REDD+ JARI/PARÁ PROJECT MONITORING REPORT OF GHG EMISSION REDUCTIONS FROM AVOIDING UNPLANNED DEFORESTATION IN 2015, 2016 & 2017

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The activities of Jari/Pará REDD+ Project are under responsibility of Biofílica Investimentos Ambientais and Fundação Jari, it's started in 2014, with the first viability studies and the signing of the contract between Biofílica and Grupo Jari. The activities have been developed simultaneously, since the process of conception of the Project until its first verification, and will be continued for the entire Project's duration, through studies planning and execution, and prospection of buyers for Project's credits, ensuring the continuation of the Project. The main Project activities that have been implemented during this first monitoring period are listed below with their respective dates, for more detailed on the implementation of each Project Activity see Section 2.1.

1. **Identification of actors and partnerships and choice of Research Institutions** – from March/2015 to June/2015
2. **Carbon Stock Estimate, Socioeconomic and Environmental Studies** – from 2015 to 2016
3. **Baseline Determination** – from 2014 to 2016 and revised from 2017 to 2018
4. **Meetings with Researchers and Proponents** – from May/2015 to September 2015
5. **Creation of the REDD+ Jari Social-Environmental Financial Management Agreement** – Started in 2015 and to be continued throughout the Project lifetime
6. **Project's budget follow up** – Started in 2014 and to be continued throughout the Project duration.
7. **Intensify and improve the efficiency of Patrimonial Surveillance: Carrying out surveillance actions by Grupo Jari team; Report illegal activities to the government authorities; Mitigation and prevention of deforestation** – Started in 2015 and to be continued throughout the Project duration
8. **Strengthening Family Agriculture and Sustainable Extractivism: Implementation of Agroforestry Systems (SAFs in Portuguese)** – Started in 2016 and to be continued throughout the Project duration.
9. **Expansion of dialogue with communities in the Project Zone** – Follow up started by the project in 2015 and to be continued throughout the Project duration

The implemented REDD+ activities are related to the greenhouse gas emission reduction by containing unplanned deforestation, promoting social inclusion socioeconomic development. 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 in its vicinity.

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. With this, the total GHG emissions reductions generated in this monitoring period (July 8, 2014 through October 22, 2017) were 1,012,082 tCO2e.

1.2 Sectoral Scope and Project Type

- **Project Scope:** 14 **–** Agriculture, Forest and other Land Use (AFOLU)
- **Project Category:** Reduction Emission from Deforestation and Degradation
- **Type of Activity:** Avoided Unplanned Deforestation (AUD)
- **Grouped Project:** No

1.3 Project Proponent

Project proponents and their respective contacts are described below.

Organization name	Biofílica Investimentos Ambientais S.A.
Contact person	Plínio Ribeiro
Title	Executive Director
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Telephone	+55 11 3073-0430
Email	plinio@biofilica.com.br
Organization name	Jari Celulose S.A.
Contact person	Patrick Nagem Nogueira
Title	Executive Director
Address	Vila Munguba, s/nº ZIP 68240-000, Monte Dourado/PA – Brasil
Telephone	+55 11 4689-8753
Email	patrick.nogueira@grupojari.com.br
Organization name	Fundação Jari
Contact person	Jorge Rafael Almeida
Title	General Coordinator
Address	Alameda Mamoré, 989 – 25th floor – Alphaville ZIP 06454-040, Barueri/SP – Brasil
Telephone	+55 93 3735-1140
Email	jorge.almeida@fundacaojari.org.br

1.4 Other Entities Involved in the Project

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

Organization name	Casa da Floresta Assessoria Ambiental
Role in the project	Development of studies to characterize the physical environment and evaluation of the region's biodiversity, as well as the development of the socio-economic data of the Jari/Pará REDD+ Project.
Contact person	Klaus D. Barreto & Mônica Cabello de Brito
Title	Directors
Address	Avenida Joaninha Morganti, 289 – Monte Alegre ZIP 13415 030, Piracicaba/SP – Brasil
Telephone	+55 19 3433-7422
Email	casadafloresta@casadafloresta.com.br
Organization name	Harmonia Socioambiental
Role in the project	Realization of social consultation for socioeconomic and environmental diagnosis and socioeconomic module.
Contact person	Nicia Coutinho
Title	Senior Consultant
Address	Alameda Augusto Fernandes Queiros, 07 – Caranazal ZIP 68040-650, Santarém/PA – Brasil
Telephone	+55 93 99159-8911
Email	hconsultoriasocioambiental@gmail.com
Organization name	Florestal Recursos Manejo Brasil Consultoria e Assessoria Ltda. (FRM BRASIL)
Role in the project	Elaboration of the Forestry Carbon Stock Estimate study of the REDD + Project Jari Pará
Contact person	Arlei Fontoura
Title	Executive Director
Address	Travessa São Pedro, 566, SL1 – Batista Campos ZIP 66023-705, Belém/PA – Brasil
Telephone	+55 91-3241-3111
Email	frmbrasil@frm-brasil.com
Organization name	BRGEO

Role in the project	Collaborate in the elaboration of the project baseline through the definition of the spatial and temporal limits, as well as in the elaboration of the baseline model.
Contact person	Amintas Brandão Jr
Title	Part-Owner
Address	-
Telephone	+55 91 98320-3333
Email	abrandaojr@gmail.com

1.5 Project Start Date

The REDD+ Jari/Pará Project starting date is July 8, 2014, the justification elaborated for the definition of the project start date is contained in the project description document.

1.6 Project Crediting Period

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.

1.7 Project Location

The Jari/Pará REDD+ 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, 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 (Integral Protection and Sustainable Use), as well as agrarian reform settlements of the National Institute of Colonization and Agrarian Reform (INCRA). The Project Area (496,988 hectares) is localized within the property Gleba Jari I (Project Zone), which totaling an area of 909,461 hectares (Receipt of registration of rural property in the CAR – *"Recibo de inscrição do imóvel rural no CAR"* in Portuguese, 2016) demonstrated in Figure 1.

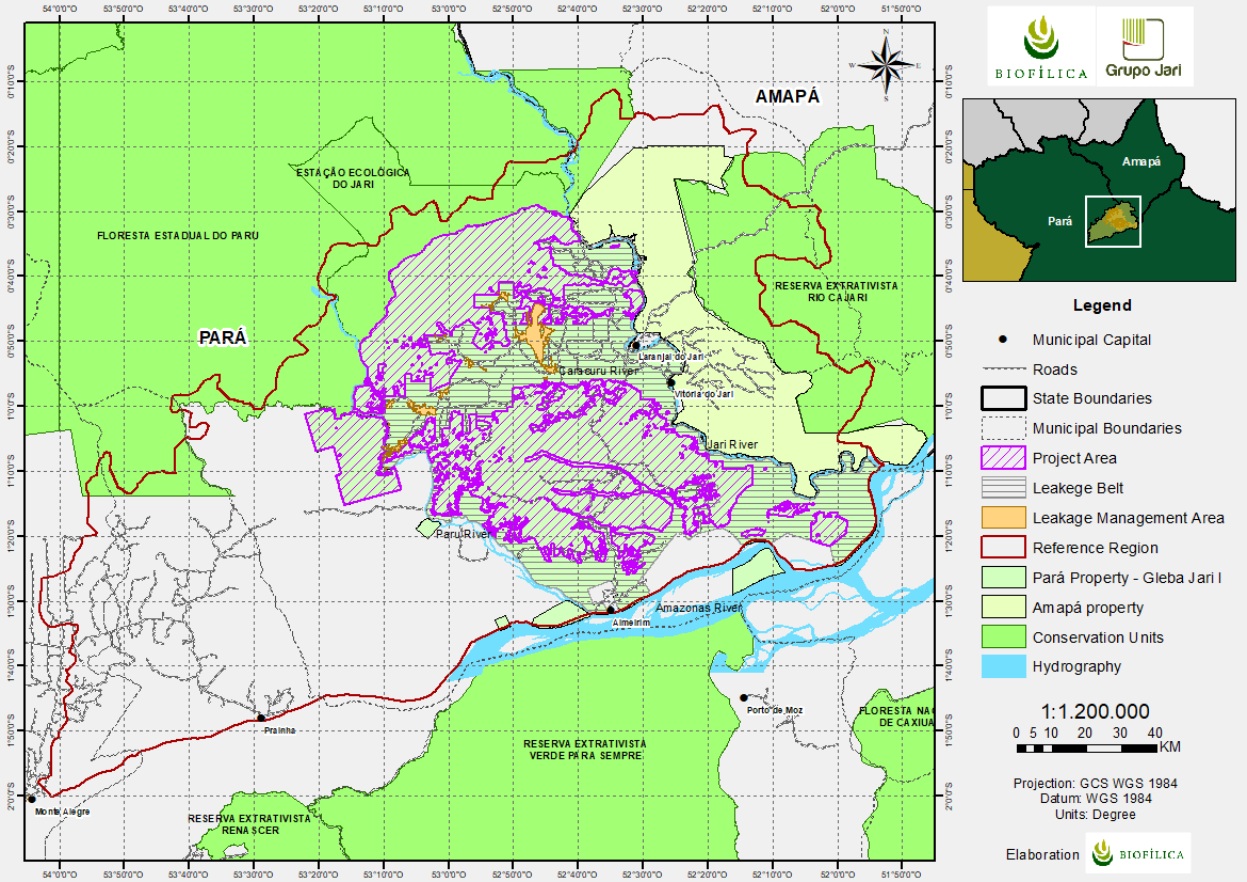

Figure 1: Location of the REDD+ Jari/Pará Project.

1.8 Title and Reference of Methodology

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

1.9 Other Programs

The Jari/Pará REDD+ Project does not hold or wishes to generate any kind of environmental credit related to GHG emissions reduction or removals claimed beyond the VCS Program.

1.10 Sustainable Development

The Jari/Pará REDD+ Project has as one of its objectives to promote sustainable development in the region, and the Fundação Jari is considered a facilitating and encouraging agent for this sustainable development. The Fundação works in the Jari region on the integral formation of young people 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 sustainable business reflected in the strengthening of local community enterprises.

All this work has already been recognized through several awards throughout its existence and its model of action is organized into three integrated areas of action: social, business and environmental management, detailed in the document *"Plano de Desenvolvimento Humano e Sustentável do Vale do Jari"*, in Portuguese, available to verifiers. Based on this support and in accordance with expected impacts, the project contributes to the following UN sustainable development goals:

Table 1. Contribution to the UN Sustainable Development Goals

Sustainable Development Goals	Application in Project
	The project intends help in the fight hunger through the implementation and monitoring of sustainable food production systems and resilient agricultural practices through strengthening family agriculture low carbon in the area, increasing productivity in family production units, recovering areas degraded previously by implantation of Agroforestry Systems, diversifying the agricultural production with the implantation of nurseries to supply seedlings of varied species and generating guarantee of food security for the families, actions applied mainly through the Technical Assistance and Rural Extension (TARE).
	The project aims to provides access and encourages education through technical and professional courses enabling better employment conditions and income, especially for women and youth. In addition, activities related to education and incentives to sustainable management practices of forest resources, reduce the spread of illegal activities, promote the appreciation of cultural diversity and contribute to the sustainable development culture. In order to achieve these objectives, the project is focused on intensifying Technical Assistance and Rural Extension (TARE) services, as well as offering training aimed at production bias, social organization, cooperativism, leadership and financial management, developing technical and professional skills.
	All project activities are open and stimulated for the participation of all the residents of the acting communities, especially women, youth and marginalized people. The Fundação Jari technicians are mainly oriented to include women in the activities in order to increase their participation in the decision-making processes. The project carries out activities aimed at the inclusion of gender and vulnerable populations with part of its resources from the Socioenvironmental Fund, respecting and fulfilling international agreements. In addition, the Grupo Jari promotes in the project region the

	inclusion of vulnerable groups in training and qualification programs seeking to offer knowledge and techniques so that these disadvantaged groups can compete in an egalitarian way in their selective hiring processes.
	Through actions that encourage the responsible exploitation of natural resources, low carbon agriculture and the recovery of degraded areas, the project promotes the conservation of natural resources, coupled with socioeconomic development for this, some of the main components of the Project activities are related to the promotion of scientific research focused on the efficient use of natural resources, seeking greater integration among the parties involved in the project and focusing on sustainable business chains, generating income and well-being for local communities and making the use of natural resources available more responsible and conscious.
	All activities undertaken by the project aim to take action to combat climate change and its impacts through the reduction of deforestation in the project area and consequently reducing the emission of greenhouse gases, the project has the potential to reduce 15,491,971 tCO_2e of GHG emissions in 30 years. And, in the monitoring period of this report the project reached the reduction of 1,012,082 tCO_2e.
	In addition to promoting the conservation of biodiversity, ensuring the maintenance of ecosystem services such as pest and diseases, pollination, water quality, climate regulation, the area serves as an ecological corridor for conservation areas in the region, this connectivity between fragments form a large and resilient conservation system to mitigate future global changes, make significant improvements in the living standards of local populations, and serve as a buffer zone for risks and threats to the mosaic of protected areas in the north of the state of Pará. Also, the project protects High Conservation Value Areas (HCVA) by stimulating and enhancing knowledge about local biodiversity through scientific studies such as long-term monitoring of flora and fauna.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The activities of the REDD+ component implemented during the first monitoring period (July 8th, 2014 – October 22th, 2017) are shown in Table 2.

Table 2. Summary of Jari/Pará REDD+ Project main activities in the monitoring period

Activity	Description	Status, applicable procedure and additional information regarding recording format
Planning Activities		
Signing of the contract addendum between proponents	Meetings between the proponents for presentation of a proposal for the expansion of the REDD+ Jari Project for the areas of Pará, which resulted in formalization of agreement among the proponents for the development of the REDD+ Jari Pará Project.	Concluded in July/2014 See the documents: *"Instrumento Particular de Prestação de Serviços, Comissão, Investimentos e Outras Avenças"* and *"1º Aditivo ao Instrumento Particular de Prestação de Serviços, Comissão, Investimentos e Outras Avenças"*
Identification of actors and partnerships and choice of Research Institutions	Contracting and firm partnerships with institutions and technical specialists. Conducting meetings aimed at forming a multidisciplinary team aligned with the project.	Concluded from March/2015 to June/2015 See the documents: Terms of Reference (*TDR* abbreviation in Potuguese) elaborated for the prospecting of partnerships
Techinical Studies		
Carbon Stock Estimate	The Forestry Carbon Stock Estimation Study was developed by FRM Brazil, aimed to estimate the carbon stock in the Jari Pará project area. The data were collected through the conduction of a forest inventory following the procedures required by the applied VCS methodology.	Conducted from May/2015 to March/2016 See the document: *Final Report: "Estudo para Determinação do Estoque de Carbono Florestal – Região do Projeto REDD+ Jari Pará"*
Baseline Determination	The Study for Baseline Determination of Deforestation was developed in partnership with BRGEO, aimed to determine the project baseline and estimate the amount of REDD credits to be potentially generated by the project. It was generated a technical report with modeling of future deforestation and knowledge about the dynamics of	Conducted from May/2014 to August/2016 and revised from January/2017 to October/2018 See the documents: *Final Report: "REDD Jari/Pará: Relatório linha de base – Projeções de desmatamento para o período 2011 – 2040"* and *"Relatório Final:*

	deforestation in the region.	*Projeto REDD+ Jari Pará – Linha de Base do Desmatamento".*
Socioeconomic and Environmental Studies	The Socioeconomic and Environmental Studies was developed together with Casa da Floresta, aimed to generate knowledge about the socio-environmental dynamics of the region and to conduct a preliminary assessment of possible impacts of the project on local social-economic and environmental context, as well as providing inputs for the design of interventions and suggesting actions and monitoring measures for the project.	Conducted from June/2015 to April/2016 See the documents: *"Contextualização Regional e Plano de Trabalho Módulo Socioeconômia Projeto REDD+ Jari - Pará"*; *"Relatório Final Avaliação da Biodiversidade Projeto REDD+ Jari - Pará"* and *"Relatório Final Caracterização do Meio Físico Projeto REDD+ Jari - Pará"*
Management and conception design activities		
Meetings with Researchers and Proponents	The main objective of the workshops with researchers and partners in the project is to align expectations, technical requirements and refinement of the project design.	Conducted from May/2015 to September 2015 See the documents: *"Projeto REDD+ Jari Pará: Workshop de Inicialização"*; *"Ata I Workshop – Projeto REDD+ Jari Pará"*; *"Memórias do II Workshop REDD+ Jari Pará"*; and *"Projeto REDD+ Jari Pará: Workshop II – Desenho".*
Creation of the REDD+ Jari Social-Environmental Financial Management Agreement	This activity started with the articulation between partners to define and propose the line of action of the Project activities. Initially the discussions were about project financing/management structure and the deliberation of the efficiency and principles of the investments that would be made. The meetings between project proponents was aiming to discuss the project planning and schedule.	Started in 2015 and to be continued throughout the Project lifetime See the documents: *"ATA Reunião de Investimentos dos Projetos REDD+ Jari Pará e Amapá"; "Memórias das Consultas sobre a Conta do Projeto REDD+ Jari"; "Fundo Socio Ambiental REDD+ Jari - Março 2015".*
Project's Financial Management		
Project's budget follow up	Biofílica carries out the annual budget follow-up that details the investments and expenses incurred until the moment of the project validation. After the Project Verification and revenue generation, the financial reports will be prepared and approved jointly with the Fundação Jari.	Started in 2014 and to be continued throughout the Project duration. See the documents: Project budget follow-up: *"Orçamento_Jari_Pará"*
Activities to prevent unplanned deforestation and monitoring of the forest cover		
Intensify and improve the efficiency of Patrimonial Surveillance: Carrying	The patrimonial security sector of Grupo Jari has been continuously conducting the surveillance in the properties since 2003 in Pará and Amapá and, since the beginning	Started in 2015 and to be continued throughout the Project duration. See the documents:

out surveillance actions by Grupo Jari team; Report illegal activities to the government authorities; Mitigation and prevention of deforestation.	of the project aims to operate in accordance with the principles of REDD+ certification. The milestone of this change of position was the meetings held between researchers and proponents in 2015, where the proposal for replication for the Pará area of the environmental monitoring carried out, linking the work of the surveillance team with the evaluation of satellite images performed by Biofílica. The challenge of including Pará area in these actions led to a need to re-evaluate existing surveillance team priorities, going beyond property care and security, adding with other essential factors to a REDD+ project, such as the field checking of areas detected as "deforestation" by satellite imagery, and actions incorporated into the Grupo Jari procedures during the monitoring period, covering issues of conflict resolution, internal processes, inspection conditions and conduct, control of activities in the Jari areas and the improvement of and monitoring of high conservation value areas. Among these activities proposed for the monitoring period, it was not possible to started the field check work of deforested areas detected by satellite (PRODES monitoring), that is better described in item 2.2.2. In spite of that, in the Project Area and the Leakage Belt, the surveillance procedure was maintained for the years monitored and is regularly conducted by rivers and land in the forest and high conservation value areas. This patrolling was carried out in accordance with the updated procedure, aiming to meet the certification criteria, and with the monthly program of the surveillance team, which aims to ensure the protection of the Grupo Jari property, preventing and identifying deforestation, illegal logging, among other illegal activities. In addition, the monitoring period covered actions by providing guidance and environmental education realized by Fundação Jari to local communities about	First meetings: *"Projeto REDD+ Jari Pará: Workshop de Inicialização"*; *"Ata I Workshop – Projeto REDD+ Jari Pará"*. Quantification of surveillance activities carried out in the monitored period: *"Controle de Atividades de Fiscalização Fundiária".* Examples of police reports and photographic records in the areas during the monitored period: *"2014 - Eugênio Gotardo; 2014 - Rubens Dias Gonçalves; 2015 - Jorge Carlos Paiva Perna; 2015 - José Carlos Nast; 2016 - Antônio Benedito carvalho Filho; 2016 - Jacinto Augustinho da Silva; 2016 - Janary Sanches da Silva e Outros; 2016 - Jonas Batista da Silva; 2016 - Matheus Soares se Souza; 2016 - Pedro conhecido por Piricó".* Examples of invasions records in the monitored period: *"Planilha de Invasão - ANO 2015; Planilha Invasões - 2o Semestre – 2014; Relatório de Invasões - 2016 - 1° Semestre; Relatório de Invasões - 2016 - 2° Semestre".* Mitigation actions, offering guidance and environmental education for local communities: *"PROJETO - AGENTES SOCIOAMBIENTAIS – ALMEIRIM/PA – 1º RELATÓRIO – ASA (2016)"; "ASA AGENTES SOCIOAMBIENTAIS II TRIMESTRE 2017"; "ASA AGENTE SOCIOAMBIENTAIS IV TRIMESTRE 2017".* Conflict management: *"SISTEMA INTEGRADO DE GESTÃO JARI – GESTÃO DE CONFLITOS"; "Reunião entre moradores da comunidade Morada*

	illegal and environmentally incorrect practices such as the use of fire, deforestation for the expansion of agricultural plots and contamination of rivers and soils, among other potentially environmentally harmful and greenhouse gas emitting practices, thus following the REDD+ certification requirements. In addition to the educational work, specific actions were carried out during the monitoring period that refer to the management of conflicts with local communities, seeking to find solutions to conflicts that occurred in the land, environmental and social order. These actions were carried out according to the procedure that conciliate the activities of various sectors of the company, including the Fundação Jari and the Surveillance Team, constituting the forming a Conflict Management Committee.	*Nova e Jorge Rafael Barbosa Almeida – Coordenador da Fundação Jari e Membro do Comitê de Gestão de Conflitos do Grupo Jari".* Grupo Jari procedures: *"FISCALIZAÇÃO DA ÁREA FUNDIÁRIA (2013 and 2018)"; "CONSERVAÇÃO DA FAUNA E FLORA"; "COMUNICAÇÃO COM PARTES INTERESSADAS.* Partial verification of PRODES monitoring: *"Projeto REDD+ Jari Pará Boletim de Monitoramento 2015, 2016 & 2017"; "Checagem em Campo dos Pontos de Desmatamento das de Áreas Ameaçadas/Projeto REDD+ Jari Pará"; "Monitoramento da Cobertura Florestal Projeto REDD+ Jari/Pará 2015 2016 2017".* Examples of surveillance Records in the High Conservation Value Areas: *"Vistoria Fundiaria AAVC - Nascente Planalto - Maio – 2016"; "Vistoria Fundiaria AAVC - Nascente Planalto - Novembro – 2016"; "Vistoria Fundiaria AAVC - Nascente Planalto - junho – 2017"; "Vistoria Fundiaria AAVC - Nascente Planalto - Novembro – 2017"; "Vistoria Fundiaria AAVC - Cerrado área 100 - Março – 2015"; "Vistoria Fundiaria AAVC - Cerrado Área 100 - Junho – 2015"; "Vistoria Fundiaria AAVC - Cerrado área 100 - Outubro – 2015"; "Vistoria Fundiaria AAVC - Cerado área 100 - Agosto – 2017"; "Vistoria Fundiaria AAVC - Cerrado área 100 - Outubro – 2017".*
Strengthening Family Agriculture and Sustainable Extractivism: Implementation of	During the monitored years, Fundação Jari carried out with the communities of the municipalities of Monte Dourado and Almeirim the project to implement Agroforestry Systems (SAFs in	Started in 2015 and to be continued throughout the Project duration. See the documents: Fundação Jari reports: *"Prestação de*

Agroforestry Systems (SAFs in Portuguese) in the communities on municipalities of Almeirim and Monte Dourado	Portuguese), with the objective of stimulating the recovery of degraded areas through agroforestry systems, contributing to increased productivity and diversification of family production through the rationalized use of already altered areas, combating and mitigating deforestation and illegal exploitation of natural resources. The activity is aimed directly at the agroextractivists communities in the region, working with four strategic axes: • Organization: through the elaboration of the Plans of Use of Family Production Units together with the assisted families, helping in the access to the investment (rural credit). The next column is indicated some examples of projects developed for community in this axis, the documents presented represent the final result of the Plans of Use, which are presented in the realization of the rural credit application; • Production: performing the implementation of SAFs in already altered areas respecting the limits determined by the legislation for agricultural use in 20% of the property; • Education: enabling families in the production and management of SAFs applied to their Family Production Unit; • Commercialization: making commercialization policies accessible and assisting in establishing business partnerships with local businesses. The parameters that were adopted by the Fundação Jari in choosing the agroextractivists to participate in the project were: being an agroextractive producer, having already altered area and available on the property for the implementation of the agroforestry system, having availability of family manpower sufficient to execute the work in the agroextractive production unit, having market already established for the marketing of products and have experience with the planned agroextractivist activities.	*Serviços de Assistência Técnica e Extensão Rural – ATER"; "Avaliação de resultados no I semestre de 2016 – Programa Negócios Agroflorestais"; "Desenvolvimento Humano e Sustentável na Amazônia – Relatório Impactos 2016"; "Desenvolvimento Humano e Sustentável na Amazônia – Relatório Impactos 2017"; "Relatório de Atividades 2017 Projetos Unidade Jari".* Examples of Rural Credit Access Projects documentation: *"PROJETO 2015 - FRANCILENE MONTEIRO DE OLIVEIRA"; "PROJETO 2015 - UBIMAR MONTEIRO DE SOUZA"; "PROJETO 2016 - RODRIGO SIMAS VIEGAS"; "PROJETO 2016 - ZILETE AIRES FURTADO"; "PROJETO 2017 - CLEIBER SALES DOS SANTOS"; "PROJETO 2017 - JOSÉ ALMIR CALDEIRA BRAZÃO".*

	The main impacts and results achieved by this activity are the valorization of the "standing forest", keeping the forest stocks, generating income, based mainly on good practices of management of the products of forest, recovering previously degraded areas and breaking the cycle of itinerant agriculture, reducing emissions from degradation and deforestation, supporting the fixation of families in the forest, preventing the expansion of the rural/forest exodus and enabling the guarantee of rights through access to policies Technical Assistance and Rural Extension (TARE), rural credit and the fair commercialization. The next column shows some documents that exemplify the results achieved.	
Expansion of dialogue with communities in the Project Zone: Follow up of feedback channels	The Grupo Jari Quality and Environment department is responsible for management and monitoring all feedback records directed at the communication channels. The channels are open to address diverse issues, from land issues, infrastructure, suggestions, product and inputs orders or compliments. The information is collected from different sources and directed to those responsible within the Grupo Jari who can solve the questions, this entire process is recorded in spreadsheets that are frequently updated until the end of each case. This procedure is very important for the project mainly because of the possibility of actors making complaints of deforestation, oftentimes identifying their responsible, thus assisting in the work of patrimonial surveillance. In addition, these channels are essential for receiving complaints, suggestions or questions about the REDD+ Project.	Follow up started by the project in 2015 and to be continued throughout the Project duration. See the documents: *"Follow-up Demanda de Parte Interessadas 2015"; "Follow-up Demanda de Parte Interessadas 2016 1"; "Follow-up Demanda de Parte Interessadas 2017".*

2.1.1 Analysis of land-use and land cover change during the monitoring period

The analysis of land-use and land cover change during the monitoring period was carried out following the procedures described on the item 3.1.4 of the Project Description, though PRODES data. Data were available in vector format (shapefile) and matrix (raster) with spatial resolution of 30 meters. According to the methodology of PRODES Câmara et al. (2006), these images undergo a geometric

correction with displacement error of less than 1 pixel (30 x 30 m). These images cover the reference period (2015 to 2017) and can be located through four Path/Row in the Landsat scene: 226/60-61; 227/60-61. The main activities carried out by the PRODES system 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.

Map accuracy assessment

PRODES data were validated from a comparison of LandSat 8 with 30 meters of spatial resolution from August, September and November 2017, with support from Google Earth images and the soil cover map generated by INPE for the year 2017. About 164 points were randomly distributed in the monitored area (Project Area and Leakage Belt). For each point a visual interpretation was made of the predominant class at the point (classes: Forest, Non-Forest, Water and Deforestation). The Figure 2 demonstrates the methodology adopted to carry out the accuracy assessment of the PRODES mapping.

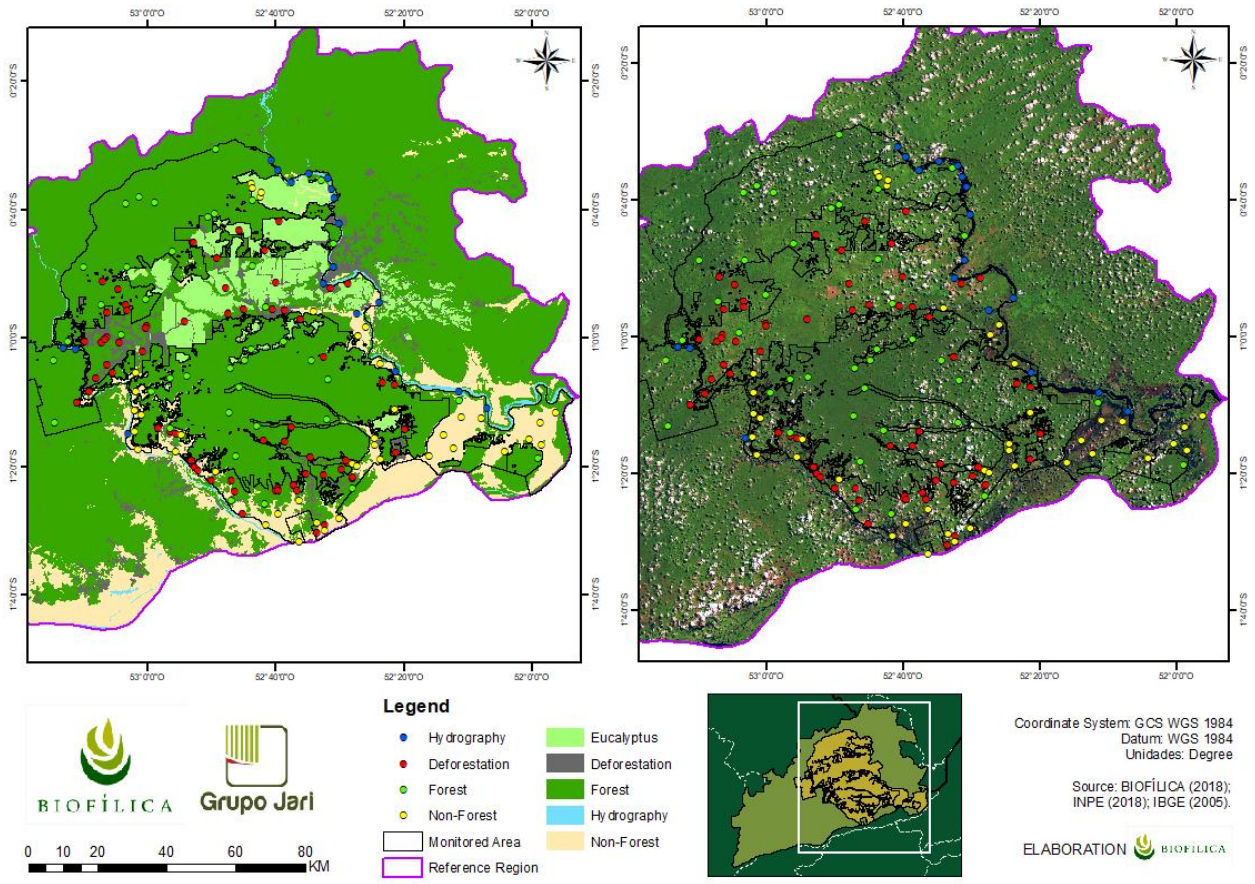

Figure 2. Map accuracy assessment

Having the reference points and the land-use and land-cover map of the monitoring period, it was possible to evaluate the performance of the monitoring process by analyzing the confusion matrix (Table 3) as per Congalton and Green (2008). The overall accuracy of the monitoring process for the land-use classes at the monitored area presented values above 80%, being 88%.

Table 3. Confusion matrix of the monitoring period

		Reference				**Total**	User accuracy	Ommission Error
		Water	Deforestation	Forest	Non-Forest			
Classified	Water	**13**	0	3	2	18	72%	28%
	Deforestation	0	**59**	4	3	66	89%	11%
	Forest	0	0	**38**	2	40	95%	5%
	Non-Forest	0	1	4	**35**	40	88%	13%
Total		13	60	49	42	**164**		
Producer accuracy		100%	98%	78%	83%			
Omission Error		0%	2%	22%	17%			
Map Accuracy								**88%**

The confusion matrix was made based on a stratified random allocation of points with the aim to sample all the land use land change classes. A total of 164 points were used in the accuracy assessment, which is more the suggested in the Project Description, being 40 points randomly distributed in the Forest class and 66 points randomly distributed in the Deforestation class and additional 58 points randomly distributed in the Hydrography and Non-Forest class.

During this monitoring period, in parallel with the survey of PRODES Project data, the Grupo Jari patrimonial surveillance team conducted its patrolling activities within of the Gleba Jari I, where the monitored areas are located. When irregularities were identified, such as deforestation, criminal burnings, and possession of land by third parties, the responsible for team issues a police report to the public security organs of the municipality. When the occurrence was grave and cannot be resolved only within the municipal bodies, the state (SEMAS) and federal agencies (IBAMA) were activated and all information regarding situations is informed so that appropriate measures are taken. In addition, all occurrences of trespassing on the property were recorded for planning future actions.

The flowchart below illustrates the future improvement of this process (Figure 3), where the information gathered by the PRODES Project and others high resolution imagery platforms will serve as indicators for field verification, complementing the work already done by the patrimonial surveillance team. Until the completion of this monitoring report, the field verification of the localized areas was not completed, so it is not included in this document.

Figure 3. Deforestation verification process flow

2.1.2 Monitoring of leakage and management of non-permanence risk factors

The monitoring of leakage was performed through satellite images, allowing the mapping of the forest cover and the land cover change in the Leakage Belt, as described in section 4.3 of this document.

Regarding risk factors of non-permanence, the main risks are related to External Risks, being managed as follows:

- Strengthening and stimulation for greater involvement of all parties involved in the design and decision-making processes in relation to Project activities through the REDD+ Technical Council and DRP Workshops (Fast Participatory Diagnostic);

- Improvement and dissemination of existing communication tools among the actors involved, such as the Internal Ombudsman, Information Channels, Feedback System and complaints repair procedures.

2.2 Deviations

2.2.1 Methodology Deviations

Not applicable.

2.2.2 Project Description Deviations

As described in Table 2. Summary of Jari/Pará REDD+ Project main activities in the monitoring period – it was verified that the project committed a “project description deviation” by not completing the output “Generation of Annual Deforestation Bulletins based on official PRODES/INPE Project data” of the activity “Deforestation Monitoring via Satellite Imagery” activity scheduled to start in 2015, as defined in Project Description. This activity is part of the “Forest Monitoring Intelligence” theme and was not included in this Monitoring Report as it had not been started within the monitoring period. The activity foresees the field check of deforested areas detected by satellite images, that have been identified by the realization of the output “Evaluation of new deforestation points and areas through satellite imagery”, and aims to improve the work of patrimonial surveillance, generate more knowledge about the dynamics of the deforestation in the Project Zone and contribute to the work of technical assistance to local communities.

Despite this deviation from what was initially foreseen in the Project Description, there were certainly no impacts on the applicability and appropriateness methodology criteria, and on the additionality of the Project. All methodology criteria of applicability and appropriateness of the project remain unchanged and are not related to the non-accomplishment of this specific action. By not carrying out such activity, the project did not commit any methodological deviations regarding its appropriateness to VM0015 requirements. Therefore, all applicability criteria remain unchanged, such as baseline activities according to VCS AFOLU requirements, scope of "Protection with controlled logging, fuel wood collection or charcoal production", and the classification of areas as "forest" according to the methodological parameters.

In the case of additionality, since it is a multiple activity project where the proof of additional efforts to reduce deforestation is not dependent on a single specific action, other activities carried out during the monitoring period are shown in Table 2, which demonstrate legitimate efforts to reduce deforestation and avoid emissions over the monitored period. As described in the Project Description and demonstrated in the Project implementation status, the activities of combat and mitigation of deforestation involves, besides the work of field surveillance teams, actions aimed at local communities, either through support and technical guidance, as well as through institutional actions aimed at communication and conflict management. So, besides the patrimonial surveillance conducted in accordance with the principles of REDD+, the activities performed in the first monitoring period were focus on mitigation

actions, as described in the Table 2. Therefore, even considering that it was not possible to start the field check activity during the monitoring period, other mitigation activities were performed allowing the presentation of the results in this report without impacting the additionality of the project.

It is also important to take into consideration the assumptions presented in the investment analysis, where it has been shown that project implementation is economically or financially less attractive compared to the baseline scenario. In this regard it is important to reinforce that although a specific activity planned to be initiated during this first monitoring period has not been implemented, further actions planned to begin after 2019 have been advanced. These actions refer to the theme "Technical Assistance and Rural Extension (TARE)" which involved the activities of Strengthening Family Agriculture and Sustainable Extractivism, through the implementation of the SAF projects, and the Environmental Education Program, with the holding of workshops for the prevention of environmental degradation by communities. The realization of these activities was essential for the project to achieve results in reducing deforestation in the Project Area and Leakage Belt and would not take place in the common practice scenario as they required additional investments from the proponents. Therefore, failure to carry out a planned activity, as described above, does not affect the financial additionality as it has been replaced by other activities, which in turn required additional investments for the project to succeed in reducing unplanned deforestation.

2.3 Grouped Project

Not applicable.

2.4 Safeguards

2.4.1 No Net Harm

Potential negative environmental and socio-economic impacts

No negative environmental and socioeconomic impacts are expected during project implementation, mainly because participation in activities is voluntary and the Project imposes no restrictions on land use to rural communities established in the region. For communities not involved with the Project, no negative impact on this aspect is also expected, as it will also not suffer any type of land restriction, or will be forced to change their way of life.

Nonetheless, there may be potential risks to project communities, the main ones being related to the lack of interest of the parties involved in participating in the planned activities and the growth of the local population due to a potential migration process for the Project area in search of the benefits generated during the execution of activities, potentially increasing the demand for natural resources. Among these, the main risk related to the implementation of the Project would be the migration of the population, however, this population movement and related impacts did not occur, since only

communities already established and consolidated in the area can participate in the Project activities, in addition patrols by Grupo Jari team that can identify possible new invasions and deforestation.

With regard to biodiversity specifically, the main source of impact would be timber forest management, however, until then the management has been implemented in a planned and well executed way, which makes possible impacts liable to be mitigated. The management carried out by the Grupo Jari followed a series of strictly monitored operational and environmental procedures in order to have the least possible impact during logging activity. In the area of high conservation value (HCV fragment of Savanna) in the area of management, were also applied measures to mitigate possible impacts and ensure the maintenance and improvement of the area, such as the planning of forest activities, installation of signs, monitoring and surveillance of the HCV area and its surrounding areas, and a forest fire prevention and control plan.

In addition, the other risks that the project is susceptible refer to the difficulties in reducing the pressure of the agents of deforestation, the lack of alignment between parties for the decision making in the subjects related to the project, which consequently generates a greater difficulty to carry out the already established actions and, finally, the insufficient resources to be invested in the activities, mainly by the Fundação Jari.

In order to mitigate these risks, some measures have been established such as the implementation of participatory stakeholder strategies in the design of activities and decision-making, creating a more appropriate interaction structure and building together an agenda that minimizes the overlap of activities. In addition, the involvement of the parties in this decision-making was strengthened, mainly through the DRP workshops and by improving existing communication channels and, finally, improving patrimonial surveillance, making it more effective, aligning the monitoring data with existing schedules.

2.4.2 Local Stakeholder Consultation

The articulation between the Jari/Pará REDD+ Project stakeholders began in 2014, after the signing of the agreement between the proponents (Biofílica and Grupo Jari) that extended the REDD+ Project to the areas of Pará. After the agreement was formalized, the next step was the identification of actors and partnerships to assist in the development of technical studies for the implementation of the project, such as research institutions and consultancies. This process was completed in June of 2015 with the definition of the Project proposal, prioritizing a multidisciplinary work model with an integrated team.

With the technical partners defined, meeting between the researchers and proponents were started in May 2015, and were completed in September 2015, where partial results of the first studies in the area were presented and initial project activities were designed. The purpose of this process was to share knowledge between the parties, align the key issues about the Project, and outline the scope of activities and their causal relationships. During the workshops the participants were divided into working

groups where technical and descriptive points regarding the certification standards and their requirements regarding Fauna, Flora, Socioeconomic, Physical Environment, Carbon Inventory and Baseline Determination were discussed. On these working groups were defined, among the strategic actions for the project, the Field Work Plan and a prior assessment of communities that would be selected to be directly involved in the first phase of the Project. This Initial Community Engagement Plan is outlined in the final report of the socioeconomic work module. The complete methodology and results of these meetings are available to the Verifier Body in the records made by the proponents, cited in Table 2.

In addition to these initiatives, since the beginning of the monitoring period in 2015, the mechanisms already implemented by the Grupo Jari and, mainly, by the Fundação Jari, have been incorporated into the communication strategies with stakeholders. These are the Conflict Management Procedures, *"Gestão de Conflitos"*, and Stakeholder Communication Procedures, *"Procedimentos de Comunicação com Partes Interessadas"* in Portuguese. The first one includes actions required in case of complaints, dissatisfaction, disagreement or confrontation of opinions regarding land, environmental or social issues of communities within or around the property. The second describes the communication channels used, the suggestion boxes distributed at strategic points and the feedback channel called *"Fale Conosco"* (Contact Us), which works by email or telephone - virtual and verbal channels - and by the comment form available with the boxes and are carried out by the Fundação Jari professionals during the technical assistance processes. The description of these procedures and the evidences with follow ups of these feedback channels during the monitoring period has been made available to the Verifier Body, cited in Table 2.

After this period, the Project implementation and monitoring will be assessed through presentation and consultation meetings, the Technical Assistance and Rural Extension Service (TARE) and the Technical Chambers (TCs). TCs represent the place where all communities directly or indirectly impacted by the Project and other regional stakeholders, whether community, governmental, non-governmental or private, will have space for participation, debate and proposal building. During the monitored period of this report these activities related to TERA and TCs had not yet been implemented.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data/Parameter Unit	**Ctot**
Data Unit	$tCO_2e\ ha^{-1}$
Description	Average carbon stock per hectare in all carbon pools in the forest class used in the baseline scenario
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	The biomass estimates above and below the ground were made

or description of measurement means and procedures applied	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))**
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))**
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	-

3.2 Data and Parameters Monitored

Data / Parameter	**$ABSLPA_{icl,t}$**
Data unit	Hectare (ha)
Description	Areas of forest cover converted into non-forest cover areas within the Project Area of the Jari/Pará REDD+ Project
Source of data	Calculated by means of LANDSAT8 satellite images used by PRODES project corresponding to orbit/point: • 2015 – 226/61 (23/08/2015); • 2016 – 226/61 (09/08/2016; 27/11/2015); • 2017 – 226/60 (12/08/2017), 226/61 (12/08/2017), 227/60 (22/10/2017) and 227/61 (18/07/2017).
Description of measurement methods and procedures to be applied	Monitoring of the forest cover in the monitored area was accomplished by overlaying PRODES vector data on the boundary of the Jari/Para REDD+ Project Area. The polygons mapped as deforestation in the years of 2015 to 2017 were selected for

	quantification of the deforested area and subsequent field verification activities.
Frequency of monitoring/recording	Annual
Value monitored	• 2015: 453 ha; • 2016: 149 ha; • 2017: 222 ha
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 meters or more were used in the mapping and the minimum mapping unit is 1 ha. Classifications were 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 project emissions
Calculation method	Where unplanned deforestation was detected, the Forest Coverage Benchmark Mark Map were 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	**$ABSLLK_{icl,t}$**
Data unit	Hectare (ha)
Description	Areas of forest cover converted into non-forest cover areas within the Leakage Belt of the Jari/Pará REDD+ Project
Source of data	Calculated by means of LANDSAT8 satellite images used by PRODES project corresponding to orbit/point: • 2015 – 226/61 (23/08/2015); • 2016 – 226/61 (08/09/2015; 27/11/2015; 09/08/2016); • 2017 – 226/60 (12/08/2017); 226/61 (12/08/2017); 227/61 (18/07/2017)
Description of measurement methods and procedures to be applied	Monitoring of the forest cover in the monitored area was accomplished by overlaying PRODES vector data on the boundary of the Jari/Para REDD+ Leakage Belt. The polygons mapped as deforestation in the years of 2015 to 2017 were selected for quantification of the deforested area and subsequent field verification activities.
Frequency of monitoring/recording	Annual
Value monitored	• 2015: 836 ha; • 2016: 208 ha; • 2017: 156 ha.
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 were used in the mapping and the minimum mapping unit is 1 ha. Classifications were 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 leakage
Calculation method	Where unplanned deforestation was detected, the Forest Coverage Benchmark Mark Map were 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	**$APDPA_{icl,t}$**
Data unit	Hectare (ha)
Description	Survey and mapping of areas of forest cover converted into non-forest cover areas due to the construction of forest management infrastructures.
Source of data	Remote sensing images, technical maps, and field maps to monitor the construction of roads, trails, and yards for sustainable forest management activities.
Description of measurement methods and procedures to be applied	The monitoring of forest cover areas in the area of sustainable forest management were done by road construction and forest trails maps and shapefiles. The Forest Benchmark Map were updated by map algebra in case of planned deforestation. The verification processes were report the reduction in carbon stock in the Project area.
Frequency of monitoring/recording	During the management year of each UPA
Value monitored	• 2015: 73 ha; • 2016: 0 ha; • 2017: 0 ha.
Monitoring equipment	Field sheets, post-exploratory reports and geographic information system.
QA/QC procedures to be applied	The mapping of deforestation areas planned for the implementation of sustainable forest management infrastructures were carried out through high resolution images and field check.
Purpose of the data	- Calculation of project emissions
Calculation method	Where unplanned deforestation was detected, the Forest Coverage Benchmark Mark Map were updated by map algebra.
Comments	These values were estimated based on shapefiles data and forest management planning information for the UPA 09, explored during the monitoring period, the report until the date has not been concluded.

Data / Parameter	∆**CabBSLLKt**
Data unit	tCO_2-e
Description	Changes in total carbon stock in the leakage belt area
Source of data	Calculated
Description of measurement methods and procedures to be applied	- Leakage prevention activities will be listed; - A map 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 leakage management areas 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.
Frequency of monitoring/recording	Annual
Value monitored	No leakage was identified during the monitored period • 2015: 0 tCO_2-e; • 2016: 0 tCO_2-e; • 2017: 0 tCO_2-e.
Monitoring equipment	Images of remote sensing of digital processing program and calculation tables.
QA/QC procedures to be applied	Images with special resolution of 30 m or more were used in the mapping and the minimum mapping unit is 1 ha. Classifications were 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 leakage
Calculation method	Evaluation of ex-post estimates in the Leakage Belt in relation to the ex ante project estimate (Table 35 of VM0015).
Comments	-

Data / Parameter	**Frequency of surveillance and patrol operations**
Data unit	Number of operations per year
Description	Record of the number of surveillance operations carried out in the design area and leakage belt during the monitoring period
Source of data	Patrimonial Surveillance Reports
Description of measurement methods and procedures to be	The Jari Group's patrimonial surveillance team execute patrols by rivers and land, to realize a field verification of irregularities in

applied	property, like criminal burnings and possession of land by third parties. All patrols are recorded and filed by the Jari Group's patrimonial surveillance team.
Frequency of monitoring/recording	Monthly
Value monitored	Set. – Dez. 2014: 25 river operations and 73 land operations; Jan. – Dez. 2015: 46 river operations and 196 land operations; Jan. – Dez. 2016: 14 river operations and 155 land operations; Jan. – Out. 2017: 22 river operations and 227 land operations.
Monitoring equipment	Property surveillance team field sheets
QA/QC procedures to be applied	Until the finalization of this monitoring report QA/QC procedures were not applied
Purpose of the data	Evaluation of the efficiency of surveillance operations
Calculation method	-
Comments	The control of patrimonial surveillance reports was implemented from the Project validation

Data / Parameter	**Monitoring of forest cover by high-resolution satellite imagery**
Data unit	Number of operations per year.
Description	Presentation of monitoring reports on land cover and land cover changes through high resolution satellite images.
Source of data	Monitoring Reports.
Description of measurement methods and procedures to be applied	The forest coverage monitoring data in the project area and leakage belt will be surveyed through analysis of high-resolution satellite images obtained through the Planet Platform. The images of the analyzed periods will be classified automatically, and through the visual interpretation of the images in order to identify changes in land use in the monitored area.
Frequency of monitoring/recording	To be established.
Value monitored	-
Monitoring equipment	Images of the Planet Monitoring System processed in data cloud and later in digital processing program, geographic information system and conventional GPS.
QA/QC procedures to be applied	Images with a special resolution of 3,125 m (Planet) and 5 m (RapidEye) will be used in the mapping, with a Ground Sample Distance (GSD) better than 4.5 m and 6.5 m respectively, with the minimum mapping unit of 1 ha. The evaluation and validation of the classifications will be done through data collected in the field using GPS navigation. The minimum accuracy of the classification map of use and ground cover is 80%.
Purpose of the data	If unplanned deforestation areas are detected, the Forest Cover Benchmark Map will be updated by map algebra.
Calculation method	The monitoring with high resolution images will be used to complement the official deforestation information of the area collected by PRODES (INPE), the main objective of the use of

	these images is to optimize the patrimonial surveillance process in the Project Area. The official deforestation data for the project will continue to be from PRODES.
Comments	Monitoring by high resolution satellite imagery would be implemented upon Project validation, but until the conclusion of this monitoring report the negotiations for hiring the services had not yet been finalized.

3.3 Monitoring Plan

3.3.1 Organizational structure, responsibilities and competencies

The monitoring plan for the Jari/Pará REDD+ Project is a combination of three components: climate, community and biodiversity. In this first verification period, only monitoring of deforestation was carried out in the Project Area and Leakage Belt, within the climate component. Biofílica is responsible for coordinating the monitoring processes during the project's life cycle. In addition, it was also responsible for the monitoring of climatic aspects with the support of the Jari Celulose and Fundação Jari teams.

Project Competencies and Responsibilities

Biofílica: 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 promotes 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.

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.

Jari Celulose: is a company of the Grupo Jari's 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.

Responsibilities: responsible for the Project co-management, for the operation low-impact forest management in Jari's properties, provide support in infrastructure and logistics for Biofílica and other professionals involved in the project, owner of the land and responsible for land security and patrimonial surveillance.

Fundação Jari: is the social enterprise of the Grupo Jari's 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 Grupo Jari's. Since 1994, it has assisted more than 6.8 million people in Brazil.

Responsibilities: responsible for the Project co-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, provide support in infrastructure and logistics for Biofílica and other professionals involved in the project. In addition, to being responsible for the development of social activities and for the social management of the Project.

3.3.2 Internal auditing performed

Biofílica Investimentos Ambientais supports annual financial auditing processes ensuring that its 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 Biofílica, the Grupo Jari 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 Grupo Jari 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.

3.3.3 Monitoring Plan for Climate Impacts

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 were carried out through analysis of avoided unplanned deforestation. Biofílica Investimentos Ambientais developed actions to monitor REDD+ activities, which aims 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 4. Data 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 pools in	ton of carbon dioxide	Calculated by allometric	Collected in periods of up

	the forest class *icl*	equivalent (tCO_2-e)	equations and field-measured data	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	ton 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	ton 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	ton 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	ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual
$\Delta CPSPA_t$	Total inventory change in the Project area in year *t*	ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual

c) Brief description of the data collection procedures

The monitoring of unplanned deforestation in the project area was based on the data processed by the PRODES project, the procedures performed for data collection and processing were described in item 2.1.1 of this document, identifying the land use conversion areas.

The monitoring of planned deforestation caused by forest management activities used information contained in maps and shapefiles of road and trails planning, as well as yard planning information, with its average size and number installed by UPA in the respective monitored years.

d) Quality control procedures and quality assurance

The mapping of deforestation occurrence data will be done through data collected in the field using 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, were used images with special resolution of 30 m or more and the minimum mapping unit 1 ha, such as LandSat-8, with good viewing and low cloud coverage.

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

e) Data archiving

Biofílica Investimentos Ambientais keeps all Jari/Pará REDD+ 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 and surveillance activities are stored by the Grupo Jari.

1.1.1 Monitoring of Project Implementation

Implementation of REDD+ activities are 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 were developed by mapping the forest coverage of the Project Area, data provided annually by PRODES. Subsequently the mapping was be validated from the assessment of accuracy with images LandSat-8 with good viewing and low cloud coverage, with support from Google Earth images.

The monitoring of deforestation for the construction of roads, branches and storage yards within the Project Area was be used Post-Exploratory Reports and maps and satellite images containing information on forest cover areas converted into the non-forest class.

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

1.1.3 Monitoring of changes in carbon stocks

Within the Project area: It is hoped that the ex-ante estimate of carbon stock for forest class were 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 planned management activities, or areas subject to the unplanned and significant decrease of the carbon stock in the Project scenario.

Within the areas of leakage management: No areas were subject to planned carbon stock decrease in the leakage management areas in the project scenario.

Ex-post estimate of non-CO_2 emissions due to forest fires: Emissions due to biomass burning were not be computed in this Project. According to VM0015 methodology emissions Non-CO_2 can be omitted conservatively since, as demonstrated by scientific research, in the Amazon region the occurrence of natural fire is rare that occurs is the predominance of anthropogenic fires related to human occupation (SCHROEDER et al, 2009). Beside that, the project does not include or stimulate these activities, but rather promotes actions that mitigate the actions of these deforestation agents through the strengthening of patrimonial surveillance and monitoring of deforested areas, so it is conservative to exclude these emissions.

1.1.4 Monitoring of impacts of natural disturbances and other catastrophic events

Decreases in carbon stock and increasing GHG emissions caused by natural disturbances or catastrophic events was 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.

Emissions due to natural disturbance or catastrophic events were estimated by multiplying the area of forest loss mapped by the average of forest carbon stock. During this monitoring period no significant reduction in carbon stock due to natural disturbance or catastrophic events were identified during the forest cover monitoring.

1.2 Monitoring of Leakage

a) Technical description of monitoring tasks

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

- Monitoring the decrease 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. If these activities cause reductions in carbon stocks and/or increase in GHG emissions in leakage management areas, such carbon stock changes and/or GHG emissions would be estimated by Biofílica Investimentos Ambientais technical staff. During this monitoring period project proponents carried none of the interventions mentioned out. Therefore carbon stock changes and GHG emissions associated to leakage prevention activities were not accounted.

- Biofílica Investimentos Ambientais performed the monitoring of forest cover in the Leakage Belt via satellite images to account for carbon stock decrease and increases in the GHG emissions due to leakage displacement.

b) Data to be collected

Table 5. Data collected for leakage monitoring for REDD+ Jari/Pará Project

Data	Description	Unit	Source	Frequency
$ABSLLK_{fcl,t}$	Area of final (post-deforestation) forest class *fcl* deforested at time *t* within the leakage belt in the baseline case	Hectare (ha)	Calculated	Annual
$\Delta CLPMLK_t$	Decrease in carbon stock due to leakage prevention measures	ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual
$ELPMLK_t$	Total annual increase in GHG emissions due to leakage prevention measures in year *t*	ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual
$\Delta CabBSLLK_t$	Total carbon stock change in the leakage belt area	ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual

c) Brief description of the data collection procedures

Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities: The decrease in carbon stocks due to activities developed in Leakage Management areas was not occur, since any activity for improved farming techniques, or management of grazing areas that could alter carbon stocks and increase GHG emissions, as compared to the baseline scenario, has been planned for implementation. And such kinds of activities were not implemented during this monitoring period.

However, if it is decided that such activities are necessary, then, the ex-ante carbon stock changes and GHG emissions associated to such activities would be estimated through step 8 of the VM0015 methodology, and, if meaningful, they would be monitored and data would be provided to the verification body at each verification event through tables 30b, 30c, 31, 32 and 33 of VM0015 methodology, version 1.1.

Monitoring of the carbon stock reduction and increase in GHG emissions due to the leakage displacement: Activity data for the leakage belt area was determined using the same methods applied to monitoring deforestation in the project area (item 1.1). If during the monitoring process a deforestation event higher than the expected for baseline scenario is identified in the leakage belt (not the case during this monitoring period), and such deforestation is attributed to deforestation agents from the project area, the losses in carbon stock will be accounted and reported using Table 22c and 21d of VM0015 approved methodology version 1.1.

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. Such kinds of activities were not implemented during this monitoring period.

Monitoring of carbon stock decrease and increase in GHG emissions due to activity displacement leakage: 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 1.1).

e) Data archiving

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

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

The decrease in the carbon stock due to the activities developed in Leakage Management Areas did not occur, 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 were not implemented during this monitoring period

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 Leakage Management Areas may lead to a reduction in carbon stock or an increase in GHG emissions:

- Changes in carbon stock from activities implemented in the Leakage Management Areas;
- 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 activity displacement leakage

Activity data for the Leakage Belt area was determined using the same methods applied to monitoring deforestation in the Project Area (item 1.1). 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 21c and 22c of the Approved Methodology VM0015 version 1.1, which did not occur during the monitoring period of this report.

1.2.3 Total ex post estimated leakage

The results were demonstrated to the verifiers 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 processes the results was presented using the Table 36 of VM0015 approved methodology version 1.1 together with spatial data (deforestation maps, when available).

b) Data to be collected

Table 6. Data collected to monitor the net ex-post GHG gases reductions for the REDD+ Jari/Pará Project

Data	Description	Unit	Source	Frequency
$\Delta REDD_{,t}$	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t	ton of carbon dioxide equivalent (tCO_2-e)	Calculated	Annual
$VCU_{,t}$	Number of Verified Carbon Units (VCUs) to be made available for trade in year *t*	ton 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 at the years 2015, 2016 and 2017 were calculated 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 were used to ensure that the data are suitable for the verification process and the number of Verified Carbon Units is reliable.

e) Data archiving

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

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Estimation of annual areas of unplanned deforestation in the project area under the without project scenario has been implemented by applying the following four steps:

- Analyses of the historical change in land cover between 2000 and 2014 in the reference region of the Jari/Pará REDD+ Project area;
- Estimation of the annual areas of unplanned baseline deforestation in the Reference Region (RR);
- Estimation of the annual areas of unplanned baseline deforestation in the Project Area (PA);
- Analysis of the ex-post scenario over the current monitoring period.

The entire process is detailed in the Jari/Pará REDD+ Project Description and the results for the 2015 to 2017 monitoring period are presented in the tables on the following pages. For the determination of the reduced emissions, the estimated stock in the forest inventory, previously performed and described in the project description, was 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 7: Carbon stocks per hectare of initial forest classes *icl* existing in the project area and leakage belt

Initial forest class *icl*							
Name: **Forest**							
ID_{icl} **1**							
Average carbon stock per hectare + 95% CI							
Cab_{icl}		Cbb_{icl}		Cdw_{icl}		$Ctot_{icl}$	
C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$	C stock $tCO_2e\ ha^{-1}$	± 95% CI $tCO_2e\ ha^{-1}$
328.8	166.0	84.8	42.8	-	-	413.7	208.8
tC ha-1	IC %	tC ha-1	IC %	tC ha-1	IC %	tC ha-1	IC %
89.7	5%	23.1	5%	0.0	0%	112.8	5%

Proporção AB/BB= 25,8% (Nogueira et al. (2008))

Cab_{icl} = Average equivalent carbon stock per hectare for the above-ground biomass reservoir for the initial forest class; tCO_2-e/ha

Cbb_{icl} = Average equivalent carbon stock per hectare for the below-ground biomass reservoir for the initial forest class; tCO_2-e/ha

Cdw_{icl} = equivalent carbon stock per hectare for the dead biomass reservoir for the initial forest class; tCO_2-e/ha

$Ctot_{icl}$ = Average carbon stock per hectare for the total biomass reservoir for the initial forest class; tCO_2-e/ha

The PRODES consolidated information of 2014, which should be the first monitoring year, was used in the analysis of the historical change in land cover, as explained above. Therefore, data monitoring for this report begins in 2015, covering information from September 2014 to October 2017.

For baseline calculations was combined the maps of annual baseline deforestation of each future year produced with the land-use and land-cover map produced for the initial situation in Step 2 of project description to produce a set of maps showing for each forest class the polygons that would be deforested each year in absence of the project activity. Were extract form these maps the number of hectares of each forest class that would be deforested and the results of the baseline projections showed a deforestation of 3,893 hectares in the Project Area between 2014 and 2017 (Table 8) and 7,432 hectares in the Leakage Belt (Table 9).

Table 8: Annual areas of unplanned baseline deforestation in the Project Area for the 2015-2017 monitoring period

Area establiseh after deforestation per zone within the project area		Total baseline deforestation in the project area	
IDz>	**1**		
Name>	**Zone 1**	$ABSLPA_t$	ABSLPA
$Project\ year_t$	ha	ha	ha
2015	1,348	1,348	1,348
2016	1,309	1,309	2,657
2017	1,236	1,236	3,893

Table 9: Annual areas of unplanned baseline deforestation in the Leakage Belt for the 2015-2017 monitoring period

Area establiseh after deforestation per zone within the leakage belt		Total baseline deforestation in the leakage belt	
IDz>	**1**		
Name>	**Zone 1**	$ABSLLK_t$	ABSLLK
$Project\ year_t$	ha	ha	ha
2015	2,294	2,294	2,294
2016	2,532	2,532	4,826
2017	2,606	2,606	7,432

For the calculation of the baseline changes in carbon stock in the Project Area (Table 10) and Leakage Belt (Table 11) for year t was used Method 1 of VM0015 version 1.1, according to Equation 10 on page 72 of VM0015 version 1.1, presented below:

$$\Delta CBSLPA_t = \sum_{p=1}^{P}\left(\sum_{icl=1}^{Icl} ABSLPA_{icl,t} * \Delta Cp_{icl,t=t*} - \sum_{z=1}^{Z} ABSLPA_{z,t} * \Delta Cp_{z,t=t*} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-1} * \Delta Cp_{icl,t=t*+1} - \sum_{z=1}^{Z} ABSLPA_{z,t-1} * \Delta Cp_{z,t=t*+1} + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-2} * \Delta Cp_{icl,t=t*+2} - \sum_{z=1}^{Z} ABSLPA_{z,t-2} * \Delta Cp_{z,t=t*+2} + \cdots + \sum_{icl=1}^{Icl} ABSLPA_{icl,t-19} * \Delta Cp_{icl,t=t*+19} - \sum_{z=1}^{Z} ABSLPA_{z,t-19} * \Delta Cp_{z,t=t*+19}\right) \quad (1)$$

Where:

$\Delta CBSLPA_t$: Total baseline carbon stock change within the project area at year t (tCO_2-e)

$ABSLPA_{icl,t}$: Area of initial forest class *icl* deforested at time *t* within the project area in the baseline case (ha);

$ABSLPA_{icl,t-1}$: Area of initial forest class *icl* deforested at time *t*-1 within the project area in the baseline case (ha);

$ABSLPA_{icl,t=t-19}$: Area of initial forest class *icl* deforested at time *t*-19 within the project area in the baseline case (ha);

$\Delta Cp_{icl,t=t*}$: Average carbon stock change factor for carbon pool pin the initial forest class *icl* applicable at time *t* (as per Table 20.a) (tCO_2-e.ha^{-1});

$\Delta Cp_{icl,t=t*+19}$: Average carbon stock change factor for carbon pool pin the initial forest class *icl* applicable at time t=t*+19 (20^{th}year after deforestation, (as per Table 20.a) (tCO_2-e.ha^{-1});

$ABSLPA_{z,t}$: Area of the zone *z* "deforested" at time *t* within the project area in the baseline case (ha);

$ABSLPA_{z,t-1}$: Area of the zone *z* "deforested" at time *t*-1 within the project area in the baseline case (ha);

$ABSLPA_{z,t-19}$: Area of the zone *z* "deforested" at time *t*-19 within the project area in the baseline case (ha);

$\Delta Cp_{z,t=t*}$: Average carbon stock change factor for carbon pool pin zone *z* applicable at time *t* = *t** (as per Table 20.b) (tCO_2-e.ha^{-1});

$\Delta Cp_{z,t=t+1}$: Average carbon stock change factor for carbon pool pin zone *z* applicable at time *t* = *t**+1 ((=2^{nd}year after deforestation, as per Table 20.b) (tCO_2-e.ha^{-1});

$\Delta Cp_{z,t=t*+19}$: Average carbon stock change factor for carbon pool pin zone *z* applicable at time *t* = *t**+19 ((=20^{th}year after deforestation, as per Table 20.b) (tCO_2-e.ha^{-1}).

Total emissions in the baseline scenario in the Project Area for the years 2015, 2016 and 2017 were 454,699 tCO2e; 444,881 tCO2e; and 423,498 tCO2e respectively as presented in Table 10. The total emissions from the baseline scenario in the leakage belt for the years 2015, 2016 and 2017 were 773,798 tCO2e; 859,759 tCO2e; and 890,989 tCO2e respectively as presented in Table 11.

Table 10: Total net baseline carbon stock change in baseline scenario in the Project Area (table 21.b. VM0015)

Carbon stock	Total carbon stock	Carbon stock	Total carbon	Total net carbon

changes per initial forest class *icl*		change of initial forest class in the project area		changes per post-deforestation zone z		stock change of post-deforestation zones in the project area		stock change of the project area	
ID_{icl}>	1	$\Delta CBSLPA_{icl,t}$	$\Delta CBSLPA_{icl}$	ID_{iz}>	1	$\Delta CBSLPA_{z,t}$	$\Delta CBSLPA_{z}$	$\Delta CBSLPA_{t}$	$\Delta CBSLPA$
Name>	Forest	annual	cumulative	Name>	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2015	454,699	454,699	454,699	2015	0	0	0	454,699	454,699
2016	452,980	452,980	907,680	2016	8,099	8,099	8,099	444,881	899,581
2017	439,462	439,462	1,347,142	2017	15,964	15,964	24,063	423,498	1,323,079

Table 11: Total net baseline carbon stock change in baseline scenario in the Leakage Belt area (table 21.c. VM0015)

Carbon stock changes per initial forest class *icl*		Total carbon stock change of initial forest class in the leakage belt area		Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in leakage belt area		Total net carbon stock change of the leakage belt area	
ID_{icl}>	1	$\Delta CBSLLK_{icl,t}$	$\Delta CBSLLK_{icl}$	ID_{iz}>	1	$\Delta CBSLLK_{z,t}$	$\Delta CBSLLK_{z}$	$\Delta CBSLLK_{t}$	$\Delta CBSLLK$
Name>	Forest	annual	cumulative	Name>	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2015	773,798	773,798	773,798	2015	0	0	0	773,798	773,798
2016	873,541	873,541	1,647,340	2016	13,783	13,783	13,783	859,759	1,633,557
2017	919,984	919,984	2,567,324	2017	28,996	28,996	42,778	890,989	2,524,545

4.2 Project Emissions

4.2.1 Emissions due to planned deforestation

Emissions associated to planned deforestation were developed in the Project area from 2015 to 2017. Total emissions related to planned deforestation is 30,286 tCO2e. This value was estimated based on the results of the post-exploratory report estimate for the UPA 09, which was explored during the monitoring period and was not terminated until the report's completion date.

Table 12 shows carbon stock decrease due to planned deforestation in the Project Area, these values were obtained by multiplying the average area of the infrastructures annually opened for roads and log decks, necessary to carry out the management within each Annual Production Unit (UPA), by the average carbon stock change, as shown in the equation below.

$$\Delta CPDdPA_t = (APDPA_{icl,t} \times Ctot_{icl,t}) \quad (2)$$

Where:

$\Delta CPDdPA_t$: Total decrease in carbon stock due to planned deforestation at year *t* in the project area;

$APDPA_{icl,t}$: Areas of planned deforestation in forest class *icl* at year *t* in the project area;

$Ctot_{icl,t}$: Average carbon stock of all accounted carbon pools in forest class *icl* at time *t*.

Table 12. Carbon stock decrease due to planned deforestation in the Project Area (Table 25.a. VM0015)

Project Year *t*	Areas of planned deforestation x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned deforestation	
	ID_{cl} =	1	annual	cummulative
	$APDPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CPDdPA_t$	$\Delta CPDdPA$
	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2015	73	414	30,286	30,286
2016	0	414	0	30,286
2017	0	414	0	30,286

4.2.2 Emissions due to planned logging activities

There were no emissions associated to planned logging activities were developed in Project Area from 2015 to 2017. As outlined in the most up-to-date Forest Management Plan 2016, logging was mainly directed to obtain long-lived wood products and based on the fact that VM0015 considers conservative to disregard these products from the calculations, all logging activities were excluded.

Table 13: Carbon stock decrease due to planned logging activities in the project area (Table 25.b. VM0015)

Project Year *t*	Areas of planned logging activities x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned logging activities	
	ID_{cl} =	1	annual	cummulative
	$APLPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CPLdPA_t$	$\Delta CPLdPA$
	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2015	0	0.0	0.0	0.0
2016	0	0.0	0.0	0.0
2017	0	0.0	0.0	0.0

4.2.3 Emissions due to planned fuel-wood and charcoal activities

No emissions associated to planned fuel-wood and charcoal activities were developed in the Project Area.

Table 14: Carbon stock decrease due to planned fuel-wood collection and charcoal production in the Project Area (Table 25.c. VM0015)

Project Year *t*	Areas of planned fuel-wood & charcoal activities x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned fuel-wood and charcoal activities	
	ID_{cl} =	1	annual	cummulative
	$APFPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CPFdPA_t$	$\Delta CPFdPA$

	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2015	0	0.0	0.0	0.0
2016	0	0.0	0.0	0.0
2017	0	0.0	0.0	0.0

4.2.4 Removals due to carbon stock increase of planned activities

Carbon stock increase due to planned activities in areas that would be deforested in the baseline case was omitted.

Table 15: Total ex post carbon stock decrease due to planned activities in the Project Area (Table 25.d. VM0015)

Project Year t	Total carbon stock decrease due to planned deforestation		Total carbon stock decrease due to planned logging activities		Total carbon stock decrease due to planned fuel-wood and charcoal activities		Total carbon stock decrease due to planned activities	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPDdPA_t$	$\Delta CPDdPA$	$\Delta CPLdPA_t$	$\Delta CPLdPA$	$\Delta CPFdPA_t$	$\Delta CPFdPA$	$\Delta CPAdPA_t$	$\Delta CPAdPA$
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2015	30,286	30,286	0,0	0,0	0,0	0,0	30,286	30,286
2016	0	30,286	0,0	0,0	0,0	0,0	0	30,286
2017	0	30,286	0,0	0,0	0,0	0,0	0	30,286

4.2.5 Total ex post carbon stock decrease in the Project Area

No carbon stock decrease associated to Project activities has occurred in the Project Area in the monitored period.

Table 16: Total Ex post estimated net carbon stock decrease in the Project Area

Project Year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2015	30,286	30,286	0,0	0,0	152,870	152,870	183,156	183,156
2016	0	30,286	0,0	0,0	51,463	204,333	51,463	234,619
2017	0	30,286	0,0	0,0	76,378	280,712	76,378	310,997

4.2.6 Emissions due to unavoidable unplanned deforestation

Total unplanned deforestation in the Project Area during this monitoring period is 824 hectares, according to PRODES data. For the years 2015, 2016 and 2017 were 453 ha, 149 ha and 222 ha, respectively as presented in Table 17.

Table 17: Observed annual areas deforested in each zone within the project area monitored (Table 13.b. VM0015)

Area establish after deforestation per zone within the project area		Total monitored deforestation in the project area		Baseline
IDz>	**1**			
Name>	**Zone 1**	Annual	Cumulative	Annual
Project year$_t$	ha	ha	ha	ha
2015	453	453	453	1,348
2016	149	149	602	1,309
2017	222	222	824	1,236

4.2.7 Emissions due to forest fires and catastrophic events

No emissions associated to forest fires and catastrophic events have occurred in the Project Area in the monitored period.

Table 18: Carbon Stock decrease due to forest fires in the Project Area (Table 25.e. VM0015)

Project Year *t*	Areas affected by forest fires x Carbon stock change (decrease)		Total carbon stock decrease due to forest fires	
	ID_{cl} =	1	annual	cummulative
	$AUFPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CUFdPA_t$	$\Delta CUFdPA$
	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2015	0	0.0	0.0	0.0
2016	0	0.0	0.0	0.0
2017	0	0.0	0.0	0.0

Table 19: Carbon Stock decrease due to catastrophic events in the Project Area (Table 25.f. VM0015)

Project Year t	Areas affected by catastrophic events x Carbon stock change (decrease)		Total carbon stock decrease due to catastrophic events	
	ID_{cl} =	1	annual	cummulative
	$ACPA_{icl,t}$	$Ctot_{icl,t}$	$\Delta CUCdPA_t$	$\Delta CUCdPA$
	ha	$tCO_2e\ ha^{-1}$	tCO_2e	tCO_2e
2015	0	0.0	0.0	0.0
2016	0	0.0	0.0	0.0
2017	0	0.0	0.0	0.0

Table 20: Carbon Stock decrease due to forest fires and catastrophic events (Table 25.g. VM0015)

Project Year *t*	Total carbon stock decrease due to forest fires	Total carbon stock decrease due to catastrophic events	Total carbon stock decrease due to forest fires and

					catastrophic events	
	annual	cummulative	annual	cummulative	annual	cummulative
	$\Delta CUFdPA_t$	$\Delta CUFdPA$	$\Delta CUCdPA_t$	$\Delta CUCdPA$	$\Delta CFCdPA_t$	$\Delta CFCdPA$
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2015	0	0.0	0.0	0.0	0.0	0.0
2016	0	0.0	0.0	0.0	0.0	0.0
2017	0	0.0	0.0	0.0	0.0	0.0

4.2.8 Ex post estimated net carbon stock change in the Project area

The calculation of the ex-post estimated net carbon stock change in the project area uses the same method described in the sections 6.1.2 and 6.1.3 of the Approved VCS Methodology VM0015, considering at this time the changes observed in the current monitoring period. The total change in carbon stock due to unavoidable unplanned deforestation in the Project area was calculated follows Equation 3.

$$\Delta \text{CUDdPA}_t = \sum_{y=1}^{t} \left(\sum_{icl=1}^{icl} AUDPA_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDPA_{fcl,y} * \Delta Ctot_{fcl,t-y} \right) \quad (3)$$

Where:

$\Delta CUDdPA_t$: Total carbon stock changes due to unavoidable unplanned deforestation in the Project Area in year *t*;

$AUDPA_{icl,y}$: Unplanned deforestation area in the initial forest class *icl* in year *t* in the Project Area in the Project scenario;

$\Delta Ctot_{icl,Ac}$: 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);

$AUDPA_{fcl,y}$: Post deforestation non-forest class area *fcl* in year t in the Project Area after unplanned deforestation in the Project scenario;

$\Delta Ctot_{fcl,Ac}$: Gain in carbon stock in the final post deforestation non-forest class *fcl* at the age of change *Ac* (number of years after change of use and soil cover).

Table 21: Ex-post carbon stock change in the Project Area (Table 21.b.2. VM0015)

Carbon stock changes per initial forest class *icl*		Total carbon stock change of initial forest class in the project area	
ID_{icl}>	**1**	$\Delta CBSLPA_{icl,t}$	$\Delta CBSLPA_{icl}$
Name>	**Forest**	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e
2015	152,870	152,870	152,870
2016	54,186	54,186	207,056

Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in the project area	
ID_{iz}>	**1**	$\Delta CBSLPA_{z,t}$	$\Delta CBSLPA_z$
Name>	**Zone 1**	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e
2015	0	0	0
2016	2,723	2,723	2,723

Total net carbon stock change of the project area	
$\Delta CBSLPA_t$	$\Delta CBSLPA$
annual	cumulative
tCO_2-e	tCO_2-e
152,870	152,870
51,463	204,333

2017	79,998	79,998	287,054	2017	3,620	3,620	6,342	76,378	280,712

Total ex post estimated carbon stock change in Project area under the Project scenario in this monitoring period is presented in Table 22.

Table 22: Net carbon stock change in the Project Area under the Project scenario (Table 27 VM0015)

Project Year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to fires and catastrophic events		Total carbon stock increase due to fires and catastrophic events		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CFCdPA_t$	$\Delta CFCdPA$	$\Delta CFCiPA_t$	$\Delta CFCiPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2015	30,286	30,286	0,0	0,0	0,0	0,0	0,0	0,0	30,286	30,286
2016	0	30,286	0,0	0,0	0,0	0,0	0,0	0,0	0	30,286
2017	0	30,286	0,0	0,0	0,0	0,0	0,0	0,0	0	30,286

4.2.9 Non-CO2 emissions from forest fires

Following the guidelines of item 6.2 of VM0015 (pg. 81), Non-CO_2 emissions from fires used to clear forests in the baseline were omitted, being monitored in the ex post scenario only when significant. During the monitoring period, the monitored area did not suffer any significant and unplanned reduction in carbon stock, for example, due to uncontrolled forest fires and other catastrophic events. And according to item 1.1.4 of VM0015 v 1.1 (page 112) these events are subject to monitoring and should be accounted for in the project scenario, when significant. Therefore, as none significant event occurred during the monitored period, this information was considered not relevant and was not monitored.

Table 23: Total ex ante estimated actual net carbon stock changes and emissions of non-CO2 gasses in the project area (Table 29 VM0015)

Project Year t	Total ex post carbon stock decrease due to planned activities		Total ex post carbon stock increase due to planned activities		Total ex post carbon stock decrease due to unavoided unplanned deforestation		Total ex post net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdPA_t$	$\Delta CPAdPA$	$\Delta CPAiPA_t$	$\Delta CPAiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$	$EBBBSLPA_t$	$EBBPSPA$
	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2-e	tCO_2-e
2015	30,286	30,286	0,0	0,0	152,870	152,870	183,156	183,156	0,0	0,0
2016	0	30,286	0,0	0,0	51,463	204,333	51,463	234,619	0,0	0,0
2017	0	30,286	0,0	0,0	76,378	280,712	76,378	310,997	0,0	0,0

4.3 Leakage

One source of leakage was monitored: leakage due to displacement activity. Leakage due to displacement activity was monitored by mapping forest cover change in the leakage belt. As defined in the VCS Methodology VM0015, deforestation above the baseline in the leakage belt area was considered activity displacement leakage. Activity data for the leakage belt area was determined using the same methods applied to deforestation mapping in the Project area.

4.3.1 Total ex post carbon stock decrease in the Leakage Belt

Total deforestation in the Leakage Belt during this monitoring period is 1,200 hectares, according to PRODES data. For the years 2015, 2016 and 2017 were 836 ha, 208 ha and 156 ha, respectively as presented in Table 24.

Table 24: Annual areas deforested in each zone within the leakage belt monitored (Table 13.c. VM0015)

Area establish after deforestation per zone within the leakage belt		Total monitored deforestation in the leakage belt		Baseline
IDz>	1			
Name>	Zone 1	Annual	Cumulative	Annual
Project year$_t$	ha	ha	ha	ha
2015	836	836	836	2.294
2016	208	208	1,044	2.532
2017	156	156	1,200	2.606

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

$$\Delta CBSLLK_t = \sum_{y=1}^{t} \left(\sum_{icl=1}^{icl} AUDLK_{icl,y} * \Delta Ctot_{icl,t-y} - \sum_{fcl=1}^{fcl} AUDLK_{fcl,y} * \Delta Ctot_{fcl,t-y} \right) \quad (4)$$

Where:

$\Delta CBSLLK_t$: Total carbon stock changes 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;

$\Delta Ctot_{icl,Ac}$: 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);

$AUDLK_{fcl,y}$: Post deforestation non-forest class area *fcl* in year *t* in the Leakage Belt after unplanned deforestation in the Project scenario;

$\Delta Ctot_{fcl,Ac}$: Gain in carbon stock in the final post deforestation non-forest class *fcl* at the age of change *Ac* (number of years after the change of LU/LC).

Table 25: Ex-post Baseline carbon stock change in the leakage belt area (Table 21.c.2. of VCS VM0015)

Carbon stock changes per initial forest class *icl*		Total carbon stock change of initial forest class in the leakage belt area		Carbon stock changes per post-deforestation zone z		Total carbon stock change of post-deforestation zones in leakage belt area		Total net carbon stock change of the leakage belt area	
ID_{icl}>	1	$\Delta CBSLLK_{icl,t}$	$\Delta CBSLLK_{icl}$	ID_{iz}>	1	$\Delta CBSLLK_{z,t}$	$\Delta CBSLLK_{z}$	$\Delta CBSLLK_{t}$	$\Delta CBSLLK$
Name>	Forest	annual	cumulative	Name>	Zone 1	annual	cumulative	annual	cumulative
Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	Project Year *t*	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2015	282,028	282,028	282,028	2015	0	0	0	282,028	282,028
2016	77,157	77,157	359,185	2016	5,023	5,023	5,023	72,133	354,162
2017	61,419	61,419	420,604	2017	6,271	6,271	11,295	55,147	409,309

4.3.2 Total ex post estimated leakage

Ex post total net carbon stock changes in the leakage belt due to displacement of activity in this monitoring period are presented in Table 26. The Leakage was calculated as the difference between the ex post and ex ante assessment.

In this case, as result, the value of the carbon stock change within the Monitoring Period from 2015 to 2017 is lower than zero (<0), so the ex post leakage was set to zero in these years as recommended by the section 1.2 – Monitoring of Leakage, of VCS VM0015.

Table 26: Total net ex ante and ex post baseline carbon stock change in the leakage belt

Total ex ante net carbon stock change of the leakage belt area		Total ex post net carbon stock change of the leakage belt area		Total ex-post Leakage	
ΔCBSLLKt	ΔCBSLLK	ΔCBSLLKt	ΔCBSLLK	ΔCBSLLKt	ΔCBSLLK
annual	cumulative	annual	cumulative	annual	cumulative
tCO2-e	tCO2-e	tCO2-e	tCO2-e	tCO_2-e	tCO_2-e
773,798	773,798	282,028	282,028	0,0	0,0
859,759	1,633,557	72,133	354,162	0,0	0,0
890,989	2,524,545	55,147	409,309	0,0	0,0

4.4 Net GHG Emission Reductions and Removals

The net anthropogenic GHG emissions reductions were calculated following the equation 19, equation 20 and equation 21 of VCS VM0015 version 1.1, presented below. The risk factor used to calculate VCS buffer

credits (VBC) is 11%, as calculated in Non-permanence Risk Report. The calculated ex post GHG emissions reductions are presented in Table 27.

$$\Delta REDD_t = (\Delta CBSLPA_t + EBBBSLPA_t) - (\Delta CPSPA_t + EBBPSPA_t) - (\Delta CLK_t + ELK_t) \quad (5)$$

Where:

$\Delta REDD_t$: Ex post estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t* (tCO_2e);

$\Delta CBSLPA_t$: Sum of baseline carbon stock changes in the project area at year *t* (tCO_2e);

$EBBBSLPA_t$: Sum of baseline emissions from biomass burning in the project area at year *t* (tCO_2e);

$\Delta CPSPA_t$: Sum of ex post actual carbon stock changes in the project area at year *t* (tCO_2e);

$EBBPSPA_t$: Sum of ex post actual emissions from biomass burning in the project area at year *t* (tCO_2e);

ΔCLK_t: Sum of ex post leakage net carbon stock changes at year *t* (tCO_2e);

ELK_t: Sum of ex post leakage emissions at year t (tCO_2e);

t: 1, 2, 3 ... T, a year of the proposed project crediting period (dimensionless).

$$VCU_t = \Delta REDD_t - VBC_t \quad (6)$$

$$VBC_t = (\Delta CBSLPA_t - \Delta CPSPA_t) * RF_t \quad (7)$$

Where:

VCU_t: Number of Verified Carbon Units that can be traded at time *t* (tCO_2e);

$\Delta REDD_t$: Ex post net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t* (tCO_2e);

VBC_t: Number of Buffer Credits deposited in the VCS Buffer at time *t* (t CO_2-e);

$\Delta CBSLPA_t$: Sum of baseline carbon stock changes in the project area at year *t* (tCO_2e);

$\Delta CPSPA_t$: Sum of ex post actual carbon stock changes in the project area at year *t* (tCO_2e);

RF_t: Risk factor used to calculate VCS buffer credits (%);

t: 1, 2, 3 ... T, a year of the proposed project crediting period (dimensionless).

Table 27: Ex post estimated net anthropogenic GHG emission reductions (ΔREDDt) and Verified Carbon Units (VCUt) (Table 36 VM0015)

Project Year t	Baseline carbon stock changes		Ex post project carbon stock changes		Ex post leakage carbon stock changes		Ex post net anthropogenic GHG emission reductions		Ex post VCUs tradable		Ex post buffer credits	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLPA_t$	ΔCBSLPA	$\Delta CPSPA_t$	ΔCPSPA	ΔCLK_t	ΔCLK	$\Delta REDD_t$	ΔREDD	VCU_t	VCU	VCB_t	VCB
	tCO_2-e	tCO_2-e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e	tCO_2e
2015	454,699	454,699	183,156	183,156	0	0	271,543	271,543	241,673	241,673	29,870	29,870
2016	444,881	899,581	51,463	234,619	0	0	393,418	664,961	350,142	591,816	43,276	73,146
2017	423,498	1,323,079	76,378	310,997	0	0	347,120	1,012,082	308,937	900,753	38,183	111,329

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APPENDIX

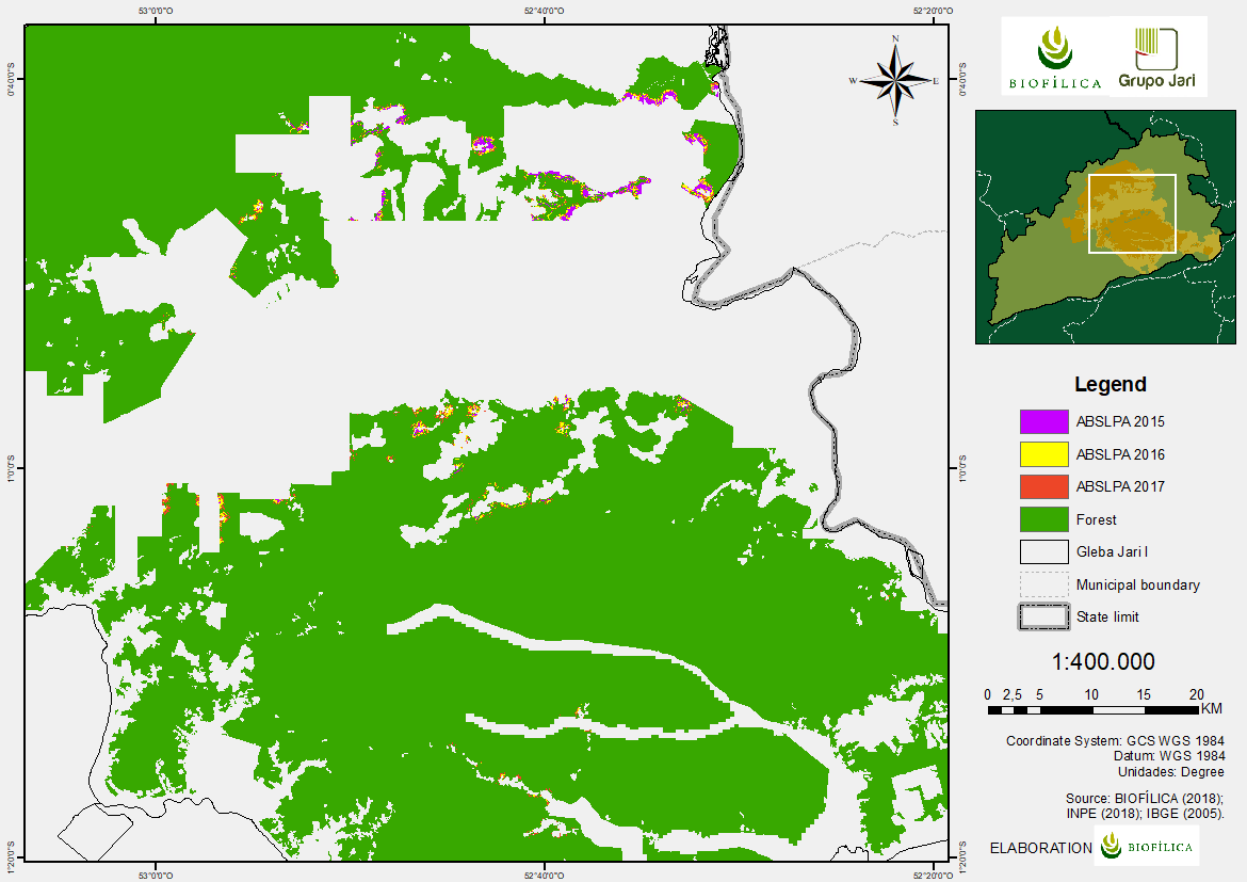

Figure 4. Map showing cumulative areas credited within the Project Area

Digital files used for the mapping (satellite images, shapefiles and GPS points) were presented to verification team as evidence of monitoring land-use and land-cover within the Project Area and Leakage Belt area.