drafting of project description document
Review and translation of project description document
Production of monitoring reports
IN THE YEAR OF VALIDATION AND FIRST VERIFICATION
Sustainable Forest Management - Annual Pre-exploratory, Exploratory and Post-Exploratory Phases
Selection and contracting of validating/verifying body and of credit registration platform
Production of validation/verification audit follow-up bulletins
Field audit follow-up
Project and Credits Registration

YEARS 2 TO 30
Sustainable Forest Management - Annual Pre-exploratory, Exploratory and Post-Exploratory Phases
Development and monitoring of environmental and social management activities
Monitoring of deforestation and emissions
Monitoring of biodiversity (Fauna and Flora) and Areas of High Value for Conservation
Development of scientific research
Verification of credits (Selection and contracting of verification body; Production of follow-up bulletins for Verification Project; Monitoring of field audit; Registration of credits)
Conducting of credit marketing processes

2.1.14 Project Start Date

The start date of the REDD+ Jari/Pará Project was set on July 8, 2014, as it represents the moment of signature of the contract to expand conservation initiatives in the region. Since the partnership between Biofílica and Jari Group began in 2010 with the purpose of developing the Jari/Amapá REDD+ Project, as of the signing of the contract to expand the partnership for the state of Pará, the guidelines for the new project began to be drawn.

Among the main guidelines defined by the expansion of the partnership, we highlight the development of an Investment Plan for both properties that encompass activities in the social, environmental and climatic areas, as described in the Project activities section.

2.1.15 Evaluation of Benefits and Crediting Period (G1.9)

The start date of the REDD+ Jari/Pará Project crediting period is July 8, 2014. The end will be on July 7, 2044, completing a period of 30 years. There will be continuous monitoring of the benefits to the climate, communities and biodiversity, and outcomes will be checked by the CCBA preferably every two years, throughout the duration of the Project.

2.1.16 Differences in Project Evaluation/Crediting Periods (G1.9)

There will be no difference between the evaluation period and the crediting period of the REDD+ Jari/Pará Project.

2.1.17 Estimated GHG Emission Reductions or Removals

Table 12. Estimated reductions or removals of GHG emissions for the REDD+ Jari/Pará Project.

YEARS	Estimated GHG emission reductions (tCO2e)
2015	334,212
2016	657,390
2017	966,046
2018	1,289,301
2019	1,638,021
2020	2,034,978
2021	2,448,357
2022	2,915,207
2023	3,444,333
2024	3,982,155
2025	4,536,455
2026	5,114,610
2027	5,708,616
2028	6,311,461
2029	6,923,197
2030	7,549,417
2031	8,173,386
2032	8,809,145
2033	9,448,731
2034	10,091,725
2035	10,733,889
2036	11,377,822
2037	11,979,972
2038	12,595,420
2039	13,177,548
2040	13,736,578
2041	14,278,048
2042	14,789,549
2043	15,291,979
2044	15,759,440
Total estimated ERs	15,759,440.1
Total number of credit years	30
Average annual ERs	525,314.7

2.1.18 Risks for the project (G1.10)

Through the "*AFOLU Non-Permanence Risk Tool v3.2*" tool, it was verified the probable natural and man-induced risks to the climatic benefits, as reported in the REDD+ Jari/Pará Project Non-Permanence Risk Report, as summarized in the table below (Table 13).

Table 13. Final score of non-permanence risk for the REDD+ Jari/Pará Project.

Category	Score
a) Internal Risk	0
b) External Risk	10
c) Natural Risk	1
General Score (a+b+c)	11

The likely risks to the expected benefits to climate, community and biodiversity during the Project life, as well as their mitigating measures, are described in Table 14.

Table 14. Identification of risks to expected benefits for the climate, communities and biodiversity and their mitigation measures for the REDD+ Jari/Pará Project.

RISK	MITIGATING MEASURES
Lack of interest from stakeholders, especially communities and public agencies in participating in the Project activities	Strengthening and greater involvement of all parties involved in the design and decision-making processes in relation to Project activities through the REDD+ Technical Board and DRP Workshops, in order to foster a sense of belonging. Another extremely important measure is linked to the improvement and dissemination of communication tools already existing among the actors involved, such as the Internal Ombudsman, Information Channels, Feedback System and complaint repair procedures.
Market risk - Difficulty in marketing verified carbon credits	Constant search for new opportunities for financing, business and activities, such as partnerships and donations for direct use in the Project activities (not necessarily linked to the sale of credits). In addition, consolidation and expansion of the commercial contacts network in order to disseminate the Project, for this, Biofílica has a robust commercial sector responsible for developing materials for publicizing the Project, participating in national and international events related to the subject.
Risks related to the management of the Social and Environmental Fund of the REDD+ Jari/Pará Project	The Technical Chambers will be the official site of consultation and accountability of the fund during the structuring of the Social and Environmental Fund. Therefore, the parties involved will have greater transparency and monitoring power over the investments made by the Fund.

2.1.19 Maintaining Long-Term Benefits (G1.11)

In order to maintain and improve the benefits for the climate, community and biodiversity for the duration of the Project, certain tools have been selected, some of which are already in use and others will be implemented:

- Improvement in patrimonial surveillance procedures: through the provision of additional tools such as remote monitoring of high-resolution satellite images, acquisition of support equipment, and provision of training to the patrimonial surveillance team, the Project aims to increase efficiency and reduce costs of patrimonial surveillance operations. In this way the surveillance operations will have a great increase in the intelligence process related to territorial monitoring and management, which should directly reflect the maintenance of long term climatic benefits;

- Sustainable socioeconomic development and social organization: through actions aimed at strengthening associations and cooperatives, it is expected that organizations will reach a higher level of organization, enabling the adequate intensification of the marketing of agricultural and extractive products. In order for these objectives to be achieved, the project must intensify the technical assistance and rural extension services, as well as offer training aimed at production bias, social organization, cooperativism, leadership and financial management. In this way, the project must guarantee the long-term maintenance of the benefits generated, from the generation of autonomy and social empowerment to seek access to public services and the articulation of partnerships, providing financial and productive independence of the cooperatives and associations involved.

- **Technical assistance and rural extension service (ATER), workshops and training in agroforestry and agricultural techniques and environmental education actions:** through technical training and qualification in rural production, agricultural and forestry techniques according to family interest, the rural producer is able to implement adequate agricultural and forestry techniques, enabling constant production and revenue generation. It is hoped that by the end of the Project communities will be able to conduct their crops in an effective and self-sufficient manner, to produce food and generate income without the need to open new areas, perpetuating the benefits to themselves, the climate and biodiversity. From environmental education campaigns for garbage care, cleaning and maintenance of igarapés/watercourses and fire control, communities are expected to adopt the techniques and alternatives passed on to maintain an environmentally healthy space.

- Strengthening of the Jari Foundation: based on the consolidation of Foundation's activities, with the implementation of a qualified and sufficient technical team to serve the communities and with the application of partnerships and lines of action aiming at their financial sustainability. It is hoped that at the end of the Project the Jari Foundation will consolidate itself as a business-promoting institution based on sustainable productive chains, moving from the predominantly welfare-oriented characteristic to a bias towards economic development that results in the generation of consistent and continuous impacts over the long term;

- Greater scientific knowledge on Biodiversity and Maintenance of High Conservation Value Attributes: in addition to providing for the maintenance of native forest cover, supporting the activities of responsible forest exploitation and providing tools to provide sustainable socioeconomic development, the Project has as its axis of action the incentive for scientific research. In this way, the Project will implement a long-term monitoring plan for Biodiversity and HCVAs. These monitoring will aim to evaluate impacts, to implement mitigation actions and to increase the scientific understanding of Biodiversity in the region.

2.1.20 Financial Sustainability (G1.12)

2.1.21 Clustered Projects

Does not apply.

2.2 Scenario and Additionality of Land Use in the Absence of the Project

2.2.1 Land Use Scenarios in the Absence of the Project (G2.1)

For the determination of the land use scenario in the absence of the Project (baseline scenario) the approved methodology VCS VM0015 version 1.1 was used in conjunction with the VCS approved tool "VT0001 - Tool for the Demonstration and Assessment of Additionality in VCS "VT0001 - *Tool for the Demonstration and Assesment of Addicionality in VCS Agriculture, Forestry and Other Land Use* (AFOLU) *Project Activities*", version 3.0.

The analysis of deforestation, vector agents and hidden causes, as well as the probable scenarios of land use in the absence of the Project were performed based on the baseline scenario and are detailed in section 3.1.4 – *Baseline Scenario.* The reference region, which encompasses the Project area, covers an area of 2,522,426 hectares and presents a historical deforestation rate of 6,613 hectares per year between 2000 and 2014 (0.40% per year in relation to the remaining forest area).

Among the realistic and credible alternative land use scenarios that would occur within the boundaries of the Project in the absence of the AFOLU Project activity recorded in the VCS, the following were considered:

I) Continuation of pre-project land use (baseline scenario):

II) Forest Management with REDD+ activities without registration as a VCS AFOLU Project :

2.2.2 Rationale for the Most Likely Scenario (G2.1)

2.2.3 Additionality of the Community and Biodiversity (G2.2)

The current scenario in the absence of the Project would be limited in generating benefits to climate, community and biodiversity. The scenario without the Project tends to progress to the increase of illegal extractive activities, conversion of forest areas into unplanned irregular occupations, expansion of the area of agriculture and livestock with low productivity and environmental degradation due to the lack of basic sanitation, increasing the deforestation pressure in the project's area of expansion and gradually advancing towards the boundaries of the Project area.

The region's scenario with the development of the REDD+ Jari/Pará Project is socially, environmentally and economically positive. Sustainable extractivism is an important path for the conservation of forests and for the economy of families. The Project seeks to improve management techniques, production and control of the productive chain. In the area of agriculture and livestock, agroecological production techniques, increased productivity in smaller areas and the strengthening of production networks can contribute to reductions in environmental impacts, as well as enhancing socioeconomic improvements for the region's population.

The role of education in the scenario with the Project is extremely important, and access to schools, vocational and technical courses should provide better conditions of employment and income. In addition, incentives to develop sustainable forest management practices reduce forest stress.

The project, together with its mechanisms, guarantees the permanence of the forest and the consequent conservation of biodiversity, maintenance of ecosystem services, water quality and climate regulation. In the scenario without Project, the forest environment is being replaced by areas that are more and more anthropized through deforestation (FEARNSIDE, 2006). In the face of the scenarios presented with and without REDD, through secondary data, the importance of the implementation and development of the Project is reiterated.

Further details on Project additionality for community and biodiversity can be found in sections *4.1.4 – Scenario in the absence of the Project: Community and 5.1.3 - Scenario in the absence of the Project: Biodiversity.*

2.2.4 Benefits to be used as Offsets (G2.2)

There is no claim for any other compensation or credits for benefits provided by the climate, community or biodiversity produced by the REDD+ Jari/Pará Project.

2.3 Actors' Participation

2.3.1 Actors' Access to Project Documents (G3.1)

The REDD+ Jari/Pará Project has determined three methods of communication with the parties involved, aiming to guarantee access to documents and all other information of the Project through oral, written and virtual form, as described below.

Writing: a printed version of each document related to the Project, such as the Project design document, monitoring report, validation and verification report and the summary will be available for consultation at the Jari Foundation office. Information and news about the Project are disclosed in two Jari Group newspapers: Circular Jari Foundation and Circular of the Jari Group.

Virtual: documents related to the Project are available through virtual means on the VCS and Biofílica websites. The circulars of the Foundation and Jari Group are also digitally accessible. News and novelties about the Project will be published in the Biofílica Newsletter through social media.

Oral: information and news about the Project will also be conveyed orally at REDD+ Technical Board events through meetings between the community council of agricultural communities and technicians as well as other opportunities for contact between stakeholders and project proponents.

The communities that are not directly involved in the development of the Project, but which are part of the Project area, will receive important information about the Project from similar dissemination tools.

2.3.2 Dissemination of Summary Project Documents (G3.1)

Documents related to the Project are available by virtual means on VCS websites (http://www.verra.org/), Biofílica (http://www.biofilica.com.br), Jari Foundation (http://www.fundacaojari.org.br/pt/) and, Jari Group (http://www.grupojari.com.br/). The circulars of the Foundation and Jari Group are also digitally accessible. News and novelties about the project will be published in the Biofílica Newsletter through social media, Facebook (https://www.facebook.com/Biofilicainvestimentosambientais/) and Linkedin (https://www.linkedin.com/company/biofilica-investimentos-ambientais-s-a-/). In addition, all information and news will be reported orally in the Technical Boards about REDD+ between stakeholders and Project proponents.

2.3.3 Information Meetings with Actors (G3.1)

Prior to the implementation of the social activities that directly involve the communities, a Participatory Rapid Diagnostic Workshop (DRP) was conducted by the proponents of the Jari Project and

Foundation, where information related to the Project was presented in a language appropriate to the participating public and using mediation techniques. This Workshop was held from 04 to 07 April 2018 with the three community nuclei already described in section 2.1.9 – *Description of Actors.*

In addition, a meeting was held with the technicians of the Jari Foundation on April 9, 2018 to explain the first results and identify and determine factors relevant to the Project, as well as outlining the next steps. The details of the Participatory Rapid Diagnostic Workshop and the meeting with Jari Foundation technicians are described in the following section (section 2.3.4 – *Costs, Risks and Benefits of the Community).*

2.3.4 Costs, Risks and Benefits of the Community (G3.2)

As mentioned above, a Participatory Rapid Diagnostic Workshop (DRP) involving the selected communities for the REDD+ Jari/Pará Project was carried out (details in section 2.1.9 – *Description of the Actors*) from 04 to 07 April 2018. The activities carried out in the three community centers allowed the analysis of the scenario of these communities through the application of the analysis of strengths and weaknesses, opportunities and threats (called the FOFA matrix), as well as the identification and prioritization of the problems encountered in these regions.

For the Nova Vida Nucleus and Areas 127 and 60, the analysis showed that the strengths of these communities are in the production of açaí, chestnut, manioc, among others, their weaknesses are concentrated in the absence of organization and community leaders, as well as lack of various services such as communication and energy. Opportunities include partnerships with municipalities, emater and Jari Foundation, as well as the creation of a local association and the threats are mainly intermediaries, hunters and fishermen. Thus, the main problems of this community nucleus are identified and prioritized, with social organization followed by lack of communication and energy, lack of technical assistance and, finally, difficulties in accessing the market.

The other two nucleus selected for the Project, the Cafezal, Recreio and Serra Grande nuclei and the Braço and Bandeira nuclei also presented a scenario analysis. The community of the Cafezal has as an advantage the union of the community, as well as a strong leadership, but it presents as a disadvantage the communitarian isolation and schools that only offer until the elementary school. Opportunities are related to strengthening partnerships and access to new markets, while threats are predatory fishing, clandestine logging and agricultural pests.

In the case of the Braço & Bandeira nuclei, it was evaluated that the main problems faced by the communities are related to lack of social organization, lack of technical assistance and lack of communication and energy. The details of the Participatory Rapid Diagnosis carried out in these nuclei, as well as the scenario analysis (FOFA analysis) and the identification and prioritization of the problems for all the selected nuclei for the REDD+ Jari/Pará Project can be consulted in the Final Report of the

Social Consultation Aiming at the Complementation of the Socioeconomic and Environmental Diagnosis of the REDD+ Jari/Pará Project, available to validators/verifiers.

The results obtained from the workshops were based on the activity plan presented in the REDD+ Jari/Pará Project.

In addition, a meeting with the technicians of the Jari Foundation was held on April 9, 2018 at the Jari Foundation's office, and at the time the following points were discussed:

- Presentation of the first results of the workshops held in the communities;
- Identification of the current problems of the Jari Foundation;
- Verification of the agents and vectors of deforestation – validation of the diagnosis of the Forest House;
- Indication of possible partners for the Project;
- Validation of feedback and conflict management procedures;
- Next Steps and Schedule.

Attending the meeting were the technicians and coordinators of the Jari Foundation who highlighted their main difficulties in the Project region, among the main points were: i) low number of technicians; ii) the need for a better qualification of the current technicians; iii) change in the institutional performance of the Foundation, with a focus on business development for the communities; and iv) definition of action plans directed to the needs of each community. These demands will serve as the basis for defining one of the axes of the Project's business plan.

Also, in order to pass on relevant and appropriate information to the communities, a REDD+ Jari/Pará Technical Board should be created with the participation of the stakeholders and community councils of the communities involved in the Project, in the same way as it was created for the REDD+ Jari/Amapá Project. Appropriate and relevant information on potential costs, risks and benefits to communities should be provided at the Project and Consultation presentation meetings and during REDD+ Technical Board meetings. In addition, participation in the Project is voluntary and the decision to participate, or not, is not definitive nor results in some type of restriction.

2.3.5 Information for Actors on the Validation/Verification Process (G3.3)

Participating communities on the Project and other interested parties will be informed about CCB validation and verification to their community and residence through the REDD+ Technical Chamber prior to the event and Jari Foundation technicians during the field visit period. Virtual channels such as Biofílica website and newsletter for social media such as Facebook and Linkedin, Jari Foundation and Jari Group will also be used to inform other interested parties and the general public.

2.3.6 Site Visit Information and Communication Opportunities with the Auditor (G3.3)

The visit to the site by the auditor will be informed to the communities and other stakeholders involved in the REDD+ Jari/Pará Project through the REDD+ Technical Chamber, prior to the event, and also by Jari Foundation technicians during the field visit period. The communication between communities and other actors with the auditor, as well as the dissemination of information will be facilitated through distribution of pamphlets, information in newspapers and virtual channels, at that moment Biofílica website and newsletter by social media like Facebook and Linkedin, Jari Foundation & Jari Group.

2.3.7 Consultation of Community Groups and Other Stakeholders (G3.4)

After the Project Design Document was fully completed, a printed and digital version of the document and an executive summary in Portuguese were sent to the Jari Foundation, which provided an agenda for presentation, discussion and submission of the abstract to stakeholders. The presentation was made in the format of a workshop for the communities with the presence of main leaders, at the time the Technical Chamber of the REDD+ Jari/Pará Project was created, which will continue with the responsibility of discussing and directing the doubts regarding the progress of the activities.

2.3.8 Ongoing Consultation and Adaptive Management (G3.4)

A communication plan should be developed from the construction of the Technical Chamber to continue communication and consultation between Project proponents, communities and other stakeholders. The same design of the REDD+ Jari/Pará Project communication plan will be used, which had the following structure:

- Main communication channel: through a technical board, created at a meeting of the Technical Council, the board is the Project official dialogue space and articulation between the communities and other interested parties, which meets at least twice a year. All the results, demands and considerations about the progress of the Project are taken to this space;
- Members of the Technical Board: the members of the Technical Board are representatives of the institutions interested in the Project, along the representatives of the communities involved;
- Definition of Frequency of meetings: at least twice a year. The first meeting of the year has as main objective to discuss the activities implemented in the previous year and to discuss the work plan for the beginning of the year. The second, usually in the second semester, is mainly to monitor the implementation of the proposed work plan for the year and the prospects until its completion;
- Invitation strategy: all interested and proponents are invited by email and direct phone call. Community representatives are invited through phone calls and direct contact.

Adaptations to this communication plan should be made to the REDD+ Jari/Pará Project, as already identified in the field trip, to include the community councils of the communities that will participate in the Technical Chamber.

2.3.9 Stakeholder Consultation Channels (G3.5)

The activities of the Project are delineated and implemented considering the wishes, characteristics and limitations of each community as defined and verified during the DRP Workshops, the events of the REDD+ Technical Chamber and the Technical Assistance and Rural Extension Service (ATER).

As described in section 2.3.4 – *Costs, Risks and Benefits of the Community,* Workshops (DRPs) and meetings between the communities and the project proponents have already been held. This communication and accessibility for discussion on the progress of Project activities between stakeholders and proponents will occur continuously throughout the duration of the Project through various channels: Technical Chamber on REDD, visits of agricultural technicians through Technical Assistance and Rural Extension (ATER), Information Channels and Feedback and Procedures for Complaints Repairing and Internal Ombudsman.

2.3.10 Participation of Actors in Decision-Making and Implementation (G3.6)

The processes related to decision-making and implementation, as well as the various activities related to the Project, are open to community participation. As already mentioned, involvement in the design, implementation, monitoring and evaluation of the Project takes place through the presentation and consultation meetings, Technical Assistance and Rural Extension Service (ATER), DRP Workshops, REDD+ Technical Chambers, Information Channels and Feedback and Complaint Repair Procedures and Internal Ombudsman, in which all interested communities have the opportunity to participate.

Due to historical and cultural issues, it is noted that in relation to productive decisions of the family, women and young people have a small participation. Rural technicians are always advised to include men and women, when this is the family configuration, in all activities in order to increase the participation of women in these decisions. For the inclusion of young people, the Foundation started a work called "Young Agroextractivist Agent", aiming to empower young people with technical knowledge on issues applicable to their day to day. Finally, activities will be carried out to include gender and vulnerable populations as part of the resources of the Social and Environmental Fund.

2.3.11 Anti-Discrimination Guarantee (G3.7)

The Jari Group has a solid Human Rights and Social Responsibility Policy, containing internal standards such as the Jari Group Integrated Policy and a Code of Conduct, a group that respects, protects and shelter human rights and social responsibility.

The code of conduct is intended to guide and direct the attitude of all employees of the Jari Group in relation to contact with internal, external and community audiences, thus adding principles and values described in the document *General Principles and Standards of Conduct.* This document is based on principles protected by transparency and ethics, by local, state and federal laws, by international treaties and conventions, such as the Universal Declaration of Human Rights, the International Labor Organization and United Nations Conventions. There are a number of issues addressed in this document, such as ethical values and law, conflicts of interest, human rights, the environment, practices in the work environment, external audiences, among others, being addressed, among others, issues such as discrimination of any kind and sexual and moral harassment.

Commitment to the life, health and safety of workers is paramount, and any discrimination of race, color, nationality, age, religion, sexual orientation, mental or physical disability, moral or sexual harassment is permitted. The code also does not allow the exploitation and use of child labor, consumption or possession of illegal drugs or alcoholic beverages in the working environment and carrying of weapons of any kind in the premises of the company.

The Jari Group provides an internal communication channel, where complaints and manifestations on issues related to the code and working relationships can be made. In this way, it is sought to ensure that the norms described in the code, as well as the Human Rights and Social Responsibility Policy of the Jari Group are employed and that human rights are respected. Communication with employees is done through suggestion boxes made available at strategic points in service providers. The Environmental Quality and Management team collects these boxes monthly, records and analyzes, sending the operation managers a report containing the demands of the service providers for decision making as needed.

2.3.12 Feedback Process and Complaint Repair (G3.8)

The REDD+ Jari/Pará Project Feedback Process and Complaint Repair is based on the same guidelines implemented in the REDD+ Jari/Pará Project, considering that the Jari Group's conflict management policy has not undergone significant changes or adaptations, as well as the implemented tools presented a positive and effective result in the communication and resolution of complaints or problems arising from the Project.

To this end, the Jari Group has a methodology for managing opposition of interests directly related to the rural communities existing in the limits or surroundings of the Group's areas, described in

the document called Conflict Management. It describes the procedures taken in the case of complaints, dissatisfaction, disagreement and confrontation of opinions regarding land, environmental or social issues.

Complaints are forwarded by a committee composed of representatives of the Jari Foundation and the institutional relations, land tenure and legal management departments of the Jari Group, and include verification of the veracity of the information, conflict classification, verification of recidivism of the complaint and survey of possible or future impacts for the Group or Communities operation. The case is analyzed by the committee, which decides on referrals and definition of strategy for the solution of the occurrence. The search for a consensus between the parties is always the main objective. In case of non-agreement between the parties, the demand will be recorded in the meeting's minutes for further verification of new negotiation possibilities. If it is still not resolved, the conflict is then referred to arbitration or court.

Conflicts and demands from other interested parties are dealt with according to the document "Stakeholder Communication Procedure", created in the Jari Group's Quality and Environmental Management sector and registered in the "Communication with the Community" form. The forms are reviewed and forwarded to the appropriate arrangements, and then returned to the communities. Communication with employees is done through suggestion boxes made available at strategic points in the enterprises providing services.

2.3.13 Accessibility of the Complaint Feedback and Repair Process (G3.8)

The Jari Group has an accessible dispute resolution procedure called the Complaint Feedback and Repair Procedure ("Conflict Resolution Procedure").

The Complaint Feedback and Repair Procedure is available from the Environmental Quality and Management Department. Also, at the end of each Technical Chamber and community council, the Jari Foundation and Biofílica Investimentos Ambientais staff verbally revise the Conflict Management Procedure and explain how any community or interested party may submit comments, suggestions, complaints, through the communication channels described in the Project, the suggestion boxes distributed at strategic points and the feedback channel called "Fale Conosco" (“Contact Us”), which works through e-mail or telephone - virtual and verbal channels - and through the "Stakeholder Commentary Form", available at the Jari Foundation's office and taken to the field with technicians for each ATER - written channel (Figure 8 and Figure 9).

Figure 8. Feedback Channel "Contact Us" among the materials available from the REDD+ Jari/Pará Project.

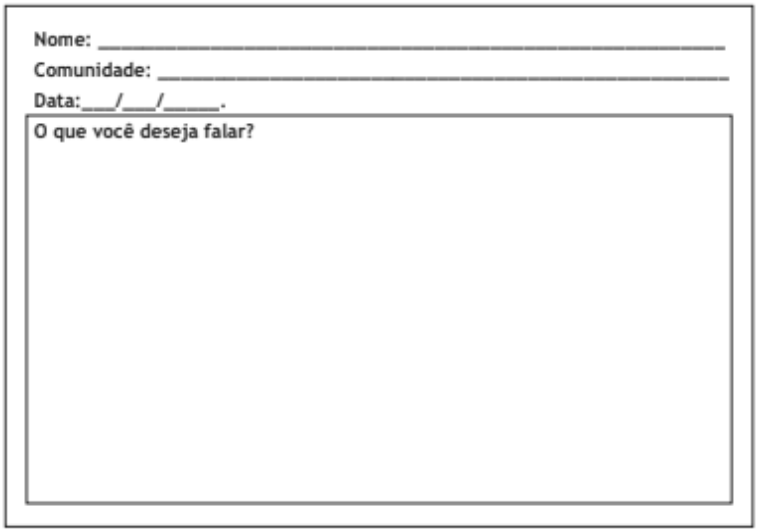


Figure 9. Stakeholder comment form.

2.3.14 Worker Guidance and Training (G3.9)

In order to provide guidance and training for stakeholders on REDD, as well as to encourage participation in decision-making on the Project, REDD+ Technical Chambers and DRP Offices are held. Other methods that stimulate and generate knowledge and skills useful to local communities are technical assistance, property micro-zoning, technical workshops and training in agroforestry and agricultural techniques, development of the land use plan and maintenance of a native forest seedlings nursery.

All activities are open to the participation of all residents of the Project's working communities, except for the REDD+ Technical Chamber, where the community has one (or more) member as a

nominated representative. The participation of women, young people and marginalized people are stimulated by the Foundation's technicians, as well as the allocation of part of the resources of the Socio-environmental Fund to include these less favored groups (inclusion of gender, youth and vulnerable populations).

For sustainable forest management activities, all employees and third parties are trained in the activities. The Group has strict standards and before the beginning of activities in the area of forest management, all employees are trained and instructed on operational and environmental procedures related to their areas of action, as well as other topics such as Sustainable Management, Forest Certification and Work Safety.

Another way to promote professional qualification is through programs and projects for youth, women and vulnerable people supported by the Jari Foundation. These programs seek to offer knowledge and techniques so that these disadvantaged groups can compete in an equal way in the selective processes of hiring of the Jari Group.

A number of compound and/or women-led enterprises have been established and supported by the Jari Foundation, such as the Agulhas Versáteis (Versatile Needles), which focuses on the production of professional uniforms and provides for the companies of the Jari Group and other companies in the region and Production of Biojewels organized by the Association of Artisan Women of Jari Valley, an association for the production of biojewels with the use of seeds of forest and that received training for craftsmanship. Other projects of the Jari Foundation also stand out as:

- Project School of Wood: professional and entrepreneurial qualification for youth and adults focused on the infrastructure and services sector, and the practice of entrepreneurship is carried out within the school environment during professional training;

- Project Generation Apprentice: qualification for the labor market of teenagers and young people. Professional qualification courses are offered in the areas of computing, administrative, electrical, mechanical and agricultural technicians. At the end of the program, most of the young participants in the qualification are hired by the Jari Group and its service providers;

- Project Canteiro Escola: qualification of young people and adults for execution of civil construction services and maintenance in general;

- Social Interaction Project: training for the use of digital tools for teenagers, youth, adults, the elderly and people with disabilities;

- Project Mundo de Tupã: enriches talents in the area of culture and art, strengthening artistic productions and general cultural skills for the world of work and artistic professionalization.

2.3.15 Equal Employment Opportunities (G3.10)

The employment opportunities offered by the Jari Group are equal to those of the surrounding communities, encompassing management positions if the requirements for the vacancy are fulfilled.

Criteria for the recruitment and selection process are established, allowing transparency and effectiveness for all those involved, where criteria of race, gender, sexual orientation, color, religion, age, ethnic origin, physical or mental disability or social class are not used. There is always a selection process conducted by the Human Resources area, for any open space in the organization, where the professionals are submitted to specific evaluations of the position in question.

At present, the Jari Group has a staff composed mostly of people from the Jari Valley region itself and the vacancies are widely announced in the region.

As mentioned above, the Group promotes the inclusion of vulnerable groups, such as youth and women, through training and qualification programs (section 2.3.14). The social programs that best enable the youth of the communities to be incorporated by the Group as a skilled workforce are the Geração Aprendiz and Escola da Madeira projects.

The Jari Group has a Human Resources Program with the aim of balancing and standardizing the selection of employees, including young people, new employees and former employees who will take on new positions. This program has four distinct procedures such as Internship Program (Youth), Admission and Integration Procedure (New Employees), Internal Recruitment Program (for new positions) and Systematic Training.

2.3.16 Labor Laws and Regulations (G3.11)

It is ensured that all employees belonging to Jari Group, Biofílica, and service providers are legally hired in compliance with Brazilian labor legislation. In addition, international agreements ratified by Brazil and issues related to worker well-being are respected.

Annually, it is verified the compliance with the norms and labor laws applied by Biofílica by an audit, this is due to the fact of being a limited liability company. Its financial statements are published on the Jus Brasil website, the largest open and legal community in Latin America.

After hiring and before the beginning of the worker's activities, there are training and qualification on technical procedures and also the promotion of empowerment regarding their rights and applicable laws. In addition, employees are directed to join the institution responsible for their rights, the respective unions to the area of work.

The pertinent laws and regulations that protect workers' rights in Brazil, as well as the international agreements ratified by Brazil on labor issues, are listed below.

Federal Legislation and Regulations

- **Decree-Law No. 5,452**, of May 1st, 1943: Approves the Consolidation of Labor Laws.

- **Law No. 6,514**, of December 22nd, 1977: Amendments to Chapter V of Title II of Consolidation of Labor Laws, on occupational safety and medicine and other measures.

International agreements ratified by Brazil

- **Convention of the International Labor Organization No. 29 of 1930, ratified by Brazil on April, 25, 1957**: Provides for the abolition of forced labor.

- **International Labor Organization Convention No. 87 of 1940**: Provides for freedom of association.

- **Convention of the International Labor Organization No. 97 of 1949, ratified by Brazil on June 18, 1965:** Provides for migrant workers.

- **Convention of the International Labor Organization No. 98 of 1949**, ratified by Brazil on November 18, 1952: Provides for the right to organize unions and collective bargaining.

- **Convention of the International Labor Organization No. 100 of 1951, ratified by Brazil on April, 25, 1957:** Provides for equal pay for men and women.

- **International Labor Organization Convention No. 105, ratified by Brazil on June 18, 1965**: Provides for the abolition of forced labor.

- **Convention of the International Labor Organization No. 111 of 1958, ratified by Brazil on March, 01, 1965**: Provides for discrimination in respect of employment and occupation.

- **Convention of the International Labor Organization No. 131 of 1970, ratified by Brazil on May, 04, 1983**: Provides for minimum wage setting, especially in developing countries.

- **Convention of the International Labor Organization No. 138 of 1973, ratified by Brazil on June, 28, 2001:** Provides for the minimum age for admission.

- **Convention of the International Labor Organization No. 142 of 1975, ratified by Brazil on November, 24, 1981**: Provides for the development of human resources.

- **International Labor Organization Convention No. 143 of 1975***:* Provides for illegal immigration and the promotion of equal opportunities for migrant workers.

- **Convention of the International Labor Organization No. 155 of 1981, ratified by Brazil on May, 18, 1992***:* Provides for the workers safety and health.

- **Convention of the International Labor Organization No. 169 of 1989, ratified by Brazil on July, 25, 2002***:* Provides for indigenous and tribal rights.

- **International Labor Organization Convention No. 182, ratified by Brazil on February 02, 2000***:* Provides for the prohibition of the worst forms of child labor and immediate action for its elimination.

2.3.17 Safety of Workers (G3.12)

An important component of the Project involves the strict care with the workers safety, considering the internal regiment and the official norms instituted by the federal and state governments. The Jari Group has a complex quality management system, *Integrated Policy of the Jari Group,* in which all activities carried out by the company are described through operational procedures, work instructions and environmental procedures. All procedures are reviewed and updated annually. The activities related

to Sustainable Forest Management are those that may pose some risk to the health and safety of the operating employees.

The monitoring is performed by a specialized work safety team that evaluates the activities in its occupational, operational and environmental safety aspects. During the period of the activities, the technicians actively circulate in the areas and intercede alerting any irregularities and/or problems.

As described previously, there is a system of annual trainings and qualification aimed at preparing own and third-party employees engaged in sustainable forest management activities (section 2.3.14). In addition to the training, all personnel involved receive personal (helmets, boots, leggings, ear protectors, gloves, among others) and collective (tents, when necessary) protective equipment.

Through internal rules and improvements in occupational health and safety practices, all positions and situations that could provide some type of occupational hazard were profoundly avoided and mitigated. Other relevant tools are reported in the following procedures and manuals:

- Task Risk Analysis (ART)
- Areas of Expertise
- Security Dialog
- Risk Management
- Occupational Health and Safety Management
- Safety Inspection – IS
- Planned Observance of Unsafe Acts – OPAI
- Hazards and Risks - Accidents
- Plan for Emergency Care
- Procedure for emergency response

As an addition to the manuals, procedures and standards, there is always the disclosure organized by the Jari Group of safety alerts relevant to the climate and the season, such as insects and venomous animals.

2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

The proponents and partners of the REDD+ Jari/Pará Project, as well as the roles, responsibilities and governance structure of each of these entities involved in the design and implementation of the Project are detailed in sections 2.1.3 – *Project Proponents* and 2.1.4. - *Other Entities Involved in the Project.* The Project has satisfactory human and financial resources for the effective implementation of activities.

2.4.2 Technical Skills Required (G4.2)

All those involved in the Project have the technical skills required for the successful completion of the REDD+ Jari/Pará Project. The areas of knowledge and technical skills required to successfully implement the Project and the specific activities, as well as the professional responsible for each area, are described in the Risk Analysis document, based on the approved VCS methodology, available in the annex hereto.

2.4.3 Management Team Experience (G4.2)

Biofílica Investimentos Ambientais is a Brazilian company that promotes the management of forest areas in the Amazon biome. The company has a specialized team and is a reference in the development of forest conservation projects, guaranteeing the quality and effectiveness of developed REDD+ activities.

The company aims to reduce deforestation and carbon emissions into the atmosphere, conserve biodiversity and water resources, and promote the social inclusion and development of communities living in the Amazon biome through the sale of credits for environmental services, development and financing of scientific research activities and the development of sustainable business chains. Biofílica aims to make environmental conservation an economically interesting activity for forest owners, communities and investors.

The Jari Foundation is the social enterprise of the Jari Group which, together with a vast network of partners, develops programs and projects in the areas of education, health, human rights, environment, culture and employment and income generation. Since 1994, it has assisted more than 6.8 million of people in Brazil and has a history of acting in the region and expertise in the design and implementation of socioeconomic development activities. The Jari Foundation has great contribution in the execution and management of social activities, guaranteeing the inclusion of the communities in the activities of the Project and in the activities of Technical Assistance and Rural Extension (ATER).

2.4.4 Project Management Partnerships/Team Development (G4.2)

Does not apply.

2.4.5 Financial Health of Implementing Organizations (G4.3)

Biofílica Investimentos Ambientais is a Brazilian company with 10 years of experience in the environmental assets market, has a diversified line of business, and investors who support the company's business.

The Jari Group has expanded its operations since its creation in 1981, demonstrating its excellent management capacity and financial health. To ensure continued success, the Group completed the conversion of the cellulose plant to the production of *Dissolving Wood Pulp* (DWP), a *commodity* that has a market price significantly higher than cellulose for paper.

The supporting documents of the financial health of both companies are classified as Commercially Sensitive Information and were shared with the audit team on a confidential basis.

2.4.6 Avoiding Corruption and Other Unethical Behaviors (G4.3)

Biofílica Investimentos Ambientais supports annual financial auditing processes ensuring that your resources are allocated responsibly and free of corruption. The financial statements and minutes of meetings related to the company are published on JusBrasil's website, the largest open and legal community in Latin America.

Like the Biofílica, the Jari Group does not tolerate any kind of corruption such as kickbacks, bribes, nepotism, favors, fraud, favoritism, extortion, money laundering, among others, and has a "Human Rights and Social Responsibility Policy: passive and active corruption inside and outside the company ". If such situations occur, all information will be verified and those responsible will be prosecuted and removed from the company. The Group also provides an Internal Ombudsman communication channel, mentioned above, which, among other functions, facilitates complaints of corruption. The complaints and claims are forwarded and correctly resolved. It should be noted that the channel is stealthy and works free through a 0800-telephone number.

2.4.7 Commercially Sensitive Information (Rules 3.5.13 – 3.5.14)

The following information is available to validators/verifiers:

- Project Financial Performance Worksheet and other related documents;
- Sustainable Forest Management Plan – Pará;
- Agreements and contracts between the parties involved;
- Diagnostic Inventory;
- Land Documents;
- Financial Statements Jari Group (Jari Celulose and Jari Foundation);
- Financial Statements Biofílica;
- Operating and Environmental Procedures of Jari Group.

2.5 Legal Situation and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

Jari Celulose, Papel e Embalagens S/A, a company controlled by the Jari Group, is the legitimate owner of the Gleba Jari-I property, where the REDD+ Jari/Pará Project is located. The activities of the Project will be developed, as well as the Right of Use of the Project area is respected according to the criteria of 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)."

Gleba Jari I is composed of ninety-nine properties certified and registered in the Real Estate Registry. Eighteen of these rural properties have limits, dimensions, confrontations, geographical coordinates and other technical specifications provided in maps and descriptive memorials approved for the realization of the Sustainable Forest Management Plan (Table 15).

Table 15. Rural properties approved to carry out the Sustainable Forest Management Plan in the REDD+ Jari/Pará Project.

Rural Real Estate	Enrollment	State	Size of area (Enrollment ha)
Alzira Antunes Martins	4,538	PA	3,600.00
Ayres Julio da Fonseca	4,521	PA	3,600.00
Benedito de Oliveira Feitosa	4,529	PA	3,600.00
Cajueiro Serra de Almeirim	375	PA	12,447.21
Campo Saracura	4,532	PA	52,272.00
Castanhal do Urucurituba	Transc nº 829, lv 3-E, fl 9 à 11	PA	17,424.00
Crispim Joaquim de Almeida	4,530	PA	3,600.00
Fazenda Saracura	2,259	PA	386,863.63
Flávia Freitas de Almeida Maia	4,518	PA	3,600.00
José Fernandes Fonseca	4,520	PA	3,600.00
Maria de Nazare de Almeida Guedes	4,539	PA	3,600.00
Panama ou Mapau	Transc nº 829, lv 3-E, fl 7 à 11	PA	52,272.00
Paraizo	Transc nº 829, lv 3-E, fl 7 à 11	PA	2,178.00
Pau Grande	2,253	PA	2,178.00
Santo Antonio da Cachoeira	360	PA	126,080.66
Santo Antônio do Urucurituba	Transc nº 829, lv 3-E, fl 9 à 11	PA	17,424.00
Serra Grande	2,247	PA	4,356.00
Terra Preta do Castanhal	2,254	PA	6,534.00

Currently, the land situation of rural properties of Jari Celulose faces an administrative blockade, which is provisional and fully reversible. The progress and development of land regularization works are

progressing and are being complied with by both parties within the deadlines stipulated in the last Conduct Adjustment Terms (TAC) established on September 6, 2016, and other letters received with the State Government, especially with the ITERPA. It is worth mentioning that Jari holds the tenure and quiet and peaceful ownership of these areas for more than 50 (fifty) years, uninterrupted, free and clear of any questions from third parties.

Through additional documentary research, it is concluded that there is no impediment, encumbrance, levies or limitation for the REDD+ Jari/Pará Project, such as blockades, encumbrances, mortgages, land arrests or disputes.

Biofílica Investimentos Ambientais has a contractual agreement with Jari Celulose S/A, the owner of the properties, for the realization of the REDD+ Jari/Pará Project. Thus, Biofílica Investimentos Ambientais is the only and exclusive developer of the REDD+ Jari/Pará Project with regard to environmental services and other co-benefits.

2.5.2 Recognition of Property Rights (G5.1)

The REDD+ Jari/Pará Project recognizes and respects all property rights, complying with significant statutory and regular requirements, as well as having the required approvals of the appropriate state, local and indigenous authorities. The Project recognizes, respects and supports the rights to lands, territories and resources, including the statutory and traditional rights of Indigenous Peoples and others within Communities and Other Actors.

Regarding possible external risks to property rights, it should be noted that there are no records of disputes with third parties for ownership of properties or for the use of natural resources or for the use of the property. There is also a good relationship with the surrounding communities. In this way, the following aspects are described in detail:

• It owns the rights of use and economic exploitation of the properties, as well as obtains the right of access to the natural resources in it, the company Jari Celulose SA, under the terms of the Federal Constitution of Brazil and the Civil Code, by virtue of being the owner of the real estate where the REDD+ Jari/Pará Project will be carried out;

• There are no records of disputes with third parties for possession of the property, for access to natural resources or for the use of real estate in the REDD+ Jari/Pará Project area, as there are no conflicts with traditional squatters claiming the regularization of their possessions;

• Although there were no records on land tenure disputes or access/use rights, activities were implemented to resolve any possible disputes or overlapping of claims, as well as to support the regularization of the land situation of the Project's communities with the designated public institutions. In this sense, the company Jari Celulose S/A signed a Term of Commitments and other letters with the Government of the State of Pará, aiming to materialize a broad partnership program to, if necessary, regularize any occupations of traditional communities, through the exchange of areas that are of interest

to Jari Celulose S.A., and to promote the activities necessary to induce the socioeconomic development of the region;

• Another measure to prevent and inhibit invasions in the Project area is the monitoring activities of the properties perimeter carried out by a land surveillance team. When invasions are identified, a police record is made, formalizing the private property invasion report, which is then forwarded to the legal department of the company for adequate measures, and to the Brazilian Institute of Environment and Natural Renewable Resources (IBAMA) for investigation of environmental crime.

2.5.3 Free, Prior, and Informed Consent (G5.2)

The Prior Informed Consent (of the appropriate holders of property rights and other stakeholders) has been applied throughout the implementation period and will continue to be applied throughout the duration of the REDD+ Jari/Pará Project. The property where the Project is located has a vastly larger area than the area used for the Project activities and there is no interference in the surrounding properties. In addition, the Project does not aim to develop any activity on private property, belonging to indigenous and traditional communities or to the government. In relation to social activities and monitoring of biodiversity, it is guaranteed that no activity will be carried out without the free, prior and informed consent of the parties involved.

No activity related to the Project will result in the involuntary removal or relocation of the Property Rights Owners of their lands or territories, nor will force them to relocate activities important to their culture or livelihoods. Any proposed removal or relocation takes place only after obtaining the Free Prior Informed Consent from the appropriate Owners of Property Rights.

In addition, all the actors that could be impacted in some way by the REDD+ Jari/Pará Project were consulted. In the communities related to the Project, workshops were carried out in order to pass information about the Project, as well as consultations regarding the opinions of the community about the Project. These consultations will continue throughout the life cycle of the Project. In addition, all information about the REDD+ Jari/Pará Project can be acquired in virtual channels, such as Biofílica website and newsletter by social media such as Facebook and Linkedin, Jari Foundation and Jari Group.

2.5.4 Protection of Property Rights (G5.3)

The implementation and development of the REDD+ Jari/Pará Project shall not lead to the involuntary removal or relocation of any party, and the activities important to the culture and livelihoods of the communities residing within the boundaries of the Project area shall be respected and supported by the Project.

As previously stated, the land regularization of the communities acting in the Project is supported and sustained by the Jari Group with the responsible public institutions.

2.5.5 Illegal Identification of Activity (G5.4)

Illegal deforestation is the main illegal activity that can negatively impact the development of the REDD+ Jari/Pará Project, with predatory hunting and exploitation of other fauna and flora species being possible.

This illegal deforestation is caused by land squatters for subsistence agriculture ("roças") and by small farmers for small-scale agricultural crops, pasture and demarcation of property boundaries. Between 2000 and 2014, 32,057 hectares were deforested in the Project Zone to install these activities. For the next 30 years, a loss of 107,430 hectares of native forest is projected in the absence of the project, of which 51,985 hectares are expected to be deforested in the project area.

It seeks to control and combat these illegal activities commonly found in the region covered by the Project through mitigating measures such as strengthening land inspection and patrimonial surveillance, as well as encouraging the engagement of other actors and stakeholders, social inclusion and regional socioeconomic development through the generation of economic alternatives to deforestation.

With the application of these measures, it is expected to improve the well-being of the communities without generating burdens on native forest and local biodiversity. Land inspection and patrimonial surveillance aim to curb illegal practices of deforestation, extraction of plant species and hunting and capture of wild animals by third parties. The mechanisms and procedures for land inspection are summarized in Table 16.

Table 16. Summary of the mechanisms of land inspection in the REDD+ Jari/Pará Project area.

Inspection of the Project area	
Purpose	To determine the conditions of inspection in the land owned by Jari Celulose S.A. by fluvial and road means.
General condition	Patrols: - To carry out regular patrols with the purpose of ensuring the protection of the land assets of Jari; - Avoid deforestation, forest fires, or other acts of aggression to the environment; - Prevent the extraction and illegal trade of wood, other products and predatory hunting and fishing; - Maintain a good relationship with squatters and existing communities; - Promote social actions; - Provide support to police and oversighting authorities, where necessary; - River patrol is carried out with boats that cover the main hydrographic basins of the region; - Road patrol is carried out by vehicles through main roads, side roads and contours to monitor the forest areas and communities existing in the areas where the company operates. Method of operation: - Sending a ream to the place of occurrence to investigate the fact and application of appropriate measures; - Activation of the legal sector for measures; - Registration at the police station by the Patrimonial Security Coordinator, of occurrences involving invasion of property, damage to property and illegal extraction of forest products; - The occurrences involving aggression to the environment should be registered in the responsible agencies (IBAMA, Environmental Police etc.) by the Patrimonial Security Coordinator; - In all situations that involve land conflicts, it is necessary to avoid confrontation between the parties, respecting the laws in force in the country.
Specific Condition	- The patrolling route is prepared in accordance with a Monthly Inspection Program; - When detected by the land inspection, occurrence of illegal activities, the Patrimonial Security must take the appropriate measures, as well as collect the geographic coordinates for sending to the Geoprocessing sector; Forest Fire Surveillance - Patrols take into account openings of plantations that may cause fire hazards to the forests, and the person responsible should be advised of the risks and necessary foresight necessary to be taken by the forest area. AAVC – Areas of High Conservation Value (HCVA) - Following proven validation of a HCVA, specific care is taken to protect the identified AHCVs. Ecological Corridors - Areas of ecological importance for the passage of fauna are monitored during the inspection.
Records	- Protocol of occurrences registered with IBAMA; - Bulletin of occurrences; - Photographic record of occurrences; - Monthly monitoring program; - Report on the Activities of Property Security.

Surveillance Intelligence Strategies	Planned investment actions in intensification and intelligence in the activities of Land Property Security: - Monitoring via high-resolution satellite imagery enabling the generation of monthly reports of altered areas; - Acquisition of support equipment for the patrolling team; - Additional financial support for logistics and vehicle maintenance costs.

2.5.6 Disputes in Progress (G5.5)

In the area of the REDD+ Jari/Pará Project, there are no conflicts, current or unresolved disputes over land rights, use of real estate or access to natural resources, as well as disputes with traditional third parties or squatters, revoking the right to property of Jari Celulose S.A., as already detailed above.

Although there are no disputes in the Project area on land ownership or rights to access or use, the Jari Group has a prepared problem-solving mechanism in the “Conflict Management” document, should any possible disputes arise over the region. In addition, the Group has a cooperation dialogue with government agencies to support the regularization of the land tenure situation for the project's communities, as already mentioned above, and has a record of at least ten years of all events related to this topic.

2.5.7 National and Local Laws (G5.6)

Compliance with Laws, Statutes and other significant regulatory instances for the REDD+ Jari/Pará Project is related to the forest management activity. In the State of Pará, the activities of the enterprise are being licensed by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA), thus having to apply federal legislation. Subordinated to the federal legislation, the legislation at the state level applies.

Regarding REDD+ activities, there is nothing establishing or regulating officially any legislation related to this subject up to the present moment. One can note a history of initiatives despite the construction and negotiation of this concept through agreements and meetings in the United Nations Framework Convention on Climate Change (UNFCCC).

So far, the most relevant initiative at the national level has been the submission of Bill No. 225/2015 which “Establishes the national system for reducing emissions from deforestation and degradation, conservation, sustainable forest management, maintenance and increase of forest carbon stocks (REDD+) e and other measures”, but is still under way.

In addition, in December 2015, the National Strategy for REDD+ of Brazil (ENREDD+) was instituted by MMA Ordinance No. 370, a document that formalizes to Brazilian society and the UNFCCC signatory countries how the Brazilian government has structured its efforts and aims to improve them by

2020, contributing to climate change mitigation by controlling deforestation and forest degradation, promoting forest recovery and promoting sustainable development.

Below are the main relevant laws and regulations at the federal and state levels listed and detailed. In addition, a brief review of international climate agreements has been conducted that has led to the creation and development of REDD+ initiatives around the world.

Federal Legislation

- **Law no. 12,651, of 05/25/2012:** Provides for the protection of native vegetation; amends Laws 6,938 of August 31, 1981; 9,393 of December 19, 1996; and 11,428 of December 22, 2006; revokes Laws Nos. 4,771, September 15, 1965; and 7,754, April 14, 1989; and Provisional Measure No. 2,166-67 of August 24, 2001; and other measures.

- Law no. 12,187, of 12/29/2009: It establishes the National Policy on Climate Change – PNMC and other measures.

- **Provisional Measure no. 571, of 05/25/2012:** Amends Law No. 12,651, of May 25, 2012; which provides for the protection of native vegetation; amends Laws 6,938 of August 31, 1981; 9,393 of December 19, 1996; and 11,428 of December 22, 2006; revokes Laws Nos. 4,771, September 15, 1965; and 7,754, April 14, 1989; and Provisional Measure No. 2,166-67 of August 24, 2001.

- **Decree no. 58,054, of 03/23/1966:** It promulgates the Convention for the protection of flora, fauna and the scenic beauties of the countries of America.

- **Decree no. 96,944, of 10/12/1988:** It creates the Program for the Defense of the Complex of Ecosystems of the Legal Amazon and other measures.

- **Decree no. 2,661, of 07/08/1998:** It regulates the sole paragraph of art. 27 of Law No. 4.771, of September 15, 1965 (Forest Code), through the establishment of precautionary standards regarding the use of fire in agropastoral and forestry practices, and other measures.

- **Decree no. 2,959, of 02/10/1999:** Provides for measures to be implemented in the Legal Amazon, for monitoring, prevention, environmental education and forest firefighting.

- **Decree no. 5,975, of 11/30/2006:** It regulates the art. 12, final part, 15, 16, 19, 20 and 21 of Law 4,771, dated September 15, 1965; art. 4, item III, of Law 6.938, dated August 31, 1981; art. 2 of Law 10.650 of April 16, 2003; amends and adds provisions to Decrees 6,514/08 and 3,420/00, and other provisions.

- Decree no. 7,390, of 12/09/2010: It regulates arts. 6, 11 and 12 of Law No. 12,187, of December 29, 2009, which establishes the National Policy on Climate Change - PNMC and other measures.

- **CONAMA Resolution No. 16, of 12/07/1989:** Establishes the Integrated Program for Environmental Assessment and Control of the Legal Amazon.

- CONAMA Resolution No. 378, of 10/19/2006: Defines those ventures potentially causing national or regional environmental impact for purposes of the provisions of item III, § 1, art. 19 of Law No. 4.771, of September 15, 1965, and other provisions.

- **CONAMA Resolution No. 379, of 10/19/2006:** Creates and regulates data and information system on forest management under the National Environmental System - SISNAMA.
- **IBAMA Ordinance No. 218, of 05/04/1989:** Provides for the clearing and exploitation of native forests and forest formations that are native successors of the Atlantic Forest, and other measures.
- **IBAMA Ordinance No. 37-N, of 04/03/1992:** It recognizes as Official List of Species of the Brazilian Flora Threatened of Extinction the relation that is presented in the Ordinance.
- **MMA Ordinance No. 103, of 04/05/2006:** Provides for the implementation of the Document of Forest Origin - DOF, and other measures.
- **MMA Ordinance No. 253, of 08/18/2006:** Establishes, as of September 1, 2006, the Forest Origin Document - DOF in substitution of the ATPF Forest Products Transport Authorization, under the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA).
- Ordinance No. 8896, of 12/09/2013: Amendments to Regulatory Norm no. 31.
- **Normative Instruction MMA no. 1, of 09/05/1996:** Provides for the Mandatory Forest Replenishment and the Integrated Forest Plan.
- **Normative Instruction MMA no. 07, of 04/27/1999:** Provides for authorization for deforestation in the States of the Legal Amazon.
- **Normative Instruction MMA no. 02, of 05/10/2001:** Provides for the economic exploitation of forests, in the rural properties located in the Legal Amazon, including the Legal Reserve areas and excluding those of permanent preservation established in the current legislation that will be realized through practices of sustainable forest management of multiple use.
- **Normative Instruction IBAMA no. 30, of 12/31/2002:** It disciplines the calculation of the geometric volume of standing trees, through the volume equation that specifies and other measures.
- **Normative Instruction IBAMA no. 112, of 08/21/2006:** It regulates the Document of Forest Origin - DOF, established by Ordinance/MMA/ no. 253, of August 18, 2006. (Amended by Normative Instruction No. 134 IBAMA, of 11/22/2006).
- **Normative Instruction MMA no. 06, of 12/15/2006:** Provides for forest replenishment and the consumption of forest raw material, and other measures.
- **Normative Instruction IBAMA no. 178, of 06/23/2008:** Defines IBAMA guidelines and procedures for assessment and consent regarding the issuance of permits for the suppression of forests and other forms of native vegetation in an area of more than 2,000 hectares in rural properties located in the Legal Amazon and 1,000 hectares in rural properties located in other regions of the country.
- Regulatory Norm no. 31, of 03/03/2005: It approves the Regulatory Norm of Safety and Health in the Work in Agriculture, Livestock, Forestry, Timber Harvesting and Aquaculture.

State Legislation

- State Law no. 7,389, of 04/01/2012: Defines the activities of local environmental impact in the State of Pará and other measures.

- State Law no. 7,381, of 3/19/2010: Provides for the restoration of the vegetation cover, of the riparian forests of the State of Pará.

- State Law no. 6,745, of 6/6/2005: Establishes the Ecological-Economic Macrozoning of the State of Pará and other measures.

- State Law no. 6,506 of 12/02/2002: It establishes the basic guidelines for the realization of the Ecological-Economic Zoning (EEZ) in the State of Pará and other measures.

- State Law no. 6,462, of 7/4/2002: Provides for the State Policy on Forests and other forms of vegetation.

- State Law no. 5,977, of 7/10/1996: Provides for the protection of wildlife in the State of Pará.

- State Law no. 5,887, of 5/9/1995: Provides for the State Environmental Policy and other measures.

- State Decree no. 518, of 09/05/2012: Establishes the Para-Forum of Climate Change and other measures.

- State Decree no. 216, of 9/22/2011: Provides for the environmental licensing of agrosilvopastoral activities carried out in altered and/or underutilized areas outside the legal reserve area and permanent preservation area in the rural properties of the State of Pará.

- State Decree no. 2,436, of 8/11/2010: Regulates the actions related, directly or indirectly, to agrosilvopastoral activities, carried out within the areas of alternative land use, considered to be of low environmental impact.

- State Decree no. 2,099, of 1/27/2010: It provides for the maintenance, recomposition, conduction of natural regeneration, compensation and composition of the Legal Reserve area of rural properties in the State of Pará and other measures.

- State Decree no. 1,697, of 6/5/2009: Establishes the Prevention, Control and Alternatives Plan for the deforestation of the State of Pará and other measures.

- State Decree no. 1,148, of 7/17/2008: Provides for the Rural Environmental Registry - CAR-PA, Legal Reserve area and other measures.

- State Decree no. 58, of 11/27/2006: Establishes the Register of Explorers and Consumers of Forest Products of the State of Pará - CEPROF-PA and the System of Commercialization and Transportation of Forest Products of the state of Pará SISFLORA-PA and its operational documents and other measures.

- State Decree no. 56, of 3/31/2006: Regulates provisions of State Law No. 6,462 of July 4, 2002; which provides for the State Policy on Forests and Other Forms of Vegetation and provides other measures, aiming at encouraging the recovery of altered and/or degraded areas and restoring legal reserve, for energy, wood, fruit, industrial or other purposes, through reforestation and agroforestry with native and exotic species and other measures. **- State Decree no. 856, of 01/30/2004:** Regulates the Register of Forest Activity.

- Resolution no. 54, of 10/24/2007 (APPENDIX1): Homologates the list of endangered species of flora and fauna in the State of Pará.

International Agreements

- FCCC/CP/2005/Misc.1: *Reducing emissions from deforestationing developing countries: approaches to stimulate action. Submission from Parties.* (In Portuguese: Reduzindo emissões de desmatamento em países em desenvolvimento: abordagem para estimular ação. Submissão das partes. COP 11, Montreal, 2005.)

- FCCC/CP/2007/6/add.1: *Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007. Addendum. Part two: Action taken by the Conference of the Parties at its thirteenth session.* (In Portuguese: Relatório da Conferência das Partes sobre sua décima terceira sessão, ocorrida em Bali de 3 a 5 de dezembro de 2007. Addendum. Part Two: Ação tomada pela Conferência das Partes em sua décima terceira sessão ou "Action Bali Plan". COP 13, Bali, 2007.)

- FCCC/CP/2009/Add.1: *Report of the Conference of the Parties on its fifteenth session, held in Copenhagem from 7 to 19 December 2009. Addendum. Part Two: Action taken by the Conference of the Parties at its fifteenth session.* (In Portuguese: Relatório da Conferência das Partes sobre sua décima quinta sessão, ocorrida em Copenhagem de 7 a 19 de dezembro de 2009. Addendum. Part Two: Ação tomada pela Conferência das Partes na sua décima quinta sessão ou "Copenhagem Accord". COP 15, Copenhagen, 2009.)

- **FCCC/CP/2010/7/Add. 1:** *Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010. Addendum. Part Two: Action taken by the Conference of the Parties at its sixtenth session.* (In Portuguese: Relatório da Conferência das Partes sobre sua décima sexta sessão, ocorrida em Cancun de 19 de novembro a 10 de dezembro de 2010. Addendum. Parte Dois: Ação tomada pela Conferência das Partes na sua décima sexta sessão ou "Cancun Agreement". COP 16, Cancun, 2010.)

- **FCCC/CP/2011/9/Add. 1:** *Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011. Addendum. Part Two: Action taken by the Conference of the Parties at its seventeenth session*. (In Portuguese: Relatório da Conferência das Partes sobre sua décima sétima sessão, ocorrida em Durban de 28 de novembro a 11 de dezembro de 2011. Addendum. Parte Dois: Ação tomada pela Conferência das Partes em sua décima sétima sessão. COP 17, Durban, 2011.)

- **FCCC/CP/2012/8/Add.1:** *Report of the Conference of the Parties on its eighteenth session, held in Doha from 26 November to 8 December 2012. Addendum. Part two: Action taken by the Conference of the Parties at its eighteenth session*. (In Portuguese: Relatório de Conferência das Partes sobre sua décima oitava sessão, ocorrida em Doha de 26 de novembro a 8 de dezembro. Addendum. Parte Dois: Ação tomada pela Conferência das Partes em sua décima oitava sessão.)

- **FCCC/CP/2013/Add.1:** *Warsaw Framework for REDD-plus, held in Warsaw, Poland, from 11 to 22 November 2013* (Tradução: Warsaw Package for REDD+, held in Warsaw, Poland, from 11 to 22 November 2013), in particular the following decisions:
- **Decision9/CP.19:** *Work programme on results-based finance to progress the full implementation of the activities referred to in decision 1/CP. 16, paragraph 70.* (In Portuguese: Programa de trabalho em financiamento baseados em resultados para o progresso da implementação completa das atividades referidas na decisão 1/CP. 16, parágrafo 70.)
- **Decision10/CP.19:** *Coordination of support for the implementation of activities in relation to mitigation actions in the forest sector by developing countries, including institutional arrangements.* (In Portuguese: Coordenação do suporte para a implementação de atividades relacionadas a ações de mitigação no setor florestal por países em desenvolvimento, incluindo arranjos institucionais.)
- **Decision12/CP.19:** *The timing and the frequency of presentations of the summary of information on how all the safeguards referred to in decision1/CP.16, appendix I, are being addressed and respected.* (In Portuguese: O tempo e a frequência na qual são apresentadas as informações resumidas de como todos os salvaguardas referidos na dicisão1/CP.16, apêndice I, estão sendo abordadas e respeitadas.)
- **Decision13/CP.19:** *Guidelines and procedures for the technical assessment of submissions from Parties on proposed forest reference emission levels and/or forest reference levels.* (In Portuguese: Guia e procedimentos para avaliação técnica das submissões das Partes em propostas de níveis de referência em emissões florestais e/ou níveis de referência florestal.)
- **Decision14/CP.19:** *Modalities for measuring, reporting and verifying.* (In Portuguese: Modalidades para medir, reportar e verificar.)
- **Decision15/CP.19:** *Addressing the drivers of deforestation and forest degradation*. (Approach of deforestation and forest degradation vectors.)
- **FCCC/CP/2015/Add.1:** *Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015. Addendum. Part two: Action taken by the Conference of the Parties at its twenty-first session*. (In Portuguese: Relatório de Conferência das Partes sobre sua vigésima primeira sessão, ocorrida em Paris de 30 de novembro a 13 de dezembro. Addendum. Parte Dois: Ação tomada pela Conferência das Partes em sua vigésima primeira sessão).
- **Nationally Determined Contribution** – **Brazilian NDC** submitted in September 2015 to the United Nations Framework Convention on Climate Change for mitigation, adaptation and means of implementation consistent with the purpose of the contributions to achieve the ultimate objective of the Convention, in accordance with decision 1/CP.20, paragraph 9.
- **CITES, of 03/03/1973***:* "*Convention on International Trade in Endangered Species of Wild Fauna and Flora*", signed in Washington D.C. on March 3, 1973, amended in Bonn on June 22, 1979.

2.5.8 Approvals (G5.7)

Project proponents have achieved recognition and approval of REDD+ Jari/Pará Project implementation through meetings between proponents, community consultation, as well as consultation and submission meetings with the formal and traditional authorities mentioned in the section 2.3 - *Participation of Actors.*

There are no official national or jurisdictional REDD+ policies yet, but project proponents are always on the look out for new information, always present in forums of federal and state government discussions to contribute to the formulation of these policies and regulations, being promptly available to adapt the Project to the new officially established rules.

2.5.9 Project Ownership (G5.8)

Jari Celulose S.A. is the legitimate owner of the real estate where the REDD+ Jari/Pará Project is being implemented and developed, as detailed in section 2.5.1 - Statutory and Customary Property Rights. For the establishment of responsibility and rights over the Project, as well as the percentage of carbon credits allocated to each party, a contract was signed between the proponents of the Project.

2.5.10 Dual Counting Risk Management (G5.9)

The REDD+ Jari/Pará Project generates benefits to the climate, communities and biodiversity, but only net reductions and removals of greenhouse gases will be marketed after being properly registered on a market platform.

2.5.11 Emissions Trading Programs and Other Linked Limits

Does not apply.

2.5.12 Other Forms of Environmental Credit

The REDD+ Jari/Pará Project is not intended to generate any other form of environmental credits related to the reductions and removals of GHG emissions claimed under the VCS (*Verified Carbon Standard*) program.

2.5.13 Participation under Other GHG Programs

The REDD+ Jari/Pará Project did not receive or sought to be registered in any other GHG program, in addition to submitting the Project to validation and verification in the VCS (*Verified Carbon Standard*) and CCBS (*Climate, Community and Biodiversity Standard*).

2.5.14 Projects Rejected by Other GHG Programs

The REDD+ Jari/Pará Project has not undergone validation/verification of any other GHG program and is therefore not rejected by any other GHG program.

2.5.15 Double Counting (G5.9)

The Government of the State of Pará brings the issue of REDD+ to debate since the beginning of the discussions on this issue in the context of international climate conferences. In 2009, the Para-Forum for Climate Change (FPMC) was created, which, among its objectives, should guide the preparation and implementation of a State Policy on Climate Change. As a result of the creation of the FPMC, a bill entitled "Draft Law of the State of Pará Policy on Climate Change" was published in the same year. This bill already anticipated the inclusion of REDD+ Programs in the compensation model derived from reductions in emissions, however this process has never been finalized.

In 2014, the FPMC created a Technical Chamber to carry out a revision of the Draft Law in order to allow a more efficient instrumentalization of the proposal. In relation to REDD, the FPMC proposed at the time the creation of a State REDD+ Strategy, aiming to organize and prioritize action in the areas of deforestation and forest degradation, conservation and forest management. To date, the State of Pará does not have a defined State REDD+ Strategy.

The proponents of the Jari Pará REDD+ Project contacted representatives of the State Secretariat of Environment and Sustainability (SEMAS) and the Forestry and Biodiversity Institute of the State of Pará (Ideflor-Bio), the second defined in the framework of the FPMC as responsible institution for the State REDD+ Strategy. It was reported that until now there has been no instrumentalization or evolution of the subject and the FPMC that would be the main thread of the discussions is currently inactive. In addition, the State Government does not provide formal procedures for registering or recognizing private voluntary projects.

Thus, it is the understanding of the proponents that there is no risk of double counting, since the Government of Pará does not have a structured judicial program or any type of state regulation for Climate Change and REDD, it does not carry out market operations, whether voluntary or non-regulated.

During the Public Consultation process of the project all interested parties related to the state government were formally communicated and as far as possible will be involved in the implementation of the same, aiming to provide adequate transparency and credibility.

3 CLIMATE

3.1 Application of the Methodology

3.1.1 Methodology Title and Reference

Verified Carbon Standard (VCS) Approved Methodology VM0015 – Methodology for Avoided Planned Deforestation, version 1.1.

3.1.2 Applicability of Methodology

For the REDD+ Jari/Pará Project, the approved methodology of VCS VM0015 is applicable as the applicability criteria are reached, as specified in the table below (Table 17).

Table 17. Criteria for the applicability of REDD+ Jari/Pará Project methodology and assistance.

Applicability Criteria	Description of how the project meets these criteria
(a) baseline activities may include planned or unplanned logging, firewood collection, charcoal production, agricultural and pasture activities, provided that the category is unplanned deforestation, according to the most recent version of VCS AFOLU Requirements.	The baseline activities include unplanned deforestation motivated by agricultural and pasture activities, according to the most recent version of the VCS AFOLU Requirements.
(b) The Project activities may be included in a category or a combination thereof defined in the description of the scope of the methodology.	The activities of the Project include "Protection from controlled logging, firewood collection, or charcoal production", being in accordance with the description of the methodology scope (details on page 12 of VM0015, Table 1 – Figure 2B).
(c) The Project area may include different types of forest including, but not limited to, primary forests, degraded forests, secondary forests, planted forests and agroforestry systems, as per the definition of "forest".	The REDD+ Jari/Pará Project presents different types of forests, mainly old forests, obeying the definition of "forest" of the Brazilian National Designated Agency, accepted by the VCS.
(d) At the beginning of the Project, the Project area should only include areas qualified as "forest" for a minimum of 10 years before the start date of the Project.	The Project area only includes areas qualified as "forest" for a minimum period of 10 years prior to the start date of the Project.
(e) The Project area may include floodplain areas (such as lowland forests, floodplain forests, mangroves) as long as they do not develop in peat. Peat should be defined as organic soils with at least 65% organic matter and minimum thickness of 50 cm. If the Project area includes floodplain forests that develop in peat (e.g., peat forests), this methodology is not applicable.	The forest types present in the Project area do not include forested wetlands and do not include peat swamp forests.

3.1.3 Project Limits

Step 1.1 of VM0015 – Project Spatial Boundaries

Region of Reference

The reference region is the spatial boundary where rates, agents, vectors, and patterns of land use and land cover are analyzed, projected for the future, and monitored. The Project area, leakage belt and leak management area are contained in the reference region (Figure 10).

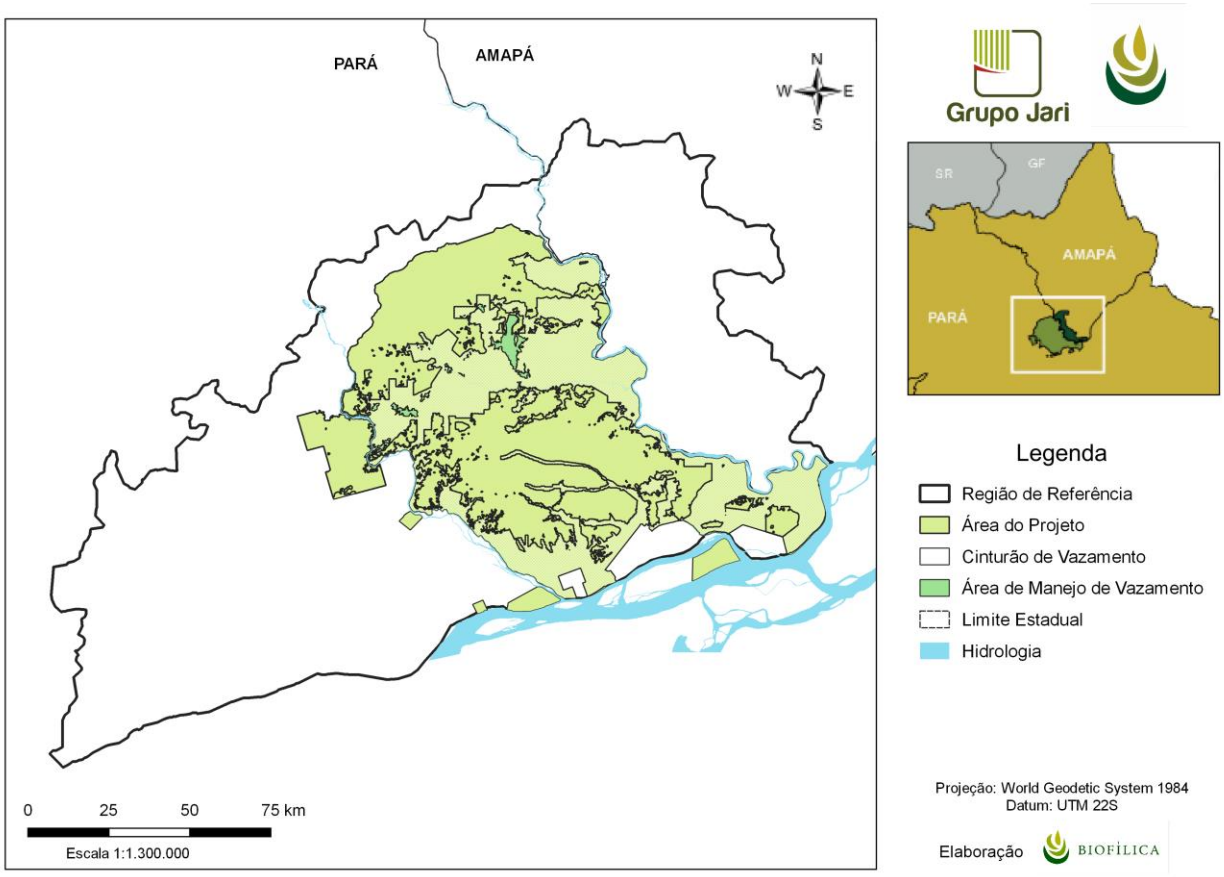


Figure 10. Location of the Reference Region, Project Area, Leakage belt, and Leak Management Area.

The reference region covers 2,522,426 ha (two million, five hundred twenty–two thousand, four hundred twenty-six ha) and presents a historical deforestation rate (between 2000 and 2014) of 6,613 ha per year (0.40% per year - in relation to the remaining forest area in 2000).

In defining the spatial boundary of the reference region, environmental characteristics (river basin boundaries), deforestation direction vector and land tenure situation were considered. The boundary of the reference region followed the guidelines described on page 20 of the VM0015 methodology, with the final area within the range suggested by footnote 09 (page 21 of methodology VM0015).

The characteristics of the reference region meet the similarity requirements with the Project area determined by the methodology VM0015 (presented on pages 22 and 23 of VM0015), presenting the following characteristics:

1) Deforestation agents and vectors:

- **Groups of agents:** the agents of deforestation are squatters and small farmers who have a diffuse pattern of occupation of the reference region, with characteristics of low density of properties, isolated occupations and distributed along the main access roads of the region (roads, branches and rivers). Agents that cause deforestation with this profile can be found throughout the Jarí Valley, both in the state of Pará and in Amapá;
- **Infrastructure Vectors:** The main vectors of deforestation in the region are the roads (official and unofficial), as well as the navigable stretches of the Jarí, Paru rivers among other smaller rivers, the construction of the Santo Antônio Hydroelectric Power Plant, increased flow in BR 156 to the northeast, and in PA 254 southeast of the Reference Region, activities related to the construction and maintenance of the Jurupari-Oriximiná Transmission Line, among other spatial vectors presented in Step 3 of this report;

2) Landscape configuration and ecological conditions:

- **Forest types:** The reference region presents different forest typologies (Table 18). The Project area contains 90.12% of the same forest classes found in the reference region.

Table 18. Main forest typologies identified in the reference region of the REDD+ Jari/Pará Project.

CLASS OF VEGETATION	AREA (ha)	AREA (%)
Submontane Open Ombrophilous Forest with Vines	184,642	7.32
Alluvial Dense Ombrophilous Forest	2,522	0.10
Uniforme Canopy Alluvial Dense Ombrophilous Forest	14,882	0.59
Submontane Dense Ombrophilous Forest	18,666	0.74
Emergent Canopy Submontane Dense Ombrophilous Forest	515,332	20.43
Uniform Canopy Submontane Dense Ombrophilous Forest	262,080	10.39
Lowland Dense Ombrophilous Forest	174,552	6.92
Emergent Canopy Lowland Dense Ombrophilous Forest	781,448	30.98
Pioneering formations with fluvial and/or lacustrine influence - herbaceous without palm trees	157,147	6.23
Non-forest classes	411,155	16.30
TOTAL	**2,522,426**	100%

- **Elevation:** The dimensions below 200 m cover 88% of the reference region (Table 19). More than 90% of the Project Area is with dimensions lower than 200 m.

Table 19. Elevation (class of 50 meters) in the reference region of the REDD+ Jari/Pará Project.

Elevation (class in meters)		AREA (ha)	% of Total (ha)	% accumulated
Min	Max			
0	75	1,116,310	43.9%	43.9%
75	150	696,837	27.8%	71.7%
150	225	332,258	13.3%	84.9%
225	300	157,139	6.3%	91.2%
300	380	81,979	3.3%	94.5%
380	450	51,884	2.1%	96.6%
450	550	59,785	2.4%	99.0%
550	600	19,165	0.8%	99.7%
600	680	7,069	0.3%	100.0%
TOTAL (ha)		**2,522,426**	100%	-

- **Declivity:** About 93% of the Reference Region is concentrated in the relief classes of Flat, Soft Undulating and Undulating Areas (Table 20). The remainder is divided into Strong Undulating (6%) and mountainous (1%).
-

Table 20. Declivity (%) found in the reference region of the REDD+ Jari/Pará Project.

Class*	AREA (ha)	% of Total (ha)	% accumulated
Flat Areas (0-3%)	1,180,904	21.9%	21.9%
Soft Undulating (3% -12%)	1,116,987	52.7%	74.6%
Undulating (12% - 24%)	206,764	18.6%	93.2%
Strong Undulating (24% -45%)	17,729	6.2%	99.4%
Mountainous (> 45%)	42	0.6%	100.0%
TOTAL (ha)	**2,522,426**	100%	-

* According to IBGE classification.

3) Socioeconomic and cultural conditions:

- **Legal status of land:** the legal status of the Project area is private property and can be found in other areas within the reference region, such as Gleba Jarí I in the state of Pará, also owned by the Orsa Group;
- **Possession of land:** the land tenure system of the Project Area (definitive title of private property) is found in other areas in the reference region, in which the same obligations, rules, institutions and processes governing the right to property, access and use of land and its resources, because it is part of the same federal unit of the Project Area;

- **Land use:** the current and projected classes of land use and coverage in the Project area (Forest, Non-Forest Vegetation, Deforestation and Hydrography) are the same as those found in the reference region;
- **Control policies and regulations:** the area of the Project is governed by the same policies, laws, and regulations applied to other areas of the reference region, because they are part of the same federation (Brazil) and because the reference region is included in the same federative unit as the Project Area (State of Amapá).

Project Area

The REDD+ Jari/Pará Project Area covers an area of 491,788 ha. To delimit this region the following steps were followed:

1) The starting point was the limit of UPA's (Annual Production Units) of PMFS Pará. From the PMFS the boundary of the REDD+ Jari/Pará Project area was identified with similar biophysical conditions and with elements that could influence the human pressure within the PMFS;

2) As a next step, a deforestation risk model was developed combining several independent variables (i.e., road distance, topography, etc.) to estimate the regions within the PMFS susceptible to deforestation;

3) The next step was to select the UPAs that presented areas with deforestation risk greater than 1%, in addition to areas that were not projected to occur in the future, but could be threatened;

4) Deforested areas until 2010 were excluded to meet the criteria set forth in item 1.1.2 of VM001;

5) Finally, areas of secondary and cerrado vegetation were excluded from the Project area.

Leakage belt

With 381,407 hectares, the leakage belt is located in the region neighboring the Project area. The definition of the leakage belt followed the methodology of mobility (*mobility analysis* - option II of VCS VM0015, pages 22 and 23) and was restricted within the area under management of the company. In order to define the spatial limits of the leakage belt, multicriteria analysis and map algebra were used.

Leakage Management Areas

The areas of leakage management are places where the Project intends to exert the influence of its activities to reduce the risks of deforestation. For the selection of these sites, the following criteria were adopted: regions deforested until 2014 that were within the zone of influence of the communities participating in the REDD+ Jari/Pará Project and its neighboring communities within a radius of up to 13 km, this distance was adopted because of the proximity between the communities in the deforested perimeter. In addition, the boundaries of the Eucalyptus plantations of the property were considered, so,

for the communities referenced within the limits of the plantation, local degraded areas were considered as their zone of influence.

The limit of the leakage management area covers 10,756 hectares and in section 2 all the activities that will be developed by the REDD+ Project in these places with these actors are described, involving the strengthening of associativism and cooperativism, technical assistance and rural extension, improvements in infrastructure and in communication channels between the population and the Jari Group.

Forest

The forest area was identified based on the results of the Forestry Satellite Monitoring Project (PRODES) of the National Institute for Space Research (INPE). Forests identified by PRODES covered 1,732,970 hectares in 2014 and are in accordance with the definition of forest determined by Appendix I of VM0015 (page 127). Figure 11 shows the forest area remaining until 2014 in the reference region. The minimum mapping unit (MMU) of PRODES data, used in this study, corresponds to 1 hectare.

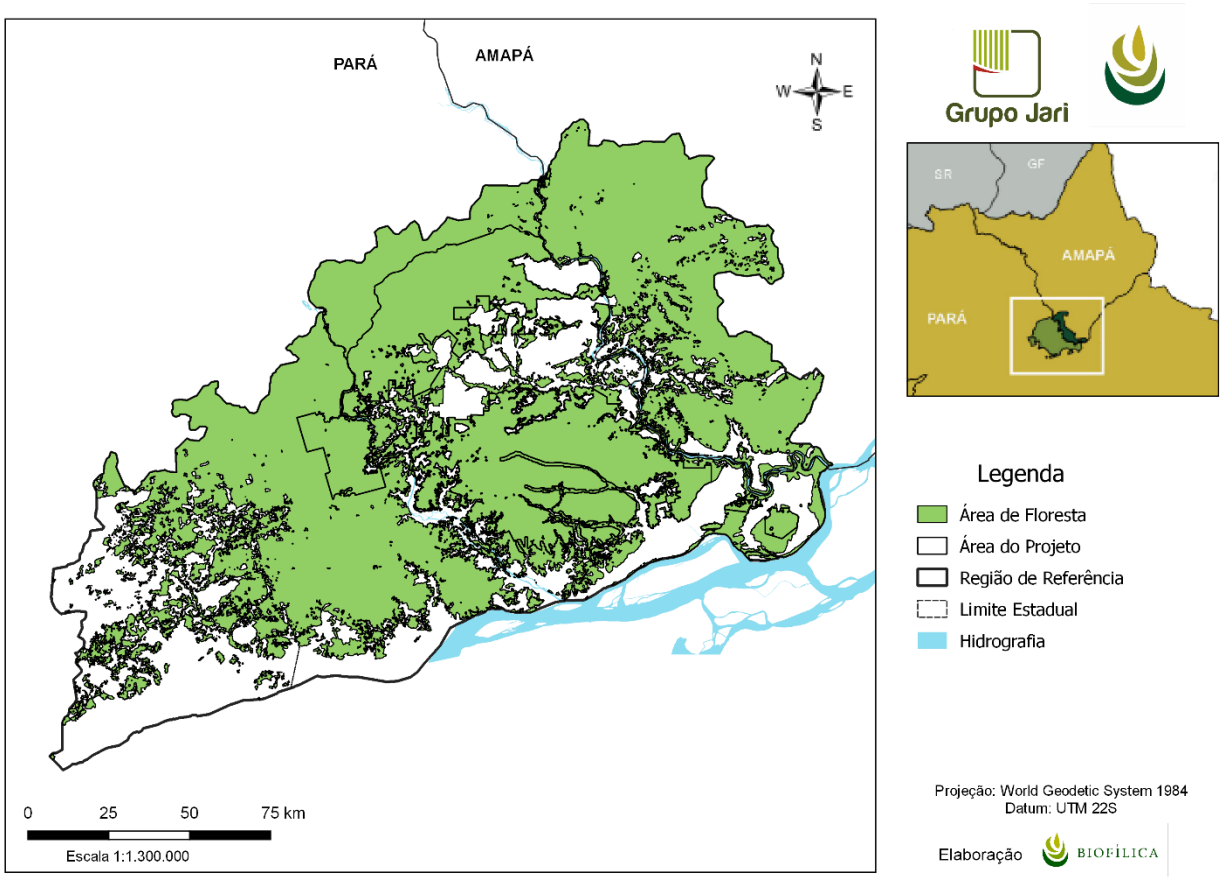


Figure 11. Reference map of the forest cover in 2014 in the reference region of the REDD+ Jari/Pará Project.

Time Limits

- Start and End Date of Historical Reference Period: the historical period of this REDD+ Project is limited to the years 2000 to 2014. These dates were defined mainly considering the data availability of PRODES Project, used to generate land cover maps and meets the requirements of methodology VM0015;

- Start date of the project AUD activity crediting period: the start date of the crediting period is 07/08/2014 and deforestation of the baseline scenario was modeled until the year 2044;

- **Start and end date of the first fixed period of the baseline**: the fixed baseline period is 10 years, as determined by methodology VM0015 (page 30). The baseline scenario will be reassessed in the year 2024.

- Monitoring period: the monitoring period for land use and change is one year, starting from the year 2015.

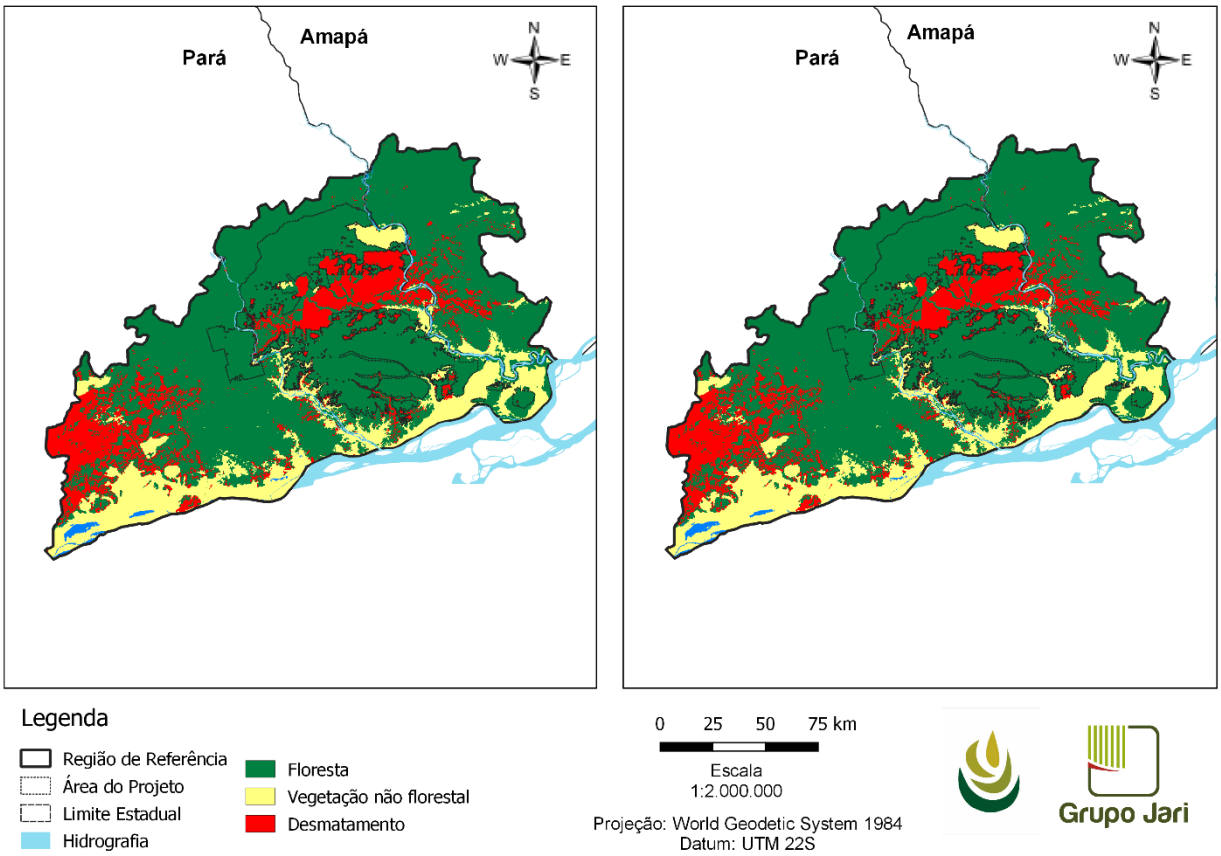


Figure 12. Map change in land use and cover from 2000 to 2014.

Step 1.3 of VM0015 - Carbon Reservoirs

The carbon reservoirs analyzed in the REDD+ Jari/Pará Project are available in Table 21. Methodological details of the carbon reservoirs estimation can be found in the document Estimation of the Forest Carbon Stock in the REDD+ Jari/Pará Project area, made available to the validator/verifier body.

GHG Sources, Sinks and Reservoirs in the Baseline Scenario

Table 21. Carbon reservoirs considered in the REDD+ Jari/Pará Project (Table 3 of methodology VM0015, page 26).

Carbon Reservoir	Included/Excluded	Justification/Explanation of choice
Above the ground	Arboreal: Included	Changes in the carbon stock of this reservoir are always significant
	Non-arboreal: Included	Significant reservoir for the forestry typology of the Project area
Below Ground	Included	Significant reservoir for the forestry typology of the Project area
Wood Products	Excluded	Omitted by conservatism, reservoir present only in the scenario with Project
Litter	Excluded	Excluded according to "VCS AFOLU *Requirements*, v3.2"
Organic ground carbon	Excluded	Excluded when the ground cover is grassland in the baseline scenario, according to "VCS AFOLU *Requirements*, v3.2"

Table 22. GHG sources included or excluded within the boundaries of the REDD+ Jari/Pará Project area (Table 4 of methodology VM0015, page 28).

Sources		Gas	Included/TBD [1]/Excluded	Justification/Explanation of choice
Baseline	Biomass Burning	CO_2	Excluded	Counted as changes in carbon stocks
		CH_4	Excluded	Not significant
		N_2O	Excluded	Considered insignificant according to "VCS AFOLU *Requirements*, v3.2"
	Emissions by Farm Animals	CO_2	Excluded	Not a significant source
		CH_4	Excluded	Does not apply to the Project. The Project does not have livestock activities, so it is conservative to exclude these emissions once they are present in the baseline scenario
		N_2O	Excluded	Does not apply to the Project. The Project does not have livestock activities, so it is conservative to exclude these emissions once they are present in the baseline scenario

Note: [1]TDB: from English means *To Be Decided*

3.1.4 Baseline Scenario

Step 2 of VM0015 - Historical Analysis of Soil Use and Coverage

Collection from appropriate data source

For the mapping of the changes in the classes of use and soil cover, data from the PRODES Digital program (INPE, 2014) were used in vector format (shapefile) with spatial resolution of 30 meters. A total of 46 Landsat satellite images were used to map forest, non-forest vegetation, hydrography and anthropogenic vegetation (deforestation) (Table 23). According to the methodology of PRODES Câmara et al. (2006), these images underwent geometric correction with displacement error less than 1 pixel (30 x 30 m). These images cover the historical reference period (2000 to 2014) and can be located through four Orbits/Point in the Landsat scene mesh: (i) 226/60-61; (ii) 227/60-61, (iii) 227/60-61 and (iv) 228/60-61.

Table 23. Satellite images used to identify and map soil cover in the REDD+ Jari/Pará Project reference region (Table 5 of methodology VM0015, page 30).

Vector (Satellite or Airplane)	Sensor	Resolution		Coverage	Date of Acquisition	Identifier	
		Spectral	(Km^2)	(DD/MM/AAAA)	Orbit	Orbit/Latitude	Point/ Longitude
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	23-09-2003	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	11-10-2004	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	14-10-2005	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	01-10-2006	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	02-09-2007	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	19-08-2008	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	25-10-2009	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	12-10-2010	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	12-08-2011	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	24-06-2012	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	18-09-2013	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	08-11-2014	226 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	17-09-2001	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	23-09-2003	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	11-10-2004	226 / 61	

Vector (Satellite or Airplane)	Sensor	Resolution		Coverage	Date of Acquisition	Identifier	
		Spectral	(Km^2)	(DD/MM/AAAA)	Orbit	Orbit/Latitude	Point/ Longitude
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	14-10-2005	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	02-11-2006	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	16-07-2007	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	19-08-2008	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	21-07-2009	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	28-10-2010	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	12-08-2011	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	06-08-2012	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	18-09-2013	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	05-09-2014	226 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	16-09-2001	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	05-10-2002	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	01-11-2003	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	03-11-2004	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	22-11-2005	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	06-09-2006	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	09-09-2007	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	29-10-2008	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	29-08-2009	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	04-11-2010	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	03-08-2011	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	10-11-2012	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	07-07-2013	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	30-10-2014	227 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	07-10-2000	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	16-09-2001	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	05-10-2002	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	16-10-2003	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	31-08-2004	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	21-10-2005	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	24-10-2006	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	09-09-2007	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	27-09-2008	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	29-08-2009	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	31-07-2010	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	03-08-2011	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	06-08-2012	227 / 61	

Vector (Satellite or Airplane)	Sensor	Resolution		Coverage	Date of Acquisition	Identifier	
		Spectral	(Km^2)	(DD/MM/AAAA)	Orbit	Orbit/Latitude	Point/ Longitude
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	08-08-2013	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	28-09-2014	227 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	11-08-2000	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	25-10-2001	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	26-09-2002	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	07-10-2003	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	09-10-2004	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	13-11-2005	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	15-10-2006	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	02-10-2007	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	01-08-2008	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	23-10-2009	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	10-10-2010	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	29-10-2011	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	21-09-2012	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	16-09-2013	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	18-08-2014	228 / 60	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	11-08-2000	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	15-09-2001	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	26-09-2002	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	19-07-2003	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	09-10-2004	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	10-09-2005	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	16-09-2007	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	02-09-2008	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	20-08-2009	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	10-10-2010	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	25-07-2011	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	13-09-2012	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	16-09-2013	228 / 61	
Satellite	*Landsat*	30 x 30 m	0.45 – 2.35 µm	185 x 185 km	18-08-2014	228 / 61	

Definition of land use and cover classes

The soil cover classes used in this Project are represented in Table 24. The following are the classes used in the Project and its area at the beginning of the historical period (2000):

- Anthropogenic Vegetation (Deforestation - 269,521 ha): area where there was forest, but that was removed through the shallow cutting process (removal of forest cover). These areas are converted to other uses

of land, different from forest areas (mosaic of different types of vegetation that includes pastures, brushings, plantations and secondary vegetation, according to Fearnside, 1996);

- Forest (1,827,782 ha): area of forest remnant belonging to different phytophysiognomies of the ombrophilous forest;

- **Non-forest vegetation (389,916 ha):** area consisting of vegetation with physiognomy diverse from forest such as Arboreal-Shrub Savannah (Cerrado), Gramineous-Woody Savannah (Clear Field of Cerrado), Campinarana, among others;

- **Hydrography (35.207 ha):** water bodies (rivers, lakes, streams, among others).

Table 24. Soil cover classes existing in the reference region of the REDD+ Jari/Pará Project (Table 6 of methodology VM0015, page 32).

Class identifier		Carbon Stock Trend	Present in[1]	Baseline activity[2]			Description (including criteria for setting unambiguous limits)
ID_{cl}	Name			LG	FW	CP	
1	Anthropized Vegetation in Balance	Constant	RR, LK, LM, PA	Yes	Yes	No	Area that has undergone deforestation by shallow cut and has vegetation different from Ombrophilous Forest
2	Forest	Descending	RR, LK, LM, PA	Yes	Yes	No	Remaining forest area
3	Hydrography	Constant	RR	No	No	No	Area with water bodies
4	Non-forest vegetation	Constant	RR, PA	No	No	No	Non-forest formation area

Notes:

[1]RR: Region of reference; LK: Leakage belt; LM: Leakage management area; PA: Project Area.

[2]LG: Timber harvest; FW: Collection of wood for energy production; CP: Charcoal Production.

Definition of land use and cover change categories

For the REDD+ Jari/Pará Project, the transition between two categories of land use was projected, with the change of areas with forest cover to areas of anthropized vegetation (deforestation) (Table 25).

Table 25. Definition of categories of land use and land use change (Table 7b of methodology VM0015, page 33).

ID_{cl}	Name	Carbon Stock Trend	Presence in	Activity in case of Baseline[1]			Name	Carbon Stock Trend	Presence in	Activity in case of Baseline[1]		
				LG	FW	CP				LG	FW	CP
I1/F1	Forest	Decreasing	PA	Yes	Yes	No	Deforestation	Constant	LM	Yes	Yes	No
I2/F1	Forest	Decreasing	LK	Yes	Yes	No	Deforestation	Constant	LM	Yes	Yes	No

Note:

[1]LK: Leakage belt; PA: Project Area.

[2]LG: Timber harvest; FW: Collection of wood for energy production; CP: Charcoal Production.

Analysis of the historical change in land use and land cover

Mapping and deforestation data provided by PRODES were used to analyze the history of changes in land use. The main activities carried out by the PRODES Project to monitor the forest cover of the Brazilian Amazon will be detailed below.

- **Preprocessing**

The procedures of imagery preprocessing performed by the PRODES Project are constituted in the following steps (CÂMARA et al., 2006):

- Selection of images with lower cloud cover and acquisition date closer to dry season in the Amazon and with adequate radiometric quality;

- Georeferencing of 30-meter spatial resolution images in 1:100,000 scale maps and NASA Ortho-rectified MrSID format images.

- **Interpretation and classification**

The method of classification of satellite images used by PRODES follows four main steps. First a spectral mixing model is generated identifying the components of vegetation, soil and shade. This technique is known as a linear spectral mixture model (MLME) that aims to estimate the percentage of vegetation, soil and shade components for each cell (pixel) of the satellite image. The second step is the application of the segmentation technique, which identifies in the satellite image spatially adjacent regions (segments) with similar spectral characteristics. After segmentation, the segments are categorized individually to identify the forest, non-forest vegetation, hydrography and deforestation classes (anthropic vegetation). Finally, the result of classified segmentation is submitted to the process of editing or auditing the classification, performed by a specialist and ending with the creation of state mosaics.

- **Postprocessing**

According to VM0015, the post-processing step includes the use of non-spectral information for the stratification of the carbon density of the land cover classes. This information was generated implicitly during the next steps.

Verification of map accuracy

The PRODES mapping has an accuracy of up to 96%. About 4% of the mapping may contain classification errors related to the presence of rocky bodies and watercourses (Table 26).

Table 26. Matrix of confusion of the soil cover map (PRODES, 2010) of the reference region generated from satellite images available in Google Earth.

		Reference					
Classified		Forest	Deforestation	Water	Non-Forest	Total	User Accuracy
	Forest	**41**	2	0	1	44	93%
	Deforestation	2	**26**	0	0	28	93%
	Water	1	0	**9**	0	10	90%
	Non-Forest	0	0	0	**11**	11	100%
	Total	44	28	9	12	**93**	
	Producer Accuracy	93%	93%	100%	92%		

Results in change history analysis in land use and soil cover

Based on the data obtained in the previous steps, the analysis of the historical change in land cover between 2000 and 2014 was carried out in the reference region of the REDD+ Jari/Pará Project area.

The map subtraction analysis resulted in a deforested area between 2000 and 2014 of approximately 94,812 ha (5.2% of forest remnant in 2000). Table 27 shows the changes occurring from the Forest class to the Deforestation class, with a decrease in the carbon stock. Figure 13 shows the annual deforestation that occurred between 2000 and 2010 in the reference region.

Table 27. Soil use change matrix in the reference region between 2000 and 2010 (Table 7a of methodology VM0015, page 32).

Initial class (2000)							
ID_{cl}		Name	Forest	Non-forest vegetation	Hydrography	Anthropized vegetation	Total (ha)
			I1	I2	I3	I4	
Class LU/LC final (2014)	F1	Forest	1,732,970	0	0	0	**1,732,970**
	F2	Non-Forest	0	389,916	0	0	**389,916**
	F3	Hydrography	0	0	35,207	0	**35,207**
	F4	Deforestation	94,812	0	0	269,521	**364,333**
Total (ha)			**1,827,782**	**389,916**	**35,207**	**269,521**	**2,522,426**

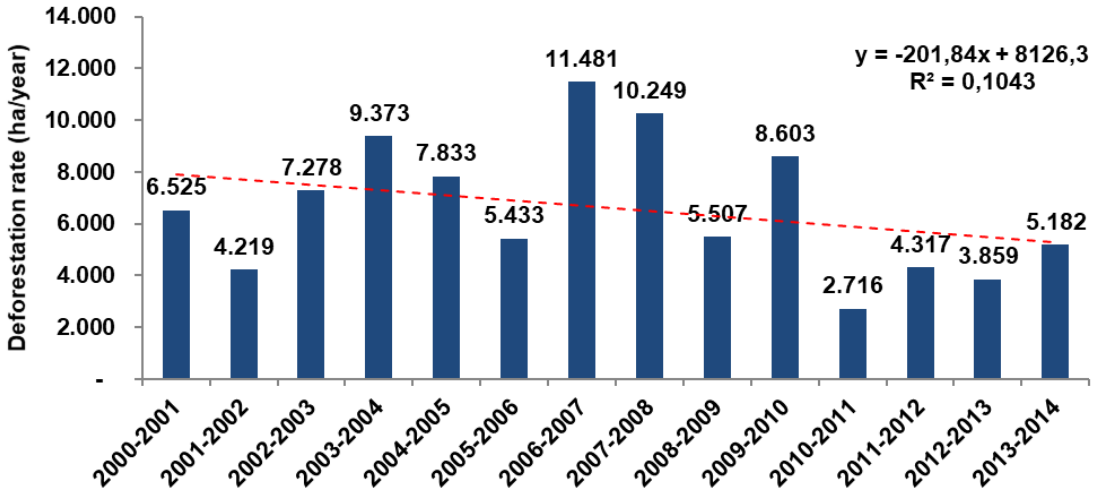


Figure 13. Annual deforestation in the reference region between 2000 and 2014.

Preparation of a methodology attached to PD

Methodological procedures for acquisition, pre-processing, classification, post-classification and evaluation of the accuracy of remote sensing images for analysis of changes in land use and land cover during the duration of the Project.

The official monitoring of the Brazilian Amazon conducted annually by PRODES was used for the development of the baseline and will be used to monitor the Project area and leakage belt. In case PRODES data are unavailable or new sensors with better resolution are available, the following procedures will be used to maintain consistency in monitoring using remote sensing:

a) **Data acquisition:** images of satellites of optical sensors or radar should be used. The optical images should be multispectral with a spectral resolution between 0.45 and 2.35 µm, and radar images should be acquired in the X (3 cm), C (5 cm) or L (23 cm) bands. For the mapping of forest cover and land use,

images with spatial resolution equal to or greater than 30 meters should be used. The data acquisition period should be in the period of low cloudiness and rainfall in the region, between August and November. For the monitoring of forest cover in the Project area and the leakage belt, the satellite image should cover the area between the following coordinates: -2,00°/0,00°S & -54,00°/-51,50°W. They will be used to monitor the data from the Forest Monitoring Project by satellite (PRODES Digital) of the National Institute of Space Research (INPE) and the information provided by PRODES Digital can be accessed at www.obt.inpe.br/prodes. Available data include *shapefile* and *geotiff* format maps on land use and cover in the Brazilian Amazon for the base year of 1997, increased deforestation between 1997 and 2000 and annual increase for the years 2000 to 2012. PRODES Digital data are updated annually between October and December of each year;

b) **Preprocessing:** Pre-processing: the images must be geometrically corrected by means of georeferencing in the ArcGIS 10 software, using as reference topographic charts on a scale of 1:100000 or NASA images in ortho-rectified $MrSID_{10}$ format. The RMS error of the georeferencing must be less than one pixel for optical image and approximately 1.5 pixel for radar images. The Universal Transverse Mercator (UTM) coordinate system, Zone 22S and SIRGAS 2000 Datum must be used for all data. The vector database provided by PRODES Digital should be converted into raster and resampled into pixels with 100 x 100 (1 ha);

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

d) **Post Processing:** the result of the classification in *raster* format will be transformed into vector format for auditing the classification in ArcGis 10 For analysis of areas with cloud cover will be performed the visual interpretation with alternative images in different dates within the same period or radar images, when necessary will be realized through the field truth;

e) Assessment of classification accuracy: was performed through the analysis of the general accuracy and the kappa index obtained from a confusion matrix such as Congalton (1999). At least 50 randomly distributed points from high spatial resolution satellite images ("4; 5 meters) and/or data collected in the field are used. The minimum accuracy of classification mapping is 80%.

Step 3 of VM0015 - Analysis of Agents, Vectors and Hidden Causes of Deforestation and its Likely Future Development

Identification of deforestation agents

a) **Deforestation agents in the reference region**: the main agents of deforestation are squatters;

b) **Relative importance of the amount of historical deforestation assigned to each agent or group**: The identified squatters account for 100% of the unplanned deforestation observed in the reference region;

c) **Brief Description**: the deforestation agents of the Jari Valley region are mostly migrants who came especially from other cities in the northern region of the country and the northeast region. These agents are historically attracted to the region by enterprises such as those linked to the Jari Project, mining, among others. In addition to the possibility of employment, such agents are attracted by the possibility of taking on indefinite or theoretically disputed areas. Such agents usually invade areas belonging to the Jari Group claiming to be in lands that belong to the state government or federal government. They clean up areas to take ownership, build improvements, and initiate small-scale plantations and small-scale animal husbandry. Through these activities, which impact and change the forest cover, the squatters seek to legitimize their occupation (LIMA and POZZOBON, 2005). Farmers in the region for more than 10 years have as main characteristic the development of activities related to extractivism and subsistence agriculture, being the production based on the work force of the family. Small farms of up to 200 ha (POEMA, 2005) are formed through the ownership of land among the squatter communities. These squatters perform deforestation for temporary or permanent plantations and pastures at different stages of degradation. According to land use and soil cover mapping data from the Amazon made by the TerraClass Project (INPE and EMBRAPA, 2014), 29% of the deforestation area in the reference region was used for the establishment of pastures. Squatters in the Jari Valley region have a diffuse pattern of land occupation (GAVLAK, 2011), which is characterized by low density of properties, isolated occupation distributed along the main road accesses of the region, such as areas near the roads derived from BR 156 in Amapá, PA 254 in Pará, vicinal roads, and along small rivers. Such agents develop small-scale deforestation activities that begin with the opening of roads (bites or trails) commonly used for encampment and which ultimately cause a deforestation clearing. Such deforestation caused mainly by squatters occurs as a result of shifting agriculture, while the dynamics of deforestation caused by smallholders occurs as a result of opening clearings for small-scale agriculture and pasture areas.

Added to this, much of the deforestation in the region is caused by a process called "silent deforestation" that is very difficult to detect by satellite images (GTPPCDAP, 2009).

d) **Brief assessment of the most likely population development of the deforestation agent groups in the Region of Reference, Project Area and Leakage Belt**: the context in the reference region, which should follow the same trend in the Project area and in the leakage belt (in the baseline scenario), shows that there are growth trends of the agents identified as squatters.

According to demographic data of the Brazilian Institute of Geography and Statistics (IBGE), from 1991 to 2010 there was a growth of 25% in the population of the municipalities of the Reference Region, however a reduction was observed in the rural population in the same period. The reduction of the rural population in the 2000s points to direct impacts on the reduction of deforestation in the region in 2011, however, deforestation data up to 2014 point to a new growth trend, which should reflect an increase in the rural population in the years preceding the beginning of the project The growth of deforestation in the region has historically been influenced by developments that generate migratory processes and economic factors that influence the process of rural exodus, or in some cases even reverse this phenomenon due to the lack of jobs and the precarious infrastructure in the cities. Through the extinction of an enterprise or the completion of temporary projects, these agents are directly impacted by the growth of unemployment and the lack of urban infrastructure, moving to the rural area in search of areas to take over. During this period, the region was impacted by the expected installation of the Santo Antônio do Jari Hydroelectric Plant, and more recently by the possibility of paving the BR-156 and PA-254 roads. These factors directly influence the growth of migratory processes, informal real estate speculation in the rural sector directly reflecting the increase in the population of deforestation agents in the region. The large population growth in the region's municipalities, which in turn presents a precarious structure of basic services and are driven by agricultural and livestock activity, will reflect over the years in increasing pressure on the natural resources of the Reference Region, Project Area and Leakage Belt.

e) **Historical deforestation statistics assigned to each agent in the reference region**: about 115,783 hectares were deforested between 2000 and 2014 in the Region of Reference, with annual rates varying from approximately 2,270 to 15,180 hectares deforested annually in the period. Through the interpolation of PRODES Project deforestation data for the period from 2000 to 2014 with data from SISCAR, it was possible to identify which groups of squatters are identified as responsible for 100% of the unplanned deforestation observed in the reference region. Although SISCAR is a self-declaratory platform and therefore may not be considered safe for the extraction of land data, it is a source that demonstrates how the reality of the Reference Region develops, as it relates to the overlapping of areas and declaration of ownership. In the Table X are presented the classes of properties declared on the platform with the average of their areas and the deforested areas between 2000 and 2014 within their limits. The data show that there is a predominant presence of smallholdings and small properties (3,258 properties, 93% of the total) in the region, with a mean area of less than 200 hectares. In the medium and large

properties, except for the area of the Jari Group, the declaration of the possessions is clearly done in a random way, they are demarcated polygons with no correlation with the use of the ground, being the forest intact, but that have the objective of acquire possession of land for occupation, most of the time a small plot has already been occupied, and this is visualized by the presence of deforestation in the place. Deforestation located within the declared properties of SISCAR represents 98% of all deforestation in the Reference Region and, within the properties of all classes, as well as in deforested areas outside its limits (2%), the deforestation behavior occurs in a similar way, there are only small and diffuse areas, which represent the outstanding characteristic of the squatter action in the region.

Identification of deforestation drivers

a) Variables that explain the amount (hectares) of deforestation

Identification of deforestation vectors:

b) Variables explaining the geographical location of deforestation

Identification underlying causes of deforestation

Analysis of the chain of events that leads to deforestation

Conclusion

Step 4 of VM0015 - Projection of Future Deforestation

Projection of the amount of future deforestation

The reference region is not stratified, since the characteristics of the agents, vectors and causes of deforestation are the same throughout its area.

Selection of the baseline approach

The methodology VM0015 suggests the use of three approaches to forecast the amount of future deforestation: (1) historical average of deforestation; (2) deforestation as a function of time; (3) modeling the rate of deforestation. After analyzing the evidences indicated in step three and the conclusions obtained, the modeling approach of the historical mean of deforestation (method 1) was adopted. Approach 1 was selected because the rate of deforestation analyzed does not show a significant trend (R^2 <80%) of increase or decrease in the future, that is, is higher than the average rate observed between 2000 and 2014. The R^2 found from PRODES annual deforestation rates was 0.10%.

Annual projection of baseline deforestation areas in the reference region

As presented in the previous item, method 1 (historical average) was selected to estimate future deforestation and to design the annual deforestation areas in the baseline in the reference region. The annual area of deforestation at baseline in year t within the reference region was calculated according to equation 1 of methodology VM0015 version 1.1 (page 44):

$$ABSLRR_{i,t} = ARR_{i,t-1} * RBSLRR_{i,t} \quad (1)$$

Where:

$ABSLRR_{i,t}$: annual deforestation area of the baseline in the reference region in year t (ha/year);

$ARR_{i,t-1}$: area with forest cover in stratum i within the reference region at year t^{-1} (ha);

$RBSLRR^{i,t}$: rate of deforestation applicable to stratum i within the reference region in year t (%);

t: 1, 2, 3 ... T, one year of the proposed project accreditation period (not dimensioned);

i: 1, 2, 3 ... I_{RR}, a stratum within the reference region (not dimensioned).

Projection of annual baseline deforestation areas in the project area and leakage belt

Spatially designed deforestation was used for the entire reference region for baseline estimation in the Project area and in the leakage belt produced in step 4.2.4 of methodology VM0015 (page 54).

Summary of the quantitative projection of deforestation

From the historical average, the values of future deforestation projected for the period from 2015 to 2044 in the reference region (Table 28), Project area (Table 29) and in the leakage belt (Table 30) are presented. The total increase in deforestation projected for the crediting period was 196 thousand ha, with an annual average of 6,500 ha.

Table 28. Annual and accumulated deforestation for the reference region by 2044 (Table 9a of methodology VM0015, page 49).

Project year t	Stratum i of the reference region	Total	
	1	Annual	Accumulated
	$ABSLRR_{i,t}$	$ABSLRR_t$	ABSLRR
	ha	ha	ha
2015	6,952	6,952	6,952
2016	6,924	6,924	13,876
2017	6,896	6,896	20,772
2018	6,869	6,869	27,641
2019	6,841	6,841	34,482
2020	6,814	6,814	41,296
2021	6,786	6,786	48,082
2022	6,759	6,759	54,841
2023	6,732	6,732	61,573
2024	6,705	6,705	68,278

2025	6,678	6,678	74,956
2026	6,651	6,651	81,607
2027	6,625	6,625	88,232
2028	6,598	6,598	94,830
2029	6,572	6,572	101,401
2030	6,545	6,545	107,947
2031	6,519	6,519	114,465
2032	6,493	6,493	120,958
2033	6,467	6,467	127,425
2034	6,441	6,441	133,866
2035	6,415	6,415	140,281
2036	6,389	6,389	146,670
2037	6,364	6,364	153,033
2038	6,338	6,338	159,371
2039	6,313	6,313	165,684
2040	6,287	6,287	171,971
2041	6,262	6,262	178,233
2042	6,237	6,237	184,470
2043	6,212	6,212	190,682
2044	6,187	6,187	196,869

Figure 15 shows cumulative deforestation by 2044 in the reference region. A total of 196,000 ha of deforested areas in the reference region between 2015 and 2044 and 561,000 ha deforested by 2044 were estimated.

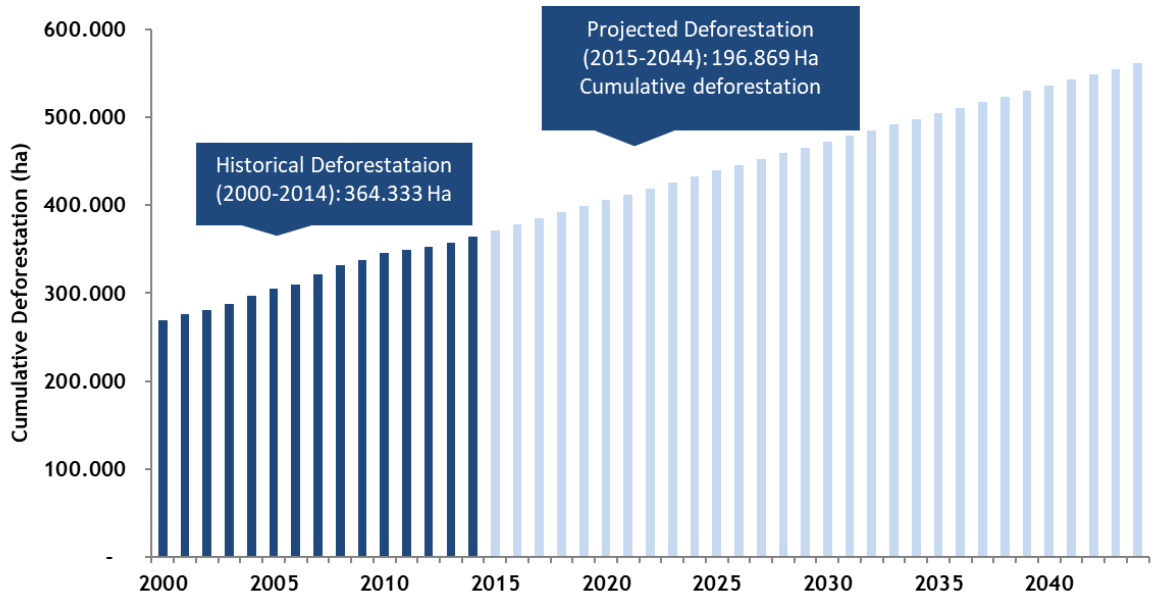


Figure 14. Deforestation accumulated until 2044 in the reference region.

In the Project area (Table 29), the projected deforestation increment was 51,985 ha between 2014 and 2044, with an average of 1,732 ha per year.

Table 29. Annual and accumulated deforestation in the Project area until 2044 (Table 9b of methodology VM0015, page 49).

Project year t	Stratum i of the reference region in the project area	Total	
	1	Annual	Accumulated
	$ABSLPA_{i,t}$	$ABSLPA_t$	ABSLPA
	ha	ha	ha
2015	1,452	1,452	1,452
2016	1,386	1,386	2,838
2017	1,307	1,307	4,145
2018	1,346	1,346	5,491
2019	1,428	1,428	6,919
2020	1,519	1,519	8,438
2021	1,559	1,559	9,997
2022	1,696	1,696	11,693
2023	1,903	1,903	13,596
2024	1,859	1,859	15,455
2025	1,913	1,913	17,368
2026	1,943	1,943	19,311
2027	1,990	1,990	21,301
2028	1,963	1,963	23,264
2029	1,986	1,986	25,250
2030	1,981	1,981	27,231
2031	1,967	1,967	29,198
2032	1,956	1,956	31,154
2033	1,968	1,968	33,122
2034	1,932	1,932	35,054
2035	1,929	1,929	36,983
2036	1,935	1,935	38,918
2037	1,799	1,799	40,717
2038	1,845	1,845	42,562
2039	1,738	1,738	44,300
2040	1,666	1,666	45,966
2041	1,613	1,613	47,579
2042	1,520	1,520	49,099
2043	1,497	1,497	50,596
2044	1,389	1,389	51,985

Table 30. Annual and accumulated deforestation for the leakage belt until 2044 (Table 9c of methodology VM0015, page 50).

Project year t	Stratum i of the reference region in the leakage belt	Total	
	1	Annual	Accumulated
	$ABSLLK_{i,t}$	$ABSLLK_t$	ABSLLK
	ha	ha	ha
2015	2,468	2,468	2,468
2016	2,812	2,812	5,280
2017	2,810	2,810	8,090
2018	2,703	2,703	10,793
2019	2,660	2,660	13,453
2020	2,569	2,569	16,022
2021	2,465	2,465	18,487
2022	2,587	2,587	21,074
2023	2,447	2,447	23,521
2024	2,339	2,339	25,860
2025	2,199	2,199	28,059
2026	2,133	2,133	30,192
2027	2,019	2,019	32,211
2028	2,021	2,021	34,232
2029	1,895	1,895	36,127
2030	1,873	1,873	38,000
2031	1,766	1,766	39,766
2032	1,677	1,677	41,443
2033	1,504	1,504	42,947
2034	1,469	1,469	44,416
2035	1,381	1,381	45,797
2036	1,331	1,331	47,128
2037	1,277	1,277	48,405
2038	1,235	1,235	49,640
2039	1,096	1,096	50,736
2040	1,071	1,071	51,807
2041	985	985	52,792
2042	927	927	53,719
2043	883	883	54,602
2044	843	843	55,445

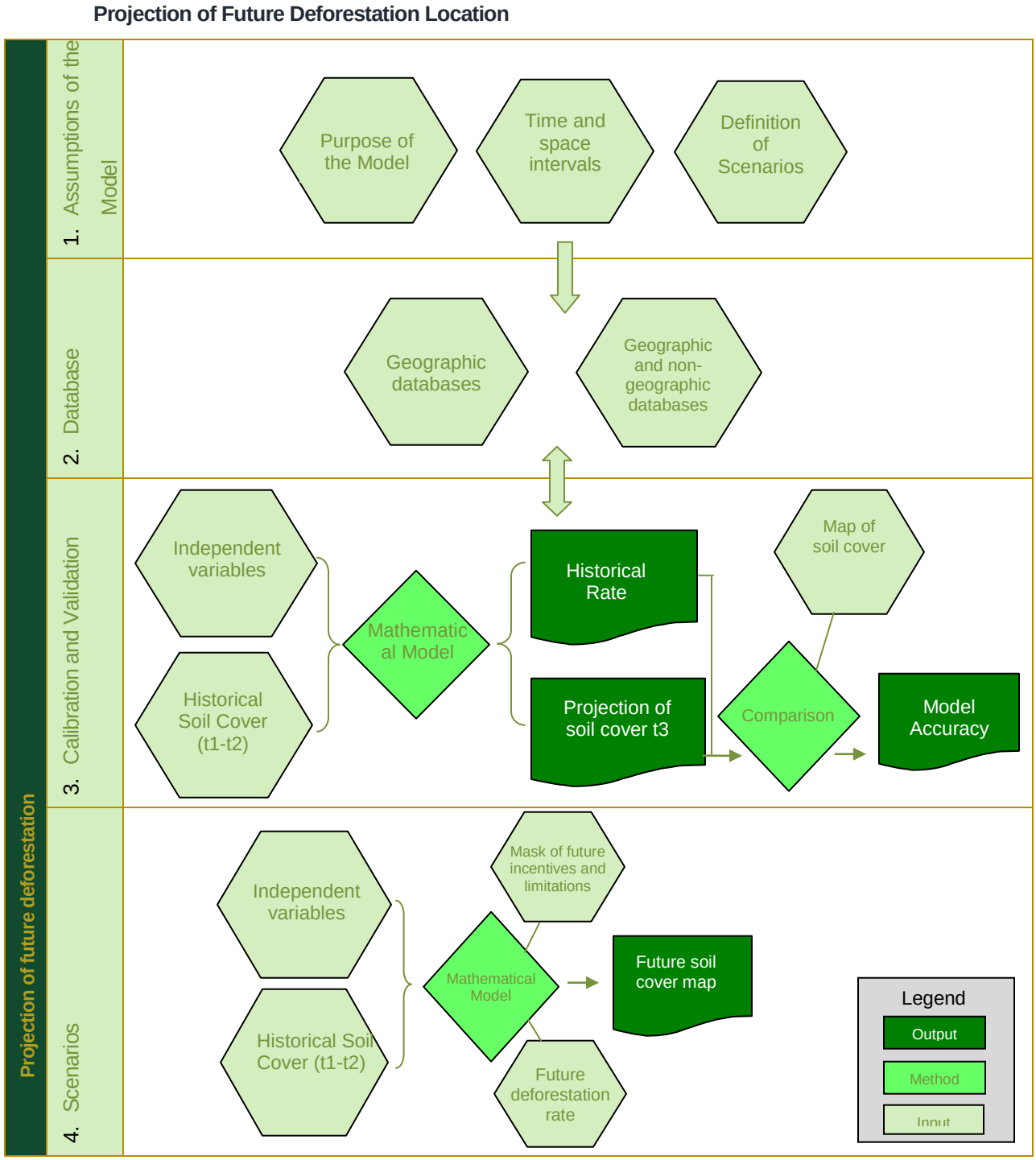


Figure 15. Flowchart of the deforestation projection model.

Preparation of factor maps

Based on the previous steps a list of variables with potential to explain the pattern of deforestation in the reference region was prepared. This data was organized in the standard digital format of the TerrSet *software*.

For the elaboration of maps of factors related to distances, a differential approach was used in this Project. Several studies show that distance maps (distance of roads, old deforestation, etc.) can be used to identify the characteristics of the deforestation occurrence. In this project, this assumption was adapted generating maps of accessibility to these variables. Using the COST module of the TerrSet software, vector variable maps were combined with the elevation variance map. The variable vector map, for example, of roads, was used as the origin point and the elevation variance map as a friction surface. The main assumption of this approach was that deforestation tends to occur in the most accessible areas and close to the vector variables. For example, deforestation is more likely to occur in a region close to a road that has a low elevation variance than in a region close to a road with extremely rugged and bumpy land.

Table 31. List of maps. Variables and factor maps (Table 10 of methodology VM0015, page 53).

Factor Map		Source	Variable represented		Meaning of pixel categories or values			Other maps and variables used to create the Factor Map		Algorithm or equation used
ID	File name		Variation	Variation	Variation		Meaning	ID	File name	
1	dst_mudanca	INPE	meters	Euclidean distance of deforestation increment cells within the historical period	0	155,195	Distance variation	1	desmatamento_00_14	Distance (TerrSet)
2	dst_assentamentos	INCRA	meters	Euclidean distance of the INCRA settlements	0	105,933	Distance variation	2	assentamentos_INCRA	Distance (TerrSet)
3	dst_dsm	INPE	meters	Euclidean distance from accumulated deforestation up to 2000	0	158,215	Distance variation	3	desmatamento_ate_00	Distance (TerrSet)
4	dst_estradas	Imazon	meters	Euclidean distance of official and unofficial roads	0	159,219	Distance variation	4	estradas_imazon	Distance (TerrSet)
5	ev_geologia0014	IBGE	probability	Empirical Probability of Geological Classes	0	0.268331	Probability variation	5	geologia_IBGE	Empirical probability (TerrSet)
6	slope	NASA	degrees	Average declivity per pixel of 100 x 100 meters	0	51.4115372	Slope variation	6	slope	None
7	srtm	NASA	meters	Average elevation per pixel of 100 x 100 meters	0	683	Elevation variation	7	srtm	None
8	dst_Jari_NovRivers	Jari	meters	Euclidean distance of navigable rivers in the reference region	0	204,626	Distance variation	8	rios_jari	Distance (TerrSet)
9	dst_jari_roads	Jari	meters	Euclidean distance of the roads used by Jari	0	204,371	Distance variation	9	estradas_jari	Distance (TerrSet)

Preparation of deforestation risk maps

Deforestation risk maps show the regions with the best (risk = 1) or worse conditions of deforestation (risk = 0). The table presented above (Table 31) shows the variables used to generate the deforestation risk maps in this study. Risk maps were prepared using the *Land Change Modeler* (LCM) module available on TerrSet. In order to calibrate this model, TerrSet has an algorithm called SimWeight (SANGERMANO et al., 2010). SimWeight stands for *Similarity Weighted*, which uses the closest neighborhood K logic to identify the relevance of each variable that is considered as a vector to predict locations with the potential for occurrence of the Forest-Deforestation transition. The logic used by SimWeight initially consists of the analysis of the relevance of each variable for the occurrence of deforestation, calculating the importance weight of the variable by the following equation (Equation 2).

Formula to calculate the Importance Weight of Independent Variables (PI):

$$PI = 1 - (DPchange/DPStudyArea) \quad (2)$$

Where:

PI = importance weight;

DPchange = standard deviation of the vector variable in the cells/pixels of change;

DPStudyArea = standard deviation of the vector variable in the cells/pixels of the entire study area.

SimWeight then calculates the risk of deforestation by combining change cells and persistence. For this, only the information of the variables with PI greater than 0.1 was used. This information was combined by the following formula adapted from Sangermano et al. (2010) (Equation 3):

Formula to calculate the Deforestation Risk:

$$R\ RiscoDesm = \frac{\sum_{i=1}^{c}\left(1.0 - \frac{1}{1+e^{\frac{1}{d_i}}}\right)}{k};\ (c \leq k) \quad (3)$$

Where:

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

c = number of cells/pixels of change;

d = distance in cells/pixels between the pixels of change;

i = change pixel identifier;

k = distance in cells/pixels of neighbors closest to the change pixel.

The use of Equation 3 results in a map with transition potential, which detects the areas with favorable conditions of deforestation occurrence over areas with the Forest class (Figure 17). This map is given as the starting point for allocating future rates of deforestation, and from this the annual rates are allocated along with some dynamic variables (see sections 4.2.3 and 4.2.4). The accessibility variable of old deforestation is an example of a dynamic variable.

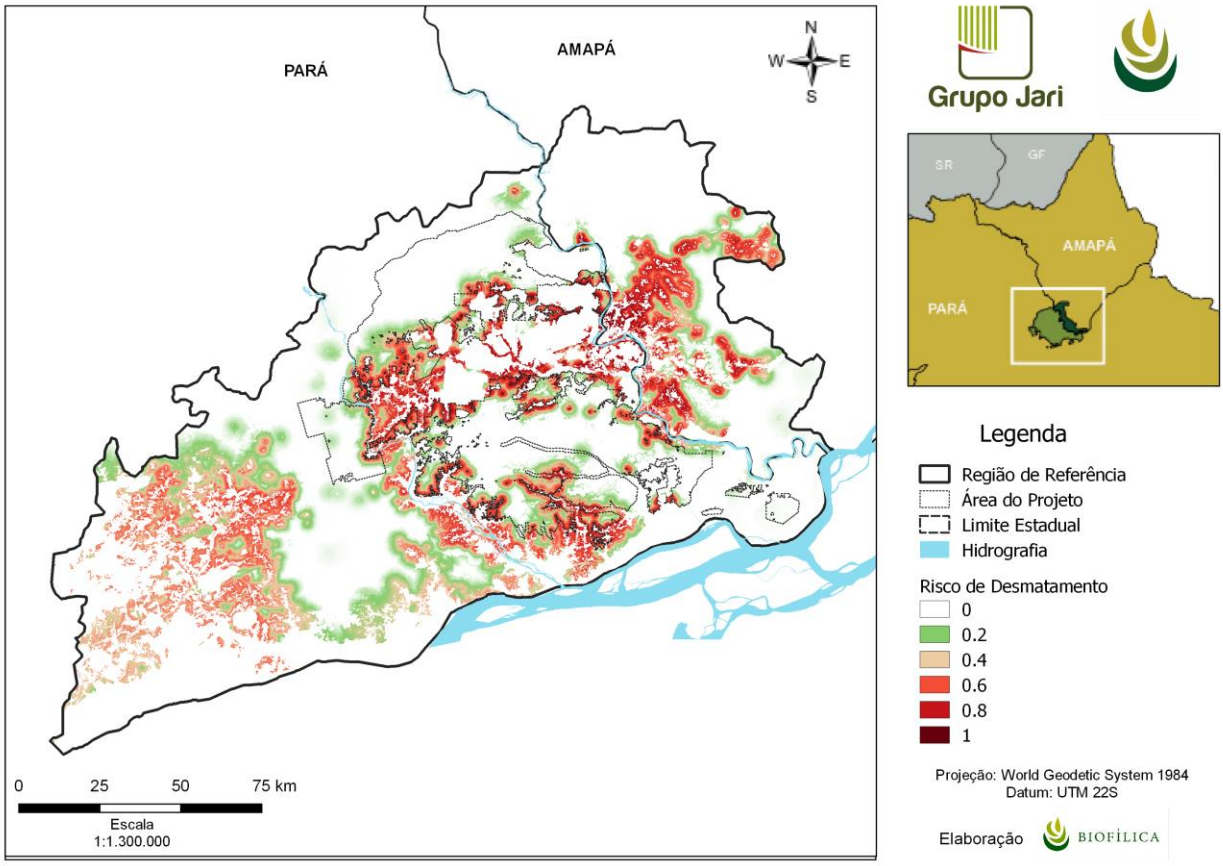


Figure 16. Transition potential map for the occurrence of deforestation in the reference region.

Selection of the most accurate deforestation risk map (Calibration and Validation of the model)

This step consists in using mathematical methods to quantify the statistical accuracy of the model to identify areas at risk of deforestation, being one of the most challenging parts of the science of land change since deforestation is a dynamic phenomenon of difficult prediction.

In this REDD+ Project we use option "A" available in methodology VM0015 (page 63-VM0015). In this option historical data of deforestation of three points in time were used to calibrate and to validate (confirm) the model. The points in time were 2000, 2007 and 2014. The 2000 and 2007 data served to calibrate the model, while the 2014 map was used as a reference for validation.

The following figure shows the variables used in the calibration model with their respective evidence weights. Values of evidence weights close to 1 (one) indicate a high correction between the variable and the occurrence of deforestation. Only the variables with weight values above 0 (zero) were used in the calibration model (Figure 18).

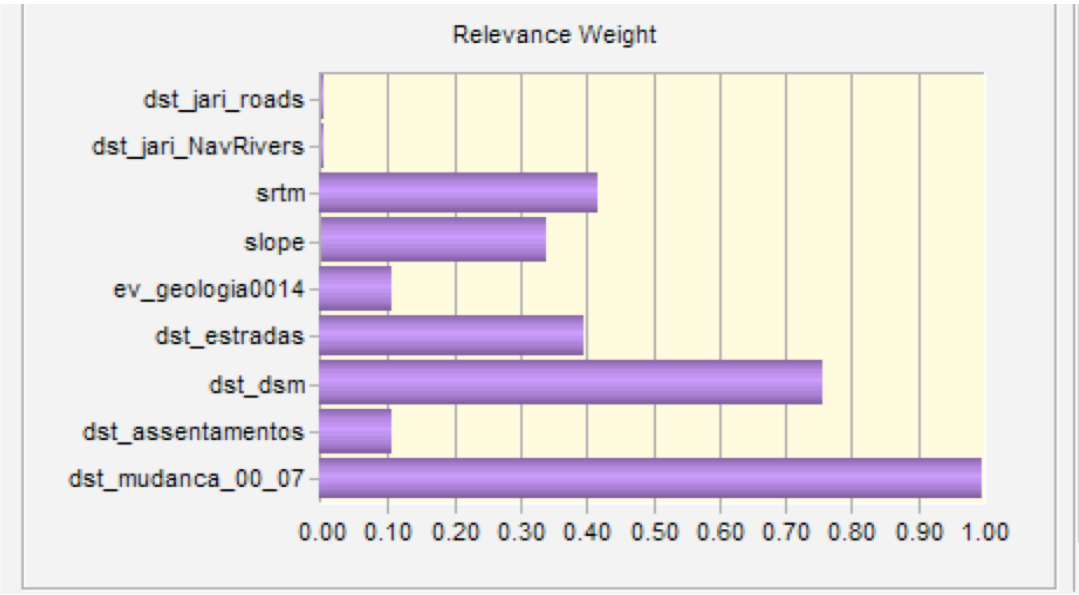


Figure 17. Relevance weight graph of the variables used in the calibration stage of the deforestation risk model (2000-2007).

The following figure is the result of pixel-to-pixel validation between the projected change map for 2007-2014 and the actual change map for 2007-2014 (Figure 19). Four categories were: (1) Type 1 error – False Alarm; (2) Type 2 error - Not modeled; (3) Successes and (4) Areas of persistence.

The Type 1 error – False Alarm indicates the areas that were designed by the model as deforestation, but that in fact were not deforested. In Type 2 error the model did not project the changes between 2007-2014. Finally, the model success cells. To calculate the accuracy of this model, the Figure of Merit (FOM) method was used. The FOM of this model was 10%, acceptable according to the VCS parameters. If the FOM had been less than 3.38% the model would not have been accepted.

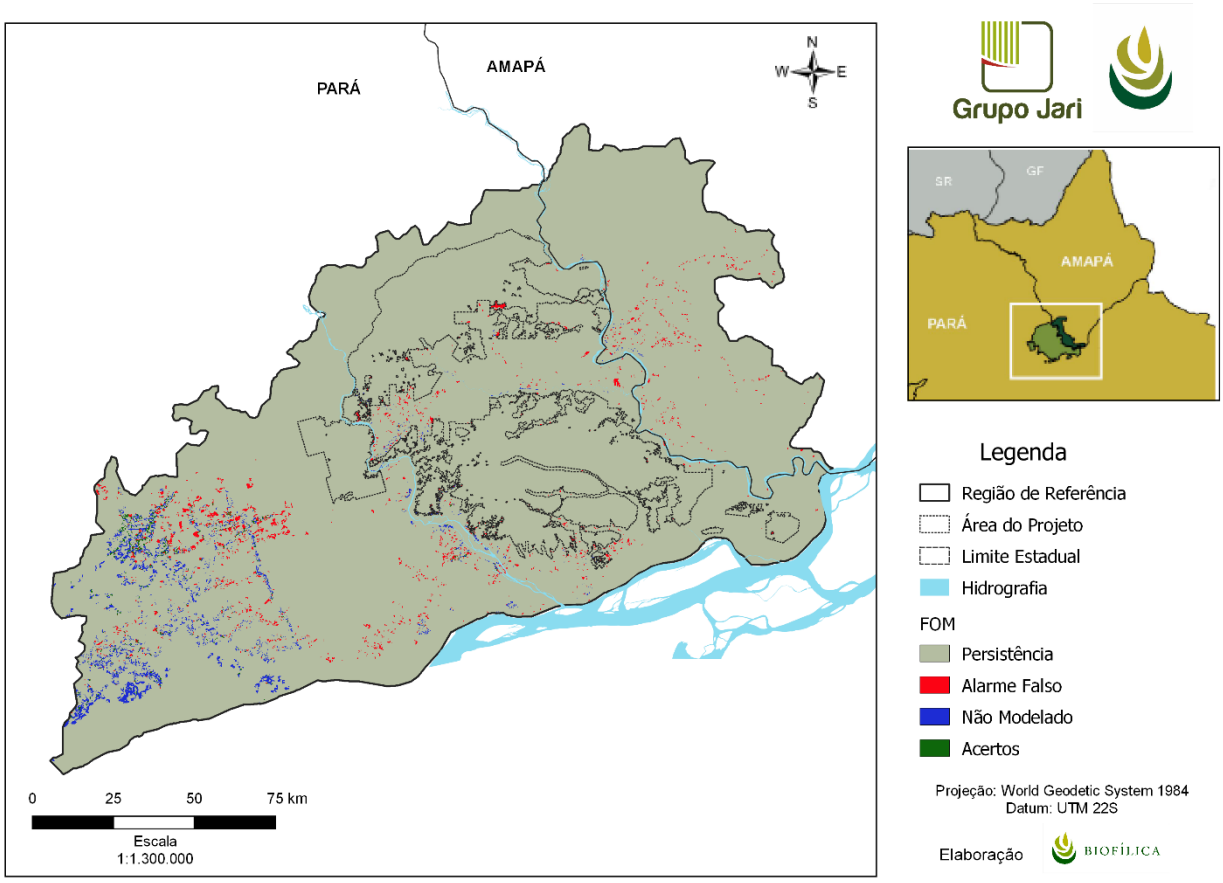


Figure 18. Demonstration of the model evaluation method with the FOM tool.

We used the pixel-to-pixel comparison methods and the Relative Operating Characteristics (ROC) (PONTIUS et al., 2001) to evaluate the accuracy of hard and soft maps projected for year 2010. The soft map that projects the risk of deforestation showed high accuracy in the model validation, as demonstrated by the ROC graph (Figure 20) with an area above the curve of 0.89. The literature suggests that the predictive model of land cover with an area above the curve of 0.80 shows high accuracy. This result indicates that the projected deforestation occurred in regions of high risk of deforestation.

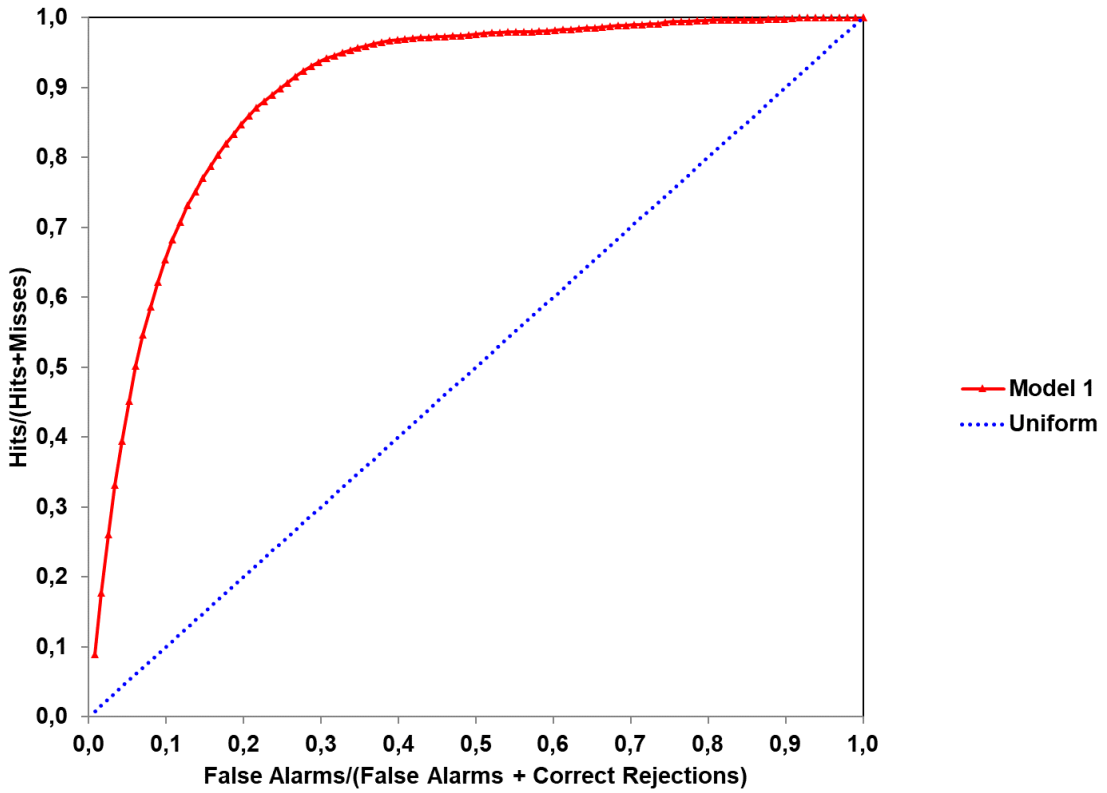


Figure 19. *Relative Operating Characteristic* curve (ROC) of deforestation model validation.

After using the FOM and ROC methods to evaluate the accuracy of the proposed model, it was identified that it is statistically acceptable according to the methods recommended by the VCS by methodology VM0015. Therefore, the approach and auxiliary variables chosen for modeling can be used to construct the baseline scenario.

Mapping the location of future deforestation

For the projection of future deforestation, the whole historical period of the project (2000-2014) was considered, with annual deforestation maps projected between 2014 and 2044. The deforestation rate calculated for the historical period was projected until the year 2044. For the spatial allocation of deforestation the starting point was the combination of the auxiliary variables identified in the model calibration. The old deforestation distance variable was calculated dynamically in each model interaction. The entire process was conducted in TerrSet software. Figure 21 below shows deforestation in the reference regions, Project area and leakage belt (Tables 9b and 9c of methodology VM0015, pages 49 and 50).

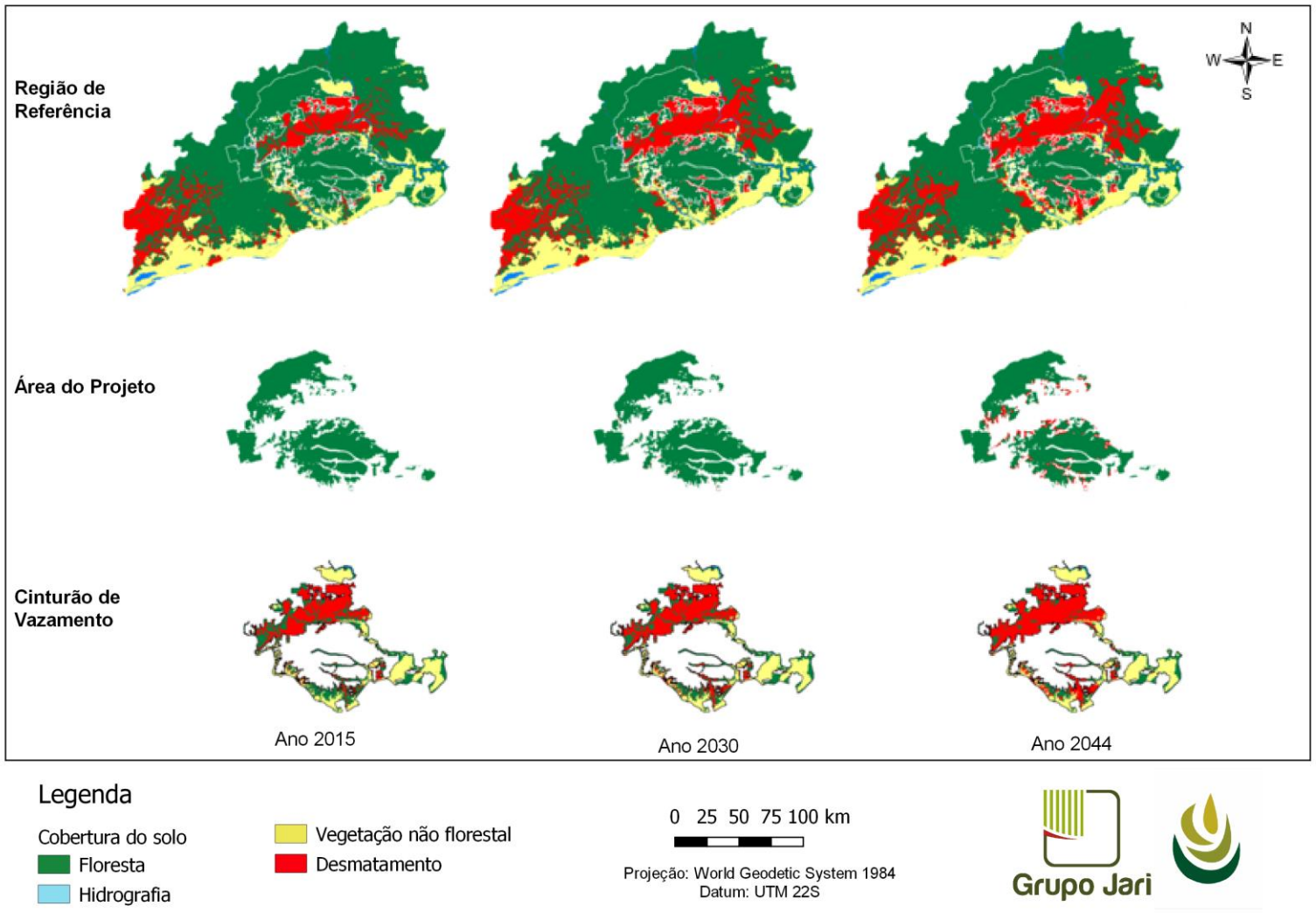


Figure 20. Projection of land cover in the reference region, project area and leakage belt of the REDD+ Jari/Pará Project until the year 2040.

3.1.5 Additionality

The additionality of the Project was analyzed according to the tool approved by VCS "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 1, 2012

The conditions of tool applicability are met because:

- AFOLU activities are the same or similar to the proposed Project activities, within their respective limits, registered or not as Project VCS AFOLU, and do not lead to violation of any applicable law even if this law is not applied;
- The baseline methodology VM0015 provides a step-by-step approach to justify the determination of the most plausible baseline scenario (see "Part 2 - Methodology Steps for ex ante estimation of GHG emissions reductions" from VM0015).

Step 1. Identification of alternative land use scenarios to those proposed by the VCS AFOLU Project activity

Sub-step 1a. – Identify alternative scenarios of credible land uses to the proposed VCS AFOLU Project activities

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

Sub-step 1c. Baseline scenario selection

Step 2. Investment analysis

Sub-step 2b. Option II Application of comparative investment analysis

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

Sub-step 2d. - Sensitivity Analysis

Step 3 – Barrier Analysis

The VCS "VT0001 - Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities - requires investment analysis (Step 2) or Barrier Analysis (Step 3). In this case, we opted for the Investment Analysis, already described in Step 2.

Step 4 – Common Practice Analysis

The integrationist spirit of the 1960s and 1970s served as basis for creation and implementation of several major ventures in the Amazon region that generated social conflicts that persist until the present day and directly reflect the articulation of deforestation that still occurs in the Amazon region. An example of this is a property south of the Jari Project, in the municipalities of Portel and Bagre, called Fazenda Pacajá, with approximately 145,681 hectares, where soybean production and sustainable forest management activities are currently practiced (BIOFÍLICA, 2017). This property was chosen to carry out the Common Practical Analysis of the Jari Pará REDD+ Project, mainly due to its historical similarities and regional contexts with the Project region (**Figure 21**).

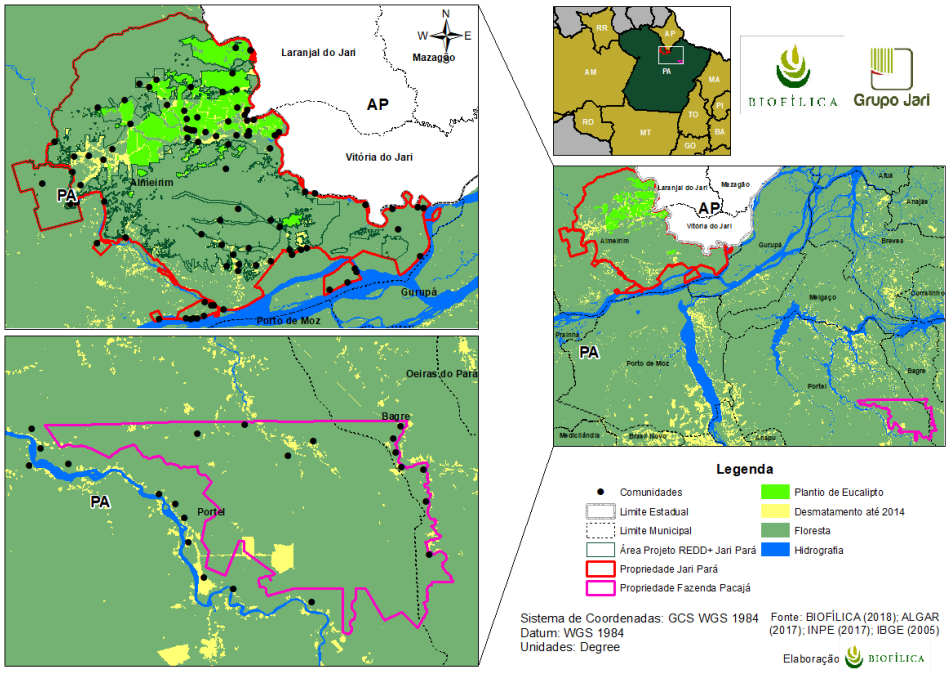


Figure 21 Location of the Common Practice Analysis

Since the beginning of management activities at Fazenda Pacajá in 1995 land conflicts have been constant, mainly due to the overlapping of management areas with areas of the surrounding communities, who argue about the right to remain on land and its priority in land regularization processes (BIOFÍLICA, 2017; FASE et al, 2009).

The communities of Fazenda Pacajá have a history of exodus and appropriation of lands similar to those of Jari, mainly families of northeastern origin who migrated to the region at the beginning of the XX century, in search of opportunities and improvement in the quality of life, especially due to the extraction of rubber (BIOFÍLICA, 2017). The occupation at that moment occurred mainly through the rubber roads that served to delimit the possessions, but without bringing a land guarantee to these communities, since their areas were not demarcated. In addition to the insecurities to carry out legalized forest management operations and communication problems between communities and regional entities, due to lack of trust, the area became the ground for several conflicts over land tenure and use (FASE et al, 2009)

The populations of Pacajá have low-scale farming systems focused on timber extraction, fish farming and agricultural production for subsistence (FASE et al, 2009). In addition, the more remote community members are extremely dependent on the products of intermediaries, since their properties are difficult to access, which ended up generating an unfavorable commercial relation to the populations (FASE et al, 2009). In addition, a large part of the region's population does not have basic infrastructure in health, education, transportation, communication and training in sustainable agricultural techniques (FASE et al, 2009). The fact that these individuals do not have a good organizational structure that helps in the search for improvements makes it increasingly complex to solve the problems and conflicts in the region.

A similar scenario occurred in the region of the Jari Pará Project, in addition to the fact that the communities in the region did not have a structured social organization, the main problems of the area were related to land issues. Social organization in the Jari Valley was problematic and complex because of historical issues such as traditional party political practices, various institutional absences and omissions, and failed associative experiences suffered by the population. These issues generated a feeling of disenchantment and distrust in the public power and in the other active entities of the region, in addition to a low collective self-esteem and individualism, generating a social demobilization in the populations (GRUPO ORSA, 2006).

In this context, the Jari Foundation (formerly the ORSA Foundation), one of the main partners in the REDD+ Project, began to work in the region aiming at improving the quality of life of the community, facilitating access to public policies and improving existing commercial relations (CASA DA FLORESTA, 2016). The Foundation works with participatory management of the region, that is, all decision-making involves the interested individuals and the union of these actors promotes the application of local development plans, focusing on social and financial growth. In addition to this, the Foundation makes possible the involvement of institutions and organizations, such as Biofílica, that can promote joint changes in the region, because of these factors the Foundation is seen as the main agent of Technical Assistance and Rural Extension (ATER) for the families assisted at Jari.

The situation of the two areas is comparable, since the fragile scenario that occurs in Pacajá, and that previously occurred in Jari, enhances the ability of individuals to become agents of deforestation, mainly because, without popular participation in the construction of public policies, without technical assistance, without credit, without development and without their own resources to invest, the local population has to dispose of the available natural resources, which in most cases occurs in an illegal and unplanned manner causing great impacts.

In a place with a weak socioenvironmental structure, where there is no intermediate technical support and weak communication channels such as in Fazenda Pacajá, it is possible to relate these situations with increasing pressure on forest resources, thus generating a gradual increase in deforestation in and around the property, as overlapping areas and land tenure conflicts are a current and constant reality. Meanwhile in the Jari areas, the Foundation's presence has been structuring the link between the Jari Group and some community groups, promoting a clear dialogue, making the management of the area more efficient, bringing direct consequences to the maintenance and conservation of the territory and forest resources.

Even with the Foundation's performance being positive, some points need improvement, precisely where the REDD+ Project intends to work, focusing mainly on the training and improvement of the staff and activities carried out, with main objective expanding the projects and actions already deployed throughout the region, seeking to strengthen the bonds already created and to thrive in new ones, thereby mitigating the potential agents and vectors of deforestation, bringing to communities new goals to improve quality of life in addition to supporting the discussions promoting environmental education and enabling diversified production techniques and more effective business strategies to reach new markets. The existence of an institution such as the Jari Foundation is essential to maintain good practices, assisting in mediation of land use discussions and

working together with the REDD+ Project to mitigate deforestation agents and consequently the risk and pressure on natural resources.

The analysis of common practice shows that conflicts of possessions could continue to occur in Jari's property in Pará, as they still exist on Fazenda Pacajá, if the Jari Foundation did not act as mediator of these issues. With the presence of the REDD+ Project, these actions could be strengthened, improving the already existing infrastructure, reaching new actors and further strengthening the Foundation's role in the region, which reinforces the need and additionality of the REDD+ Project in the area.

3.1.6 Deviations from the Methodology

No deviation of methodology was applied in this Project.

3.2 Quantification of Reductions and Removals of GHG Emissions

3.2.1 Emissions in the Baseline

Step 5 of VM0015 - Definition of the Component of Changes in Land Use and Coverage in the Baseline

Baseline *activity* data calculation by forest class

The results of the baseline projections showed a deforestation of approximately 51,985 hectares in the Project area between 2014 and 2044 (Table 32) and 55,445 hectares in the leakage belt (Table 33).

Table 32. Annual area deforested by forest class icl within the Project area in the baseline case (table 11b of VM0015).

Area deforested by forest class *icl* within the Project area		Total deforestation of baseline in the Project area	
ID*icl*>	Icl1	$ABSLPA_t$	ABSLPA
Name>	Forest	annual	accumulated
Project $year_t$	ha	ha	ha
2015	1,452	1,452	1,452
2016	1,386	1,386	2,838
2017	1,307	1,307	4,145
2018	1,346	1,346	5,491
2019	1,428	1,428	6,919
2020	1,519	1,519	8,438
2021	1,559	1,559	9,997
2022	1,696	1,696	11,693
2023	1,903	1,903	13,596
2024	1,859	1,859	15,455
2025	1,913	1,913	17,368
2026	1,943	1,943	19,311
2027	1,990	1,990	21,301
2028	1,963	1,963	23,264
2029	1,986	1,986	25,250
2030	1,981	1,981	27,231
2031	1,967	1,967	29,198
2032	1,956	1,956	31,154
2033	1,968	1,968	33,122

2034	1,932	1,932	35,054
2035	1,929	1,929	36,983
2036	1,935	1,935	38,918
2037	1,799	1,799	40,717
2038	1,845	1,845	42,562
2039	1,738	1,738	44,300
2040	1,666	1,666	45,966
2041	1,613	1,613	47,579
2042	1,520	1,520	49,099
2043	1,497	1,497	50,596
2044	1,389	1,389	51,985

Table 33. Annual area deforested by forest class icl within the leakage belt in the baseline case (table 11c of VM0015).

Area deforested by *icl* forest class within leakage belt		Total deforestation of baseline in the leakage belt	
ID*icl*>	Icl1	$ABSLPA_t$	ABSLPA
Name>	Forest	annual	accumulated
Project $year_t$	ha	ha	ha
2015	2,468	2,468	2,468
2016	2,812	2,812	5,280
2017	2,810	2,810	8,090
2018	2,703	2,703	10,793
2019	2,660	2,660	13,453
2020	2,569	2,569	16,022
2021	2,465	2,465	18,487
2022	2,587	2,587	21,074
2023	2,447	2,447	23,521
2024	2,339	2,339	25,860
2025	2,199	2,199	28,059
2026	2,133	2,133	30,192
2027	2,019	2,019	32,211
2028	2,021	2,021	34,232
2029	1,895	1,895	36,127
2030	1,873	1,873	38,000
2031	1,766	1,766	39,766
2032	1,677	1,677	41,443
2033	1,504	1,504	42,947
2034	1,469	1,469	44,416
2035	1,381	1,381	45,797
2036	1,331	1,331	47,128
2037	1,277	1,277	48,405
2038	1,235	1,235	49,640
2039	1,096	1,096	50,736
2040	1,071	1,071	51,807
2041	985	985	52,792
2042	927	927	53,719
2043	883	883	54,602
2044	843	843	55,445

Calculation of baseline *activity* data by post-deforestation class

Available in methodology VM0015, method 1 was used to determine the substitute class of forest cover in the baseline of the Project (indicated as anthropic Vegetation in Balance). Table 34 shows the area of zone 1,

which comprises the Project area, the leakage belt and the leakage management areas, as well as the corresponding areas of each class of use and coverage after deforestation.

Table 34. Areas of the reference region covering different combinations of potential post-deforestation classes.

Zone		Name		Total of all other LU/LC classes present in the zone		Total area of each zone	
		Zone 1					
		ID_{fcl}	1				
		Area	% of Zone	Area	% of Zone	Area	% of Zone
IDz	Name	ha	%	ha	ha	ha	%
1	Zone 1	883,951	100	107,430	12.15%	883,951	100
Total area per class *fcl*		883,951	100	107,430	12.15%	883,951	100

Table 35. Annual deforested area in each zone within the Project area in the baseline scenario (Table 13b of VM0015).

Area established after deforestation by Zone within the Project area		Total deforestation of baseline in the Project area	
IDz>	1		
Name>	Zone 1	$ABSLPA_t$	ABSLPA
$Project\ year_t$	ha	ha	ha
2015	1,452	1,452	1,452
2016	1,386	1,386	2,838
2017	1,307	1,307	4,145
2018	1,346	1,346	5,491
2019	1,428	1,428	6,919
2020	1,519	1,519	8,438
2021	1,559	1,559	9,997
2022	1,696	1,696	11,693
2023	1,903	1,903	13,596
2024	1,859	1,859	15,455
2025	1,913	1,913	17,368
2026	1,943	1,943	19,311
2027	1,990	1,990	21,301
2028	1,963	1,963	23,264
2029	1,986	1,986	25,250
2030	1,981	1,981	27,231
2031	1,967	1,967	29,198
2032	1,956	1,956	31,154
2033	1,968	1,968	33,122
2034	1,932	1,932	35,054
2035	1,929	1,929	36,983
2036	1,935	1,935	38,918
2037	1,799	1,799	40,717
2038	1,845	1,845	42,562
2039	1,738	1,738	44,300
2040	1,666	1,666	45,966
2041	1,613	1,613	47,579
2042	1,520	1,520	49,099

2043	1,497	1,497	50,596
2044	1,389	1,389	51,985

Table 36. Annual deforested area in each zone within the leakage belt in the baseline scenario (Table 13c of VM0015).

Area established after deforestation by Zone within the leakage belt		Total deforestation of baseline in the leakage belt	
IDz>	1		
Name>	Zone 1	$ABSLLK_t$	ABSLLK
Project $year_t$	ha	ha	ha
2015	2,468	2,468	2,468
2016	2,812	2,812	5,280
2017	2,810	2,810	8,090
2018	2,703	2,703	10,793
2019	2,660	2,660	13,453
2020	2,569	2,569	16,022
2021	2,465	2,465	18,487
2022	2,587	2,587	21,074
2023	2,447	2,447	23,521
2024	2,339	2,339	25,860
2025	2,199	2,199	28,059
2026	2,133	2,133	30,192
2027	2,019	2,019	32,211
2028	2,021	2,021	34,232
2029	1,895	1,895	36,127
2030	1,873	1,873	38,000
2031	1,766	1,766	39,766
2032	1,677	1,677	41,443
2033	1,504	1,504	42,947
2034	1,469	1,469	44,416
2035	1,381	1,381	45,797
2036	1,331	1,331	47,128
2037	1,277	1,277	48,405
2038	1,235	1,235	49,640
2039	1,096	1,096	50,736
2040	1,071	1,071	51,807
2041	985	985	52,792
2042	927	927	53,719
2043	883	883	54,602
2044	843	843	55,445

Calculation of *activity* data by category of change in land use and land cover

Does not apply.

Step 6 of VM0015 - Estimation of Changes in Carbon Stocks and Non-CO_2 Emissions at Baseline

The estimate of the carbon stock for the Forest class was reached through forest inventory carried out by the technical team of FRM Brasil, in the year 2016, in partnership with Biofílica Investimentos Ambientais. The main results found in this study will be described below, and more information can be obtained in the document Final Report for the Determination of Forest Carbon Stock.

Estimate of average carbon stock by use class and change in land cover

The implementation of the forest inventory in the REDD+ Jari/Pará Project area adopted the recommendations presented in the VCS approved methodology VM0015, distributing the plots proportionally to the area of each typology and considering a uniform distribution of plots in the management area. As already presented in section 2.1.5 – *Physical* Parameters a total of 10 typologies were identified in the Project area, which resulted in a total of 70 planned initial sample units. In addition, it was also considered an analysis for the plots implanted in managed areas and unmanaged areas. All plots were evenly distributed to cover much of the Project area.

According to EMBRAPA (2005), the permanent plots may be have a circular, square or rectangular shape. However, the most used shape is the square in tropical forests. Based on this guideline, the inventory was carried out in 1-hectare square plots, as it was found that with this format and dimension it is possible to obtain greater representativity and less difficulty of operation.

For each plot, data will be collected from the arboreal stratum, collecting individuals with Diameter at the Chest Height (DCH) of more than 20 centimeters and for better ordering each plot was divided into subunits of 0.25 hectares. Each implemented plot received an identification plate with the unit number, this numbering was allocated at the start point of each plot, and was also done for the subunits (Figure 22).

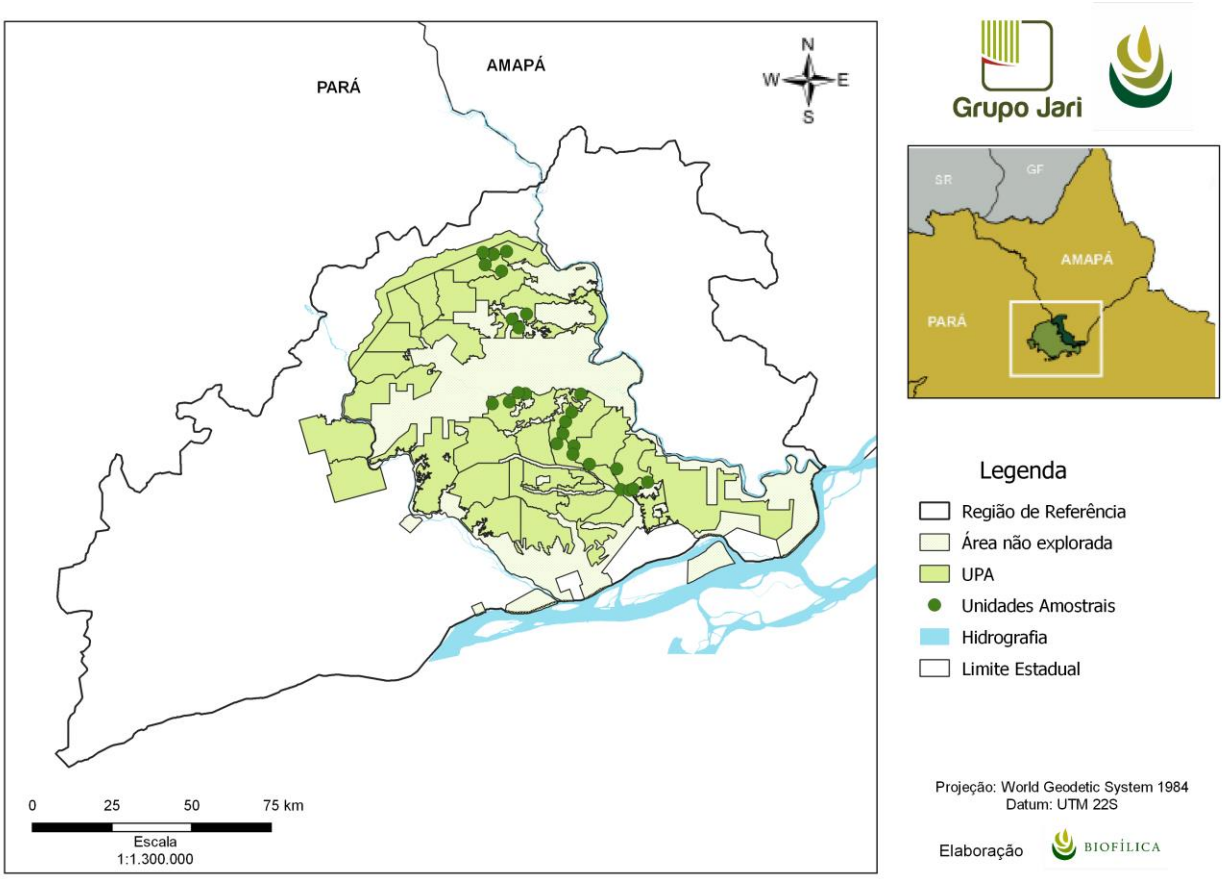


Figure 22. Allocation of sample forest inventory units in the Project area.

Estimated Variables: Biomass and Carbon

Dry biomass

The above-ground dry biomass of the Project area was estimated using allometric equations, and ten different models were tested (ARAUJO et al., 1999; CHAMBERS et al., 2001; CHAVE et al., 2005; CHAVE et al., 2014; GERWING, 2002; HIGUSHI et al., 1998; NOGUEIRA et al., 2008). All of them adopt the diameter above the soil (DCH> 10 cm) of the trees sampled as an independent variable, while others consider, in addition to the DCH, the basic density of the tree species. DCH values above the maximum value used for the development of the allometric equations tested were truncated to the maximum value. Basic wood density values were obtained from the *Global Wood Density Database*. Due to the fact that the database reports more than one density value per species, the average of the values reported by species for the Project region was preferably used.

For cases where this information was not present, the global averages of the values reported for the species were adopted. However, when species-specific values were not available, the average biomass of the arboreal genus was adopted, according to the standard procedure typically reported in the literature (MEDJIBE et al., 2011; RUTISHAUSER et al., 2015; WEST et al., 2014). We emphasize that below-ground biomass is already included in the estimation. To quantify the biomass, we used the allometric equation described by Nogueira et al. (2008), showing more appropriate for the region of study. The following is a description of equation (4):

$$B = \exp(-1.716 + 2.413 * \ln(DAP)) \quad (4)$$

Where:

B: dry biomass (kg);

DCH: diameter at breast height (1.30 cm);

Carbon Content

In accordance with the methodology VM0015, the carbon stocks were quantified in tons of carbon dioxide equivalent per hectare (tCO_2-e ha^{-1}). For calculations and conservatively, the estimated carbon stocks considered only the biomass reservoirs above and below the ground. The following equation was used for the conversion of the dry biomass into tCO_2-e ha^{-1} based on the sampled trees and their respective plots and subplots (equation 5):

$$C_{i,j,k} = \sum_{i=1}^{N} \left(\frac{B_{i,j,k} \cdot (1+S) \cdot FC \cdot \left(\frac{44}{12}\right)}{1000} \right) \quad (5)$$

Where:

$B_{i,j,k}$: ton of dry biomass per hectare of tree *i* in plot *j* and sub plot *k;*

S: fraction of biomass below the ground in relation to B_i;

FC: fraction of biomass carbon.

The carbon fraction of biomass used for the calculations was 0.485, value reported by Silva (2007) and previously used in other REDD+ Projects implemented in the Brazilian Amazon. The proportion of below-ground biomass was estimated with the standard value reported by Nogueira et al. (2008), corresponding to 25.8% of above-ground biomass.

Amostral Effort

The amostral effort (number of plots to be implanted) was estimated according to the equation A3-1 of the methodology VM0015 (equation 6):

$$n = \frac{t_{st}^2 \cdot CV^2}{E^2 + \frac{t_{st}^2 \cdot CV^2}{N}} \quad (6)$$

Where:

t: value of the *t*-student table at the 95% confidence level;

E: maximum allowed value of sampling error (10%);

CV: coefficient of variation for biomass in tropical forests (%);

N: possible number of sample plots.

Furthermore, VM0015 recommends the adoption of different strata in order to reduce sample effort in the area of carbon project. For this purpose, strata were tested based (1) on managed areas and unmanaged areas and (2) based on the different forest typologies present in the study area.

Number of Individuals

A total of 8,668 individuals distributed in 378 species were identified in the 71 inventoried plots. The identified species that presented the greatest wealth were: Breu vermelho (3,90%), Cariperana (2,97%), Mandioqueira escamosa (2,56%) and Cupiúba (2,41%).

The 378 identified species are distributed in 56 families, in addition to 1 unidentified class, and the families that showed the greatest diversity were: Fabaceae (21.4%), Sapotaceae (8.5%), Lecythidaceae (5.3%) and Lauraceae (4.7%).

Carbon Stock

The adoption of a single stratum for the Project area is presented as the best sampling strategy for the biomass inventory. Still, this measure proves to be interesting in the context of the study because it tends to improve future calculations related to the baseline modeling of the REDD+ Project area.

For the estimation of the carbon stock an average final stock of total dry biomass 413,67 tCO_2-e ha^{-1}, was obtained, considering only one stratum. Considering the two strata, managed area and unmanaged area,

we have a mean stock of 400,53 tCO_2-e ha^{-1} and 471,14 tCO_2-e ha^{-1}, respectively. Considering the strata of forest typology, the typology that presented the lowest carbon stock was the Cerrado, with 23,56 tCO_2-e ha^{-1} and the one with the highest carbon stock was the Montane Dense Ombrophilous Forest 641,06 tCO_2-e ha^{-1}.

Calculation of Reduced Emissions

For the determination of the reduced emissions, the estimated stock in the inventory should be multiplied by 3.6667 (44/12), due to the fact that 1 kg of C corresponds to 3.66667 kg of CO2 (mass of CO2 = 44 and the mass of C = 12; 44/12 = 3.66667). The average carbon values per hectare for each initial class of land use and cover considered for the baseline scenario present in the area of the project and leakage belt can be seen in the table below (Table 33).

Table 37. Carbon stocks per hectare for the initial *icl* class existing in the Project area and leakage belt (Table 15a of VM0015).

Initial class of forest *icl*							
Name:	Forest						
ID_{icl}	1						
Average carbon stock per hectare +90% CL							
Cab_{icl}		Cbb_{icl}		Cdw_{icl}		$Ctot_{icl}$	
C stock	± 95% CI	C stock	± 95% CI	C stock	± 95% CI	C stock	± 95% CI
$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$	$tCO_2e\ ha^{-1}$
306.9	10.0	106.7	1.8	-	-	413.7	11.7
tC ha-1	IC %	tC ha-1	IC %	tC ha-1	IC %	tC ha-1	IC %
119.01	3.24	20.89	1.68	-	-	139.89	2.84

Where:

Cab_{icl} : Average equivalent carbon stock per hectare for the above-ground biomass reservoir for the initial forest class;

Cbb_{icl} : Average equivalent carbon stock per hectare for the below-ground biomass reservoir for the initial forest class;

Cdw_{icl} : Average equivalent carbon stock per hectare for the dead biomass reservoir for the initial forest class;

$Ctot_{icl}$: Average carbon stock per hectare for the total biomass reservoir for the initial forest class.

Post-deforestation classes projected for the Project area and leakage belt in the baseline scenario and non-forest classes existing in the areas of leakage management

The methodology VM0015 allows the use of estimates from local studies, and thus a value of 60.1 tCO2e ha-1 was taken as reference for the carbon stock of the anthropic vegetation class in equilibrium, the class projected to exist in the project area and the leakage belt in the Project scenario. This estimation of carbon stock

was obtained by WANDERLLI (FEARNSIDE, 2015), through a long-term study of the landscape and average vegetation composition in deforested areas of the Brazilian Amazon, which consists of a matrix composed of pastures, small-scale agriculture and secondary vegetation, usually found in a post-deforestation scenario in the Amazon.

Wanderlli & Fearnside (2015) is a revised scientific literature and represents one of the most updated studies for the Brazilian Amazon on the carbon stock in deforested areas, satisfying the requirements of section 4.5.6 of the VCS Standard:

1. Data were not collected directly from primary sources;
2. The data were collected from secondary sources, by researchers from INPA (renowned research institute for the subject in Brazil), published by an international and reputed scientific journal (*Forest Ecology and Management*, 2015);
3. The data are from a period that accurately reflects the current practice available for the determination of carbon stock;
4. No sampling was applied on these data;
5. The data are available to the public through the website: http://www.ppginpa.eco.br/documents/teses_dissertacoes/wandelli-fearnside-2015-for-colman_Land-use-history-and-capoeira-growth.pdf. Accessed on June 18, 2018;
6. They are available for independent evaluation of VCSA and VVB;
7. The data are appropriate for the geographic scope of VM0015,
8. Expert review was not necessary;
9. Data are not maintained only in a central storage repository.

Calculation of the carbon stock change factors

The baseline scenario of the Project considers the changes in forest carbon stock replaced by a type of vegetation that may be areas of pasture, small-scale plantations or temporary and permanent agricultural crops. The requirements of the AFOLU VCS document require consideration of the carbon stock decay of carbon reservoirs in organic soil, below-ground biomass, dead wood, and timber products.

To calculate this decay, VM0015 version 1.1 applies a linear function to account for the initial carbon stock decay for the initial forest class (icl) and an increase in the carbon stock in the class after deforestation (fcl). Table 38 and Table 39 show how the carbon stock change factor was calculated.

Table 38. Change factor in carbon stock for the initial forest class *icl* (Method 1) (Table 20a of VM0015).

Years after deforestation		$\Delta Cab_{icl,t}$	$\Delta Cbb_{icl,t}$	$\Delta Cdw_{icl,t}$	$\Delta Ctot_{cl,t}$
1	t*	306.9	10.7	0.0	317.6
2	t*+1	0	10.7	0.0	10.7
3	t*+2	0	10.7	0.0	10.7
4	t*+3	0	10.7	0.0	10.7
5	t*+4	0	10.7	0.0	10.7
6	t*+5	0	10.7	0.0	10.7
7	t*+6	0	10.7	0.0	10.7
8	t*+7	0	10.7	0.0	10.7
9	t*+8	0	10.7	0.0	10.7
10	t*+9	0	10.7	0.0	10.7
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 39. Carbon stock change factor for forest class *fcl* or z zones (Method 1) (Table 20b of VM0015).

Years after deforestation		$\Delta Cab_{icl,t}$
1	t*	6.0
2	t*+1	6.0
3	t*+2	6.0
4	t*+3	6.0
5	t*+4	6.0
6	t*+5	6.0
7	t*+6	6.0
8	t*+7	6.0
9	t*+8	6.0
10	t*+9	6.0
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...	

Calculation of baseline changes in carbon stock

For the calculation of the baseline changes in carbon stock in the Project area (Table 40) and leakage belt (Table 41) for year t was used Method 1 of VM0015 version 1.1, according to equation 10 on page 72 of VM0015 version 1.1.

Table 40. Baseline changes in carbon stocks in the Project area.

Changes in carbon stock by initial forest class *icl*		Total change in carbon stock from the initial forest class of the Project area	Changes in post-deforestation carbon stock by z zone	Total changes in post-deforestation carbon stock by zone in the Project area	Total net change in carbon stock in the Project area	
ID_{icl}>	1	$\Delta CBSLPA_{icl}$	1	$\Delta CBSLPA_z$	$\Delta CBSLPA_t$	$\Delta CBSLPA$
Name>	Forest	accumulated	Zone 1	accumulated	annual	accumulated
$Project\ year_t$	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2015	461,178.2	461,178.2	8,723.9	8,723.9	452,454.3	452,454.3
2016	455,712.3	916,890.5	17,051.3	25,775.1	438,661.0	891,115.3
2017	445,413.0	1,362,303.4	24,904.0	50,679.1	420,509.0	1,311,624.3
2018	471,749.2	1,834,052.6	32,991.0	83,670.1	438,758.2	1,750,382.5
2019	512,159.1	2,346,211.7	41,570.7	125,240.8	470,588.4	2,220,970.9
2020	556,302.8	2,902,514.5	50,697.1	175,937.9	505,605.6	2,726,576.6
2021	585,219.2	3,487,733.7	60,063.9	236,001.8	525,155.3	3,251,731.9
2022	645,371.3	4,133,105.0	70,253.8	306,255.6	575,117.5	3,826,849.3
2023	729,218.6	4,862,323.6	81,687.4	387,943.0	647,531.2	4,474,380.6
2024	735,553.7	5,597,877.3	92,856.6	480,799.6	642,697.0	5,117,077.6
2025	757,048.7	6,354,926.0	95,626.4	576,426.0	661,422.3	5,778,499.9
2026	772,201.7	7,127,127.6	98,973.0	675,399.0	673,228.7	6,451,728.6
2027	793,917.4	7,921,045.1	103,076.6	778,475.6	690,840.9	7,142,569.5
2028	792,215.0	8,713,260.1	106,783.6	885,259.2	685,431.4	7,828,000.9
2029	805,230.1	9,518,490.2	110,136.2	995,395.4	695,093.9	8,523,094.8
2030	808,626.1	10,327,116.3	112,912.0	1,108,307.3	695,714.2	9,218,809.0
2031	808,683.4	11,135,799.7	115,363.3	1,223,670.6	693,320.1	9,912,129.1
2032	808,081.9	11,943,881.7	116,925.4	1,340,596.1	691,156.5	10,603,285.6
2033	812,459.0	12,756,340.6	117,316.0	1,457,912.1	695,143.0	11,298,428.6
2034	802,188.1	13,558,528.8	117,754.6	1,575,666.6	684,433.5	11,982,862.1
2035	801,438.1	14,359,966.8	117,850.7	1,693,517.3	683,587.3	12,666,449.5
2036	803,194.3	15,163,161.1	117,802.6	1,811,320.0	685,391.7	13,351,841.1
2037	759,411.6	15,922,572.7	116,655.1	1,927,975.1	642,756.5	13,994,597.7
2038	772,271.6	16,694,844.3	115,946.1	2,043,921.2	656,325.5	14,650,923.1
2039	736,781.8	17,431,626.1	114,456.1	2,158,377.2	622,325.8	15,273,248.9

2040	711,320.0	18,142,946.2	112,563.5	2,270,940.7	598,756.5	15,872,005.4
2041	691,273.9	18,834,220.1	110,436.6	2,381,377.3	580,837.3	16,452,842.8
2042	658,074.9	19,492,295.0	107,817.0	2,489,194.4	550,257.9	17,003,100.7
2043	645,988.4	20,138,283.4	104,987.2	2,594,181.5	541,001.2	17,544,101.9
2044	607,043.3	20,745,326.7	101,724.7	2,695,906.2	505,318.6	18,049,420.5

Table 41. Baseline changes in carbon stock in the leakage belt.

Changes in carbon stock by initial forest class *icl*		Total change in carbon stock from the initial forest class of the leakage belt area	Changes in post-deforestation carbon stock by z zone	Total changes in post-deforestation carbon stock by zone in the leakage belt area	Total net changes in carbon stock in the leakage belt area	
ID_{icl}>	1	$\Delta CBSLPA_{icl}$	1	$\Delta CBSLPA_z$	$\Delta CBSLPA_t$	$\Delta CBSLPA$
Name>	Forest	accumulated	Zone 1	accumulated	annual	accumulated
Project $year_t$	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO2-e
2013	783,875.9	783,875.9	14,828.2	14,828.2	769,047.6	769,047.6
2014	919,475.9	1,703,351.8	31,723.3	46,551.5	887,752.6	1,656,800.3
2015	948,852.3	2,652,204.0	48,606.3	95,157.8	900,246.0	2,557,046.2
2016	944,857.6	3,597,061.6	64,846.4	160,004.2	880,011.2	3,437,057.4
2017	960,048.4	4,557,110.0	80,828.2	240,832.4	879,220.2	4,316,277.6
2018	959,534.7	5,516,644.7	96,263.3	337,095.7	863,271.4	5,179,549.0
2019	953,920.8	6,470,565.5	111,073.5	448,169.1	842,847.3	6,022,396.4
2020	1,018,978.1	7,489,543.6	126,616.7	574,785.8	892,361.4	6,914,757.8
2021	1,002,122.1	8,491,665.7	141,318.7	716,104.5	860,803.4	7,775,561.2
2022	993,935.7	9,485,601.4	155,371.9	871,476.4	838,563.8	8,614,125.0
2023	948,092.7	10,433,694.0	153,755.7	1,025,232.0	794,337.0	9,408,462.0
2024	920,587.7	11,354,281.7	149,676.1	1,174,908.2	770,911.6	10,179,373.6
2025	877,154.1	12,231,435.8	144,923.6	1,319,831.8	732,230.4	10,911,604.0
2026	870,489.2	13,101,924.9	140,826.0	1,460,657.8	729,663.1	11,641,267.1
2027	823,649.7	13,925,574.7	136,229.8	1,596,887.6	687,420.0	12,328,687.1
2028	809,468.8	14,735,043.5	132,048.1	1,728,935.6	677,420.7	13,006,107.8
2029	769,165.7	15,504,209.1	127,848.3	1,856,784.0	641,317.3	13,647,425.1
2030	732,135.6	16,236,344.7	122,380.9	1,979,164.9	609,754.7	14,257,179.9
2031	668,970.1	16,905,314.8	116,715.2	2,095,880.0	552,254.9	14,809,434.8
2032	648,941.8	17,554,256.6	111,488.0	2,207,368.1	537,453.8	15,346,888.6
2033	613,200.6	18,167,457.2	106,573.3	2,313,941.4	506,627.3	15,853,515.8
2034	589,293.9	18,756,751.1	101,754.8	2,415,696.1	487,539.2	16,341,055.0
2035	564,799.9	19,321,551.0	97,296.7	2,512,992.8	467,503.2	16,808,558.2
2036	543,519.5	19,865,070.5	92,574.2	2,605,567.1	450,945.3	17,259,503.5
2037	492,327.0	20,357,397.5	87,773.7	2,693,340.7	404,553.3	17,664,056.7
2038	476,093.9	20,833,491.4	82,955.1	2,776,295.9	393,138.8	18,057,195.5
2039	441,361.4	21,274,852.8	78,262.7	2,854,558.6	363,098.7	18,420,294.2
2040	415,554.2	21,690,406.9	73,756.6	2,928,315.2	341,797.6	18,762,091.8
2041	395,420.9	22,085,827.9	70,025.5	2,998,340.7	325,395.5	19,087,487.2
2042	376,462.1	22,462,290.0	66,264.4	3,064,605.0	310,197.8	19,397,685.0

Baseline of non-CO_2 emissions from forest fires

Non-CO_2 emissions were not considered and accounted for the REDD+ Jari/Pará Project.

3.2.2 Project Emissions

Step 7 of VM0015 - Ex-ante estimate of Actual Changes in Carbon Stocks and Non-CO_2 Emissions in the Project Area

Non-CO_2 emissions were not considered and accounted for the REDD+ Jari/Pará Project.

Ex ante estimation of real changes in carbon stock

Ex ante estimation of actual changes in carbon stock due to planned activities

For the REDD+ Jari/Pará Project area only sustainable forest management activities are planned, i.e., low impact activities.

In this case, it was estimated a reduction of carbon stock related to deforestation for the implementation of infrastructure such as the opening of roads and forest yards in each annual production unit (UPA) within the Project area. This estimate was based on the Gleba Jari I post-exploratory reports, in which an average of 0.73% of the open area was adopted in the UPAs for infrastructures in the management activity. Table 42 presents the estimated area of planned deforestation and the impact on the carbon stock in the Project area. Figure 34 shows the location of each UPA in the REDD+ Jari/Pará Project area.

Table 42. Ex-ante estimate of stock reduction due to planned deforestation in the Project area (Table 25a of Methodology VM0015).

Project Year *t*	Areas of planned deforestation x Change in carbon stock (reduction) in the Project area		Total carbon stock reduction due to planned deforestation	
	ID_{cl}	1	annual	Accumulated
	$APDPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CPDdPA_t$	$\Delta CPDdPA_t$
	ha	$tCO2eha^{-1}$	tCO2e	tCO2e
2015	67.1	413.7	27,751.2	27,751.2
2016	67.1	413.7	27,751.2	55,502.4
2017	67.1	413.7	27,751.2	83,253.6
2018	67.1	413.7	27,751.2	111,004.9
2019	67.1	413.7	27,751.2	138,756.1
2020	67.1	413.7	27,751.2	166,507.3
2021	67.1	413.7	27,751.2	194,258.5
2022	67.1	413.7	27,751.2	222,009.7
2023	67.1	413.7	27,751.2	249,760.9
2024	67.1	413.7	27,751.2	277,512.2
2025	67.1	413.7	27,751.2	305,263.4

2026	67.1	413.7	27,751.2	333,014.6
2027	67.1	413.7	27,751.2	360,765.8
2028	67.1	413.7	27,751.2	388,517.0
2029	67.1	413.7	27,751.2	416,268.2
2030	67.1	413.7	27,751.2	444,019.4
2031	67.1	413.7	27,751.2	471,770.7
2032	67.1	413.7	27,751.2	499,521.9
2033	67.1	413.7	27,751.2	527,273.1
2034	67.1	413.7	27,751.2	555,024.3
2035	67.1	413.7	27,751.2	582,775.5
2036	67.1	413.7	27,751.2	610,526.7
2037	67.1	413.7	27,751.2	638,277.9
2038	67.1	413.7	27,751.2	666,029.2
2039	67.1	413.7	27,751.2	693,780.4
2040	67.1	413.7	27,751.2	721,531.6
2041	67.1	413.7	27,751.2	749,282.8
2042	67.1	413.7	27,751.2	777,034.0
2043	67.1	413.7	27,751.2	804,785.2
2044	67.1	413.7	27,751.2	832,536.5

Extraction of wood

All planned forest management activity performed by Jari Celulose will be monitored and reported in each Project verification event, and this monitoring will be based on the Post-Exploratory Reports.

In this sense, a significance analysis was performed based on the "*Tool for testing significance of GHG emissions in A/R CDM project activities*" in order to evaluate the impact of the emissions of the logging activity on the Project emissions. For the calculation were used data provided by Jari Celulose referring to the annual intensity of forest exploitation and the amount of carbon extracted.

For the significance assessment, the relationship between the balance of carbon stock changes due to the logging activity and the total baseline emissions was applied. The results showed that the emissions related to the logging activity are below the threshold of 5% of significance required by the Standard and therefore can be disregarded from the scope of project emissions.

All calculations related to the significance test were shared with the audit team. If the reduction of the carbon stock due to the extraction of wood is observed, Table 25b of VM0015 will be filled ex-post.

The construction of infrastructures for forest management activities, such as yards and roads, will be considered as planned deforestation in the Project area. And, according to footnote 85 of VM0015, the carbon stock of forest management products with the purpose of constituting durable wood products can be conservatively ignored in the project scenario.

Charcoal production and collection of firewood

The charcoal production or firewood collection is not expected for the Project, and during the social diagnosis this type of use was not verified among families. If there is a reduction of forest carbon stock due to this activity, table 25c of VM0015 will be presented ex post. Table 43 presents the ex ante estimate of the carbon stock reduction due to activities planned by the Project.

Table 43. Ex-ante estimate of inventory reduction due to planned activities in the Project area (Table 25d of Methodology VM0015).

Project Year *t*	Total carbon stock depletion due to planned deforestation		Total carbon stock depletion due to planned harvest activities		Total decrease in carbon stock due to firewood collection and charcoal production activities		Total carbon stock reduction due to planned activities	
	Annual	accumulated	annual	accumulated	annual	accumulated	annual	accumulated
	$\Delta CPDdPA_t$	$\Delta CPDdPA$	$\Delta CPDdPA_t$	$\Delta CPDdPA$	$\Delta CPFdPA_t$	$\Delta CPFdPA$	$\Delta CPAdPA_t$	$\Delta CPAdPA$
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2015	27,751.2	27,751.2	0.0	0.0	0.0	0.0	27,751.2	27,751.2
2016	27,751.2	55,502.4	0.0	0.0	0.0	0.0	27,751.2	55,502.4
2017	27,751.2	83,253.6	0.0	0.0	0.0	0.0	27,751.2	83,253.6
2018	27,751.2	111,004.9	0.0	0.0	0.0	0.0	27,751.2	111,004.9
2019	27,751.2	138,756.1	0.0	0.0	0.0	0.0	27,751.2	138,756.1
2020	27,751.2	166,507.3	0.0	0.0	0.0	0.0	27,751.2	166,507.3
2021	27,751.2	194,258.5	0.0	0.0	0.0	0.0	27,751.2	194,258.5
2022	27,751.2	222,009.7	0.0	0.0	0.0	0.0	27,751.2	222,009.7
2023	27,751.2	249,760.9	0.0	0.0	0.0	0.0	27,751.2	249,760.9
2024	27,751.2	277,512.2	0.0	0.0	0.0	0.0	27,751.2	277,512.2
2025	27,751.2	305,263.4	0.0	0.0	0.0	0.0	27,751.2	305,263.4
2026	27,751.2	333,014.6	0.0	0.0	0.0	0.0	27,751.2	333,014.6
2027	27,751.2	360,765.8	0.0	0.0	0.0	0.0	27,751.2	360,765.8
2028	27,751.2	388,517.0	0.0	0.0	0.0	0.0	27,751.2	388,517.0
2029	27,751.2	416,268.2	0.0	0.0	0.0	0.0	27,751.2	416,268.2
2030	27,751.2	444,019.4	0.0	0.0	0.0	0.0	27,751.2	444,019.4
2031	27,751.2	471,770.7	0.0	0.0	0.0	0.0	27,751.2	471,770.7
2032	27,751.2	499,521.9	0.0	0.0	0.0	0.0	27,751.2	499,521.9
2033	27,751.2	527,273.1	0.0	0.0	0.0	0.0	27,751.2	527,273.1
2034	27,751.2	555,024.3	0.0	0.0	0.0	0.0	27,751.2	555,024.3
2035	27,751.2	582,775.5	0.0	0.0	0.0	0.0	27,751.2	582,775.5
2036	27,751.2	610,526.7	0.0	0.0	0.0	0.0	27,751.2	610,526.7
2037	27,751.2	638,277.9	0.0	0.0	0.0	0.0	27,751.2	638,277.9
2038	27,751.2	666,029.2	0.0	0.0	0.0	0.0	27,751.2	666,029.2
2039	27,751.2	693,780.4	0.0	0.0	0.0	0.0	27,751.2	693,780.4
2040	27,751.2	721,531.6	0.0	0.0	0.0	0.0	27,751.2	721,531.6
2041	27,751.2	749,282.8	0.0	0.0	0.0	0.0	27,751.2	749,282.8
2042	27,751.2	777,034.0	0.0	0.0	0.0	0.0	27,751.2	777,034.0
2043	27,751.2	804,785.2	0.0	0.0	0.0	0.0	27,751.2	804,785.2
2044	27,751.2	832,536.5	0.0	0.0	0.0	0.0	27,751.2	832,536.5

Optional accounting for increase in carbon stocks

The ex ante estimate of the increase in carbon stock by regeneration after management activities was not considered by conservative measure.

Ex ante estimate of changes in carbon stock due to unavoidable unplanned deforestation in the Project area

Project activities are expected to reduce about 90% of baseline emissions in the first five years of implementation, and to gradually increase their efficiency over the years. Considering the implementation of effective monitoring of forest cover and strengthening the degree of governance in the area due to the management activity, the activities foreseen by the Project and the greater alignment with the communities, the project is expected to reach high levels of effectiveness during its 30-year duration.

Ex ante estimate of net real changes in carbon stock in the Project area

The changes in carbon stock related to planned activities and the effectiveness of the Project are presented in Table 44

Table 44. Ex-ante estimates of net carbon reduction in the Project area on the Project scenario (Table 27 of VM0015).

Project Year *t*	Total carbon stock depletion due to planned activities		Total increase in carbon stock due to planned activities		Total carbon stock depletion due to unavoidable unplanned deforestation		Total carbon stock change due to Project scenario	
	Annual	accumulated	annual	accumulated	annual	accumulated	annual	accumulated
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2015	27,751.2	27,751.2	0.0	0.0	45,245.4	45,245.4	72,996.6	72,996.6
2016	27,751.2	55,502.4	0.0	0.0	43,866.1	89,111.5	71,617.3	144,614.0
2017	27,751.2	83,253.6	0.0	0.0	42,050.9	131,162.4	69,802.1	214,416.1
2018	27,751.2	111,004.9	0.0	0.0	43,875.8	175,038.3	71,627.0	286,043.1
2019	27,751.2	138,756.1	0.0	0.0	47,058.8	222,097.1	74,810.1	360,853.2
2020	27,751.2	166,507.3	0.0	0.0	40,448.4	262,545.5	68,199.7	429,052.8
2021	27,751.2	194,258.5	0.0	0.0	42,012.4	304,558.0	69,763.6	498,816.5
2022	27,751.2	222,009.7	0.0	0.0	40,258.2	344,816.2	68,009.4	566,825.9
2023	27,751.2	249,760.9	0.0	0.0	45,327.2	390,143.4	73,078.4	639,904.3
2024	27,751.2	277,512.2	0.0	0.0	38,561.8	428,705.2	66,313.0	706,217.4
2025	27,751.2	305,263.4	0.0	0.0	39,685.3	468,390.5	67,436.6	773,653.9
2026	27,751.2	333,014.6	0.0	0.0	33,661.4	502,052.0	61,412.7	835,066.6
2027	27,751.2	360,765.8	0.0	0.0	34,542.0	536,594.0	62,293.3	897,359.8
2028	27,751.2	388,517.0	0.0	0.0	27,417.3	564,011.3	55,168.5	952,528.3
2029	27,751.2	416,268.2	0.0	0.0	27,803.8	591,815.0	55,555.0	1,008,083.3
2030	27,751.2	444,019.4	0.0	0.0	20,871.4	612,686.5	48,622.6	1,056,705.9
2031	27,751.2	471,770.7	0.0	0.0	20,799.6	633,486.1	48,550.8	1,105,256.7
2032	27,751.2	499,521.9	0.0	0.0	13,823.1	647,309.2	41,574.3	1,146,831.1
2033	27,751.2	527,273.1	0.0	0.0	13,902.9	661,212.0	41,654.1	1,188,485.1
2034	27,751.2	555,024.3	0.0	0.0	6,844.3	668,056.4	34,595.6	1,223,080.7
2035	27,751.2	582,775.5	0.0	0.0	6,835.9	674,892.3	34,587.1	1,257,667.8
2036	27,751.2	610,526.7	0.0	0.0	6,853.9	681,746.2	34,605.1	1,292,272.9
2037	27,751.2	638,277.9	0.0	0.0	6,427.6	688,173.7	34,178.8	1,326,451.7
2038	27,751.2	666,029.2	0.0	0.0	6,563.3	694,737.0	34,314.5	1,360,766.2
2039	27,751.2	693,780.4	0.0	0.0	6,223.3	700,960.3	33,974.5	1,394,740.6

2040	27,751.2	721,531.6	0.0	0.0	5,987.6	706,947.8	33,738.8	1,428,479.4
2041	27,751.2	749,282.8	0.0	0.0	5,808.4	712,756.2	33,559.6	1,462,039.0
2042	27,751.2	777,034.0	0.0	0.0	5,502.6	718,258.8	33,253.8	1,495,292.8
2043	27,751.2	804,785.2	0.0	0.0	5,410.0	723,668.8	33,161.2	1,528,454.0
2044	27,751.2	832,536.5	0.0	0.0	5,053.2	728,722.0	32,804.4	1,561,258.4

Ex-ante estimate of non-CO_2 emissions due to forest fires

No non-CO2 emissions from fire were recorded for the Baseline scenario.

Table 45 shows the expected net changes and non-CO2 emissions in the Project. Should an increase in projected emissions is verified in relation to the scenario with Project, these emissions will be monitored and reported during the Project development.

Table 45. Total ex ante estimate of net changes in carbon stock and non-CO_2 emissions in the Project area.

Project Year *t*	Total ex ante decrease in carbon stock due to planned activities		Total ex ante increase in carbon stock due to planned activities		Total ex ante of carbon stock depletion due to unavoidable unplanned deforestation		Net total ex ante of changes in carbon stock		Total estimated ex-ante non-CO_2 emissions from forest fires in the Project area	
	annual	accumulated	annual	accumulated	annual	accumulated	Annual	Accumulated	annual	accumulated
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$EBBPSPA_t$	EBBPSPA
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2015	27,751.2	27,751.2	0.0	0.0	45,245.4	45,245.4	72,996.6	72,996.6	0.0	0.0
2016	27,751.2	55,502.4	0.0	0.0	43,866.1	89,111.5	71,617.3	144,614.0	0.0	0.0
2017	27,751.2	83,253.6	0.0	0.0	42,050.9	131,162.4	69,802.1	214,416.1	0.0	0.0
2018	27,751.2	111,004.9	0.0	0.0	43,875.8	175,038.3	71,627.0	286,043.1	0.0	0.0
2019	27,751.2	138,756.1	0.0	0.0	47,058.8	222,097.1	74,810.1	360,853.2	0.0	0.0
2020	27,751.2	166,507.3	0.0	0.0	40,448.4	262,545.5	68,199.7	429,052.8	0.0	0.0
2021	27,751.2	194,258.5	0.0	0.0	42,012.4	304,558.0	69,763.6	498,816.5	0.0	0.0
2022	27,751.2	222,009.7	0.0	0.0	40,258.2	344,816.2	68,009.4	566,825.9	0.0	0.0
2023	27,751.2	249,760.9	0.0	0.0	45,327.2	390,143.4	73,078.4	639,904.3	0.0	0.0
2024	27,751.2	277,512.2	0.0	0.0	38,561.8	428,705.2	66,313.0	706,217.4	0.0	0.0
2025	27,751.2	305,263.4	0.0	0.0	39,685.3	468,390.5	67,436.6	773,653.9	0.0	0.0
2026	27,751.2	333,014.6	0.0	0.0	33,661.4	502,052.0	61,412.7	835,066.6	0.0	0.0
2027	27,751.2	360,765.8	0.0	0.0	34,542.0	536,594.0	62,293.3	897,359.8	0.0	0.0
2028	27,751.2	388,517.0	0.0	0.0	27,417.3	564,011.3	55,168.5	952,528.3	0.0	0.0
2029	27,751.2	416,268.2	0.0	0.0	27,803.8	591,815.0	55,555.0	1,008,083.3	0.0	0.0
2030	27,751.2	444,019.4	0.0	0.0	20,871.4	612,686.5	48,622.6	1,056,705.9	0.0	0.0
2031	27,751.2	471,770.7	0.0	0.0	20,799.6	633,486.1	48,550.8	1,105,256.7	0.0	0.0
2032	27,751.2	499,521.9	0.0	0.0	13,823.1	647,309.2	41,574.3	1,146,831.1	0.0	0.0
2033	27,751.2	527,273.1	0.0	0.0	13,902.9	661,212.0	41,654.1	1,188,485.1	0.0	0.0
2034	27,751.2	555,024.3	0.0	0.0	6,844.3	668,056.4	34,595.6	1,223,080.7	0.0	0.0
2035	27,751.2	582,775.5	0.0	0.0	6,835.9	674,892.3	34,587.1	1,257,667.8	0.0	0.0
2036	27,751.2	610,526.7	0.0	0.0	6,853.9	681,746.2	34,605.1	1,292,272.9	0.0	0.0
2037	27,751.2	638,277.9	0.0	0.0	6,427.6	688,173.7	34,178.8	1,326,451.7	0.0	0.0
2038	27,751.2	666,029.2	0.0	0.0	6,563.3	694,737.0	34,314.5	1,360,766.2	0.0	0.0
2039	27,751.2	693,780.4	0.0	0.0	6,223.3	700,960.3	33,974.5	1,394,740.6	0.0	0.0
2040	27,751.2	721,531.6	0.0	0.0	5,987.6	706,947.8	33,738.8	1,428,479.4	0.0	0.0

2041	27,751.2	749,282.8	0.0	0.0	5,808.4	712,756.2	33,559.6	1,462,039.0	0.0	0.0
2042	27,751.2	777,034.0	0.0	0.0	5,502.6	718,258.8	33,253.8	1,495,292.8	0.0	0.0
2043	27,751.2	804,785.2	0.0	0.0	5,410.0	723,668.8	33,161.2	1,528,454.0	0.0	0.0
2044	27,751.2	832,536.5	0.0	0.0	5,053.2	728,722.0	32,804.4	1,561,258.4	0.0	0.0

3.2.3 Leakage

Step 8 of VM0015 - Ex-ante leakage estimate

Ex-ante estimate of carbon stock reduction and increased GHG emissions due to leakage prevention measures

Initially, it is expected that leakage prevention measures will be employed within the limits of Gleba Jari I, conducting courses and training related to sustainable development and conservation and environmental awareness. Subsequently, outside the limits of the Project, through assistance to associations of small farmers in the environment. These initiatives will focus not only on training and guidance for farmers in the region but also on raising people's awareness of environmental issues and preserving the forest.

As already mentioned in this document, it is not expected to develop any activity that could lead to the reduction of carbon stocks or the increase of GHG emissions compared to the baseline scenario. If there are significant changes in carbon stock, these activities will be monitored, accounted for and reported.

Changes in carbon stock due to activities implemented in the areas of leakage management

Table 30c of VM0015 is not applicable because no reduction is expected due to the implementation of activities.

Ex-ante estimate of methane (CH_4) and nitrous oxide (N_2O) emissions by intensification of livestock

According to the above, there are no activities that will lead to a significant increase in methane and nitrous oxide emissions. Therefore, Tables 31 and 32 of VM0015 were not applied.

Total ex-ante estimate of carbon stock changes and increase in GHG emissions due to leakage prevention measures

Table 33 of VM0015 does not apply.

Ex-ante estimate of the reduction of carbon stocks and increase of GHG emissions due to activity displacement

Deforestation agents in the project region are migrant squatters from other northern and northeastern regions of the country as described in Step 3. Considering that the area of the Leakage Belt is part of Gleba Jari I and the Project Zone, that is, it is inserted under the same criteria of land ownership and governance of the project area, the same factors adopted for the Project Effectiveness Index were considered.

Thus, a displacement factor of 10% was adopted for the first five years. Then the reduction of the leakage displacement factor is gradual, already considering the influence of the Project in this context. Thus, the leakage displacement factor tends to approach to zero during the 30 years of project implementation.

The ex ante estimate of the leakage due to activity shift for the first fixed baseline period is found in Table 46 and the total ex ante leakage is shown in Table 47.

Table 46. Ex-ante estimate of leakage due to displacement of activity (Table 34 of VM0015).

Project Year *t*	Estimated total ex-ante decrease in carbon stock due to displacement of deforestation		Total ex ante estimated increase in GHG emissions due to displacement of forest fires	
	annual	accumulated	annual	Accumulated
	$\Delta CADLK_t$	$\Delta CADLK$	$EADLK_t$	EADLK
	tCO2e	tCO2e	tCO2e	tCO2e
2015	45,245.4	45,245.4	0.0	0.0
2016	43,866.1	89,111.5	0.0	0.0
2017	42,050.9	131,162.4	0.0	0.0
2018	43,875.8	175,038.3	0.0	0.0
2019	47,058.8	222,097.1	0.0	0.0
2020	40,448.4	262,545.5	0.0	0.0
2021	42,012.4	304,558.0	0.0	0.0
2022	40,258.2	344,816.2	0.0	0.0
2023	45,327.2	390,143.4	0.0	0.0
2024	38,561.8	428,705.2	0.0	0.0
2025	39,685.3	468,390.5	0.0	0.0
2026	33,661.4	502,052.0	0.0	0.0
2027	34,542.0	536,594.0	0.0	0.0
2028	27,417.3	564,011.3	0.0	0.0
2029	27,803.8	591,815.0	0.0	0.0
2030	20,871.4	612,686.5	0.0	0.0
2031	20,799.6	633,486.1	0.0	0.0
2032	13,823.1	647,309.2	0.0	0.0
2033	13,902.9	661,212.0	0.0	0.0
2034	6,844.3	668,056.4	0.0	0.0
2035	6,835.9	674,892.3	0.0	0.0
2036	6,853.9	681,746.2	0.0	0.0
2037	6,427.6	688,173.7	0.0	0.0
2038	6,563.3	694,737.0	0.0	0.0
2039	6,223.3	700,960.3	0.0	0.0
2040	5,987.6	706,947.8	0.0	0.0
2041	5,808.4	712,756.2	0.0	0.0
2042	5,502.6	718,258.8	0.0	0.0
2043	5,410.0	723,668.8	0.0	0.0
2044	5,053.2	728,722.0	0.0	0.0

Table 47. Ex ante total leakage estimate (Table 35 of VM0015).

Project Year *t*	Total ex ante GHG emissions from increased animal husbandry		Total ex ante increase in GHG emissions due to the displacement of forest fires		Total ex ante of carbon stock depletion due to displacement of deforestation		Decrease in carbon stock due to leakage prevention activities		Total net changes in carbon stock due to leakage		Total net increase in emissions due to leakage	
	annual	accumulated	annual	accumulated	annual	accumulated	annual	accumulated	annual	accumulated	annual	accumulated
	$EgLK_t$	EgLK	$EADLK_t$	EADLK	$\Delta CADLK_t$	$\Delta CADLK$	$\Delta CLPMLK_t$	$\Delta CLPMLK$	ΔCLK_t	ΔCLK	ELK_t	ELK
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2015	0.0	0.0	0.0	0.0	45,245.4	45,245.4	0.0	0.0	45,245.4	45,245.4	0.0	0.0
2016	0.0	0.0	0.0	0.0	43,866.1	89,111.5	0.0	0.0	43,866.1	89,111.5	0.0	0.0
2017	0.0	0.0	0.0	0.0	42,050.9	131,162.4	0.0	0.0	42,050.9	131,162.4	0.0	0.0
2018	0.0	0.0	0.0	0.0	43,875.8	175,038.3	0.0	0.0	43,875.8	175,038.3	0.0	0.0
2019	0.0	0.0	0.0	0.0	47,058.8	222,097.1	0.0	0.0	47,058.8	222,097.1	0.0	0.0
2020	0.0	0.0	0.0	0.0	40,448.4	262,545.5	0.0	0.0	40,448.4	262,545.5	0.0	0.0
2021	0.0	0.0	0.0	0.0	42,012.4	304,558.0	0.0	0.0	42,012.4	304,558.0	0.0	0.0
2022	0.0	0.0	0.0	0.0	40,258.2	344,816.2	0.0	0.0	40,258.2	344,816.2	0.0	0.0
2023	0.0	0.0	0.0	0.0	45,327.2	390,143.4	0.0	0.0	45,327.2	390,143.4	0.0	0.0
2024	0.0	0.0	0.0	0.0	38,561.8	428,705.2	0.0	0.0	38,561.8	428,705.2	0.0	0.0
2025	0.0	0.0	0.0	0.0	39,685.3	468,390.5	0.0	0.0	39,685.3	468,390.5	0.0	0.0
2026	0.0	0.0	0.0	0.0	33,661.4	502,052.0	0.0	0.0	33,661.4	502,052.0	0.0	0.0
2027	0.0	0.0	0.0	0.0	34,542.0	536,594.0	0.0	0.0	34,542.0	536,594.0	0.0	0.0
2028	0.0	0.0	0.0	0.0	27,417.3	564,011.3	0.0	0.0	27,417.3	564,011.3	0.0	0.0
2029	0.0	0.0	0.0	0.0	27,803.8	591,815.0	0.0	0.0	27,803.8	591,815.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	20,871.4	612,686.5	0.0	0.0	20,871.4	612,686.5	0.0	0.0
2031	0.0	0.0	0.0	0.0	20,799.6	633,486.1	0.0	0.0	20,799.6	633,486.1	0.0	0.0
2032	0.0	0.0	0.0	0.0	13,823.1	647,309.2	0.0	0.0	13,823.1	647,309.2	0.0	0.0
2033	0.0	0.0	0.0	0.0	13,902.9	661,212.0	0.0	0.0	13,902.9	661,212.0	0.0	0.0
2034	0.0	0.0	0.0	0.0	6,844.3	668,056.4	0.0	0.0	6,844.3	668,056.4	0.0	0.0
2035	0.0	0.0	0.0	0.0	6,835.9	674,892.3	0.0	0.0	6,835.9	674,892.3	0.0	0.0
2036	0.0	0.0	0.0	0.0	6,853.9	681,746.2	0.0	0.0	6,853.9	681,746.2	0.0	0.0
2037	0.0	0.0	0.0	0.0	6,427.6	688,173.7	0.0	0.0	6,427.6	688,173.7	0.0	0.0
2038	0.0	0.0	0.0	0.0	6,563.3	694,737.0	0.0	0.0	6,563.3	694,737.0	0.0	0.0

2039	0.0	0.0	0.0	0.0	6,223.3	700,960.3	0.0	0.0	6,223.3	700,960.3	0.0	0.0
2040	0.0	0.0	0.0	0.0	5,987.6	706,947.8	0.0	0.0	5,987.6	706,947.8	0.0	0.0
2041	0.0	0.0	0.0	0.0	5,808.4	712,756.2	0.0	0.0	5,808.4	712,756.2	0.0	0.0
2042	0.0	0.0	0.0	0.0	5,502.6	718,258.8	0.0	0.0	5,502.6	718,258.8	0.0	0.0
2043	0.0	0.0	0.0	0.0	5,410.0	723,668.8	0.0	0.0	5,410.0	723,668.8	0.0	0.0
2044	0.0	0.0	0.0	0.0	5,053.2	728,722.0	0.0	0.0	5,053.2	728,722.0	0.0	0.0

3.2.4 Net GHG Emission Reductions and Removals

Step 9 if VM0015 - Net ex-ante net reduction in anthropogenic GHG emissions

Significance assessment

Using the document "*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 74% of the expected emissions in the baseline scenario and biomass below ground will contribute 15%.

Calculation of ex ante estimates of total net GHG emission reductions

The equation 19 suggested by VM0015 was used for the ex ante estimation of the project emissions reductions.

Ex-ante calculation of Verified Carbon Units (VCUs)

To estimate the number of VCUs, we used equation 20 of VM0015. The Risk Factor parameter of the Project was estimated through the document *VCS AFOLU Non-Permanence Risk Tool*, resulting in 11%.

Table 48. Ex ante estimate of net anthropogenic emissions reductions (DREDD) and Verified Carbon Units (Table 36 of VM0015).

Project Year *t*	Changes in baseline carbon stock	Baseline GHG emissions	Ex-ante Project Changes in Carbon Stock	Ex ante GHG emissions from the Project	Ex-ante changes in carbon stock per leakage	Ex ante GHG emissions per leakage	Reduced net emissions of anthropogenic GHG ex ante		Ex ante marketable VCUs		Ex ante insurance credits	
	annual	annual	annual	annual	annual	annual	annual	accumulated	annual	accumulated	annual	accumulated
	$\Delta CBSLPA_t$	$\Delta EBBBSLPA_t$	$\Delta CPSPA_t$	$EBBPSPA_t$	ΔCLK_t	ELK_t	$\Delta REDD_t$	$\Delta REDD$	VCU_t	VCU	VCB_t	VCB
	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
2015	452,454	0.0	72,997	0.0	45,245	0	334,212	334,212	292,472	292,472	41,740	41,740
2016	438,661	0.0	71,617	0.0	43,866	0	323,178	657,390	282,803	575,275	40,375	82,115
2017	420,509	0.0	69,802	0.0	42,051	0	308,656	966,046	270,078	845,353	38,578	120,693
2018	438,758	0.0	71,627	0.0	43,876	0	323,255	1,289,301	282,871	1,128,224	40,384	161,077
2019	470,588	0.0	74,810	0.0	47,059	0	348,720	1,638,021	305,184	1,433,408	43,536	204,613
2020	505,606	0.0	68,200	0.0	40,448	0	396,958	2,034,978	348,843	1,782,251	48,115	252,728
2021	525,155	0.0	69,764	0.0	42,012	0	413,379	2,448,357	363,286	2,145,537	50,093	302,821
2022	575,117	0.0	68,009	0.0	40,258	0	466,850	2,915,207	411,068	2,556,605	55,782	358,603
2023	647,531	0.0	73,078	0.0	45,327	0	529,126	3,444,333	465,936	3,022,540	63,190	421,792
2024	642,697	0.0	66,313	0.0	38,562	0	537,822	3,982,155	474,420	3,496,960	63,402	485,195
2025	661,422	0.0	67,437	0.0	39,685	0	554,300	4,536,455	488,962	3,985,922	65,338	550,533
2026	673,229	0.0	61,413	0.0	33,661	0	578,155	5,114,610	510,855	4,496,777	67,300	617,833
2027	690,841	0.0	62,293	0.0	34,542	0	594,006	5,708,616	524,865	5,021,643	69,140	686,973
2028	685,431	0.0	55,168	0.0	27,417	0	602,846	6,311,461	533,517	5,555,159	69,329	756,302
2029	695,094	0.0	55,555	0.0	27,804	0	611,735	6,923,197	541,386	6,096,545	70,349	826,651
2030	695,714	0.0	48,623	0.0	20,871	0	626,220	7,549,417	555,040	6,651,585	71,180	897,831
2031	693,320	0.0	48,551	0.0	20,800	0	623,970	8,173,386	553,045	7,204,630	70,925	968,756
2032	691,156	0.0	41,574	0.0	13,823	0	635,759	8,809,145	564,305	7,768,935	71,454	1,040,210
2033	695,143	0.0	41,654	0.0	13,903	0	639,586	9,448,731	567,702	8,336,638	71,884	1,112,094
2034	684,434	0.0	34,596	0.0	6,844	0	642,994	10,091,725	571,511	8,908,149	71,482	1,183,576
2035	683,587	0.0	34,587	0.0	6,836	0	642,164	10,733,889	570,774	9,478,923	71,390	1,254,966
2036	685,392	0.0	34,605	0.0	6,854	0	643,933	11,377,822	572,346	10,051,270	71,587	1,326,553

2037	642,757	0.0	34,179	0.0	6,428	0	602,150	11,979,972	535,207	10,586,476	66,944	1,393,496
2038	656,325	0.0	34,314	0.0	6,563	0	615,448	12,595,420	547,027	11,133,503	68,421	1,461,917
2039	622,326	0.0	33,974	0.0	6,223	0	582,128	13,177,548	517,409	11,650,912	64,719	1,526,636
2040	598,757	0.0	33,739	0.0	5,988	0	559,030	13,736,578	496,878	12,147,790	62,152	1,588,788
2041	580,837	0.0	33,560	0.0	5,808	0	541,469	14,278,048	481,269	12,629,059	60,201	1,648,988
2042	550,258	0.0	33,254	0.0	5,503	0	511,502	14,789,549	454,631	13,083,690	56,870	1,705,859
2043	541,001	0.0	33,161	0.0	5,410	0	502,430	15,291,979	446,568	13,530,258	55,862	1,761,721
2044	505,319	0.0	32,804	0.0	5,053	0	467,461	15,759,440	415,484	13,945,742	51,977	1,813,698

3.3 Monitoring

3.3.1 Data and Parameters Available in Validation

Below is the description of the data and parameters available in the validation.

Data/Parameter Unit	**Deforestation**
Data Unit	Hectare (ha)
Description	Maps of forest cover areas converted into non-forest cover areas
Data Source	Measured through data from the PRODES/INPE Project
Applied Value	0.40%/year on average (2000-2014)
Justification of the data choice or description of measurement means and procedures applied	Data from the PRODES Digital program (official mapping satellite of Brazilian Amazon Forest) were used to map the deforestation and production of the Forest Cover Excellence Brand Map. During the analyzed period, a total of 46 *Landsat* images were used. And for the classification of the images in the mapping of forest classes, non-forest vegetation, hydrography and deforestation, the ISOSEG method of unsupervised classification was used
Purpose of the Data	- Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	View the documents: - Câmara et al. 2006. Methodology for the calculation of the annual rate of deforestation in the Legal Amazon - Determination of the Forest Carbon Stock for the REDD+ Jari/Pará Project

Data/Parameter Unit	**Ctot**
Data Unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock per hectare in all carbon reservoirs in the forest class used in the baseline scenario
Data Source	Calculated by allometric equations, literature expansion factors, and field-measured data
Applied Value	413,67 $tCO_2e\ ha^{-1}$
Justification of the data choice or description of measurement means and procedures applied	The biomass estimates above and below the ground were made using forest inventory data and allometric equations executed in areas similar to the Project area (Nogueira et al., 2008)
Purpose of the Data	- Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	View the documents: - Forest Carbon Inventory Estimate for REDD+ Jari/Pará Project

Data/Parameter Unit	**DCH**
Data Unit	Cm
Description	Diameter at chest height (130 cm) for each tree with DCH equal to or greater than 15 cm in each portion of the forest inventory
Data Source	Measured in the field by FRM Brasil

Applied Value	See worksheet with field data
Justification of the data choice or description of measurement means and procedures applied	Requirement demanded by Methodology VCS VM0015. Forest inventory data collected less than 10 years ago in multiple plots located in wide spatial distribution.
Purpose of the Data	- Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	Main variable for the carbon stock estimation of the REDD+ Jari/Pará Project

Data/Parameter Unit	**B= exp (-1.716+2.413*(ln(DAP))^2)**
Data Unit	Kg (weight)
Description	Equation to convert DCH to biomass
Data Source	Nogueira et al. (2008). Estimates of forest biomass in the Brazilian Amazon: New allometric equations and biomass adjustments of wood volume inventories. Forest Ecology and Management, v. 256, n. 11, p. 1853-1867, 2008
Applied Value	**B= exp (-1.716+2.413*(ln(DAP))^2)**
Justification of the data choice or description of measurement means and procedures applied	Equation developed for forests with forest-like characteristics in the reference region
Purpose of the Data	- Baseline scenario determination (for AFOLU projects only) - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	-

Data/Parameter Unit	**CF**
Data Unit	t
Description	Carbon contained in dry biomass
Data Source	Nogueira et al. (2008). Estimates of forest biomass in the Brazilian Amazon: New allometric equations and biomass adjustments of wood volume inventories. Forest Ecology and Management, v. 256, n. 11, p. 1853-1867, 2008
Applied Value	0.485
Justification of the data choice or description of measurement means and procedures applied	Value found in scientific literature
Purpose of the Data	- Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	-

Data/Parameter Unit	**44/12**
Data Unit	tCO_2e
Description	Carbon mass conversion factor for mass of CO_2e

Data Source	Scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Applied Value	44/12
Justification of the data choice or description of measurement means and procedures applied	Standard IPCC value
Purpose of the Data	- Determination of baseline scenario (AFOLU projects only) - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	-

3.3.2 Monitored Data and Parameters

The description of the data and monitored parameters subsequent to validation follows.

Climate

Data/Parameter Unit	**Deforestation in the Project area and leakage belt**
Data Unit	Hectare (ha)
Description	Areas of forest cover converted into non-forest cover areas within the Project area and leakage belt of the REDD+ Jari/Pará Project
Data Source	Calculated by means of remote sensing imagery together with GPS data collected in the field
Description of the means of measurement and procedures to be applied	Monitoring of forest cover in the Project area and leakage belt will be performed through satellite imagery analysis. When PRODES system data are not available, monitoring of forest cover will be by automatic classification and visual interpretation of images from other optical sensors or SAR data
Monitoring/recording frequency	Annual
Applied Value	Does not apply
Monitoring equipment	Images if remote sensing of digital processing program, geographic information system and navigational GPS
QA/QC procedures to be applied	Images with special resolution of 30 m or more will be used in the mapping and the minimum mapping unit is 1 ha. Classifications will be assessed through data collected in the field using GPS navigation. The minimum accuracy of use classification map and ground cover is 80%
Purpose of the Data	- Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Method of calculation	If unplanned deforestation areas are detected, the Forest Coverage Excellence Mark Map will be updated by map algebra
Comments	- PRODES Digital Project: http://www.dpi.inpe.br/prodesdigital/prodes.php - More information on quality assurance and control available at: Câmara et al. 2006. Methodology for the calculation of the annual rate of deforestation in the Legal Amazon

Data/Parameter Unit	**Ctot**
Data Unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock per hectare in all carbon reservoirs in forest class used in

	baseline scenario
Data Source	Calculated by allometric equations, expansion factors of scientific literature and data measured in field by FRM Brazil
Description of the means of measurement and procedures to be applied	The biomass estimates above and below the ground were made using forest inventory data and allometric equations executed in areas similar to the Project area (Nogueira et al., 2008)
Monitoring/recording frequency	Forest inventory data collected over periods of up to 10 years in multiple plots
Applied Value	Does not apply
Monitoring equipment	Does not apply
QA/QC procedures to be applied	Mandatory monitoring according to methodology VM0015. Forest inventory data collected over periods of up to 10 years in multiple plots
Purpose of the Data	- Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Method of calculation	Comparisons between the average value of total carbon stock contained in the forest class used in baseline scenario, according to *Forest Carbon Inventory Estimate for the REDD+ Jari/Pará Project*
Comments	Mandatory requirement of Methodology VM0015 for areas with wood extraction

Data/Parameter Unit	**DCH**
Data Unit	cm
Description	Diameter at chest height (130 cm) for each tree with DCH equal to or greater than 15 cm in each portion of the forest inventory
Data Source	Calculated from the circumference at chest height measured in the field by FRM Brazil
Description of the means of measurement and procedures to be applied	DCH is calculated from the circumference at chest height (CCH) data of each tree measured in the field
Monitoring/recording frequency	Forest inventory data collected over periods of up to 10 years in multiple plots
Applied Value	Does not apply
Monitoring equipment	Calculated from the circumference at chest height of data measured in field using tape measure
QA/QC procedures to be applied	Mandatory monitoring according to Methodology VM0015. Forest inventory data collected over periods of up to 10 years in multiple plots
Purpose of the Data	- Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Method of calculation	DCH is calculated from the circumference at chest height (CCH) data of each tree measured in the field
Comments	Main variable used in the estimation of changes in the carbon stock in the REDD+ Jari/Pará Project

Data/Parameter Unit	**Deforestation planned to build Sustainable Forest Management infrastructure**
Data Unit	Hectare (ha)
Description	Map of forest cover areas converted into non-forest cover areas due to the construction of roads, trails and forest yards for sustainable forest management
Data Source	Remote sensing images, technical maps, and field maps to monitor the construction of roads, trails, and yards for sustainable forest management activities
Description of the means of	The monitoring of forest cover areas in the area of sustainable forest management

measurement and procedures to be applied	will be done by satellite imagery analysis, road construction maps, forest trails and yards, and field verification. The Forest Coverage Excellence Brand Map will be updated by map algebra in case of planned deforestation. The verification processes will report the reduction in carbon stock in the Project area
Monitoring/recording frequency	During the management year of each UPA
Applied Value	Does not apply
Monitoring equipment	Field card and geographic information system
QA/QC procedures to be applied	The mapping of deforestation areas planned for the implementation of Sustainable Forest Management infrastructures will be carried out through high resolution images and field check
Purpose of the Data	- Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Method of calculation	If unplanned deforestation areas are detected, the Forest Coverage Excellence Mark Map will be updated by map algebra
Comments	-

Data/Parameter Unit	**ΔCabBSLLKt**
Data Unit	tCO_2-e
Description	Changes in total carbon stock in the leakage belt area
Data Source	Calculated
Description of the means of measurement and procedures to be applied	- Leakage prevention activities will be listed; - A map will be prepared showing the areas of intervention and the type of intervention; - Areas where leakage prevention activities impact the carbon stock will be identified; - Non-forest classes existing in these areas in the baseline case will be identified; - Carbon stocks will be measured in the identified classes or conservative estimates of the literature will be used; - Changes in the carbon stock in the areas of leakage management under the project scenario will be reported using Table 30.b of Methodology VM0015; - Changes in the net carbon stock caused by the prevention measures during the baseline fixed period and optionally in the project crediting period will be calculated; - The results of the calculations will be reported in Table 30.c of Methodology VM0015.
Monitoring/recording frequency	To be determined depending on the activity
Applied Value	0
Monitoring equipment	To be determined depending on the activity
QA/QC procedures to be applied	To be determined depending on the activity
Purpose of the Data	- Calculation of leakage
Method of calculation	To be determined depending on the activity
Comments	Does not apply

Data/Parameter Unit	**Harvest Damage Assessment**
Data Unit	M^3/ha
Description	Evaluation carried out by sampling in the UPAs during and after the harvesting operation
Data Source	Post-Exploratory Report
Description of the means of	See Sustainable Forest Management Plan

measurement and procedures to be applied	
Monitoring/recording frequency	Annual, after the end of the harvesting operations of each UPA
Applied Value	Does not apply
Monitoring equipment	See Sustainable Forest Management Plan
QA/QC procedures to be applied	Information on control and quality assurance procedures, see section 3.3.3 – *Monitoring Plan*
Method of calculation	See Sustainable Forest Management Plan
Comments	Evaluation carried out by sampling in the UPAs during and after the harvesting operation

Data/Parameter Unit	**Frequency of surveillance and patrol operations**
Data Unit	Number of operations per year
Description	Record of surveillance operations number carried out at the farm during the monitoring period
Data Source	Patrimonial Surveillance Reports
Description of the means of measurement and procedures to be applied	To be established
Monitoring/recording frequency	Monthly
Applied Value	Does not apply
Monitoring equipment	Does not apply
QA/QC procedures to be applied	To be established
Method of calculation	Does not apply
Comments	The Patrimonial Surveillance Reports will be implemented from the Project validation

Communities and Other Actors

Data/Parameter Unit	**Number of courses and training**
Data Unit	Number/year
Description	Number of performed courses and training
Data Source	Project Monitoring and Activity Report
Description of the means of measurement and procedures to be applied	Questionnaires and attendance list applied to participants
Monitoring/recording frequency	Annual
Applied Value	Does not apply
Monitoring equipment	Does not apply
QA/QC procedures to be applied	Validation of the systematized information in the draft of the Project Monitoring Report with the proponents before the official publication of the report
Method of calculation	Does not apply
Comments	-

Data/Parameter Unit	**Number of persons trained**
Data Unit	Number/year

Description	Number of persons trained per year
Data Source	Structured interviews and supporting documents (attendance list)
Description of the means of measurement and procedures to be applied	Annual
Monitoring/recording frequency	Does not apply
Applied Value	Does not apply
Monitoring equipment	Validate
QA/QC procedures to be applied	Validation of the systematized information in the draft of the Project Monitoring Report with the proponents before the official publication of the report
Method of calculation	Does not apply
Comments	-

Data/Parameter Unit	**Frequency of publication of Activity Reports**
Data Unit	Verification number/event
Description	Time interval between publications and evaluations of activity reports
Data Source	Project Monitoring and Activity Report
Description of the means of measurement and procedures to be applied	Interviews and structured questionnaires
Monitoring/recording frequency	Annual
Applied Value	Does not apply
Monitoring equipment	Does not apply
QA/QC procedures to be applied	Evaluation of data compiled and systematized in a meeting with stakeholders to support the future activities planning
Method of calculation	Does not apply
Comments	-

Data/Parameter Unit	**Number of producers benefited by the REDD+ Project**
Data Unit	Number of producers
Description	Number of producers participating in REDD+ Project activities receiving technical follow-up after the training phase
Data Source	Activity and interview reports
Description of the means of measurement and procedures to be applied	Reports generated by the designated technical officer to advise the associations participating in the social activities of the Project
Monitoring/recording frequency	Annual
Applied Value	Does not apply
Monitoring equipment	Research format
QA/QC procedures to be applied	Validation of the systematized information in the draft of the Project Monitoring Report with the proponents before the official publication of the report
Method of calculation	Does not apply
Comments	-

Data/Parameter Unit	**Number of beneficiary associations**
Data Unit	Number of associations

Description	Number of associations benefiting from the technical follow-up of the Project
Data Source	Technical Activities Report
Description of the means of measurement and procedures to be applied	Reports generated by the designated technical officer to advise the associations participating in the social activities of the Project
Monitoring/recording frequency	Annual
Applied Value	Does not apply
Monitoring equipment	Research format
QA/QC procedures to be applied	Validation of the systematized information in the draft of the Project Monitoring Report with the proponents before the official publication of the report
Method of calculation	Does not apply
Comments	-

Data/Parameter Unit	**Gross revenue from new activities implemented after courses and training**
Data Unit	R$/ha
Description	Additional gross revenue generated for participants in Project activities after the implementation of new techniques learned
Data Source	Project Monitoring and Activity Report
Description of the means of measurement and procedures to be applied	Structured Interviews
Monitoring/recording frequency	Annual
Applied Value	Does not apply
Monitoring equipment	Does not apply
QA/QC procedures to be applied	Validation of the systematized information in the draft of the Project Monitoring Report with the proponents before the official publication of the report
Method of calculation	Does not apply
Comments	-

Biodiversity

Data/Parameter Unit	**Number of animals species monitored**
Data Unit	Number
Description	Quantity of animal species monitored
Data Source	Field Data Sheets, Data Sheet and Fauna Monitoring Report
Description of the means of measurement and procedures to be applied	To be established
Monitoring/recording frequency	2 times a year
Applied Value	Does not apply
Monitoring equipment	Does not apply
QA/QC procedures to be applied	To be established
Method of calculation	Data sheet
Comments	-

Data/Parameter Unit	**Diversity of the vegetal community in permanent plots**
Data Unit	Does not apply
Description	Variety of species found in the vegetal community within the permanent plots
Data Source	Field Data Sheets, Data Sheet and Post-Exploratory Report
Description of the means of measurement and procedures to be applied	To be established
Monitoring/recording frequency	One year before harvest. At intervals of one, three and five years after the UPA harvest
Applied Value	To be established
Monitoring equipment	To be established
QA/QC procedures to be applied	To be established
Method of calculation	Data sheet
Comments	-

Data/Parameter Unit	**Wealth of the monitored fauna taxon**
Data Unit	Number
Description	Abundance of the species number identified by the study in the same taxon
Data Source	Field Data Sheets, Data Sheet and Fauna Monitoring Report
Description of the means of measurement and procedures to be applied	To be established
Monitoring/recording frequency	Annual
Applied Value	When the used methodology is compatible and comparable with those adopted in the initial diagnoses, use the values raised by group as reference
Monitoring equipment	Does not apply
QA/QC procedures to be applied	To be established
Method of calculation	Digital data sheet
Comments	-

Data/Parameter Unit	**Status of relevant species in the IUCN Red List of Endangered Species**
Data Unit	Does not apply
Description	Continuous monitoring of relevant species to the Project in relation to its status in the IUCN Endangered Species List, with emphasis on the species referred to as Critically Endangered (CR) or Endangered (E)
Data Source	Field Data Sheets, Data Sheet and Fauna Monitoring Report
Description of the means of measurement and procedures to be applied	Systematization and comparison of data and information collected in fauna surveys and ethnozoological interviews with the Official IUCN List, available at: http://www.iucnredlist.org
Monitoring/recording frequency	Annual
Applied Value	Does not apply
Monitoring equipment	Does not apply
QA/QC procedures to be applied	Comparison of different information sources (empirical survey and traditional knowledge)
Method of calculation	Does not apply

Comments	-

Data/Parameter Unit	**HCVA of Cerrado**
Data Unit	Number of species present
Description	-
Data Source	Field survey
Description of the means of measurement and procedures to be applied	Data collection should be performed periodically by specialist staff
Monitoring/recording frequency	Once every 5 years (flora) and 2 times per year (fauna)
Applied Value	Does not apply
Monitoring equipment	To be established
QA/QC procedures to be applied	To be established
Method of calculation	To be established
Comments	-

3.3.3 Monitoring Plan

The monitoring plan of the REDD+ Jari/Pará Project is a combination of three components: climate, community and biodiversity. Biofílica Investimentos Ambientais is one of the proponents and implementing partners of this Project, being responsible for coordinating the monitoring processes during its life cycle. The climate aspects will be monitored directly by the Biofílica team and the social and biodiversity aspects will be monitored by the Jari Foundation and partners hired with skills in the subject.

3.3.4 3.3.3.1 Monitoring Plan for Climate Impacts

The Climate Impact Monitoring Plan will encompass key issues for the demonstration of emission reduction by deforestation and degradation due to avoided unplanned deforestation, in accordance with the applied methodology VM0015, and changes in carbon stock throughout the project life cycle due to changes in land use within the Project area and in the leakage belt.

Part 1 – Application of Methodology VM0015

1. TASK 1: MONITORING CARBON STOCK CHANGES AND GHG EMISSIONS FOR PERIODICAL CHECKS

1.1 Monitoring current changes in carbon stock and GHG emissions in the Project area

a) Technical description of monitoring tasks

In the Project area, the monitoring of changes in carbon stock and GHG emissions will be carried out through analysis of avoided unplanned deforestation. Biofílica Investimentos Ambientais will develop actions to

monitor REDD+ activities, which aim to avoid unplanned deforestation by verifying areas of forest cover by satellite images and field checks in the Project area.

b) Data to be collected

Table 49. Data to be collected to monitor changes in carbon stock and GHG emissions for periodic verification in the REDD+ Jari/Pará Project.

Data/Parameter	Description	Unit	Source	Frequency
$Ctot_{icl}$	Average carbon stock for all carbon reservoirs in the forest class *icl*	Tonne of carbon dioxide equivalent ($tCO_2.e$)	Calculated by allometric equations and field-measured data	Collected in periods of up to 10 years
$APDPA_{icl,t}$	Areas of planned deforestation in forest class *icl* in year *t* in the Project area	Hectare (ha)	Calculated through remote sensing images, technical maps and data, field and post-exploratory information on management	Annual
$\Delta CPLdPA_t$	Total decrease in carbon stock due to planned timber cutting activities in year *t* in the Project area	Tonne of carbon dioxide equivalent ($tCO_2.e$)	Calculated	Annual
$ACPA_{icl,t}$	Annual area within the Project area affected by catastrophic events in class *icl* in year *t*	Hectare (ha)	Calculated through remote sensing images	Each time a catastrophic event occurs
$AUFPA_{icl,t}$	Areas affected by forest fire in class *icl* where carbon stock recovery occurs in year *t*	Hectare (ha)	Calculated through remote sensing images	Each time a forest fire event occurs
$\Delta CUFdPA_t$	Total carbon stock decrease due to unplanned forest fires in year *t* in the Project area	Tonne of carbon dioxide equivalent ($tCO_2.e$)	Calculated	Each time a forest fire event occurs
$\Delta CUCdPA_t$	Total decrease in carbon stock due to catastrophic events in year *t* in the Project area	Tonne of carbon dioxide equivalent ($tCO_2.e$)	Calculated	Each time a catastrophic event occurs
$\Delta CUDdPA_t$	Total current change in carbon stock due to avoided planned deforestation in year *t* in the Project area	Tonne of carbon dioxide equivalent ($tCO_2.e$)	Calculated	Annual
$\Delta CPSPA_t$	Total inventory change in the Project area in year *t*	Tonne of carbon dioxide equivalent ($tCO_2.e$)	Calculated	Annual

c) Brief description of the data collection procedures

Monitoring of land use and cover change:

The Project plans to use the data processed by PRODES as a basis for monitoring, and the main activities developed for data collection and processing are:

- Selection of optical satellite images with less cloud cover and date of collection of images near the dry season in the Amazon and appropriate radiometric quality;

- Georeferencing of satellite imagery with scale 1: 100,000 topographic maps or NASA images in ortho-rectified MrSID format;

- Production of a spectral mixing model to estimate the percentage of vegetation, soil and shade components for each pixel in the image;

- Use of segmentation technique determining in the satellite image the spatially adjacent regions (segments) with similar spectral characteristics;

- Classification of the segments to identify forest classes, non-forest vegetation and deforestation.

Carbon stock monitoring and non-CO_2 emissions:

Carbon stock changes (reduction) will be monitored through the forest inventory and the measurement of the Diameter at Chest Height (130 cm), for each tree with DCH equal to or greater than 15 cm in each plot of the forest inventory. The most widely used variable to estimate the carbon stock and changes in the carbon stock of the REDD+ Jari/Pará Project is the DCH.

d) Quality control procedures and quality assurance

Monitoring of land use and cover change:

The mapping of deforestation occurrence data will be done through data collected in GPS navigation in order to corroborate the information obtained by satellite images. The minimum classification accuracy for use and ground cover is 80%. For cloud-covered areas, images of SAR sensors such as RADARSAT-2, Cosmo SkyMed or TerraSAR-X will be used.

Biofílica Investimentos Ambientais will be responsible for storing during the Project period the original digital data (raster) and processed (vectors) of satellite images, coordinates, technical maps, photos and field cards. Maps with installed infrastructure, satellite images and annual deforestation reports will be made available to the verification body at each verification event.

Carbon stock monitoring and non-CO_2 emissions:

The Jari Group will be responsible for keeping the original reports and field records stored and Biofílica Investimentos Ambientais will keep a digital copy of these documents throughout the duration of the Project. Spreadsheets, forest inventory reports, and parcel monitoring reports will be made available to verifiers at each verification event.

e) Data filing

Biofílica Investimentos Ambientais will keep all REDD+ Jari/Pará Project data and reports stored in digital files for the duration of the Project. The original reports and collected field records produced by the forest management activity will be stored by the Jari Group and as previously stated, Biofílica Investimentos Ambientais will keep a copy of these documents filed in digital format throughout the Project.

Through the Jari Foundation's Activity Report and Impact Report prepared periodically, compilation and announcement of social activities results will be carried out, being made available in digital format. All documents

related to the monitoring of the REDD+ Jari/Pará Project will be gathered in paper and/or digital files and made available to the verifiers at each verification event.

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

These activities are the responsibility of Biofílica Investimentos Ambientais, of the Jari Group and the Jari Foundation.

1.1.1 Monitoring of Project Implementation

Implementation of REDD+ activities will be monitored through physical-financial timelines, performance and quality monitoring reports, forest cover maps, meeting reports, land invasion police reports and other actions to control illegal deforestation, and other relevant documents.

1.1.2 Monitoring of changes in land use and land cover within the Project area

The planned and unplanned deforestation monitoring will be developed by mapping the forest coverage of the Project area, data provided annually by PRODES, using satellite images with spatial resolution of 30 meters. Subsequently the mapping will be validated from the assessment of accuracy with high resolution images and field verification, when necessary. The monitoring of deforestation for the implementation of infrastructures of social activities will be carried out through specific field files and for the construction of roads, branches and storage yards within the Project area will be used Post-Exploratory Reports and maps and satellite images containing information on forest cover areas converted into the non-forest class. Aiming for greater flexibility in the deforestation mapping process, different techniques for classification and visual interpretation can be used during the Project progress, such as complementary mapping using alternative images and sensors and data collected in the field.

Data on deforestation events will be compared to the baseline scenario. The emission reduction values for the monitored period will be based on the comparison between the expected deforestation and the actual deforestation.

1.1.3 Monitoring of changes in carbon stocks

<u>In the Project area:</u>

It is hoped that the ex-ante estimate of carbon stock for forest class will not change during the baseline period. However, Methodology VM0015 requests monitoring of the carbon stock in the Project area subject to the relevant decrease of the carbon stock in the Project scenario in accordance with the ex-ante evaluation due to controlled deforestation and planned management activities, or areas subject to the unplanned and significant decrease of the carbon stock in the Project scenario.

The total change in carbon stock due to unavoidable unplanned deforestation in the Project area is calculated as follows (Equation 7):

$$\Delta \text{CUDdPA}_t = \sum_{y=1}^{t} \left(\sum_{icl=1}^{icl} AUDPA_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDPA_{fcl,y} * \Delta Ctot_{fcl,t-y} \right) \quad (7)$$

Where:

ΔCUDdPAt: Total change in carbon stock due to unavoidable unplanned deforestation in the Project area in year *t*;

AUDPAicl,y: Unplanned deforestation area in the initial forest class icl in year *t* in the Project area in the Project scenario;

ΔCtoticl,Ac: Loss of carbon stock in the initial forest class icl at the age of change *Ac* (number of years after the change of use and soil cover);

AUDPAfcl,y: Non-forest class area *fcl* in year *t* in the Project area after unplanned deforestation in the Project scenario;

ΔCtotfcl,Ac: Gain in carbon stock in the final non-forest class *fcl* at the age of change *Ac* (number of years after change of use and soil cover).

If there is a significant reduction in the carbon stock due to forestry activities, this reduction will be presented in the verification processes using Table 29 of the Approved Methodology VM0015 version 1.1.

Within the areas of leakage management:

In the Project scenario, no area will be subject to planned carbon stock reduction in the areas of leakage management.

Ex-ante estimate of non-CO_2 emissions due to forest fires

Emissions due to biomass burning will not be computed in this Project.

1.1.4 Monitoring of impacts of natural disturbances and other catastrophic events

Reducing carbon stock and increasing GHG emissions caused by natural disturbances or catastrophic events will be controlled by monitoring the forest cover by satellite using the same methods applied for monitoring the forest cover in the Project area.

The main activities developed by the Project for data collection and processing are:

- Selection of optical satellite images with less cloud cover and date of collection of images near the dry season in the Amazon and appropriate radiometric quality;

- Georeferencing of satellite imagery with scale 1: 100,000 topographic maps or NASA images in ortho-rectified MrSID format;

- Mapping of areas of forest cover reached.

The multiplication of the mapped area of forest loss by the average forest carbon stock will be used to estimate the emissions caused by natural disturbances or catastrophic events. If there is a significant decrease in the carbon stock due to natural disturbances or catastrophic events, this reduction will be reported in the verification processes using Tables 25e, 25f and 25g of the Approved Methodology VM0015 version 1.1.

1.2 Leakage Monitoring

a) Technical description of monitoring tasks

The REDD+ Jari/Pará Project will include two monitoring activities for leakage sources:

- Monitoring the reduction in carbon stocks and/or increase in GHG emissions correlated with leakage prevention measures if project proponents implement activities such as tree planting, agricultural intensification, fertilization, forage production and/or other measures of improvement in agricultural areas and pastures. In case these activities imply a reduction in carbon stocks and/or an increase in GHG emissions in the areas of leakage management, these carbon stock changes and/or GHG emissions will be calculated by Biofílica Investimentos Ambientais.

- Monitoring of forest cover in the leakage belt through satellite imagery will be conducted by Biofílica Investimentos Ambientais.

b) Data to be collected

Table 50. Data to be collected for leakage monitoring for REDD+ Jari/Pará Project.

Data	Description	Unit	Source	Frequency
$\Delta CLPMLK_t$	Decrease in carbon stock due to leakage prevention measures	Tonne of carbon dioxide equivalent (tCO_2e)	Calculated	Annual
$EgLK_t$	Emissions from animals in pastures in leakage management areas in year *t*	Tonne of carbon dioxide equivalent (tCO_2e)	Calculated	Annual
$ELPMLK_t$	Total annual increase in GHG emissions due to leakage prevention measures in year *t*	Tonne of carbon dioxide equivalent (tCO_2e)	Calculated	Annual
$\Delta CabBSLLK_t$	Total changes in carbon stock in the leakage belt area	Tonne of carbon dioxide equivalent (tCO_2e)	Calculated	Annual

c) Brief description of the data collection procedures

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

In order to validate the monitoring of changes in carbon stock due to the activities implemented in the areas of leakage management, the main activities carried out by the Project for data collection and processing are:

– List of leakage prevention activities;

– Production of map showing the intervention areas and type of intervention;

– Recognition of areas where leakage prevention activities have an impact on the carbon stock;

– Non-forest classes existing in these areas in the baseline case will be identified;

– The carbon stocks in the identified classes will be measured or there will be use of a conservative estimation of literature;

– Changes in the carbon stock in the areas of leakage management under the project scenario will be reported using Table 30b of VM0015;

– Calculation of net changes in carbon stock caused by leakage prevention measures during the fixed period of the baseline and crediting period of the Project;

– The results of the calculations will be reported by Table 30c of approved Methodology VM0015.

Monitoring of the carbon stock reduction and increase in GHG emissions due to the leakage displacement:

Monitoring of changes in carbon stock

The processes used to monitor deforestation in the Project area will be the same for data collection (item 1.2 above).

Monitoring the increase of GHG emissions

Emissions due to forest fires are not computed at the baseline.

d) Quality control procedures and quality assurance

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

To be determined according to the activity, if implemented.

Monitoring of the carbon stock reduction and increase in GHG emissions due to the leakage displacement:

The procedures for quality control and quality assurance will be carried out with the same methods used to monitor deforestation in the Project area (section 1.2).

e) Data filing

The original reports and field maps will be stored by the Jari Group. Biofílica Investimentos Ambientais will be responsible for storing during the Project period the original digital data (raster) and processed (vectors) of satellite images, coordinates, technical maps, photos and field cards. Maps with installed infrastructure, satellite images and annual deforestation reports will be made available to the verification body at each verification event.

f) Organization and responsibilities of parties involved on the above points

These activities are the responsibility of Biofílica Investimentos Ambientais and the Jari Group.

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

It is not expected that there will be a decrease in the carbon stock due to the activities developed in areas of leakage management, since no agrarian improvement or management of pasture areas capable of

altering the carbon stock and increasing GHG emissions when compared to the baseline scenario has plans to be implemented. However, should such activities prove necessary, the ex-ante changes in carbon stock and GHG emissions associated with these activities will be estimated in accordance with step 8 of the Approved Methodology VM0015. If the results are relevant, they will be monitored and the data made available to the verifiers at each verification event using Tables 30b, 30c, 31, 32 and 33 of Methodology VM0015 version 1.1.

The following activities in areas of leakage management may lead to a reduction in carbon stock or an increase in GHG emissions:

- Changes in carbon stock from activities implemented in the areas of leakage management;

- Emissions of methane (CH_4) and nitrous oxide (N_2O) from intensification of livestock (involving a change in the animals' diet and/or number of animals).

Nitrous oxide (N_2O) emissions from nitrogen fertilization are always considered insignificant, according to the latest version of the VCS standard. The consumption of fossil fuels is always considered insignificant in AUD of the project activities and should not be considered.

1.2.2 Monitoring of carbon stock decrease and increase in GHG emissions due to leakage displacement

Activity data for the leakage belt area will be produced using the same methods applied to monitoring deforestation in the Project area (item 1.2 above). If there is a deforestation event larger than expected for the baseline scenario during the monitoring process and it is recognized in the leakage belt and deforestation is attributed to deforestation agents in the Project area, the losses in the carbon stock will be accounted for and reported using Tables 22c and 21c of the Approved Methodology VM0015 version 1.1.

The total change in carbon stock from unavoidable unplanned deforestation in the leakage belt area is calculated as follows (Equation 8):

$$\Delta CBSLLK_t = \sum_{y=1}^{t}\left(\sum_{icl=1}^{icl} AUDLK_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDLK_{fcl,y} * \Delta Ctot_{fcl,t-y}\right) \quad (8)$$

Where:

$\Delta CBSLLK_t$: change in carbon stock due to unavoidable unplanned deforestation in the area of the leakage belt in year *t*;

$AUDLK_{icl,y}$: Unplanned deforestation area in the initial forest class *icl* in year *t* in the area of the leakage belt in the Project scenario;

ΔCtoticl,Ac: Loss in the carbon stock in the initial forest class *icl* at the age of change *Ac* (number of years after the change of LU/LC);

AUDLKfcl,y: Non-forest class area *fcl* in year *t* in the leakage belt area after unplanned deforestation in the Project scenario;

ΔCtotfcl,Ac: Gain in carbon stock in the final non-forest class *fcl* at the age of change *Ac* (number of years after the change of LU/LC).

1.2.3 Estimated total ex-post leakage

The results will be demonstrated to the verifiers at each verification event using Table 35 of the Approved Methodology VM0015 version 1.1.

1.3 Ex-post net reductions of GHG gases

a) Technical description of monitoring tasks

In the verification procedures, the results will be depicted using Table 36 of approved Methodology VM0015 version 1.1 along with spatial data (deforestation maps, when available).

b) Data to be collected

Table 51. Data to be collected to monitor the net ex-post GHG gases reductions for the REDD+ Jari/Pará Project.

Data	Description	Unit	Source	Frequency
$\Delta REDD_{,t}$	Reduction of net GHG emissions attributable to Project activities in AUD in year *t*	Tonne of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual
$VCU_{,t}$	Number of Verified Carbon Units (VCUs) to be made available for commercialization in year *t*	Tonne of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual

c) Brief description of the data collection procedures

The calculation of the number of Verified Carbon Units (VCUs) to be produced by the REDD+ Jari/Pará Project activities in year t will be done using equation 19 and 20 of Methodology VM0015 version 1.1.

d) Quality control procedures and quality assurance

All tasks and tools listed in part 2 of the Approved Methodology VM0015 will be used to ensure that the data are suitable for the verification process and the number of Verified Carbon Units is reliable.

e) Data filing

Biofílica Investimentos Ambientais will store all REDD+ Jari/Pará Project data and reports in digital files during the Project. All documents related to Project monitoring will be compiled into paper and/or digital files, and made available to the verifiers at each verification event.

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

These activities are the responsibility of Biofílica Investimentos Ambientais.

2. TASK 2: REVIEWING BASELINE PROJECTIONS RELATED TO FUTURE PERIODS OF BASELINE FIXING

2.1 Updated information on agents, vectors and underlying causes of deforestation

They will be updated and used in the revision of baseline projections after 10-year fixed period, statistical and spatial data, studies and information on agents, vectors and underlying causes of deforestation required to carry out steps 2 and 3 of the Approved Methodology Version VM0015 Monitoring data on sustainable forest management and other activities developed in the Project area will be used where available.

2.2 Adjustment of land-use change and land use component

If, during the next fixed baseline period, any national or subnational baseline becomes available, it will be applied to the next period. If there is no national or subnational baseline available, step 4 of Methodology VM0015 will be redone by considering the 10-year period (2015-2024) and using updated variables on the agents, vectors and underlying causes of deforestation in the reference region. The area of annual deforestation and the location of deforestation at the baseline are the two main components to be revisited.

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

2.3 Adjustment in the baseline carbon component

According to the results generated during the changes in the carbon stock monitoring processes throughout the Project, the spatial estimate of the carbon component can be reviewed in Methodology VM0015 version 1.1, Part 3, item 1.1.3. New techniques can be analyzed for estimating spatial biomass, such as LIDAR or interferometric SAR data.

3.3.5 3.3.3.2 Monitoring Plan of Impacts to the Community and Other Actors

An Initial Monitoring Plan for Impacts to Communities is presented below, and the complete monitoring plan should be completed later and posted on the Internet and communicated to the communities, project proponents, partners and other stakeholders.

a) Technical description of monitoring tasks

The monitoring of benefits to communities presents five components and aims to access the effectiveness of focused interventions: in the engagement of local actors and stakeholders, in the

strengthening of associativism, in the promotion of rural technical assistance, strengthening of the Jari Foundation and improvements in communication and energy systems.

b) Data to be collected

Table 52. Data to be collected to monitor activities.

Component	Data/Parameter	Description	Unit	Source	Frequency
Engagement of actors	No. of Meetings held	Number of meetings with stakeholders held during the reporting period	Number	Meeting minutes, Attendance list, Social activities report	Semester
	No. of Engaged Communities	Number of communities engaged in articulation meetings with stakeholders	Number	Meeting minutes, Attendance list, Social activities report	Semester
	No. of Institutions Engaged	Number of institutions participating in articulation meetings, including those described in the actors involved in the Project	Number	Meeting minutes, Attendance list, Social activities report	Semester
	Status of Referrals	Referral status of guidelines raised and discussed during stakeholder meetings	Does not apply	Meeting minutes, Attendance list, Social activities report	Semester
Strengthening of Associativism	No. of Associations Affected	Number of associations contacted and engaged with the Project	Number	Social activities report	Annual
	No. of New Associations	Number of new associations formalized from Project intervention	Number	Social activities report	Annual
	No. of Cooperatives Affected	Number of associations contacted and engaged with the Project	Number	Social activities report	Annual
	No. of New Cooperatives	Number of new cooperatives formalized after Project intervention	Number	Social activities report	Annual
	No. of Courses and Training	Number of courses and trainings developed by the Projects	Number	Social activities report	Annual
	% of Regularized Associations	Of the total number of cooperatives served by the Project, which percentage is regularized	Number	Social activities report	Annual

	% Regularized Cooperatives	Of the total number of cooperatives served by the Project, which percentage is regularized	Number	Social activities report	Annual
	No. of Action Plans Prepared	Number of action plans prepared by associations	Number	Social activities report	Annual
	No. of Accessed Public Policies and Services	Number of public policies and services accessed by Project communities	Number	Social activities report	Annual
Realization of ATER	No. of Families Reached	Number of families served by the ATER service	Number	Social Activities Report	Semester
	Frequency of Technical Visits	Average attendance of families by extensionist technicians	Average number of visits per month	Advice sheets and social activities report	Semester
	No. of Courses and Trainings	Number of courses and trainings developed within the scope of ATER	Number	Social Activities Report	Semester
	No. of Cultures Developed in the Property	Average of the diversity of agricultural, livestock and extractive uses developed in the limits of rural properties	Number	Advice sheets and social activities report	Semester
	Cultivated Area	Average area per family for agricultural crops and livestock activities	Hectares	Advice sheets and social activities report	Semester
	Access to market	Final spaces for the marketing of products produced in rural properties	Does not apply	Advice sheets and social activities report	Semester
	Family Income	Monthly average income per family, focusing on the participation of agricultural and extractive activities	R$ (Reais)	Advice sheets and social activities report	Semester
Strengthening of Jari Foundation	No. of Contracted Professionals	Number of contracted technicians	Number	Social Activity Reports	Annual
	No. of Courses and Trainings for Professionals	Number of courses and trainings developed within the scope of the foundation's performance	Number	Social Activity Reports	Annual
	Strategic Planning and Fundraising Plan	Quantity of processed products	Does not apply	Social Activity Reports	Annual

	Amount of Raised Resources	Number of signed fund-raising contracts	Number	Social Activity Reports	Annual
	Number of Impact Business Generated	Number of contracts signed	Number	Social Activity Reports	Annual
Energy and Communication	No. of Meetings for Articulation of Projects for Access to Energy	Number of meetings held	Number	Social activities report	Annual
	No. of Public Policies and Services Accessed for Energy Generation	Number of electricity public policies and services accessed by Project communities	Number	Social activities report	Annual
	No. of Cellular and/or Internet Antennas Implanted	Number of cellular and internet antennas in operation	Number	Social activities report	Annual

c) Summary of the data collection procedure

The data will be collected during and after the activities with stakeholders and/or through specific interviews. This information will be systematized and presented through reports of social activities of the Project, every six months.

d) Quality control and assurance procedures

The data collected and portrayed in the reports will be presented and validated during the technical chamber meetings, for which the affected producers, associations and cooperatives will be invited to participate as members throughout the project life cycle.

e) Data filing

All data and reports produced by the REDD+ Jari/Pará Project will be stored by Biofílica Investimentos Ambientais through digital archives during the Project life cycle. Original (physical) reports, meeting minutes and field records produced will be stored by the Jari Foundation in the execution of social activities. Biofílica Investimentos Ambientais will maintain a copy of these documents in digital format throughout the Project. All documents related to the monitoring of the REDD+ Jari/Pará Project will be gathered in physical and/or virtual archives and made available to the verification body in each verification event.

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

All monitoring activities are the responsibility of Biofílica Investimentos Ambientais and the Jari Foundation in the execution of social activities.

3.3.6 3.3.3.3 Monitoring Plan on Biodiversity Impacts

The biodiversity-related monitoring plan aims at implementing the assessment of the local community of flora and fauna in the face of management practices and forest integrity. For the flora, the monitoring plan includes the remeasurement of permanent plots with a frequency of 5 years, in order to evaluate the forest dynamics (recruitment rates, mortality, species substitution) and variations in the carbon stock. For the fauna, it is planned to implant two annual campaigns, one per semester so that seasonal variations, such as the presence of migratory species and reproductive periods, are considered. Regarding the AHCVs, the verification of the adopted measures effectiveness to maintain and improve them is already incorporated within the described tasks.

a) Technical description of monitoring tasks

Data and parameters to be collected are in section 3.3.2 – *Data and Parameters Monitored* of this document.

b) Data to be collected

An annual monitoring will be carried out for the parameters related to the impacts of the Project activities. The parameters associated to the survey of fauna will be collected at least twice a year (summer and winter). This information will be systematized and presented through fauna monitoring reports related to a monitoring year, previous to each verification event.

During the studies will be collected the data of the relevant species. This information will be systematized and presented through fauna monitoring reports related to a monitoring year, previous to each verification event.

c) Quality control and assurance procedure

The quality control procedures associated with data collection will depend on the internal procedures of the organization responsible for the field surveys of each study.

The surveys based on ethnozoology will be presented and validated during meetings with stakeholders, from which surrounding communities will be invited to participate as members throughout the project life cycle.

d) Data filing

All data and reports produced by the REDD+ Jari/Pará Project will be stored by Biofílica Investimentos Ambientais through digital archives during the Project life cycle. Original (physical) reports and field records produced will be stored by the organizations responsible for the field surveys and/or the Jari Group. Biofílica will keep a copy of these documents in digital format throughout the Project. All documents relating to Project monitoring will be gathered in physical and/or virtual archives and made available to the verification body at each verification event.

e) Organization and responsibilities of the parties involved in the above

All monitoring activities are the responsibility of Biofílica Investimentos Ambientais, of the collaborating organizations in biodiversity studies and of the teaching and research institution to participate.

3.3.7 Dissemination of the Monitoring and Results Plan (CL4.2)

It will be through the website of Biofílica Investimentos Ambientais that the monitoring plan, as well as its results obtained will be available to the public. Statements of relevant and summary information addressed to communities and stakeholders will be transmitted through the REDD+ Technical Chamber and visits by Foundation technicians to rural communities.

3.4 Optional Criteria: Benefits of Adapting to Climate Change

Does not apply. This project is not intended to be validated for the Gold Level of this section.

3.4.1 Regional Climate Change Scenarios (GL1.1)

Does not apply.

3.4.2 Impacts of Climate Change (GL1.2)

Does not apply.

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

Does not apply.

4 COMMUNITY

4.1 Scenario of the Communities in the Absence of the Project

4.1.1 Description of Communities at the Beginning of the Project (CM1.1)

Historical social transformations in the territory

The occupation of the Jari Valley can be defined by several different moments. The first is related to the indigenous occupation by various ethnic groups, such as Waiãpi, Aparaí, Wayana, Tiriyós, Katxuayana, Karanã, Kastumi (the last two are already extinct), among others. These people who lived in the region practiced hunting, fishing and the use of forest resources as a survival mechanism.

The European occupation of the municipality of Almeirim (PA), municipality of the communities involved in the Project, began between 1634 and 1637, when the Captaincy of the North Cape was granted to Bento Maciel Parente (MORAES & MORAES, 2000). It has two different versions. The first indicates as a historical landmark the construction of a fort by the Dutch in a village called Paru and the second attributes the origin of the municipality to the Capuchin Friars of Santo Antônio who built the

village of Paru as a catechesis area for the Indians of the region (IBGE, 2005; SEPOF, 2008). In 1758, the village acquired category of Town, being called Almeirim. However, in the time of Independence, it became extinct.

As reported in the Environmental-Economic Diagnosis of the municipality of Almeirim-Pará (IFT, 2010), in 1985, Almeirim was the scene of the Cabanagem movement, being invaded and almost totally destroyed. With the advent of the Republic, in 1890, it regained the category of Town and in the same year it gained the one of Municipality. However, in 1930, the municipality was extinguished, being its territory annexed to Prainha, but returning the old position in the same year (UFPA, 2008). According to the territorial division of the State of Pará, in 1936, Almeirim was presented subdivided into four districts: Almeirim, Boca do Braço, Santana do Cajari and Santo Antônio do Caracuru. In the administrative formation of Almeirim, since 1983, through State Law No. 5075, of May 2, the district of Monte Dourado was created and annexed to the municipality of Almeirim, thus being in territorial division dated 18/08/1988, the municipality is made up of 3 districts: Almeirim, Arumanduba and Monte Dourado, remaining in this way since that date (IBGE, 2005; SEPOF, 2008).

The cultural manifestations of the municipality are characterized mainly by the performance of religious festivities in honor of several saints, most notably the feast of the saint patroness of the city, Nossa Senhora da Conceição, held in December, and of São Benedito, held in June. The two events are practiced by the society of Almeirim with great devotion, with the execution of novenas, procession and camp feasts (SEPOF, 2008). Also outstanding are the dança do gambá (possum dance), carried out by the Castro family for more than 100 years, which are remnants of quilombos residents in the municipality. In addition, the municipality stands out regionally as musical, artistic and football crib. Every year, in August, the Art and Culture Fair of Almeirim – FEARCA is held, being the largest party in the city, attracting thousands of visitors from all over the region. Two other important dates are the birthdays of the district of Monte Dourado and the municipality of Almeirim. (IFT, 2010)

The agricultural and extractive culture is well preserved, and the second is more representative, highlighting the historical and cultural relationship, for mastery and appropriation of knowledge on ecosystems and low-impact activities on the environment. In this way, although Almeirim's society yearns for the change in the local scenario for development, it is in favor of maintaining the reproduction of historical social traditions. In this context, the rural communities maintain the tradition of important events, which are the festivals of chestnut, golden bream, shrimp and acarí. (IFT, 2010).

Contemporary features of the territory

Currently, according to estimates published in the Official Gazette of the Union, the population living in 2014 in the municipality of Almeirim is 33,466 (thirty-three thousand, four hundred and sixty-six) inhabitants, maintaining between 1991 and 2014 a population between 30,000 and 34,000 inhabitants. The municipality has an area of 72,960 km² (IBGE, 2011) and is located in the physiographic zone of the Lower Amazon. Despite an increase in the urbanization rate in the municipality between 2000 and 2010,

from 55.7% to 59.4%, the rural population is still quite significant, accounting for 40.6% in the 2010 IBGE demographic census (Figure 24).

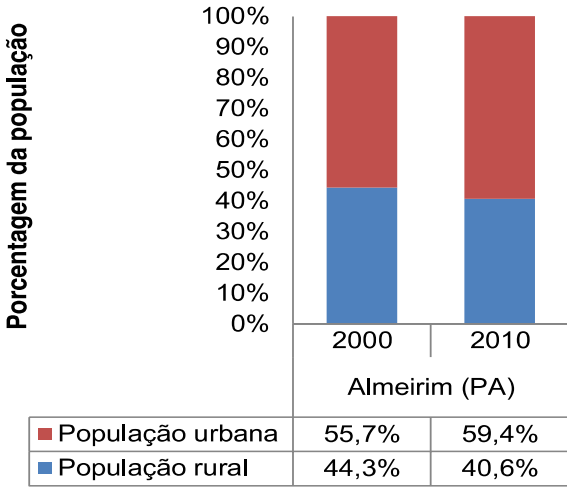


Figure 23. Evolution of population percentage in the municipality of Almeirim.

The Demographic Census also shows a predominantly young population (up to the age of 20) and economically active, mostly male, as shown in Figures 25 and 26.

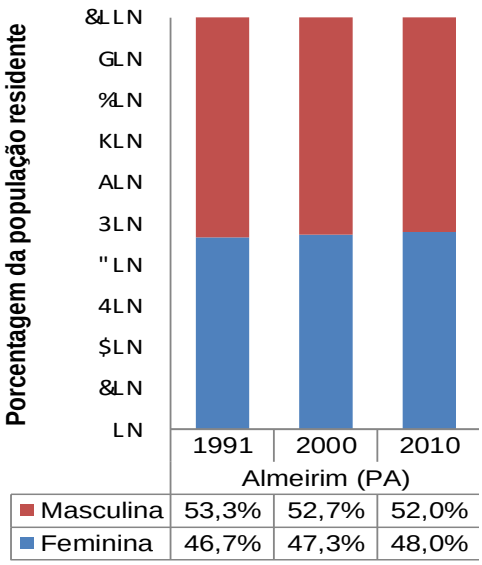


Figure 24. Percentage of the resident population by gender in the municipality of Almeirim. Source: Atlas of Human Development, 2013.

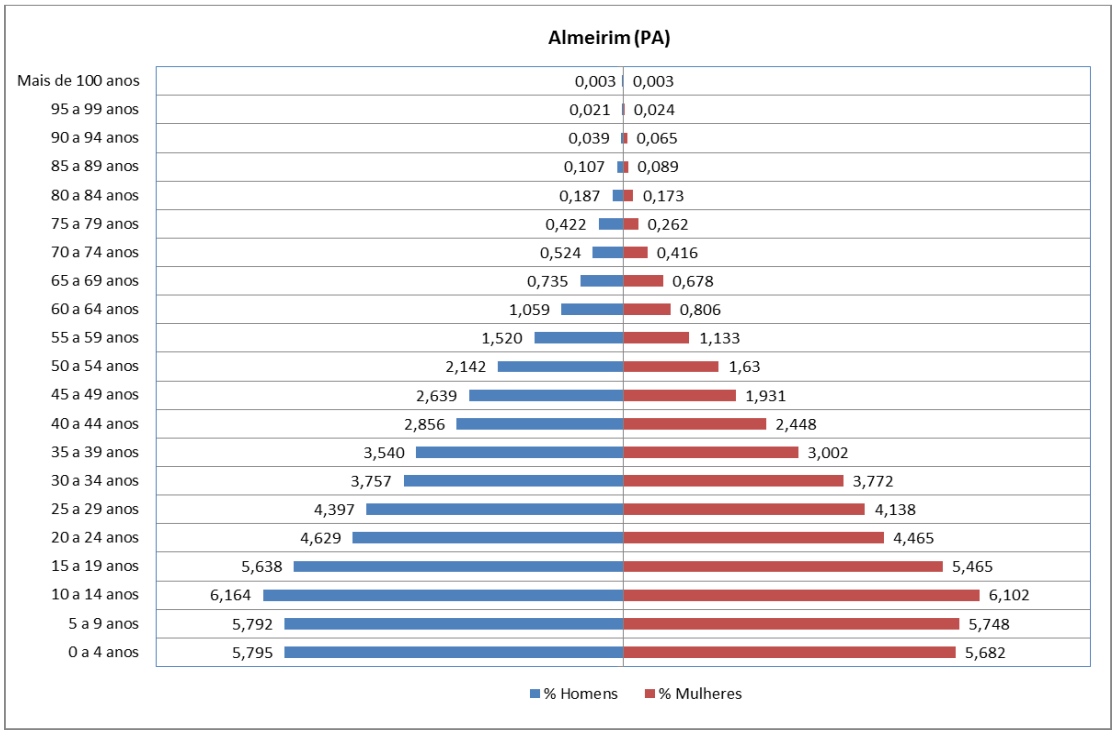


Figure 25. Age pyramid for the municipality of Almeirim in 2010. Source: IBGE **–** Demographic Census 2010.

The municipal Human Development Indexes in Almeirim were categorized as low, while the index in Brazil is classified as medium. The most problematic indicator in the municipality is education, which is very low, and the most favorable to the HDI is the indicator of longevity, reaching the very high category (Table 53).

Table 53. Human Development Indexes for the municipality of Almeirim in relation to income, longevity and education.

	IDHM		Renda		Longevidade		Educação	
	2000	2010	2000	2010	2000	2010	2000	2010
Almeirim	0,526	0,642	0,66	0,659	0,733	0,809	0,3	0,497
Brasil	0,612	0,727	0,692	0,739	0,727	0,816	0,456	0,637

Source: Atlas of Human Development, 2013. United Nations Development Program, 2012.

Education rates, in the calculation of the HDI, were the worst when compared to longevity and income. However, despite being a low index, there is a significant evolution in schooling, a decrease in illiteracy and early school dropout in the years studied (Figure 27).

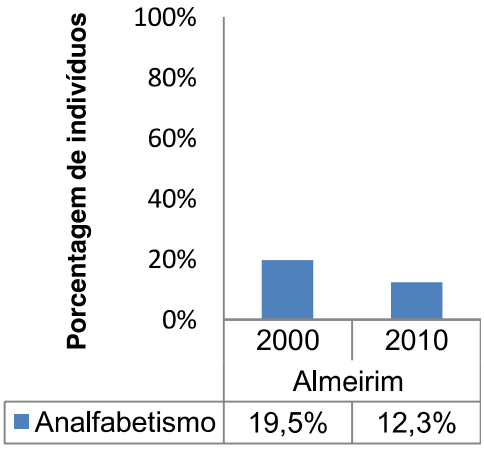


Figure 26. Illiteracy rate of persons aged 15 years or over. Source: IBGE – Demographic Census 2000 and 2010.

In the Jari Valley region, all municipalities have primary and secondary schools, and Almeirim registers the largest number of educational establishments, followed by Laranjal do Jari and, lastly, Vitória do Jari (Figure 28).

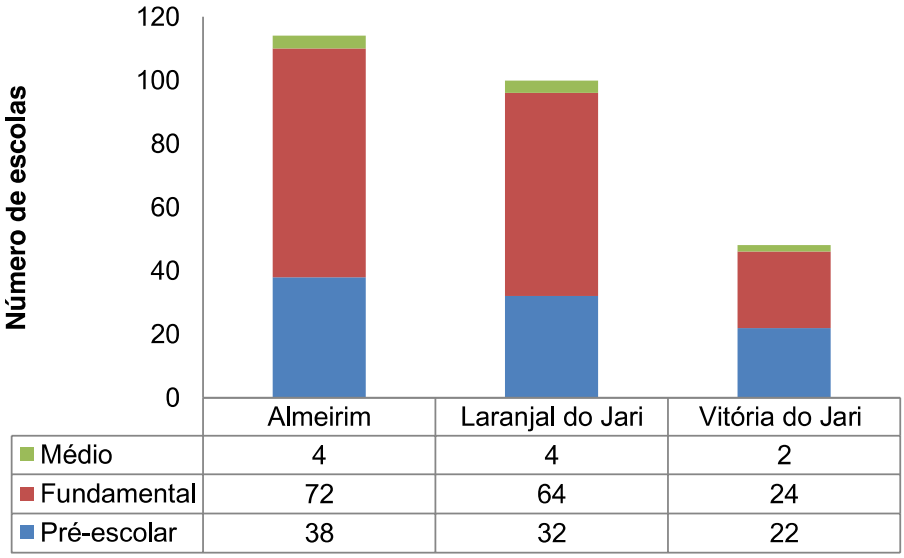
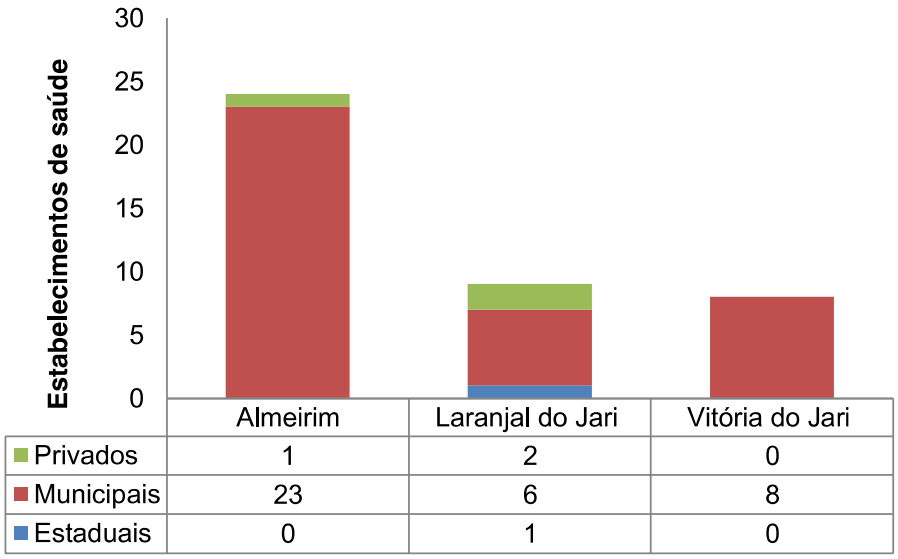


Figure 27. Number of schools per level and municipality in the Jari Valley region in 2012. Source: IBGE, 2012.

As for health, all the municipalities of Jari Valley have public health facilities, Almeirim and Laranjal do Jari also have private establishments. The great majority is municipal, and only Laranjal do Jari has a state health establishment (Figure 29).



	Almeirim	Laranjal do Jari	Vitória do Jari
Privados	1	2	0
Municipais	23	6	8
Estaduais	0	1	0

Figure 28. Health establishments in the municipalities of Jari Valley in 2009. Source: IBGE, Medical Health Care 2009. NOTE: Zeros are attributed to the values of municipalities where there is no occurrence of the variable or where, by rounding, the totals do not reach the unit of measurement.

Almeirim accounts for more than double the number of health facilities compared to Laranjal do Jari and Vitória do Jari, being mostly municipal.

According to data from the National Register of Health Establishments (CNES, 2010), in Almeirim there are 3.6 hospitalization beds per 1,000 inhabitants, and the values of Laranjal do Jari and Vitória do Jari are much lower, 0.9 and 0.7

Almeirim has 42 doctors, all attending the Unified Health System (SUS), 1.3 professionals per 1,000 inhabitants (Table 54). Only the two physiotherapists of the municipality do not attend the SUS. Of the three municipalities is the only one that does not have a social worker or speech therapist. Almeirim has the best nursing auxiliary ratio per 1,000 inhabitants (2.0).

Table 54. Health professionals According to selected categories in the municipality of Almeirim, 2010.

Category	Total	Serves the SUS	Does not serve SUS	Professional per 1,000 inhabitants	Professional SUS per 1,000 inhabitants
Doctors	42	42	-	1.3	1.3
Anesthetist	5	5	-	0.2	0.2
General surgeon	6	6	-	0.2	0.2
General Clinic	16	16	-	0.5	0.5
Gynecologist Obstetrician	4	4	-	0.1	0.1
Family's doctor	3	3	-	0.1	0.1
Pediatrician	3	3	-	0.1	0.1
Psychiatrist	1	1	-	0.0	0.0
Radiologist	2	2	-	0.1	0.1
Dental surgeon	3	3	-	0.1	0.1
Nurse	15	15	-	0.5	0.5

Physiotherapist	2	-	2	0.1	-
Speech Therapist	-	-	-	-	-
Nutritionist	1	1	-	0.0	0.0
Pharmaceutical	2	2	-	0.1	0.1
Social Worker	-	-	-	-	-
Psychologist	1	1	-	0.0	0.0
Nursing assistant	62	62	-	2.0	2.0
Nursing Technician	20	20	-	0.6	0.6

Source: CNES, 2010.

Regarding to the economy of the Jari Valley region, and in the case of the Gross Domestic Product (GDP), the services sector plays an important role in the region, resulting from a predominantly urban population, being one of the main sectors of employment, representing the largest part of GDP, followed by industry and agriculture (Figure 30).

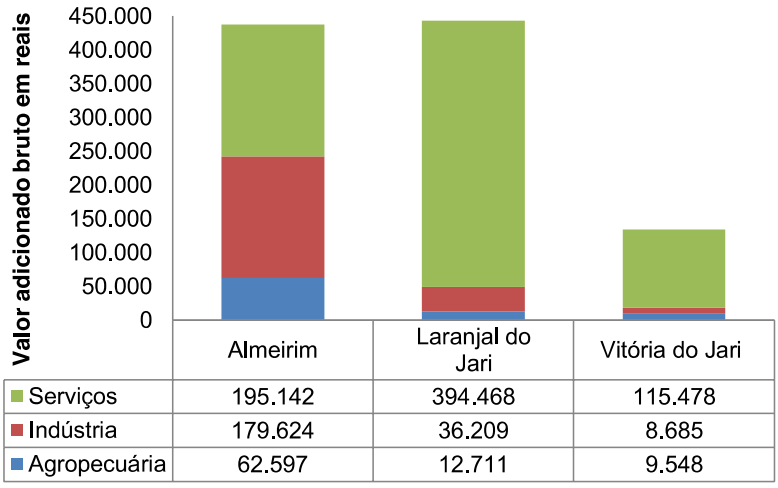


Figure 29. Gross Domestic Product of Almeirim, Laranjal do Jari and Vitória do Jari in 2012. Source: IBGE, in partnership with the State Statistical Bodies, State Secretariats of Government and Superintendence of the Manaus Free Trade Zone SUFRAMA, 2012.

The highest value of the total GDP is in Laranjal do Jari (R $ 443,388.00), followed by Almeirim (R $ 437,363.00) and Vitória do Jari (R $ 133,711.00, approximately 30% of the GDP of other municipalities). The sector of the industry is representative mainly in the municipality of Almeirim, where the agroindustrial pole of Jari Celulose is located, and where the three sectors (services, industry and agriculture) are more balanced, with less expression of the agricultural sector. In Laranjal do Jari, the services sector represents approximately 89% of total GDP, in Vitória do Jari 86.3% and in Almeirim 44.6%.

According to data collected in the 2010 Environmental Socioeconomic Diagnosis document, in Jari Valley, urban centers present their economy based on the tertiary sector, where the clothing, footwear and food trade is strong. In the secondary sector, there is a strong influence of the large

companies that operate in the region, CADAM PPSA, Jari Celulose, Orsa Florestal and the companies outsourced by them. In rural communities, as well as the data from this document and the evidence collected in the field, the primary sector prevails, and in some communities the production of agricultural crops prevails, while other communities have a more extractive or agroextractivist profile, standing out in the first cassava production and its processing in flour, and in the second, the predominant chestnut extraction. No extensive livestock breeding was observed.

Contemporary characteristics of communities of practice

The REDD+ Project's communities have as a common characteristic the development of small-scale agricultural activities, mainly based on the cutting and burning itinerant system, where the forest is felled and burned. Burning ashes provide nutrients for crop cultivation for one to two years, when productivity drops dramatically and new areas need to be opened for clearing. The main crops are cassava for the production of flour, rice, corn and beans. Fruticulture sometimes occupies open areas not more fertile for grazing, with banana and cupuaçu being the main types of permanent crop identified in the analyzed areas.

The main income-generating activities in each community were characterized based on the data collected during the primary data collection stage, of which agriculture, horticulture, extractivism and daily payment predominate. Some of the families still have government benefits (Table 55), as shown in the table below.

Table 55. Means of obtaining income by community.

Means of obtaining income	Nova Vida	Braço	Bandeira	Cafezal	Recreio	Serra Grande
Agriculture	52%	27%	57%	42%	69%	75%
Extractivism	48%	27%	29%	47%	23%	0%
Horticulture	0%	46%	14%	11%	0%	0%
Daily	13%	11%	22%	44%	83%	0%
Government Benefits	63%	56%	67%	78%	83%	0%
Eucalyptus	0%	0%	0%	0%	8%	25%

Source: Family Diagnosis REDD+ Jari/Pará Project.

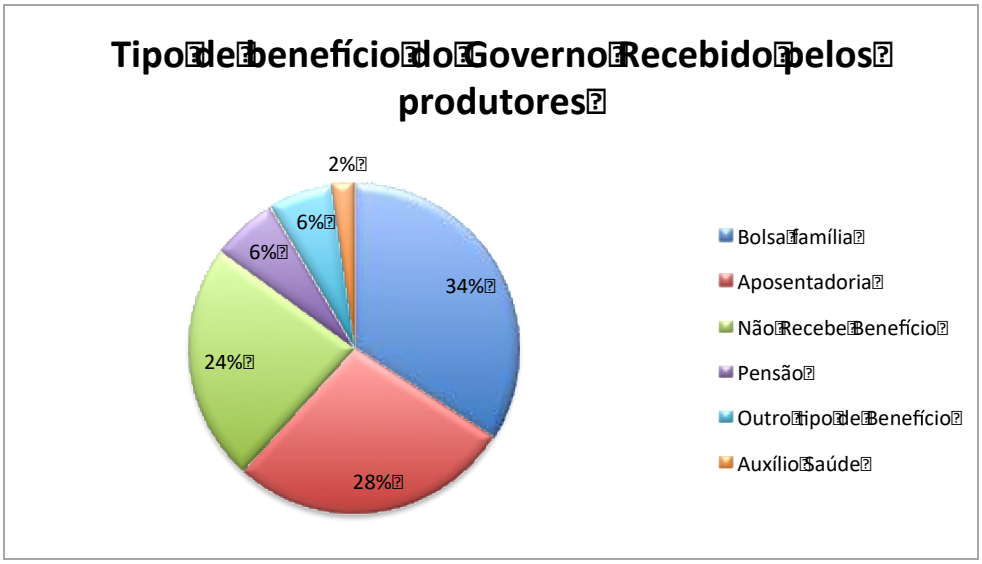


Figure 30. Type of government benefit received by producers. Source: Family Diagnosis REDD+ Jari/Pará Project.

The data collected did not allow to estimate an average of the annual income of families, due to the high volatility of the income, associated to the difference in the types of crops produced or extracted and the amounts acquired by each one.

With the purpose of characterizing the communities at the beginning of the Project in terms of welfare, social, economic and cultural diversity and making it possible to monitor the benefits of the Project to the communities, Biofílica Investimentos Ambientais interviewed 42 producers in 2018 through the Family Diagnosis of the REDD+ Jari/Pará Project. The main results of the Family Diagnosis show that the majority of the producers are migrants from Pará and Maranhão, are between 50 and 69 years of age and have lived in the region for 10 years at most. It is also noticed that the great majority of the producers served are men for historical and cultural reason, as these state themselves as income providers and women are charged with the function of caring for the well-being of the family and the functioning of the house (Figures 32 and 36).

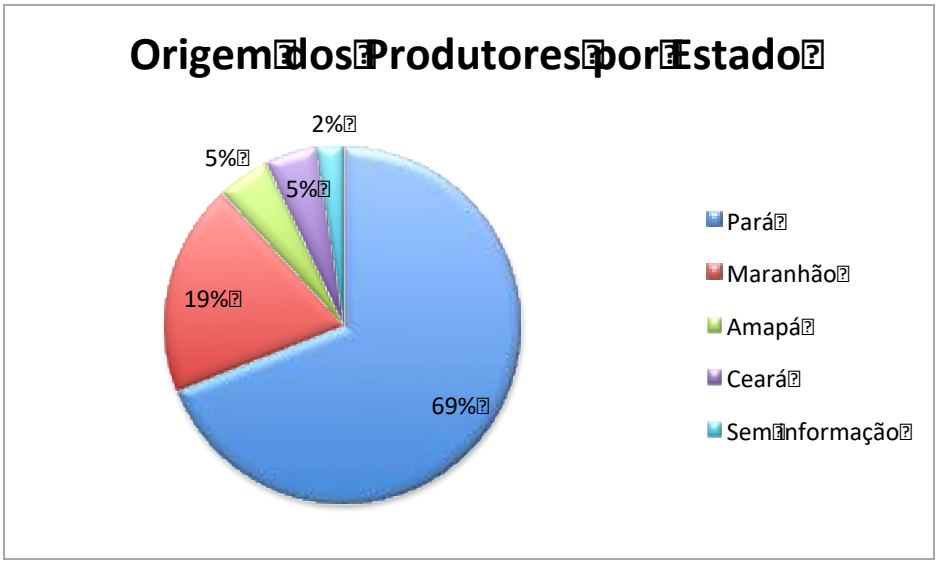


Figure 31. Origin of producers assisted by state. Source: Family Diagnosis REDD+ Jari/Pará Project.

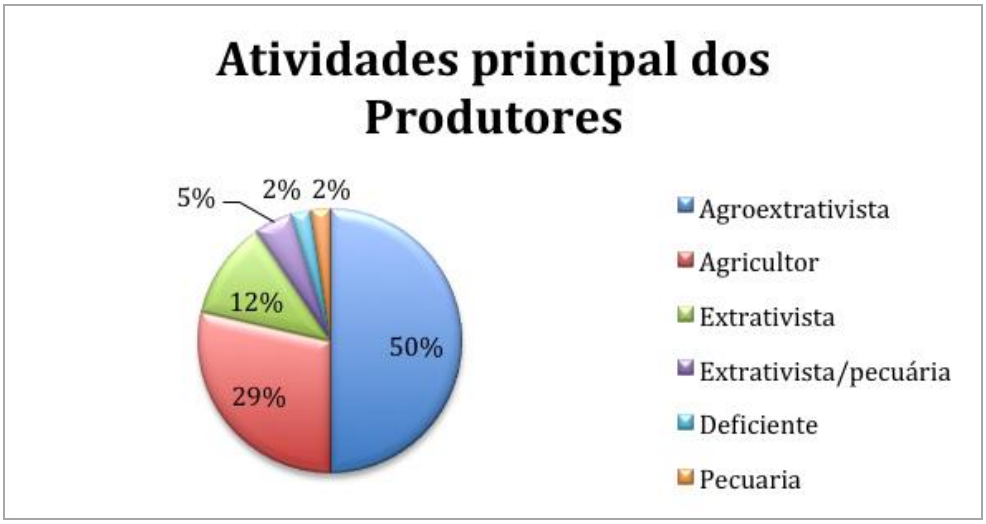


Figure 32. Main activity of producers assisted by state. Source: Family Diagnosis REDD+ Jari/Pará Project.

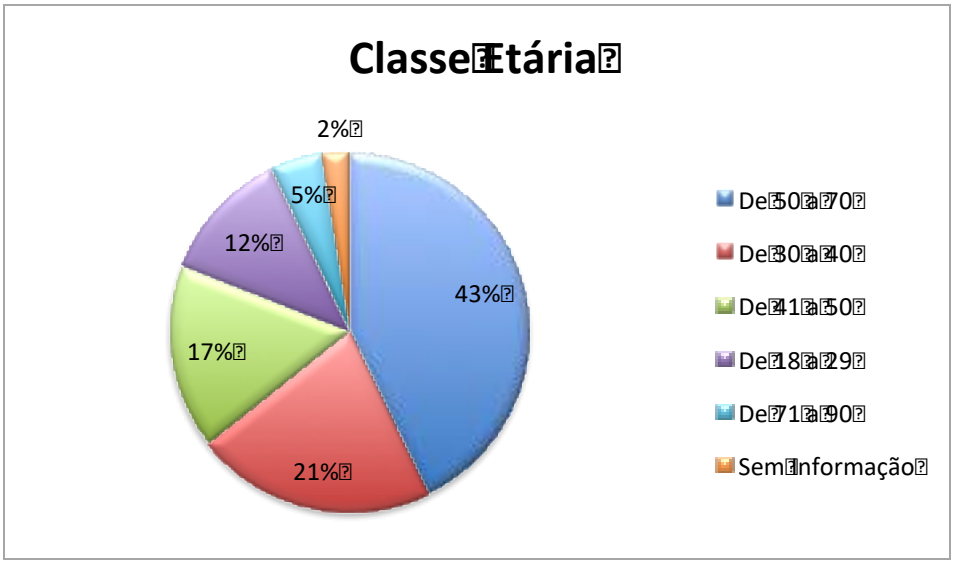


Figure 33. Age group of producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

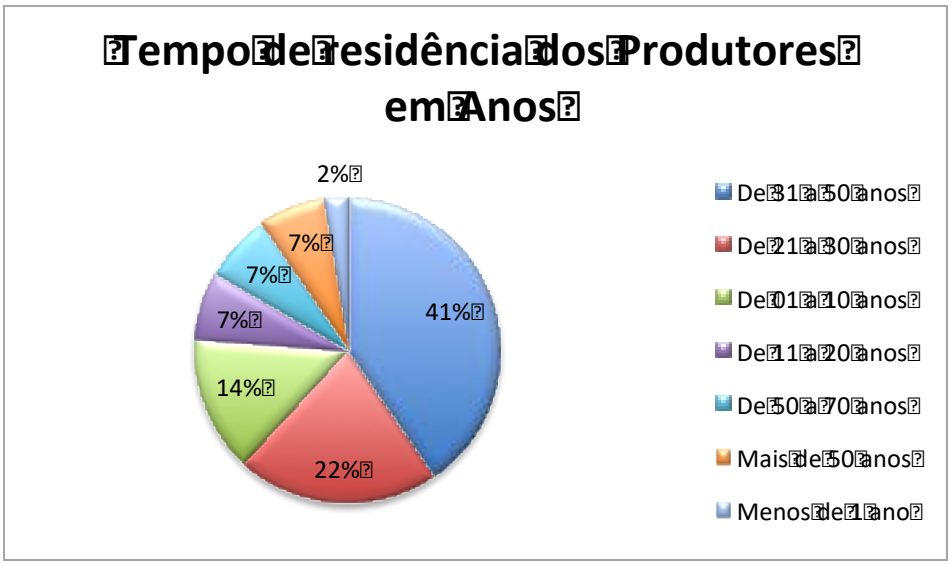


Figure 34. Time of residence in the region of the producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

Figure 35. Gender distribution of producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

Regarding the occupation of the soil, they have an area ranging from 1 to 400 ha (Figure 37), the income from the production of the areas originated 49% of the activities of agriculture and 41% of the extractivism, having as main agricultural product the manioc flour and extractivist the açaí and the chestnut (Figure 38).

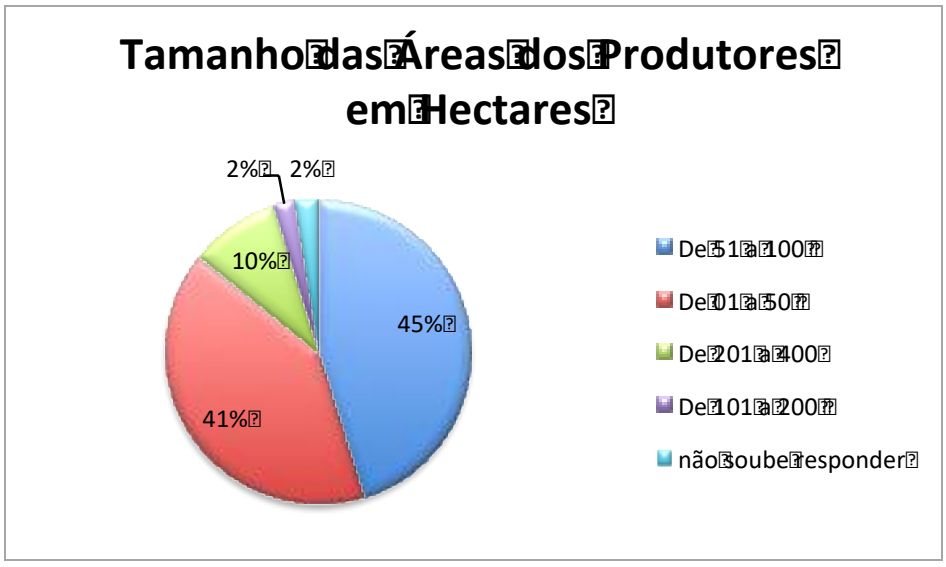


Figure 36. Average size in hectares of the properties areas of the assisted producers. Source: Family Diagnosis of the REDD+ Jari/Pará project.

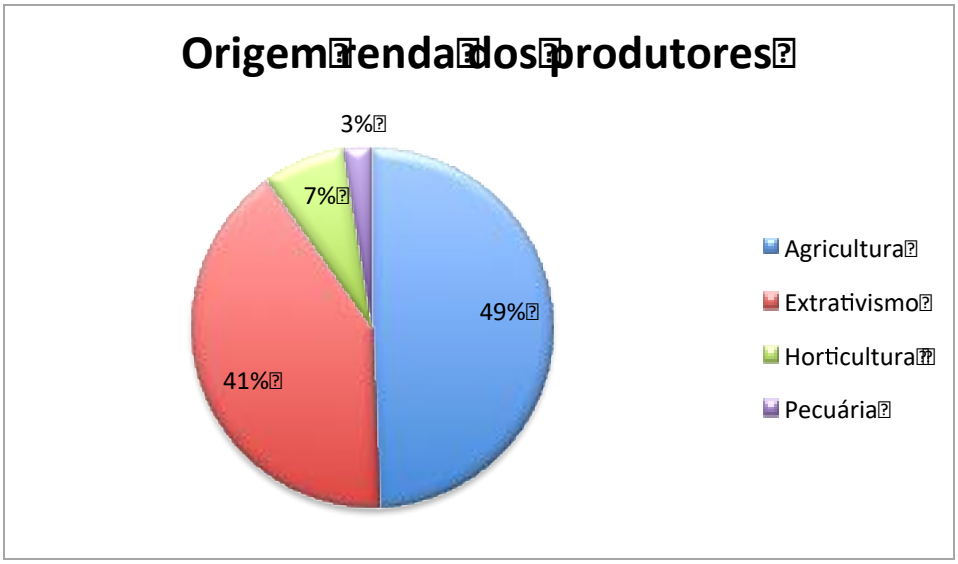


Figure 37. Source of families' income. Source: Family Diagnosis of the REDD+ Jari/Pará project.

Regarding the species produced, agriculture is characterized predominantly as monocultural from the cultivation of manioc and/or cassava, in which among the crops produced has a weight of 33% when united the production of flour that is the main by-product of the crop. Consortium agricultural production is not common, but when it happens it is on a small scale and is basically linked to the plantation of corn and beans, where in most cases they are cultivated for subsistence only. In the fruit category, four main species were identified, banana, cupuaçú, orange and cocoa. However, it is worth mentioning that usually in the existence of fruit cultivation the family producer grows only one of the species mentioned. The only forest species cultivated is eucalyptus, which occurs as a result of the development program developed by the Jari Foundation (Figure 39).

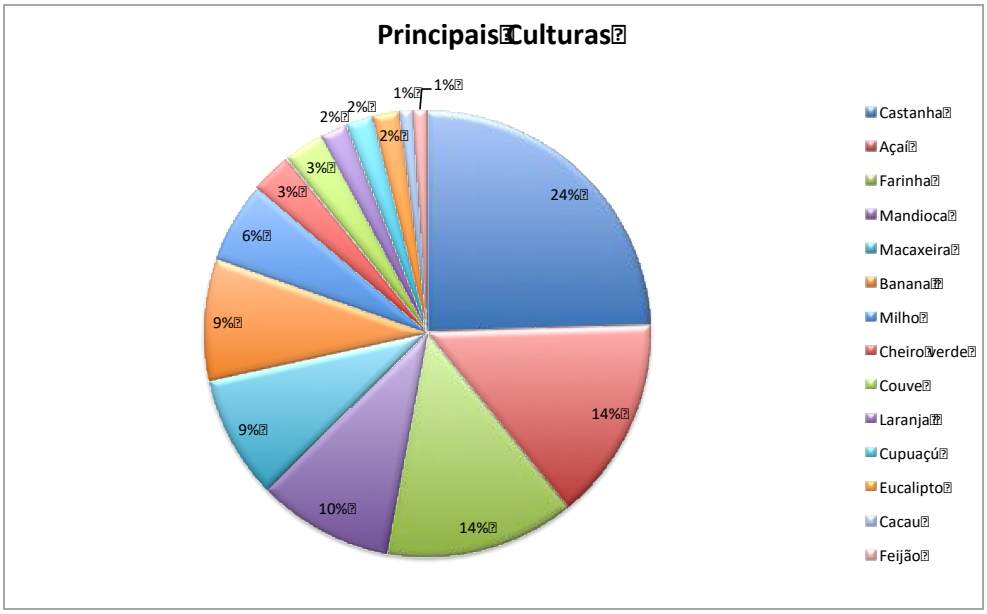


Figure 38. Main crops developed by the producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

In sanitary/health matters, the majority of families receive a health worker visit at least once a month and have as main sanitary installation, the septic tank (Figure 40 and Figure 41). The most common diseases in the communities are the flu, diarrhea and insect bites. Household waste is destined for burning, in most cases.

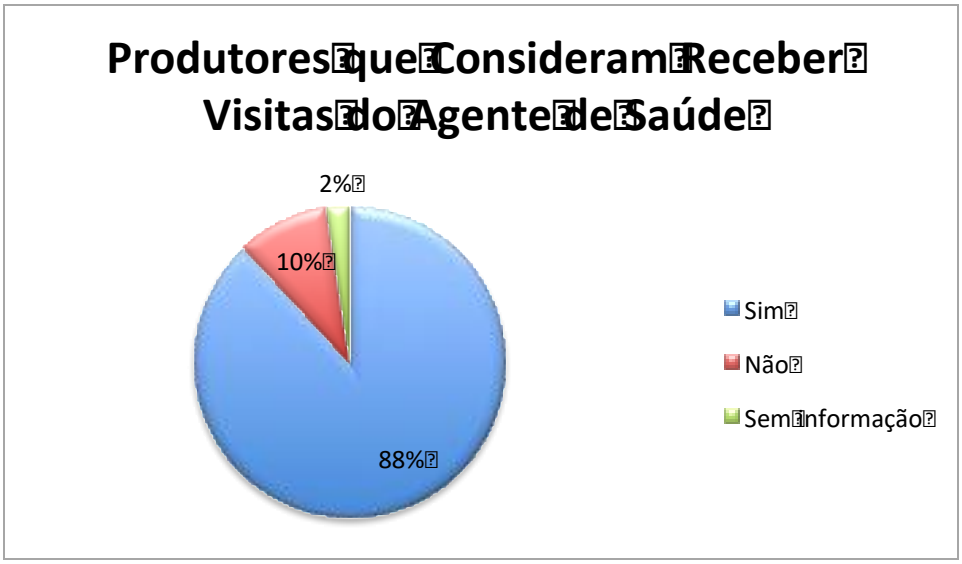


Figure 39. Receipt of visits of health agents to producers advised by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

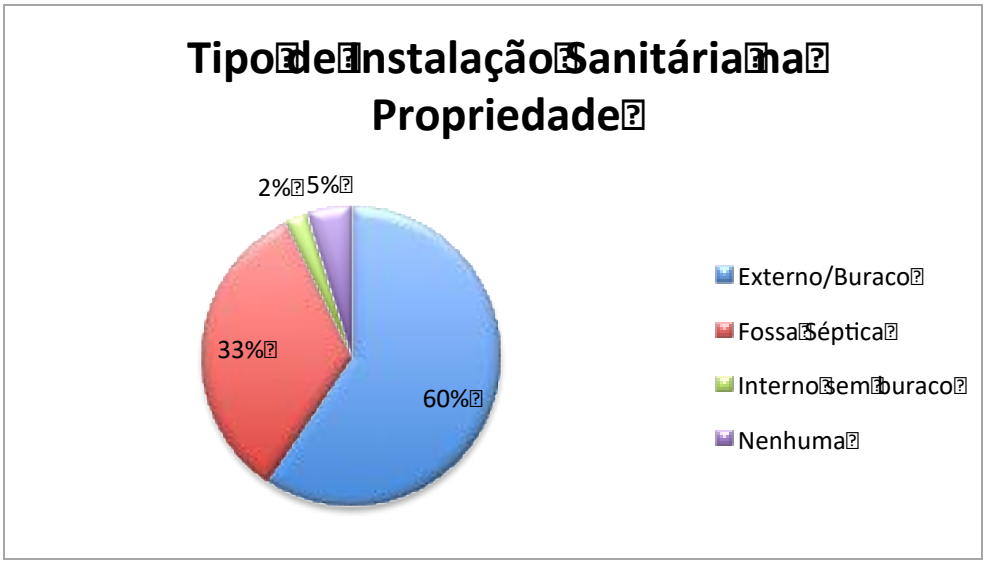


Figure 40. Sanitary installations in the residences of the producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

The question of water suitable for human consumption shows that communities have reasonable supply and treatment conditions, close to 50% of households have well water and a little more than 70% are treated with hypochlorite (Figure 42 and Figure 43).

Figure 41. Water sources of the producers advised by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

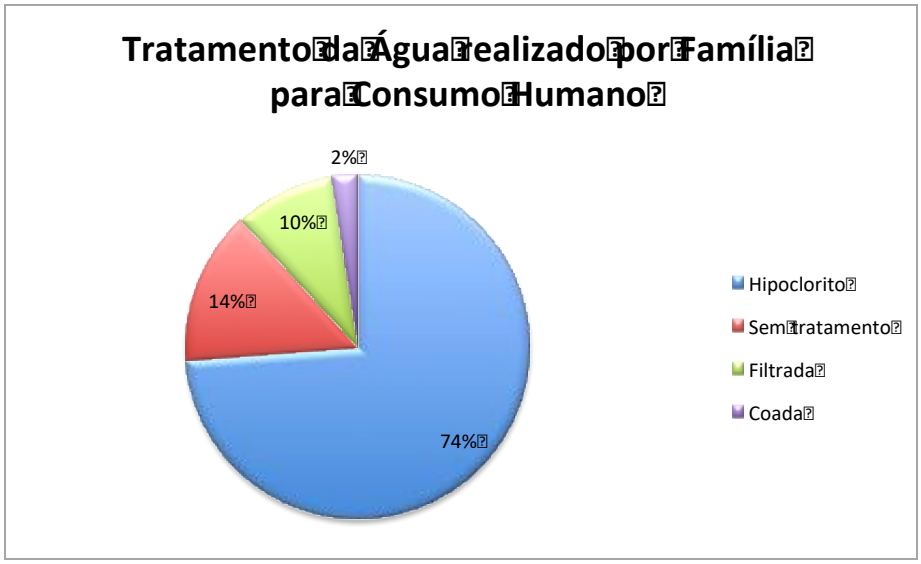


Figure 42. Water treatments used by the producers advised by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

Well-being conditions in these communities are associated with the provision of public services, such as education, health and transportation. The transport conditions are incipient, there is no frequency of public transportation, making it difficult for the families to move and to sell their production. The energy consumed is still an issue to be solved, 60% still does not have public energy service (Figure 44). Regarding education, the analysis is median, although 80% of the communities have a school, the level of education goes until elementary school (Figure 45 and Figure 46).

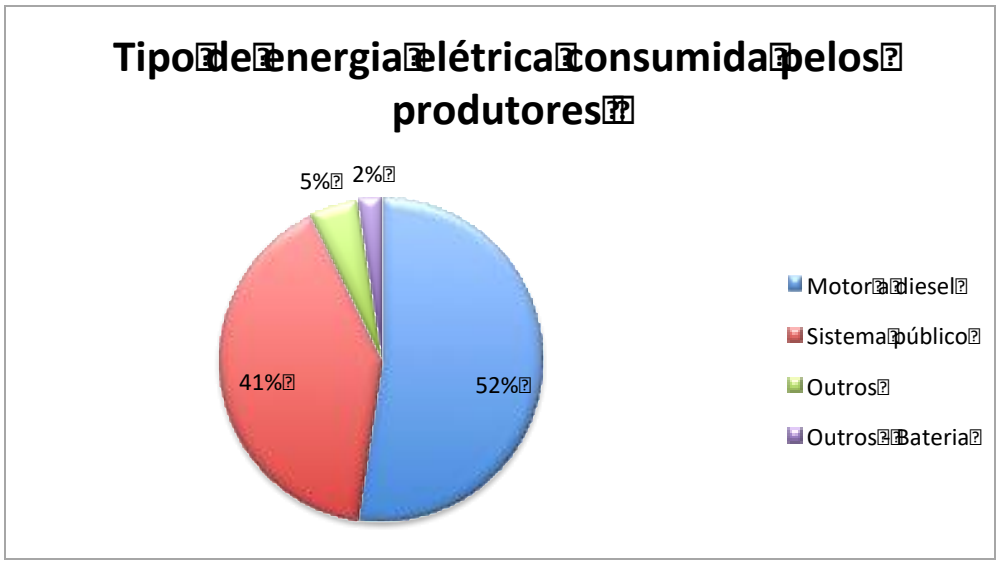


Figure 43. Type of energy used by producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

Figure 44. Access to school by producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

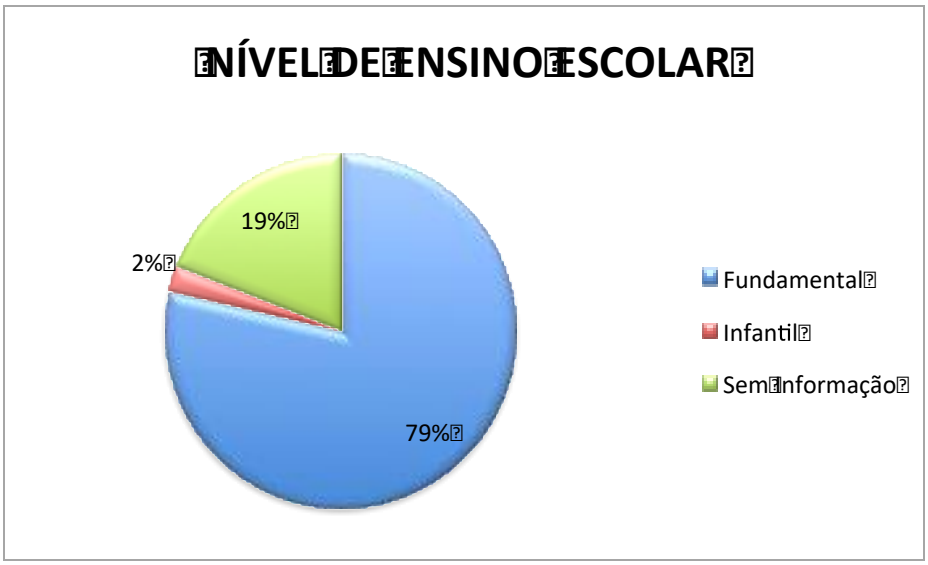


Figure 45. Level of school education in the communities of producers assisted by the Project. Source: Family Diagnosis of the REDD+ Jari/Pará project.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

The project will be developed within three community nuclei, comprising a total of seven communities, which within the nucleus observe a good interaction between communities and community groups. This interaction occurs due to the geographic proximity between them, so the relationship of the outer distant communities of the nuclei is considered incipient and/or superficial due to the geographic distance and the absence of common activities to be carried out jointly by the communities. The REDD+

Jari/Pará Project may provide for the proximity and interaction between communities and community groups.

4.1.3 Attributes of High Value for Conservation (CM1.2)

The High Conservation Values (HCV) concept was developed by the Forest Stewardship Council (FSC, 1996) for the certification of timber products from responsible forest management, according to standard Principles and Criteria that reconcile environmental and ecological safeguards with social benefits and economic viability (FSC, 2014).

According to Jennings et al. (2003), an area with HCVA represents a natural or managed area with exceptional values or critical importance, meeting the objectives of conservation of biodiversity, rare ecosystems and areas with relevant social and cultural functions.

Within the context of the socio-economic context of the REDD+ Jari/Pará Project, some cultural, historical and relevant aspects are discussed for local traditional communities, which may characterize High Conservation Values Area, which must be identified and managed in order to guarantee their maintenance and improvement (BROWN et al., 2013). From the six listed criteria, two of them are directly related to traditional populations:

HCVA5: Key areas and resources to maintain the basic needs of local communities (subsistence, food, health, water, etc.);

HCVA 6: Areas of special cultural, archaeological or historical significance, nationally and globally, and/or of cultural, ecological, economic or religious/sacred importance to local communities.

So far two High Value Areas have been identified within the scope of Jari's forest management enterprise. One of them corresponds to an area of Cerrado, which was identified as of exceptional importance due to its small expressiveness in a landscape with predominance of dense ombrophilous forests. This area presents HCVA 3 (rare ecosystems and habitats), so it will be addressed in more detail in the Section Biodiversity.

The other HCVA identified in the Project area is a spring located near the Vila do Planalto, which provides a resource that is fundamental to the needs of the local community (HCVA 5) and is in a critical situation (HCVA 4), with a compromise of its integrity due to the intense chemical weathering process favored by the terrain slope and very concentrated rainfall events, as described in a document presented by the Jari Group (2015). Details of this high conservation value area can be seen in Table 56 below.

Table 56. Identification of the area of high conservation value in the REDD+ Jari/Pará Project area.

High Conservation Value	The spring of the Vila do Planalto, which is in a critical situation (HCVA 4) and is fundamental for local communities (HCVA 5).
Qualification Attribute	Area of little more than 10 hectares in the surroundings of the spring with function of protection of the natural vegetation responsible for the geological stabilization and maintenance of the quality of the water that is destined to supply the local community, being fundamental for their subsistence (Figure 47).
Focal Area	Protective measures such as signs and land inspection are carried out with the aim of reducing possible negative impacts (e.g., deforestation, degradation and forest fires). The monitoring of the maintenance of the High Value is carried out from surveys to verify the structural integrity of the habitat in the surroundings of the source and the analysis of the quality of water produced in the place.

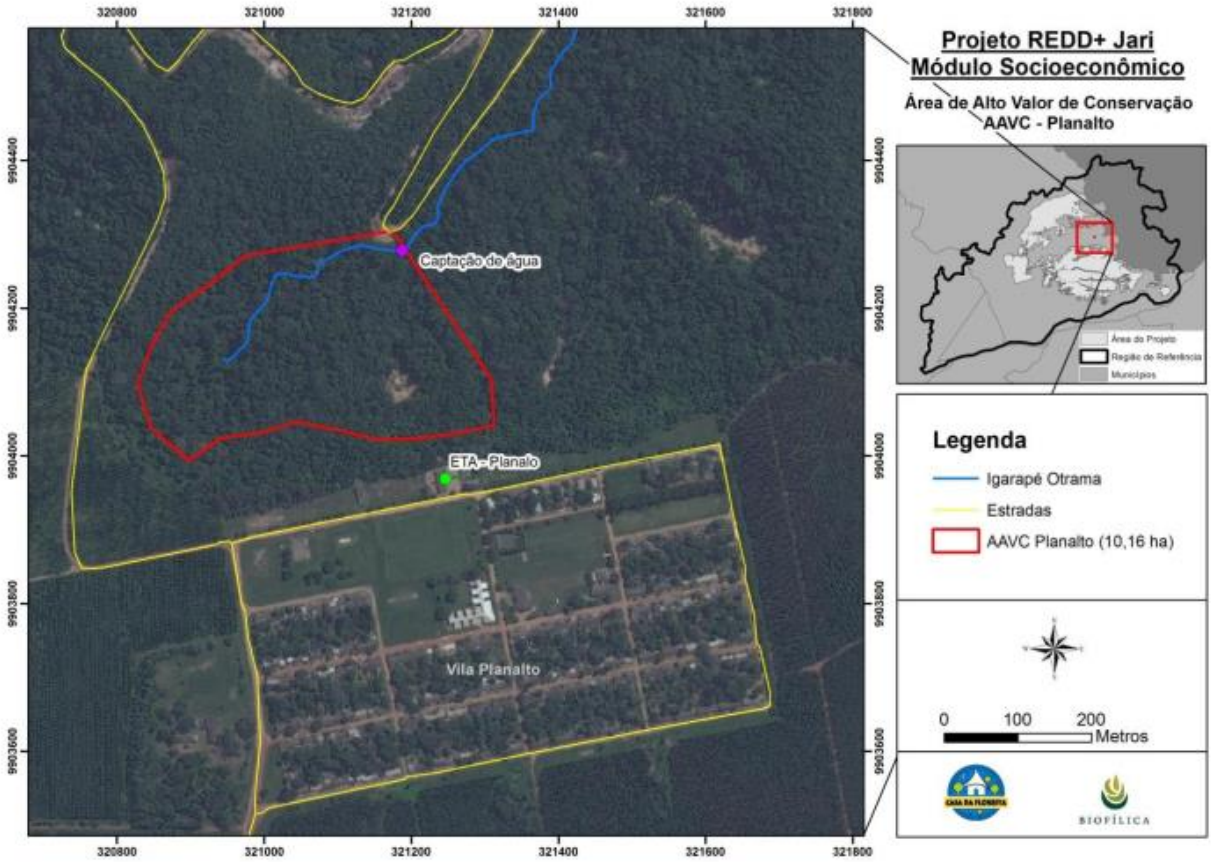


Figure 46. Detail for the location and delimitation of the HCVA Spring of Vila Planalto (Source: Casa da Floresta, 2016).

According to the data collected in the field, it is suggested to consider the potential of high conservation value HCVA 5, of the areas used by the communities for the extractivism of chestnut. Chestnuts are used as a priority income source for at least 50% of the communities that will be involved in the Cafezal, Recreio and Nova Vida Project. According to reports, the extractivists have used them for at

least 50 years, becoming for these communities, besides the main income generating activity, a traditional activity that has already become a culture for the region. A fact that proves this relationship with the culture of the chestnut production is the festival held annually in the Cafezal community, which mobilizes the whole community in the organization of the event with gastronomy and cultural presentations all aimed at the use of the chestnut.

It should be noted that, according to the traditional occupation of the REDD+ Jari/Pará Project region, the 98 communities identified and recognized in the area develop their main commercial and subsistence bases in small-scale agricultural activities, such as cassava production and flour production and the extraction of non-timber products, such as chestnut and açaí, for at least half a century. This context suggests an intrinsic relationship between these communities and the tropical forest and their resources, which represents the occurrence of HCVA 5 and HCVA 6 in other localities in the Project area.

Studies with communities in tropical forests converge revealing the importance of non-timber products to forested and periforested human populations, contributing significantly to daily life, either as food supplements (fruits, roots, hunting, condiments), medicinal products, for the construction of houses, furniture, handicrafts and utensils, as well as representing a prominent role in family income and socioeconomics, both locally and regionally, as well as for international markets (LESCURE, 2000; EMPERAIRE, 2000; LÓPES et al., 2004).

In the Recreio community the producers mentioned the existence of the Cachoeira do Panama, it is suggested to analyze if it characterizes a HCVA 6 because it is considered an area of special cultural significance.

4.1.4 Scenario in the absence of the Project: Community (CM1.3)

The current scenario of the territory presents socioeconomic indicators, which characterize a region with low socioeconomic well-being conditions and few productive economic alternatives, these circumstances contribute to leave the families in a situation of vulnerability in the search for better living conditions. Therefore, these factors can be considered as potential causes that lead to deforestation in the REDD+ Jari/Pará Project communities.

Within the communities, we highlight the following vectors:

- **Low income parameters**: the factors that lead to low income in families are due to the limitation of the productive activities developed, presenting low productivity, lack of better production techniques, low diversification, difficulties in the outflow of production, as well as access to the consumer market;

- Low level of education: the communities involved in the project have a relatively low level of education, 57% of the producers have not completed elementary school;

- Developed activities: the agricultural and livestock activities carried out by the producers are developed with the lack of technologies and good productive practices, a fact that contributes to deforestation. In agriculture, the production system used is the cutting and burning system, in which

producers every two or three years, due to the infertility of the soil, have the need to open new areas and carry out the burning, to start a new cycle Livestock, despite the low scale, is still done in a conventional way with the opening of large areas for grazing. Despite the low incidence of interviewed producers practicing this activity, it was verified from the interviews that some of the producers are interested in the opening of areas for pasture, a factor that is a great motivation for deforestation;

- Low social organization: the need for access to public policies and the guarantee of exceptional rights in communities is a fundamental factor in the search for socioeconomic well-being for families, and this is based on a good political and institutional articulation. However, the communities involved have a low level of social organization, which weakens the local conditions of search for these fundamental rights, such as access to education, communication, energy and health. Of the producers interviewed, 50% participate in some community organization, the other 50% do not participate or do not have an organization that represents them. It is worth mentioning that of the existing organizations, only one showed a certain level of social organization, the others showed latent weaknesses in both management and recognition by producers.

According to this information, we can affirm that adverse socioeconomic conditions stimulate illegal economic activities, such as the predatory extraction of non-timber forest products and forest products, leading to a series of negative impacts on the ecological processes of the forest and the depletion of natural resources of interest (ASNER et al., 2009).

It was also confirmed that extractive activities are the basis of subsistence for many rural communities in the region, but there is no satisfactory data available on this management, which represents a unique gap in assessing whether these activities occur predatorily or not. It was found that despite planning for the time for harvesting and organization of the producers for collection, there is no planning for the areas to be collected or for the productive scale. Bioecological studies of exploited species, such as population dynamics, phenology, genetics and gene flow, among others, are necessary to analyze the renewal, and consequent sustainability, of resources exploited over time, as well as the adequacy of forest management (BENSUSAN; ARMSTRONG, 2008; EMPERAIRE, 2000; SEBBENN et al., 2000).

Finally, we can consider within the scope of the Project that agriculture represents the greatest potential vector of deforestation. The activity has low yield in production and has been demanding ever larger areas, which requires attention on the part of the actions directed to the rural development and the combat to the deforestation, to increase the yield per hectare without the necessity of the opening of new areas. It is also possible to foresee an increase in the areas destined to livestock, considering the interest of the producers and considering the increase of the effective herd and of the urban food demand and habits.

Given the exposed situation, we can predict two possible scenarios for deforestation in the project reference region (Table 57). Scenario 1 represents the continuity of the *status quo*, without the REDD+ Project, leading to increasing pressure on forest resources and consequent increase in deforestation.

Scenario 2 highlights actions aimed at socioeconomic development based on the REDD+ Project, which are likely to mitigate impacts on forest resources and avoid deforestation in the region.

The REDD+ Jari/Pará Project actions that stimulate the increase and improvement of income, especially in the rural area from agriculture and sustainable extractive practices, are essential to achieve the goals of reducing emissions by deforestation and degradation, enabling the maintenance of families in the rural area and an increase in the supply of properly produced food.

It is necessary to stimulate the search for actions that can contribute to the development of public policies focused on education, access to energy and communication. The education of the rural and urban population is essential to optimize forest knowledge and management, as well as guarantee better income and employment conditions. In addition, education is an important tool for the population to participate more in political spaces and decision-making on natural resources.

Another important measure for the success of these actions is community empowerment, based on strengthening and consolidating social organizations, aiming at the integral and effective participation of community members in decision-making, implementation and management of local socioeconomic development projects, contributing to the management of risks associated with rural activities and the improvement of socioeconomic aspects by the community members themselves.

Table 57. Relationship between vectors, agents, underlying causes of deforestation and scenarios with and without the REDD+ Jari/Pará Project.

Potential vectors of deforestation	Situation found	Deforestation agents	Underlying Causes of Deforestation	Scenario 1 (without REDD+)	Scenario 2 (with REDD+)
Economy and Income	Low income levels, most of the producers are unemployed and dependent on government programs	Population with insufficient income to meet basic needs	Lack of policy principles for socioeconomic development, as well as ATER programs for communities	Demand for domestic resources pressures the forest natural resources due to increased unplanned agroextractivist activities	Activities aimed at the generation of income and jobs and incentives for sustainable practices in the management of forest resources such as the pressures on the forest
Education	Low level of schooling and difficulties in access to secondary education	Uninformed population with low levels of schooling	Lack of Public Policies for Education	Increase in illegal logging activities due to low formal education and consequent difficulty in getting jobs	Activities aimed at education, technical and professionals courses and incentives for sustainable practices in the management of forest resources reduce illegal activities
Agriculture	Low productivity. Increase in areas for agriculture	Small-scale, expanding farmers	Population increase and urbanization increase demand for food	Demand for food in the urban environment and low agricultural productivity motivates the conversion of forest areas into agriculture	Increased agricultural productivity, agro-ecological production techniques and strengthening of production marketing channels prevent the conversion of forest areas into agriculture.
Livestock	Low-scale livestock production and remained constant during the period	Extensive stockfarming cattlemen	Population increase and urban eating habits demand higher meat production	Increased demand for meat and low pasture productivity lead to the conversion of forest areas into pasture	Implementing good livestock practices increases productivity and prevents new areas from being converted to pasture
Extractivism	Basis of subsistence for rural communities. Scarcity of official data on the management	Small scale extractivists	Domestic and international market demand	Predatory extractivism negatively impacts the forest (timber and non-timber resources)	Improvements in traditional management practices, studies on ecology, production and management of forest species and control of the productive chain avoid environmental degradation and allow socioeconomic gains with sustainable extractivism
Social Organization	Absence or fragility of community social organizations	Producers with difficulties in accessing public policies and with levels of access to essential basic rights below expected	Lack of public policies focused on socioeconomic development and education	Demand for better conditions of housing, communication and energy increases the need for producers to leave the community encouraging the rural exodus	Activities that promote social organizational strengthening, facilitate access to existing public policies, avoid rural exodus, and keep families in their territories

Source: DSEA REDD+ Jari/Pará Project

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The guarantee of access to a positive scenario and the good progress of the Project demands a rural development agent, with expertise and capacity to attend to the needs of the families. Currently, this role is assumed by the Jari Foundation, actions for its strengthening are planned, with a view to maintaining and expanding its operations, visualizing a more positive scenario for the Project.

Therefore, it is concluded that the most probable scenario for the communities in the absence of the Project would be the continuity of the chain of events that leads to deforestation, such as low levels of income, little diversification of production combined with low productivity, difficulty in accessing public policies, among others, due to the lack of action of the Jari Foundation, which carries out actions to promote well-being and economic development in the communities. The unfeasibility of the Foundation's activities would result in the continuity of the problems encountered in the communities, such as:

- Small producers with little access to public policies;
- Low social organization;
- Development of shifting agriculture of low technology, profitability and productivity;
- Absence of specialized rural technical assistance;
- Lack of access to communication and energy.

In this scenario, considering no significant improvement in public management models, the tendency would be for the rate of deforestation to continue unaltered or increase and thus the socioeconomic context shown above would remain stagnant or worsen due to the demographic increase and the increase in pressures on the deforestation hidden causes.

In the event of a catastrophic scenario, it is possible that the situation of the Project communities will deepen the indicators of deterioration in the following:

a) **Social**: continuity of levels of education, health, energy, communication, living conditions, and other infrastructures, in an incipient way;

b) **Economic**: stagnation and decrease in family income, agriculture and alternatives to promote diversification and verticalization of production, production outflow;

c) **Environmental**: degradation of forests and water sources, accumulation of residues, potentiating of illegal logging, and looting of existing natural resources;

d) **Associative**: weakening and absence of representative entities, in view of the high demand for the strengthening of social organizations.

Such a condition presented in this scenario may result in rural exodus, that is, the departure of the inhabitants to the cities, where there is a risk of marginalization due to the low labor absorption conditions in the Jari Valley.

The stagnation of the educational level and information related to the guarantee of rights is also directly related to the current use of land. Poverty favors inadequate sanitation facilities and access to health infrastructure would remain inadequate in communities.

In the scenario with the presence of the REDD+ Jari/Pará Project, communities are perceived with increasing levels of socioeconomic conditions, reaching levels of development from their production until access to public policies that ensure the continuity of families in communities, avoiding rural exodus. In addition, with the Project and from the strengthening of the Jari Foundation, a process of innovation is created to develop a strategy of a business structure of social impact, generating a favorable business environment economically, environmentally, and socially sustainable.

4.2 Positive Net Impacts to Communities

4.2.1 Expected Impacts to Communities (CM2.1)

The impacts of the Project were estimated based on the analysis theory of changes and causal relationships between activities, results and consequent impacts proposed by Richards and Panfil (2011), detailed in Table 10 of this document.

Impacts to the communities described below include benefits, costs, and risks, including those related to social, cultural, environmental, and economic aspects; the following items present issues related to impacts for communities.

Direct impacts

The opportunities that the Project will provide to the communities will generate a chain of direct impacts such as:

- Producers trained in better production techniques;
- Access to technical assistance and rural extension services directed to the reality of each community;
- Creation of new spaces of participation generating opportunities of direct communication with other interested parties;
- Qualified information about access to public policies;
- Access to training in agroforestry and agricultural techniques;
- Access to management, leadership and finance training;
- Generation of an institutional environment favorable to the generation of new businesses;
- Strengthened social organization;
- Communication with new markets;
- Increased knowledge and skills in agroforestry systems, agricultural production and REDD+;
- Environmental awareness in waste management;
- Knowledge in fire control and management techniques.

Indirect impacts

Empowerment of resource management, access to information on global trends, increased self-esteem and confidence, greater access to local public policies, greater opportunities for access to credit (loans), conscientiously used natural resources, rural community settlement and consequent reduction of rural exodus and urban marginalization, mitigation of risks of extreme climatic events, access to energy in desirable quantity and quality, increased availability of food, approximation and dialogue with public agents.

Costs

No significant cost is expected from community groups, only the time that producers should invest in the development of activities is considered as a cost to communities.

Potential risks

The risks to the described communities are mainly related to the lack of interest of other stakeholders, for example, governmental institutions in participating in Project activities, coming from outsiders, reducing the supply of natural resources (hunting and non-forest wood products).

One of the potential risks that the Project could cause to the well-being of the Community Groups is related to the increase in the number of local populations that migrates to the Project area in search of the benefits generated by the Project in the course of its execution. However, this population movement and related impacts are not expected, since only communities that are already established and consolidated in the area can participate in the activities of the Project. In addition, territorial patrols and land monitoring are conducted by Jari Group teams to avoid new land invasions and deforestation.

Any other negative impact of the Project is not expected because participation in Project activities is voluntary and the Project does not impose any restrictions on land use to established rural communities. Among the rural communities not served by the Project, no negative impact is expected, as they will also not be subject to any type of land restriction, nor will be contained to change their way of life.

4.2.2 Mitigation of Negative Impacts to Communities (CM2.2)

As mentioned in the section above (section 4.2.1 - *Expected Impacts for Communities*), the REDD+ Jari/Pará Project does not provide negative impacts to the well-being of local communities. Some potential risks are identified as a lack of interest from other stakeholders and an increase in the number of local people due to migration to the Project area.

In order to mitigate these risks, some measures can be taken to consolidate the involvement of all parties involved in the decision-making processes of the Project activities in the Technical Chambers and

DRP Workshops, as well as to improve already existing communication tools. Another mitigation measure to minimize the risks of invasion and increase in the number of people in the region is through the expansion of land surveillance and territorial patrols.

For maintenance and improvement of the High Value Area for Conservation (HCVA), protection measures such as signs and land inspection are carried out. The monitoring of the HCVA is carried out from surveys to verify the structural integrity of the habitat in the surroundings of the spring and the quality analysis of the water produced in the place.

4.2.3 Net Positive Welfare for Communities (CM2.3, GL1.4)

The REDD+ Jari/Pará project proposes a socioeconomic development process for the communities involved in the Project, focusing in particular on social strengthening, through the consolidation of local social organizations and the provision of a differentiated ATER with a focus on diversification, increase and production commercialization, associated to activities with social and environmental focus. To this end, training and direct training for producers will be carried out through participatory strategies with the joint construction of knowledge and the most appropriate techniques for the communities, maximizing the results to be obtained and continuously involving producers in management.

In the scenario without Project, as described in item 4.1.4 – *Scenario without Project*: *Community*, the lack of public policies and the context of low income cause the communities of the Project area to seek more favorable alternatives to increase income from increasing land use in an unplanned way. Another problem in the current scenario is inefficient and unprofitable agriculture and difficulties in market access that result in difficulties for the welfare of people living in these communities.

The REDD+ Jari/Pará Project proposes to consolidate a plan for socioeconomic development focused on strengthening social organizations, improving productive processes with the provision of rural technical assistance, strengthening the Jari Foundation and facilitating the community communication system.

The Project aims to create opportunities for communities with the following net positive impacts:

1. Involvement of local actors in participatory management models to assist them in the empowerment of local management, through the participation of local technical chambers' meetings;

2. Facilitate the aggregation of community social capital. in the quest for social organization, based on the search for collective commitments with a view to guaranteeing essential basic rights;

3. Facilitate access to public policies in order to guarantee public goods and services in the context of the strengthening of social and third sector organizations, trade unions, companies, and communities;

4. Opportunity to develop business chains of social impact, through rural technical assistance,

training and research and facilitation of access to markets;

5. Improve community energy and communication systems by bringing them into contact with the world.

The main problems that will be addressed in this context are:

- Low access to public policies;
- Low social organization;
- Family farming with low rates of diversification, productivity and profitability;
- Absence of specialized ATER;
- Difficulties of access to the market for products from extractivism and agriculture.

In addition to the positive impacts, the Project, working on aspects of associative strengthening, improvement of family agriculture, provision of technical assistance and improvement in energy and communication systems, is intended to influence social issues and the living conditions of communities around the Project area, in order to reduce social vulnerability and rural exodus, providing families with an improvement in the quality of life and income stability allowing families to obtain goods and services that promote economic and social well-being.

4.2.4 Protection of High Conservation Value Attributes (CM2.4)

So far, during the preliminary assessment conducted with the DSEA (socioeconomic and environmental diagnosis) studies, no impacts were identified on high conservation value attributes related to social issues (AHCV 5 and 6). However, if these are to be identified at some future time, measures must be taken to ensure that there are no negative net impacts to the attributes. However, attention is requested to the Chestnut Trees, the management of these species should be implemented to ensure the continuity of their production.

Brazil nut deserves special care, since, along with other non-timber forest products, such as copaiba and andiroba, they have an importance as a source of income for local traditional communities. For this reason, any valuable tree species to support communities must be protected. And, in addition to the commitment of the Jari Group, Brazil nut is still protected by Brazilian federal law (Federal Decree No. 5.975 of November 30, 2006), and felling this tree would constitute an illegal activity.

As mitigation, the main "castanhais" (areas with high concentration of chestnut trees) must be identified with the support of the Jari Foundation.

During the planning phase and the forest inventory a census is carried out prior to harvesting, where all "tree of social interest" is mapped, especially Brazil nut, copaiba and andiroba. This allows the forestry team to plan the harvest without damaging the trees of interest to the communities and during harvesting, signs and warnings are distributed at the site of the operation and surrounding communities are advised. There is no access restriction for local communities (only for outsiders), but the signs and

warnings are extremely important to avoid risk.

For the REDD+ Jari/Pará Project area, the areas with the region's chestnut sites have been mapped (Figure 48).

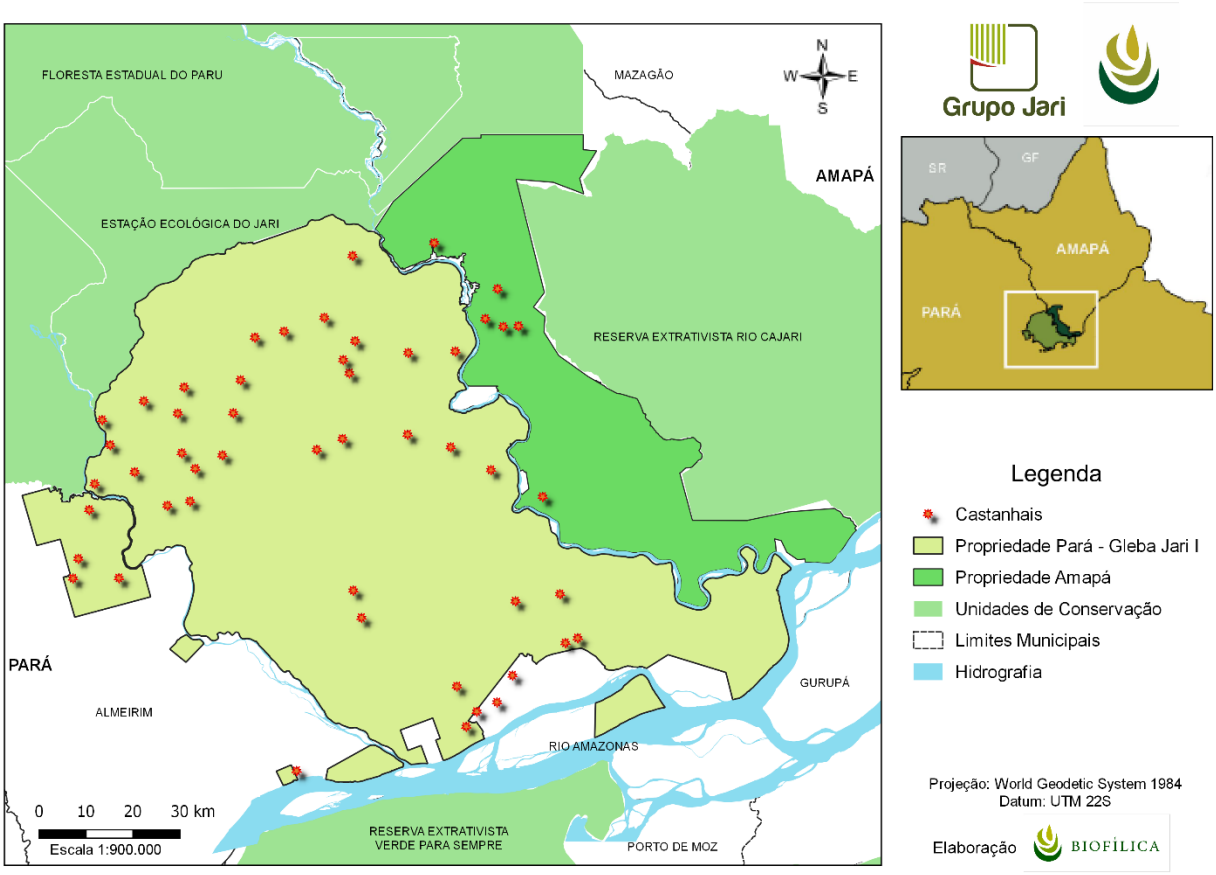


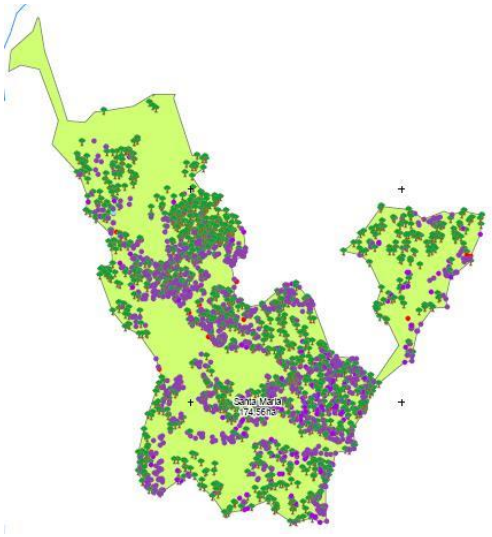
Figure 47. Areas of potential local chestnut in the REDD+ Jari/Pará Project area.

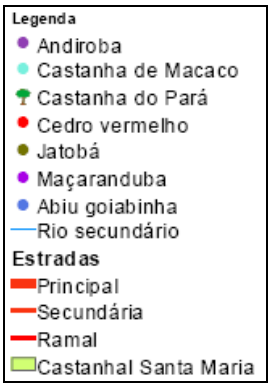
The mapping of each tree has not yet occurred throughout the Project area due to the large extension of the area, in order to be more efficient, the mapping of species of importance to the communities should be done in conjunction with the forest census at the time of management

Among the communities directly involved in the Project, the community of the Cafezal already has its mapping done, this action was taken from the initiative between IDEFLORBio and Jari Foundation, which performed the inventory in the community area (Figure 49). The Jari Group surveyed 425.25 hectares of chestnut areas of the agroextrativists producers of the Community of Cafezal, where the chestnuts are collected and 3,431 plants of Brazil nut trees were inventoried. The inventoried population stand represents, on average, an annual production (harvest) of 3,431 hectoliters of raw nuts, that is, approximately 171,550 kg, if 100% of the harvest is made.

This work in the area inventoried 2,640 plants of andirobeiras in the year 2011, it is currently estimated that this number is on average 15% more of adult plants with productive potential, raising this

number to 3,036. This inventoried population stand represents an annual production (seed collection) of 54,648 kilograms of seed of andiroba in natura with average yield of 18 kilograms of seeds per plant, that is, approximately 9,108 kg of andiroba oil, yielding three (three) kilograms per plant, if 100% of the seeds are collected.





Nome vulgar	Freq	n/há Densidade Absoluta	Densidade Relativa
Abiu goiabinha	1	0,01	0,03%
Andiroba	1.356	7,77	40,71%
Carapanauba preta folha peq	2	0,01	0,06%
Cariperana	1	0,01	0,03%
Castanha de macaco	1	0,01	0,03%
Castanha do Pará	1.650	9,45	49,53%
Cedro vermelho	22	0,13	0,66%
Coração de negro	1	0,01	0,03%
Jatobá	4	0,02	0,12%
Maçaranduba	293	1,68	8,80%
Total geral	3.331	19,08	100,00%

Figure 48. Map Castanhal Santa Maria **–** Community of Cafezal (BNDES, 2018).

4.3 Impacts on Other Actors

4.3.1 Impacts on Other Actors (CM3.1)

For this REDD+ Jari/Pará Project, negative impacts on other stakeholders are not predicted or unlikely. It is possible to observe positive impacts of the Project, which can bring well-being to other actors, such as:

- All local communities, as well as other actors residing in the Project region, whether or not participating in the Project's activities, will benefit from all the positive impacts related to the conservation and protection of forest cover;

- The activities of the Project lead to a greater commercial turnaround in the region, thus contributing to the increase of income and purchasing power among the producers that participate in these activities, benefiting local merchants;

- All the communities in the region will benefit not only the participants in the Project activities, but also the improvements made in the roads and branches, in the flow of production, in school buses and with greater access to public policies.

As indicated above, the negative impacts from these activities are unlikely, and may be:

- Competition regarding the time allocation of community members, time allocated in meetings with government agencies and other institutions versus time allocated to the agricultural activity;

- Failure to communicate the actions of the Project and in the establishment of possible conflicts arising from the implementation and conduction of the activities.

4.3.2 Mitigation of Negative Impacts on Other Actors (CM3.2)

As mentioned above, negative impacts on other stakeholders in this Project are not expected or unlikely to occur. A mitigating measure is the implementation of participatory strategies in the design of the activity and in the decision making regarding the most appropriate moment and structure of interaction, with the joint construction of the agenda minimizing the overlap of activities, just as it has been done. In addition, a conflict resolution procedure has been structured and, if it is not being effective, it is recommended that the forms of communication and referral of conflicts be adapted.

4.3.3 Net Impacts on Other Actors (CM3.3)

As described and detailed in section 4.3.1 – *Impacts on Other Actors*, other negative impacts on the well-being of other groups of local actors are unlikely, since the project does not limit access to natural resources in the Project area of any agent originally dependent on these resources, and the activities to be carried out in relation to the surrounding communities are based mainly on articulation with government agencies and other local institutions precisely to promote improvement in living conditions, greater access to public policies, and rural extension and technical assistance. The activities outlined and proposed for this Project only crave impacts that promote inclusion and well-being to communities and other stakeholders.

4.4 Monitoring Impacts on Communities

4.4.1 Monitoring Plan for Communities (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

Monitoring the impacts of the Project on communities and other stakeholders is an important management tool, making it possible to evaluate the effectiveness of the activities in achieving the proposed objectives.

It is important to create an impact monitoring system on communities. At first, the same should be done by the technicians of the Jari Foundation, based on the initial data collected in the family diagnosis, which demonstrates the initial conditions of the families.

It is important to clearly identify which development indicators are intended to be modified, as well as to price them. In this sense, the development of a monitoring system for the Project is suggested, based on the targets set for the construction of the indicators to be collected, the verification tools and the procedures for analysis and evaluation of results and evaluation, to indicate, where necessary, the essential measures to improve the intended progress.

An Initial Plan for Monitoring Impacts to Communities is described in section 3.3.3.2 – *Monitoring Plan of Impacts to the Community and Other Actors*, which essentially covers process indicators and part of the results indicators. Subsequently, it is intended to complement this initial monitoring plan, with the need for its evaluation and validation by stakeholders.

The Initial Plan for Monitoring Impacts to Communities contains, in essence, process indicators and part of the results indicators. For the presentation of the Comprehensive Monitoring Plan for Impacts to Communities, the plan presented here will be evaluated and validated by stakeholders, the process and results indicators will be complemented and the impact indicators will be established.

The activities carried out by the REDD+ Jari/Pará Project, as well as the monitoring, aim to access the effectiveness of the focused interventions: engagement of local actors and stakeholders, strengthening of associativism, promotion of rural technical assistance, strengthening of the Jari Foundation and improvements in communication and energy systems. Monitoring of benefits to communities has five components:

- Monitoring of stakeholder engagement, which aims to monitor the implementation of activities linked to the articulation and engagement of institutions and entities (governmental, nongovernmental and private) to facilitate communities in access to public policies, basic services and rural development, from the constitution of technical chambers;

- Monitoring the strengthening of associativism, focusing on activities (courses, trainings and articulations) developed to strengthen associativism, its results and impacts;

- Monitoring activities to coordinate rural technical assistance services, monitoring the result in increasing diversification, agroextractivist productivity and the implementation of more sustainable techniques and technologies, as well as market access;

- Monitoring the Strengthening activities of the Jari Foundation, monitoring the outcome in increasing the effectiveness of impact business development actions with communities;

- Monitoring of activities to improve energy supply and communication for communities, monitoring the results of articulation efforts with the government for access to the Luz para Todos (Light for Everyone) program and the results of installing telephony and internet access points in the communities.

4.4.2 Dissemination of the Monitoring Plan (CM4.3)

As specified above (section 4.4.1 - *Monitoring Plan for Communities*), an Initial Monitoring Plan for Community Impacts was demonstrated, and the complete monitoring plan should be finalized in the future. This information will be disseminated on the internet and communicated to the communities, project proponents, partners and other stakeholders.

4.5 Exceptional Criteria: Exceptional Benefits to Communities

Does not apply. This project is not intended to be validated for the Gold Level of this section.

4.5.1 Exceptional Community Criteria (GL2.1)

Does not apply.

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

Does not apply.

4.5.3 Community Participation Risks (GL2.3)

Does not apply.

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

Does not apply.

4.5.5 Net Impacts on Women (GL2.5)

Does not apply.

4.5.6 Benefit Sharing Mechanisms (GL2.6)

Does not apply.

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

Does not apply.

4.5.8 Governance and Implementation Structures (GL2.8)

Does not apply.

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

Does not apply.

5 BIODIVERSITY

5.1 Biodiversity Scenario in the Absence of the Project

5.1.1 Existing Conditions (B1.1)

Vegetation and Flora

The area of the Project is composed of ten different plant phytophysiognomies, including forest and non-forest formations, with predominance of Lowland Dense Ombrophilous Forests and Submontane Dense Ombrophilous Forests, as already mentioned in section 2.1.5 - *Physical Parameters.*

For the phytosociological characterization carried out in the REDD+ Jari/Pará project area, a survey was carried out with the installation of 71 sample plots with dimensions of 100 x 100 meters (1 hectare), subdivided into four subplots. At the end of the forest inventory, 8,664 individuals were distributed in 340 tree species, highlighting the richness of the flora existing in this Amazon region (NELSON and OLIVEIRA, 2001). The richest and most abundant families in the Project area were: family Sapotaceae, Mimosaceae, Caesalpiniaceae, Burseraceae and Fabaceae.

In order to illustrate and demonstrate the species of major commercial interest in the Project area in recent years, the seventy inventoried and most interesting species in the region were selected. The table below shows these species (Table 58).

Table 58. List of species with major commercial interest in the REDD+ Jari/Pará Project area.

Common Name	Scientific Name	Family
Abiurana	*Pouteria bangii* (Rusby) T.D.Penn.	Sapotaceae
Acapú	*Vouacapoua americana* Aubl.	Fabaceae
Acariquara	*Minquartia guianensis* Aubl.	Olacaceae
Amapá	*Parahancornia fasciculata* (Poir.) Benoist	Apocynaceae
Amapá amargoso	*Macoubea guianensis* Aubl.	Apocynaceae
Amapá doce	*Brosimum parinarioides* Ducke	Moraceae
Andiroba	*Carapa guianensis* Aubl.	Meliaceae
Angelim	*Hymenolobium sericeum* Ducke	Fabaceae
Angelim amarelo	*Hymenolobium flavum* Ducke	Lauraceae
Angelim da mata	*Hymenolobium excelsum* Ducke	Fabaceae
Angelim pedra	*Hymenolobium petraeum* Ducke	Fabaceae
Angelim rajado	*Pithecellobium racemosum* Ducke	Fabaceae
Angelim vermelho	*Dinizia excelsa* Ducke	Fabaceae
Breu vermelho	*Tetragastris altissima* (Aubl.) Swart	Burseraceae
Brazil Nut	*Bertholletia excelsa* Bonpl	Lecythidaceae
Castanha sapucaia	*Lecythis zabucajo* Aubl	Lecythidaceae
Cedro vermelho	*Cedrela odorata* L.	Meliaceae
Cedrorana	*Cedrelinga catenaeformis* (Ducke)Ducke	Fabaceae
Copaiba	*Copaifera duckei* Dwyer	Fabaceae
Copaiba preta	*Copaifera officinalis* L.	Fabaceae
Cumarú	*Dipteryx odorata* (Aubl.) Willd.	Fabaceae
Cumaru rosa	*Dipteryx magnifica* Ducke	Fabaceae
Cupiúba	*Goupia glabra* Aubl.	Goupiaceae
Faieira	*Roupala montana* Aubl.	Proteaceae
Fava Bolota	*Parkia platycephala* Benth.	Fabaceae
Fava de Rosca	*Enterolobium schomburgkii* (Benth.) Benth.	Fabaceae
Guajará	*Pouteria elegans* (A.DC.) Penn.	Sapotaceae
Ipê amarelo	*Tabebuia Alba (*Chamiso) Sandwith	Bignoniaceae
Itaúba	*Mezilaurus itauba* (Meisn.) Taub. ex Mez	Lauraceae
Itaúba amarela	*Mezilaurus lindaviana* Schwacke & Mez	Lauraceae
Itaúba preta	*Siparuna glycycarpa* (Ducke) Renner & Hausner	Lauraceae
Jaboti da terra firme	*Erisma* sp.	Vochysiaceae
Jarana amarela	*Lecythis poiteaui* O.Berg	Lecythidaceae
Jatobá	*Hymenaea courbaril* L.	Fabaceae
Jutaí mirim	*Hymenaea intermedia* Ducke	Fabaceae
Jutaí pororoca	*Dialium guianense* (Aubl.) Sandw.	Fabaceae
Macacaúba vermelha	*Platymiscium ulei* Harms	Fabaceae
Maçaranduba	*Manilkara huberi* Stand.	Sapotaceae
Mandioqueira escamosa	*Qualea paraensis* Ducke	Vochysiaceae
Mandioqueira lisa	*Qualea albiflora* Warm.	Vochysiaceae
Maparajuba	*Manilkara bidentada* (A. DC.) A. Chev.	Sapotaceae
Mata-matá branco	*Eschweilera odorata* Poepp.	Lecythidaceae
Mata-matá jiboia	*Eschweilera paniculata* (O.Berg) Miers	Lecythidaceae
Mata-matá preto	*Eschweilera subglandulosa* Miers	Lecythidaceae
Mata-matá rosa da terra firme	*Eschweilera rosea* (Poepp) Miers.	Lecythidaceae

Muiracatiara	*Astronium gracile* Engl.	Anacardiaceae
Muirapixuna	*Martiodendron parviflorum* (Amsh.) Koeppen.	Caesalpiniaceae
Pau d'arco amarelo	*Tabebuia serratifolia* (Vahl) Nichols.	Bignoniaceae
Pau d'arco roxo	*Tabebuia impetiginosa* (Mart. ex DC.) Standl.	Bignoniaceae
Pau-rosa	*Aniba parviflora* (Meisn.) Mez	Lauraceae
Piquiá	*Caryocar villosum* (Aubl.) Pers.	Caryocaraceae
Piquiarana	*Caryocar glabrum* (Aubl.) Pers.	Caryocaraceae
Quaruba branca	*Vochysia divergens* Pohl.	Vochysiaceae
Quaruba cedro da terra firme	*Vochysia maxima* Ducke	Vochysiaceae
Quaruba rosa	*Vochysia obscura* Warm.	Vochysiaceae
Sucupira amarela	*Vatairea* sp.	Fabaceae
Sucupira de morcego	*Diplotropis racemosa* (Hoehne) Amshoff.	Fabaceae
Sucupira preta	*Diplotropis purpurea* (Rich.) Amsh.	Fabaceae
Sumaúma	*Ceiba pentandra* (L.) Gaertn.	Malvaceae
Tachi branco	*Sclerolobium paraense* Huber	Caesalpiniaceae
Tanimbuca amarela	*Terminalia argentea* (Berg.) Mart. & Zucc.	Combretaceae
Tanimbuca folha grande	*Buchenavia grandis* Ducke	Combretaceae
Tanimbuca folha média	*Terminalia amazonica* Exell	Combretaceae
Tanimbuca folha pequena	*Buchenavia parvifolia* Ducke	Combretaceae
Tatajuba	*Bagassa guianensis* Aubl	Moraceae
Tauari	*Couratari pulchra* Sandw	Lecythidaceae
Tauari branco	*Couratari oblongifolia* Ducke & Knuth	Lecythidaceae
Timborana	*Piptadenia communis* Bentham	Fabaceae
Ucuúba branca	*Virola flexuosa* A.C.Smith	Myristicaceae
Ucuubão	*Osteophloeum platyspermum* (A.DC.) Warb.	Myristicaceae

One species that deserves attention is Bertholletia excelsa Bonpl. known as castanheira-do-Brasil or castanha-do-Pará (Figure 60), a species of rectilinear stem, covered with a grayish-brown bark, large and very fragrant yellow flowers, flowering between the months of November to February (LORENZI, 2016). Usually located in fry land areas throughout the Amazon and belonging to the final phase of ecological succession with long life. This species is considered one of the most important species of the whole biome, because it is more explored and exported. It has moderately good resistant wood, but its exploitation is prohibited by law due to the use of its fruits (SILVA, 2006).

It is considered a key species and its presence in the forest has a significant importance since the communities located nearby use their fruit both for consumption and for commercialization, aiding in their income. The seed of this species is one of the most recognized non-wood forest products (NTFP) in the domestic and foreign markets.

The presence of this species in the area is an extremely important factor in the planning of social actions, both in the economic aspect, for historically symbolizing a significant source of income for the extractive communities, and in the ecological aspect, since this species is listed in official country lists of endangered species.

Figure 49. Image of Brazil nut tree (*Bertholletia excelsa*).

Regarding to species threatened with extinction, eleven of them are listed in threatened species provided by bodies such as IBAMA and IUCN, being: six species present in the IBAMA list and eight species in the IUCN list. Table 59 lists the endangered flora species according to the IUCN Red List of Threatened Species.

Table 59. Flora species threatened according to the IUCN Red List of Threatened Species.

IUCN Threat Category	Scientific Name
Critically Endangered (CR)	*Vouacapoua americana* Aubl.
Endangered (EN)	*Manilkara elata* (F. Allemão ex Miq.) Monach
	Pouteria amapaenses Pires & T.D.Penn.
	Virola surinamensis (Rol.) Warb.
Vulnerable (VU)	*Bertholletia excelsa* H. & B.
	Joannesia princeps Vell.
	Pouteria krukovii (A.C.Sm.) Baehni
	Pouteria oppositifolia (Ducke) Baehni

In order to avoid conflicts regarding the exploitation of species with some degree of threat, the following information is hereby provided, that the species mentioned in any category, present in Ordinance N° 443/2014, dated December 17, 2007, are fully protected. As the referential ordinance generates impacts that directly affect the activities related to the forest area, in particular, the timber management of the native species, Normative Instruction No. 1/2015 was elaborated, in order to specify

how the exploitation of species considered to be endangered may be carried out. Therefore, it is determined that only the species included in the category VU – Vulnerable, sustainable management is allowed, applying more rigid criteria for its exploitation, but without the prohibition of management. The other categories (EN, CR) require specific regulation by the competent body.

Among the species considered to be threatened in the Project area are the Bertholletia excelsa (Brazil nut), whose wood is considered of the highest quality for civil and naval construction, possessing an intense history of exploration of the species. Within this context, decree 1,282, dated October 19, 1994 was first elaborated, later revoked and replaced by the decree 5.975, dated November 30, 2006 that prohibits the cutting of the species. Therefore, even if it falls into the vulnerable category, its cutting is restricted by law. Thus, their exploitation is permitted based only on non-timber forest products, such as chestnuts.

Fauna

The region of the Project area is very rich and presents a very diverse fauna, presenting 1,245 species already registered. In relation to the avifauna, one can affirm that the region is in an area of high concentration of birds' species. In all, 578 species of native birds were distributed, distributed in 73 families and 24 orders. The most numerous families were composed by the birds, standing out Thraupidae, Tyrannidae and Thamnophilidae, with 52, 50 and 47 species, respectively. Then the families of eagles and hawks (Accipitridae) and hummingbirds (Trochilidae), with 29 species each.

Figure 50. Birds registered in the REDD+ Jari/Pará Project area. Identification: a. jacumirim (*Penelope marail*); b. macuru-de-testa-branca (*Notharchus marcrorhynchos*); c. pipira-vermelha (*Ramphocelus carbo*); d. tucano-grande-de-papo-branco (*Ramphatos tucanus tucanus*).

The Project area also includes species considered endemic to the North Amazon, which accounted for 7.6% of the wealth raised, that is, 44 species. A particular site is only considered an Important Bird Area (IBA) for Conservation when it has at least 21 endemic species, once again extolling the diversity of birds sheltered in the region, according to De Luca et al. (2009). There is also a record of 157 species with high sensitivity to disturbance, such as tovacuçu (*Grallaria varia*), vira-folha-de-peito-vermelho (*Sclerurus macconnelli*), inhambu-anhangá (*Crypturellus variegatus*), and large predators, as gavião-real (*Harpia harpija*) and uiraçu-falso (*Morphnus guianensis*). Medium-sensitive birds comprised 38.6% of the avifauna, or 223 species. It is observed that for both of these sensitivity categories, most are dependent on forests, denoting the occurrence of a forest environment in good state of conservation, with areas with significant environmental integrity.

The mammal community found in the Project area is composed of 116 species, 54 of which are bats, 30 large and medium sized mammals and 32 small ones. From the endemic species, 10 are restricted to the Guiana Shield (LIM et al., 2005).

The region in which the REDD+ Jari/Pará Project is inserted has 86 species of amphibians and 85 species of reptiles, some of which still do not have their epithet identified or described. Amphibians are represented by two orders: Anura (toads, frogs and tree frogs) with 83 species, and Gymnophiona (blind-snakes), with only 3 species. As for the reptiles, there are three orders: Squamata (lizards, snakes and amphisbaena), Testudines (turtles, tortoises and terrapins), Crocodylia (alligators), with 75, 7 and 3 species, respectively. As for Squamata, 41 snakes, 33 lizards and 1 amphisbaena have been recorded.

The ichthyofauna is composed of 356 species for the region, distributed in 46 families and 12 orders, according to the environmental impact study (EIA/RIMA) of HEP (Santo Antônio do Jari Hydroelectric Plant) and also through the monitoring program of HEP Santo Antônio. Among the inventoried orders, the richest were Characiformes, with 156 species, that is, 44% of the total richness, followed by Siluriformes, with 113 species. Regarding the endemism of the Guiana Shield, the study area has the potential to house 63 species of fish, of which 17 would be restricted, i.e., exclusive to the Jari basin. Among the species confirmed for the locality, there are 21 endemic of this geological province, composed basically by Characiformes and Siluriformes. Most registered endemic fish live in small inland watercourses, for example, *Bryconops affinis*, *B. melanurus* and *Lithosus bovallii*.

From all the species registered in the project area, 135 are listed on the CITES (*Convention on International Trade in Endangered Species of Wild Fauna and Flora*), being 114 species of birds, 7 species of amphibians and 14 species of reptiles. In the list issued by IBAMA there are a total of 14 species, classified as follows: a species of mammal considered to be endangered (category EN), three species of birds and nine species of mammals fall within the category VU (vulnerable) and one species of mammal is critically endangered (category CR).

In the IUCN list, there are a total of nineteen species in the three categories preached by the organization, being a species of mammal in category EN (endangered), seventeen species of animals (seven species of birds, six species of mammals, two species of amphibians and two reptile species) in the VU category (vulnerable) and one mammal species in category CR (critically endangered) (Table 60). No species of endangered or CITES-listed fish were recorded.

Table 60. Species of wildlife endangered according to the IUCN Red List of Threatened Species.

BIRDS		
IUCN Threat Categories	**Popular Name**	**Scientific name**
Vulnerable (VU)	Pomba-botafogo	*Patagioenas subvinacea*
	Mutum-poranga	*Crax alector*
	Formigueiro-liso	*Myrmoborus lugubris*
	Choquinha-estriada	*Myrmotherula surinamensis*
	Tucano-grande-de-papobranco	*Ramphastos tucanus*
	Tucano-de-bico-preto	*Ramphastos vitellinus*
	Azulona	*Tinamus tao*
MAMMALS		
IUCN Threat Categories	**Popular Name**	**Scientific name**
Vulnerable (VU)	Queixada	*Tayassu pecari*
	Gato-do-mato-pequeno	*Leopardus tigrinus*
	Anta	*Tapirus terrestris*
	Macaco-aranha-preto	*Ateles paniscus*
	Tamanduá-bandeira	*Myrmecophaga tridactyla*
	Tatu-canastra	*Priodontes maximus*
Endangered (EN)	Ariranha	*Pteronura brasiliensis*
Critically Endangered (CR)	Macaco-preto	*Chiropotes satanas*
AMPHIBIANS		
IUCN Threat Categories	**Popular Name**	**Scientific name**
Vulnerable (VU)	Sapinho	*Anomaloglossus beebei*
	Sapo	*Atelopus spumarius*
REPTILES		
IUCN Threat Categories	**Popular Name**	**Scientific name**
Vulnerable (VU)	Tracajá	*Podocnemis unifilis*
	Jabuti, jabutitinga	*Chelonoidis denticulatus*

5.1.2 Attributes of High Conservation Value (B1.2)

As defined by the HCV Resource Network, the high value attributes for conservation 1, 2 and 3 were considered for the present work, since they are criteria related to biodiversity. Within this context, to guide the following items in this document, the guidelines for identification, management and monitoring of high values were considered, as stated in the "General Guide for the Identification of High Conservation Values" (BROWN et al., 2013), "Common Guidance for the Management & Monitoring of High Conservation Values" (BROWN, SENIOR, 2014), "FSC Principles and Criteria for Forest Stewardship" (FSC, 2012) and "The Climate, Community and Biodiversity Alliance" (CCBA, 2013).

Currently, the area bounded for the REDD+ Jari/Pará Project has two areas of High Conservation Value: a fragment of Cerrado and a spring, the latter related to the well-being of the communities and, therefore, previously described in Section 4.1.3. In addition, after analyzing the biodiversity data presented here, some observations about potential HCVAs deserve attention. In the table below, information about these areas of high conservation value is presented (Table 61).

Table 61. Identification of the area of high conservation value in the REDD+ Jari/Pará Project area.

High Conservation Value	HCVA 3 (forest areas that contain or are contained in rare, threatened or endangered ecosystems) - Cerrado fragment in native management area. Area of 212.6 hectares of Cerrado inserted in the REDD+ Jari/Pará project area.
Qualification Attribute	From the diagnosis of vegetation, small savannas in the Amazon have a set of distinct characteristics, not found in surrounding forests, and, thus, can act as a refuge for several species of flora and fauna, falling under HCV 3.
Focal Area	In order to ensure the maintenance and improvement of the natural characteristics of the Cerrado ecosystem/habitat identified within the project area, all 212.6 hectares of conservation area must be managed, as well as a damping area of 10 meters wide around the perimeter of the HCVA.

Given that within the Project area is an area of high conservation value (HCV) of attribute number 3, related to forest areas that contain or are contained in rare, threatened or endangered ecosystems, the activities and mitigating measures to improve and maintain it are already listed and are included in the Project.

5.1.3 Scenario in the Absence of the Project: Biodiversity (B1.3)

The scenario in the absence of the REDD+ Jari/Pará Project would be for the occupation of land squatters and small farmers, who would be impacting the forest areas through the opening of the forest by the cutting and burning system. These areas are cultivated for a short period of time, one or two years, and then abandoned due to the fact that the soil becomes unproductive, with the opening of new areas to raise subsistence agriculture. The increase in deforestation was 51,985 hectares of land in the Project area during the thirty years of the project.

Although the Amazon is the most complete Brazilian biome, the problem of deforestation advances on its frontiers (FONSECA et al., 2014). Apart from this, illegal and rampant logging results in extensive areas of degraded forest, which implies loss of habitat and resources for local biodiversity (GARDNER, 2010). In addition to the loss of biodiversity, among the main impacts of deforestation are the reduction of productivity (erosion, soil compaction and nutrient exhaustion) and changes in the hydrological regime, which highlights the need for measures to contain it, with loss of sustainable forest

use (FEARNSIDE, 2005). In the last two decades, several studies have estimated that changes in land use, including deforestation and forest degradation, accounted for around 17-29% of greenhouse gas emissions in tropical regions (FEARNSIDE, 2000; MYERS, 2007; VAN DER WERF et al., 2009).

Project initiatives such as REDD+ are one of the few alternatives for the conservation of the biome and associated biodiversity (PAVAN, CENAMO, 2012). Therefore, measures to reduce deforestation rates are urgent (LAURENCE; VASCONCELOS, 2009), and regional protected area systems are fundamental to neutralize and buffer impacts in the Amazon region (SILVA et al., 2005). It should be noted that the REDD+ Jari/Pará Project is located in a strategic conservation area - among several Conservation Units (of Integral Protection and Sustainable Use), often composing the buffer zone and establishing a forest connection between UCs. Thus, responsible forest management maximizes the conservation potential of these UCs as well as enhances the enterprise as an important private sector actor in mitigating climate change and conserving socio-biodiversity.

The survey of secondary data of the Jari Project about its biota showed a high number of species occurring, some of which indicate the occurrence of intact environments. This fact is certainly related to the maintenance of the standing forest due to the good management practices applied in the forest, corroborating the one observed in other areas also managed in Amazon (GUILHERME; CINTRA, 2001; WUNDERLE et al., 2006; HENRIQUES et al., 2008; CARDONA, 2012). In addition, the great territorial extension of the Jari Project and its forest and savanna adjacencies have a great variety of phytophysiognomies, which also contribute to the high biodiversity found.

The differences in the way the forests are managed, including the maximum number of trees removed per hectare, the rotation and the latency period of the production units, allowing future exploration (BARRETO et al., 1998) and good local sustainable management practices determine the effects (positive or negative) and their extent on biodiversity (GARDNER, 2010). Thus, in view of the results presented, biodiversity studies are encouraged in the two broadest typologies (Dense Ombrophilous Forest and Open Ombrophilous Forest) and two with differentiated edaphic characteristics (areas with fluvial and cerrado influence).

Generally, without the REDD+ Project and in a more pessimistic scenario, the deforestation pressure in the project's area of expansion tends to increase and gradually move towards the boundaries of the Project area. With the REDD+ mechanism, resources for the sale of carbon credits will contribute to the promotion of activities aimed at reducing the loss of forest habitat, which guarantees the standing of the forest and the consequent conservation of the species of fauna and flora, maintaining their populations viable, since, with the advancement of deforestation, the forest environment tends to be replaced by anthropic areas over time (FEARNSIDE, 2006). The progress of deforestation leads to loss of structural and functional connectivity among remnants of forest, which reduces gene flow among populations, affecting fauna displacement and dispersion of propagules (Laurance, VASCONCELOS, 2009). Also, the opening of new roads can allow the advancement of degradation and deforestation, as well as facilitating the entry of people from outside the Project, which could increase the extraction of

vegetation, predatory hunting and fishing in areas for conservation and forest timber and non-timber management.

Fragmentation also tends to cause a drastic reduction of species richness, whose density is smaller in small fragments, mainly affecting more specialized taxons (Laurence and Vasconcelos, 2009), many of which are endangered, endemic or restricted. The fact that there are species with restricted areas in the region and even the occurrence of endangered species shows the need to protect the forests and savannas of this region for the conservation of biodiversity.

The permanence of natural environments in the Project area is of extreme conservacionist importance, since, in addition to promoting the conservation of biodiversity, it guarantees the maintenance of ecosystem services, such as pest and disease control, pollination, water quality, climate regulation and obtaining of resources for traditional communities. According to Silva et al. (2005), the connectivity between the fragments constitutes a large and resilient conservation system to mitigate future global changes, make significant improvements in the living standards of local populations, and provide global communities with ecological services. In addition, the REDD+ Project seeks to protect the High Conservation Value Areas (HCVA), stimulate and improve knowledge about local biodiversity through studies, for example, long-term monitoring, since knowledge about the flora and, more specifically, of the fauna of the region can still be considered scarce.

5.2 Net Positive Impacts on Biodiversity

5.2.1 Expected Changes in Biodiversity (B2.1)

Table 62. Description of expected changes to biodiversity for the REDD+ Jari/Pará Project.

Biodiversity Element	REDD+ Activities
Estimated Change	Reducing deforestation and forest degradation
Justification of Change	The activities of the Project aim at the reduction of deforestation and forest degradation, based on the practices of sustainable forest management, deforestation monitoring, patrimonial surveillance, technical assistance service and rural extension, among others, thus generating a positive impact on biodiversity.

Biodiversity Element	REDD+ Activities
Estimated Change	Habitat Conservation/Biodiversity Conservation
Justification of Change	The positive impact is ensured by monitoring biodiversity, implementing the Property Use Plans, practicing sustainable forest management, developing scientific research to ensure knowledge of local biodiversity, and all activities listed by the Project.

5.2.2 Mitigation Measures (B2.3)

The REDD+ Jari/Pará Project aims to generate only net positive impacts to climate, community and biodiversity, but negative impacts may arise as an adverse effect and sustainable forest management is believed to be the main source of this type of impact for the biodiversity. Despite this, this activity has positive impacts that guarantee its viability, when applied in a planned and well executed way, making the damages liable to mitigation. The management performed by the Jari Group is planned and performed according to a series of operating procedures, working instructions and environmental procedures that are rigorously followed and monitored. In addition, all collaborator and employees are trained and instructed before starting activities.

In order to ensure that there is the least possible impact on biodiversity with the extraction of wood, some techniques are adopted, the main ones being:

- **Road and branch planning:** aiming to ensure the smallest number of roads possible, reducing vegetation felling, and protecting relevant species or being used by fauna;

- 100% forest inventory and extraction planning: the inventory allows the recognition of trees with minimum desired diameter, as well as ensures that the maximum volume extracted per UPA is met. In addition, the individuals selected for extraction have planned fall targeting aimed at affecting the minimum of neighboring trees, permanent preservation area and trees with relevant value, as well as ensuring worker safety;

- **Cutting of vines:** prevents the felling of the desired individual from affecting nearby trees.

In relation to the area with high conservation value present in the Project area, HCVA case 3 - Cerrado Fragment in native management area (attribute related to forest areas that contain or are contained in rare, threatened or endangered ecosystems) and in order to mitigate the negative impacts on biodiversity and ensure the maintenance and improvement of this region, some measures are adopted:

- Micro-planning of forest activities: consists of the prior analysis of the operational, environmental quality and safety limitations, aiming at optimizing operations, labor and resources, such

as the protection of the HCVA, the fall of trees in APP and social impacts on nearby communities, and also the verification of experiments in the area selected for cutting;

- Installation of signaling boards: on the access roads and those located near the HCVA, educational and indicative signs will be placed, aimed at environmental conservation. The project aims to raise public awareness about environmental problems and prevent the trampling of wild animals on the company's roads;

- Monitoring and surveillance of HCVA and surrounding areas: these activities will be carried out in order to guarantee the maintenance of the HCVA integrity and its vicinity, as well as to avoid invasion, hunting, cutting of trees and movement of unauthorized persons. It will be carried out according to the operational procedure of inspection of the land area;

- Plan for the prevention and combat of forest fires: will be carried out jointly with the Operations team of Jari Celulose SA, considering that it already has the structure of observation towers for identification and location of fires, serving to guide the movement of combat teams to control possible forest fires that may occur in the operational areas and jeopardize the integrity of the HCVA.

The activities and measures required to improve and maintain this attribute are activities already included in the Project (Table 10).

5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

The activities proposed by the REDD+ Jari/Pará Project seek to generate diverse benefits to the climate, communities and biodiversity. The main benefits to biodiversity are linked to the reduction of deforestation and forest degradation and the conservation of biodiversity and habitats.

The implementation of the Project activities, as described above, have a direct and positive impact on biodiversity, such as the maintenance of vegetation cover and the conservation of biodiversity, acting directly against the loss of habitats and also against the fragmentation of the local vegetation cover. These positive impacts are due to avoided deforestation, improvements in management practices, monitoring of deforestation and biodiversity, technical assistance and rural extension, patrimonial surveillance, and other activities carried out during the life of the Project.

The effectiveness of the Project's activities is intended to generate positive net impacts to the climate, communities and biodiversity, but negative impacts may arise, and mitigation measures are necessary to avoid and minimize these impacts. From all the activities listed for the Project (Table 10), sustainable forest management may be the activity with the most negative impacts on biodiversity.

The sustainable forest management implemented by the Jari Group is well planned and performed in a correct manner, following strict norms and well established criteria, which guarantee the abundance and biodiversity of the local species. In large part, the negative impacts of this activity are ephemeral and not very severe, and do not endanger the conservation of the species. Negative impacts may be related to disturbances due to increased vehicle and person traffic in the Project region and noise

production, local suppression of few species to open tracks and infrastructure, possible trampling of animals, increased hunting, fishing, and extraction of wood and non-timber products, as a consequence of the opening of tracks and bites.

In the scenario with the Project, we can see the generation of several positive impacts on biodiversity, a result of the reduction of deforestation and forest degradation in the Project area, thus promoting biodiversity conservation and mitigating the risks of extinction, guaranteeing genetic diversity, among others effects. The indirect impacts promoted by climate change on biodiversity will also be attenuated.

5.2.4 High Value Attributes for Protected Conservation (B2.4)

The Project area has a High Conservation Value attribute related to biodiversity, which has already been described in section 5.1.2 – *Attributes of High Conservation Value* and is related to forest areas that contain or are contained in rare ecosystems, threatened or endangered. The measures proposed to ensure the integrity of this ecosystem and thus, maintain and improve this attribute are activities already incorporated by the Project (Table 10). Therefore, the potential positive and negative impacts for this area have already been described and the activities of the Project are already aimed at generating positive impacts on this attribute.

5.2.5 Species Used (B2.5)

An important role in the region's economy is filled by vegetable extraction and forestry, mainly as a source of subsistence for families. The vegetal extraction of the municipalities mainly counts on the management of non-timber forest products (NWFP) of native species of the region, such as brazil nuts and açaí.

In addition, the rural communities living in the Project area are mainly engaged in the production of cassava, flour and manioc, according to the Family Diagnosis of the REDD+ Jari/Pará Project. Crops of corn, banana, orange, cabbage, cupuaçu, eucalyptus and cacao are also employed by some local communities but in smaller scales than the others already mentioned.

5.2.6 Invasive Species (B2.5)

The REDD+ Jari/Pará Project encourages the use of native species by local rural communities, such as chestnut, açaí, cassava, cupuaçu, among others. Nonetheless, some non-native species are used by the communities because they have been introduced in the region for a long time, dating back to

historical period and are still part of the local culture, serving as a source of food and income for these rural and urban communities in the region.

Widely cultivated in other regions of Brazil, these exotic species are not recognized for threatening and/or harming native species. No invasive species will be introduced or their population will increase due to the activities of the Project, noting that this Project promotes the use of native species by local communities.

5.2.7 Impact of Exotic Species (B2.6)

As specified above (section 5.2.6 – *Invasive Species*), the REDD+ Jari/Pará Project encourages the use of native species by local communities. In addition, approximately 75% of the main crops and sources of income of the producers assisted by the Project are based on the development and production of native species (chestnut, açaí, flour, cassava, cupuaçu, among others)

The few non-native species are however used by local communities, i.e., small-scale use and do not have an adverse impact on the environment. Again, quoting the text above, these species have been cultivated for years, being part of the cultural history of the region and serving as a source of subsistence for these communities and not being encouraged their use by the REDD+ Jari/Pará Project.

5.2.8 Exclusion of Genetically Modified Organisms (GMO) (B2.7)

Through the REDD+ Jari/Pará Project it is guaranteed that no genetically modified organisms (GMOs) will be used. It is also ensured that the seeds and seedlings of forest and agricultural species provided to communities are not GMOs. The reduction or removal of greenhouse gas emissions will be achieved through reduction of deforestation and forest degradation.

5.2.9 Use of Fertilizers (B2.8)

Table 63. Description of the main fertilizer used in the REDD+ Jari/Pará Project.

Name	Organic Compost
Rationale of Use	The composting process, when done properly, provides a remarkable organic fertilizer with ideal carbon and nitrogen rates, and prevents the anaerobic decomposition of organic waste available on farms, such as straw and manure, from emitting greenhouse gases and contaminating water.
Potential Adverse Effect	Unknown

For the REDD+ Jari/Pará Project region there is no intention to use any chemical pesticide, biological control agent or other types of inputs. In order to avoid possible harmful effects such as contamination of water bodies causing emission of greenhouse gases, chemical fertilizers are used in extreme cases.

These parameters will be monitored throughout the implementation of the Project and, if any chemical compound is applied, or the use of biological control agents or any other type of input by the responsible parties, they will be reported in the monitoring report.

5.2.10 Product Waste Management (B2.9)

A series of documents establish standards and criteria for the identification, classification and management of waste in the area of the REDD+ Jari/Pará Project carried out by the Jari Group. The criteria for classification, disposal and transportation of the waste generated by the Jari Group are determined according to NBR 10.004, called the environmental procedure "Waste management", which establishes conditions for classification in relation to dangerousness, adequate disposal, transportation, operation of the intermediate disposal area and waste conditioning.

All records are checked and verified through a waste control worksheet, which facilitates the handling and management of information. The forest residue has economic interest, being fundamental for the viability of the enterprise. The standards and measures of transportation and use of these services are determined by various procedures, as well as the monitoring of activities. Residues of agricultural production from communities are transformed into organic compost and reused as fertilizer.

5.3 Impacts on Biodiversity Outside the Project Zone

5.3.1 Negative Impacts on Biodiversity Outside the Project Area (B3.1) and Mitigation Measures (B3.2)

The table suggested by this section with the possible negative impacts on biodiversity outside the Project zone was not filled due to the fact that no negative impacts are expected outside the Project zone, nor are there expected leakages resulting from the implementation of the project's activities. This fact can be explained because the Project area is surrounded by conservation units (UCs), in addition to that the social activities of the REDD+ Jari/Pará Project are already designed to mitigate any possible leakages, thus providing harmony among man in the field and the forest.

5.3.2 Net Impacts on Biodiversity Outside the Project Area (B3.3)

As mentioned in the section above (section 5.3.1), no negative impacts are expected outside the Project area, nor are leakages due to activities undertaken. Therefore, mitigating actions are not necessary. In addition, the social activities carried out by this Project are already designed to mitigate possible leakages that may occur.

As the Project area is surrounded by conservation units (UCs), positive impacts on biodiversity outside the Project area are observed, with the main expected positive impacts being the maintenance of an ecological corridor for biodiversity, which serves as a refuge and protection for endangered species and ecosystems and are places where ecological processes can occur without any human intervention or only with sustainable use, and the Project area functions as a buffer zone for risks and threats to the mosaic of protected areas of the North of the State of Pará.

5.4 Monitoring of Impacts on Biodiversity

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

A fundamental tool, the monitoring of biodiversity makes it possible to measure the impacts of the possible activities caused by the Project on biodiversity, providing adjustments and relevant repairs in the pursuit of the desired goals.

For the REDD+ Jari/Pará Project, monitoring of the managed areas is systematically carried out by the Jari Group team and also in conjunction with researchers from universities in Brazil and abroad, evaluated through periodic forest inventories and following forest sustainable management criteria, aiming at the short- and long-term monitoring. The general monitoring of activities, as well as the environmental, economic and social performance of forest management, is also carried out.

It should be noted that the REDD+ Jari/Pará Project is located in a strategic conservation area - among several Conservation Units (of Integral Protection and Sustainable Use), often composing the buffer zone and establishing a forest connection between UCs. With this, responsible forest management maximizes the conservation potential of these UCs as well as enhances the enterprise as an important actor in the private sector in mitigating climate change and conserving socio-biodiversity.

The region where the Jari Project is located has a rich biodiversity and the occurrence of a significant number of species, in addition to extending through various forest phytophysiognomies, which contribute to the increase of local biodiversity. This diverse biota indicates the existence of good management practices applied to the Amazon forest and, consequently, the maintenance of the forest standing and the occurrence of intact environments (CARDONA, 2012).

The maintenance of standing forest as well as the conservation of species of fauna and flora are extremely necessary to ensure the continuity and improvement of biodiversity. With the advancement of

deforestation, these areas tend to be reduced, but REDD+ mechanisms and resources for the sale of carbon credits contribute to and prevent the reduction of forest habitat loss (FEARNSIDE, 2006).

It is extremely important the permanence of natural environments in the Project area, as well as promoting the conservation of biodiversity, guarantees the maintenance of ecosystem services, such as pest and disease control, pollination, water quality, climate regulation and resource acquisition for traditional communities. The connectivity among fragments constitutes a large and resilient conservation system to mitigate future global changes, make significant improvements in the living standards of local populations, and provide global communities with ecological services. In addition, this Project seeks to protect Areas of High Conservation Value (HCVA), stimulate and improve knowledge about local biodiversity through studies, for example, long-term monitoring, as knowledge about flora and, more specifically, the fauna of the region can still be considered scarce (Silva et al., 2005).

Therefore, a plan for the monitoring of fauna and flora is recommended in order to better understand the biota of the region, according to the needs and demands of CCB standards (CCBA, 2013) with the aim of maintaining local wealth and key endangered species for Gold Level (CCBA, 2013) and high conservation value attributes (HCVs) (BROWN et al., 2013). This monitoring should aim at assessing the local community for management practices and forest integrity. For the fauna, it is recommended to carry out campaigns that accompany the periods of low and high rainfall, in order to evaluate the seasonal dynamics of the species along with the management practices. For the flora, it is recommended to use permanent plots, with remediation every five years, in order to evaluate the forest dynamics (recruitment rates, mortality, species substitution) and variations in the carbon stock.

Along with the monitoring of fauna and flora, it is recommended that the environmental managers of the REDD+ Jari/Pará Project establish a systematized database with all the data so far collected in the Jari Group's forests. This rescue, updating and constant feeding of the information, is of great relevance for the company to have organized data about the safeguarded biodiversity. This database will serve as a subsidy for several socio-environmental programs, as well as guidelines for sustainable actions. It should be noted that for this document the company did not have a database, which limited or made difficult the compilation of data already generated, which are scattered in several reports.

Table 64 presents proposals for biodiversity monitoring for the REDD+ Jari/Pará Project, with a definition of the periodicity, objective, indicators and the positive impacts of the Project.

Table 64. Biodiversity Monitoring Plan for the REDD+ Jari/Pará Project.

Monitoring	Frequency (systematic campaigns)	Purpose	Results (Positive implication)	Indicators
Flora	One every 5 years	Evaluation of structure and composition	Maintenance of forest integrity	- Wealth (number of species); - Recruitment and mortality.
Birds	Two annually	Wealth and composition assessment	Biodiversity Conservation	- Accumulation curve; - Wealth (number of species); - Abundance of sensitive species; - Abundance of species dependent on forest environments.
Mammals	Two annually	Wealth and composition assessment	Biodiversity Conservation	- Accumulation curve; - Wealth (number of species); - Composition; - Frequency of occurrence.
Vulnerable Species (VU)	Two annually	Maintenance of key species	*Gold Level* Maintenance	- Presence of> 10 pairs or 30 individuals of queixada (*Tayassu pecari);* - Presence of> 10 pairs or 30 individuals of poranga (*Crax alector)* *.
Endangered (EN) or Critically Endangered Species (CR)	Two annually	Maintenance of key species	*Gold Level* Maintenance	- Presence of cuxiú-preto (*Chiropotes satanas*) *; - Presence of ariranha (*Pteronura brasiliensis)* *.
Attributes of the HCVA of cerrado	One every 5 years (flora) and 2 annual (fauna)	Maintenance of HCVAs	Maintenance of rare ecosystem	- Indicators of flora, avifauna, mastofauna and herpetofauna mentioned above; - Presence of endangered species.

Before being included in monitoring, some of these species, such as Poranga (*Crax alector*), Cuxiú-preto (*Chiropotes satanas*) and Arinranha (*Pteronura brasiliensis*) need evaluation in the field, since their presence is known only to the region, not necessarily occurring within the perimeter of the REDD+ Jari/Pará Project. If found, one should study its use as *Gold Level*.

In addition to the monitoring plan described, the possibility of implementing a participatory monitoring program is evaluated, in which some community residents are selected and trained to carry out information gathering in the region. Information on the presence of endemic species and included in lists of endangered species and the presence of invasive alien species, as well as increased or reduced observations can be produced by the community. This possibility is still being evaluated and before it should be presented and discussed during the meetings of the Technical Chamber.

5.4.2 Dissemination of the Biodiversity Monitoring Plan (B4.3)

The monitoring plan and any monitoring results obtained will be disseminated and communicated in the REDD+ Technical Chamber held by the REDD+ Jari/Pará Project. Information is also available to communities, stakeholders and the public through virtual channels, such as the website (http://www.biofilica.com.br).

5.5 Optional Criteria: Exceptional Benefits to Biodiversity

5.5.1 Priority Status for High Biodiversity Conservation (GL3.1)

The REDD+ Jari/Pará Project area is home to a large number of species; in addition, the project's large territorial extension and its forest and savanna adjacencies have a wide variety of phytophysiognomies, also contributing to the high biodiversity found in the area.

In the Project region, the presence of threatened flora and fauna species was verified according to the IUCN Red List of Threatened Species. As already described in section 5.1.1 – *Existing Conditions/Biodiversity Scenario in the Absence of the Project*, the species considered to be threatened according to IUCN criteria are:

- Critically Endangered (CR)

Flora: *Vouacapoua americana*;

Fauna: *Chiropotes satanas.*

- Endangered (EN)

Flora: *Manilkara elata; Pouteria amapaenses; Virola surinamensis;*

Fauna: *Pteronura brasiliensis.*

- Vulnerable (VU)

Flora: *Bertholletia excelsa; Joannesia princeps; Pouteria krukovii; Pouteria oppositifolia;*

Fauna: *Patagioenas subvinacea; Crax alector; Myrmoborus lugubris; Myrmotherula surinamensis; Ramphastos tucanus; Ramphastos vitellinus; Tinamus tao; Tayassu pecari; Leopardus tigrinus; Tapirus terrestres; Ateles paniscus; Myrmecophaga tridactyla; Priodontes maximus; Anomaloglossus beebei; Atelopus spumarius; Podocnemis unifilis; Chelonoidis denticulatus.*

5.5.2 Tendencies of Trigger Species Populations (GL3.2, GL3.3)

Trigger species and their respective population trends for the REDD+ Jari/Pará Project can be found in the table below (Table 65).

Table 65. Identification and description of the trigger species and the tendency of the populations for the scenarios without and with REDD+ Jari/Pará Project.

Trigger Species	*Chiropotes satanas*
Population Trend at the Beginning of the Project	Decreasing. It is believed that the species has decreased by at least 80% in the last 30 years, and this trend should continue (IUCN, 2018).
Scenario without Project	Without the REDD+ Jari/Pará Project, the population trend of this species is a decrease and worsening of its threatened state, mainly due to the loss of habitat caused by deforestation and forest degradation. Another aggravating factor is predatory hunting.
Scenario with Project	The REDD+ Jari/Pará Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss and consequent improvement in biodiversity conservation. In addition, the Project fosters research that also helps in the identification and conservation of these environments. Therefore, it is expected with the Project, that there will be improvements in the trend of the population of *Chiropotes satanas*.

Trigger Species	*Pteronura brasiliensis*
Population Trend at the Beginning of the Project	Decreasing (IUCN, 2018).
Scenario without Project	Without the REDD+ Jari/Pará Project, the population trend of this species is a decrease and worsening of its threatened state, mainly due to the loss and degradation of habitat caused by deforestation and forest degradation. Another aggravating factor is predatory hunting.
Scenario with Project	The REDD+ Jari/Pará Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss and consequent improvement in biodiversity conservation. In addition, the Project fosters research that also helps in the identification and conservation of these environments. Therefore, it is expected with the Project that there will be improvements in the trend of the population of *Pteronura brasiliensis*.

Trigger Species	*Tayassu pecari*
Population Trend at the Beginning of the Project	Decreasing (IUCN, 2018).
Scenario without Project	Without the REDD+ Jari/Pará Project, the population trend of this species is a decrease and worsening of its threatened state, mainly due to the loss and degradation of habitat caused by deforestation and forest degradation. Another aggravating factor is predatory hunting.
Scenario with Project	The REDD+ Jari/Pará Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss and consequent improvement in biodiversity conservation. In addition, the Project fosters research that also helps in the identification and conservation of these environments. Therefore, it is expected with the Project that there will be improvements in the population trend of *Tayassu pecari.*

Trigger Species	*Crax alector*
Population Trend at the Beginning of the Project	Decreasing. It is suspected that this species loses between 15% and 24.4% of the adequate habitat within its distribution over three generations (35 years) based on a model of deforestation in the Amazon (IUCN, 2018).
Scenario without Project	Without the REDD+ Jari/Pará Project, the population trend of this species is a decrease and worsening of its threatened state, mainly due to the loss and degradation of habitat caused by deforestation and forest degradation. Another aggravating factor is predatory hunting.
Scenario with Project	The REDD+ Jari/Pará Project, which projects mitigation and reduction of deforestation and forest degradation, aims at minimizing habitat loss and consequent improvement in biodiversity conservation. In addition, the Project fosters research that also helps in the identification and conservation of these environments. Therefore, it is expected with the Project, that there will be improvements in the trend of the population of Crax alector.

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