AMAZON RIO REDD+ IFM EMISSION REDUCTIONS FROM AVOIDING PLANNED DEGRADATION

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Project Title	**Amazon Rio REDD+ IFM** GHG Emission Reductions from Avoiding Planned Degradation
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Version 1.0 of the "Project Description" (PD) for the Amazon Rio REDD+ IFM Project as well as the documents (i) "Consentimento Livre, Prévio e Informado (CLPI)" (Free, Prior and Informed Consent) (ii) "Inventário Florestal Expedito" (Expedited Forest Inventory), (iii) "Plano de Gestão da RPDS Amazon" (Amazon Rio RPDS Management Plan) and (iv) vegetation maps, among others, found in the annexes, were elaborated by Rosana Della Méa and Virgílio Viana, with technical support from consultants Mariano Cenamo, Diego Serrano, Bruno Matta, Pablo Pacheco, Thais Megid, Renata Freire, Priscila Barros, Lucas Rosa and Rodrigo Freire.

Project Title	**Amazon Rio REDD+ IFM** GHG Emission Reductions from Avoiding Planned Degradation
Project Location	Rio Amazon I, II, III and IV Reserves. Manicoré Municipality, Amazonas, Brazil.
Project Proponent	EBCF – Empresa Brasileira de Conservação Florestal Contact: Leonardo Barrionuevo (CEO) Email: Leonardo@ebcf.com.br Phone: +1 305-321-4577
Auditor	Rainforest Alliance (Klaus Geiger kgeiger@ra.org; Phone: +1 (802) 923-3766) and Imaflora (Bruno B. Souza, bruno@imaflora.org; Phone +55 (19) 98324 5522.
Project Start Date	5 June 2013, crediting period 36 years, 36-year lifetime (extendable).
Validation Type	Full Validation
History of CCB Status	None - undergoing initial validation and verification
CCB Standards Edition	CCB. 2013. Climate, Community & Biodiversity Standards, Version 3. CCB, Arlington, VA, EUA. December 2013. At: www.climate-standards.org

Project Description	The EBCF bought the property and its respective management plan. However, the logging operations ceased voluntarily. Thus, the GHG emissions that would have been generated and the environmental impacts on local flora and fauna that would have occurred during the harvesting and processing of timber can be avoided. The area's management plan has been replaced with a project for alternative land-use that does not have significant impacts on the environment and which involves local communities as decision maker agents. The area will be used for ecotourism and extraction of non-wood forest products. The project is designed to prevent the emission of 1.85 million tons of carbon, and to directly benefit more than 450 families in an area of 20,000 hectares of Amazonian biodiversity.
Gold Level Criteria	In terms of climate, it is understood that balanced ecosystems have greater ecological and social resilience and adaptability to climate change, this can be seen in the protection of bodies of water, the regulation of river flow during flood peaks and droughts, and the regular supply of food, products and environmental services. From a social point of view, the project has a strong presence among populations clearly marginalized by the State social care system and strategically interacts with the communities to give more visibility to women, the elderly and children. There are exceptional benefits for biodiversity due to the Amazon Rio project's qualifying factors for High Conservation Values (HCVs), including the area's rare and/or endemic species including several species that are protected by specific legislation prohibiting cutting, such as the Brazil nut tree, rubber tree and mahogany.
Project Conclusion Date	9 September 2016
Expected Schedule Check	Periodic, every 5 years.

SUMMARY

ILLUSTRATIONS

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Annex	Content / theme	archive name	Status / Observations
1	Authorization, operating licenses and Timber Management Plan of the exploited areas	Anexo 1_Autorizacoes LO PMFS referente as areas ja manejadas	No change post audit
2	Complements to licensing procedures	Anexo 2_Valdenor II projeto mãe (complementos)	No change post audit
3	Operational information and trade relations with Gethal	anexo 3_Projeto mae Valdenor II - Gethal 1997	No change post audit
4	operating licenses for the PSUs	Anexo 4_L.O. todas UPAS	No change post audit
5	fitosionomias maps in the project area	Anexo 5_Mapa Fitofisionomias	Changed post audit
6	Permits logging and Annual Operating Plan	Anexo 6 Autefs POA	No change post audit
7	Data from pre exploratory inventories	Anexo_7_Inventário Florestal 100% UPA 6 (2007)	No change post audit
8	expeditious forest inventory report conducted in 2013 for the preparation of the RPDS Amazon River Management Plan	Anexo 8_Relatório Inventario Florestal Expedito 2013	No change post audit
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11	Escrtituras property	Anexo_11_Escrituras	No change post audit
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13	co trade relations information Gethal	anexo 13_Declaracoes de venda Gethal	No change post audit
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16	Project Cash Flow Amazon River REDD + IFM	Anexo 16 - Análise de Fluxo de Caixa Amazon Rio Vs Final	Changed post audit
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18	Calculation of project emissions	Anexo 18_planilha de calculos de emissoes_Vs_AccuracyReview.xlsx	Changed the Review Accuracy

19		Anexo 19_EBCF commitment to conservation	No change post audit
20	EBCF board process of identifying barriers proejto risks Amazon River REDD + IFM	Anexo 20_Minuta de reuniao de conselho sobre riscos e barreiras	No change post audit
21	Data on energy consumption and transportation to the calculation of emissions	Anexo 21_EBCF consumo de energia e transporte+balançofinal_Final	Changed post audit
22	project risk analysis	Anexo 22_VCS Non-Permanence Risk Report v3_Vs_AccuracyReview.pdf	Changed post audit
23	Report forest inventory estimate biomass and deploying continuous inventory	Anexo 23 - Inventário_Florestal_Vs_Final	Changed post audit
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26	Results and data of the senses communities	Anexo 26_SENSO_Todas_Comunidades_2013	No change post audit
27	Business Plan and shareholder agreements EBCF	Anexo 27_Plano de negócios e Acordo de Acionista EBCF	No change post audit
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29	Spreadsheet performance monitoring emissions calculations project	Anexo 29_planilha de calculos ex-post_Vs_AccuracyReview.xlsx	Changed the Review Accuracy
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	comuniadde of Kamayuá in indigenous policies)		
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ABBREVIATIONS

AAV	Voluntary Environmental Agent (*Agentes Ambientais Voluntários*)
AFOLU	Agriculture, Forestry and Other Land Use
AGB	Above-ground biomass
ANTAQ	National Agency for Waterway Services *(Agência Nacional de Transportes Aquaviários)*
APD	Avoiding Planned Deforestation
APP	Permanent Preservation Areas
ATER	Technical Assistance and Rural Development *(Assistência Técnica e Extensão Rural)*
AUTEF	Logging Authorization (*Autorização de Exploração Florestal*)
AUTEX	Logging Authorization *(Autorização de Exploração Florestal)*
CAAD	Council of Agro-Extractivist Associations of Democracia *(Central das Associacões Agroextrativistas de Democracia)*
CAAM	Council of Agro-Extractivist Associations of Manicoré *(Associaçoes Agroextrativistas de Manicore)*
CDM	Clean Development Mechanism
CEUC	State Center Of Conservation Units (*Centro Estadual De Unidades De Conservação*)
CNS	National Council of Extractivist Populations *(Conselho Nacional das Populações Extrativistas)*
CRA	Environmental Reserve Quotas *(Cotas de Reserva Ambiental)*
DBH	Diameter at Breast Height
DOF	Document of Forest Origin *(Documento de Origem Florestal)*
EBCF	Empresa Brasileira de Conservação de Florestas S.A.
EIA	Environmental Impact Assessment
EMBRAPA	Brazilian Agricultural Research Corporation
FAS	Amazonas Sustainable Foundation *(Fundação Amazonas Sustentável)*
FI	Forest Inventory
FDA	Dense Ombrophilous Alluvial Forest (*Floresta Ombrófila Densa Aluvial de Dossel emergente*)
FDTB	Dense Ombrophilous Lowland Forest (*Floresta Ombrófila Densa de Terras Baixas e Dossel emergente*)
FPIC	Free, Prior and Informed Consent
FSC	Forest Stewardship Council
FUNAI	National Indian Foundation *(Fundação Nacional do Índio)*
GHG	Greenhouse Gases
GIS	Geographic Information System

HCV	High Conservation Value
IBAMA	Brazilian Institute of the Environment and Renewable Natural Resources *(Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis)*
IBGE	Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*)
ICMBio	Chico Mendes Institute for Biodiversity Conservation
IDAM	Institute for Sustainable Development of Agriculture and Forestry of the State of Amazonas *(Instituto de Desenvolvimento Agropecuário e Florestal Sustentável do Estado do Amazonas)*
IEA	International Energy Agency
IEB	International Institute of Brazilian Education *(Instituto Internacional de Educação do Brasil)*
IFM-LtPF	Improved Forest Management - Logged to Protected Forest
IMAZON	Institute of Man and Environment in the Amazon *(Instituto do Homem e Meio Ambiente da Amazônia)*
INPE	National Institute for Space Research *(Instituto Nacional de Pesquisas Espaciais)*
IPAAM	Environmental Protection Institute of Amazonas State *(Instituto de Proteção Ambiental do Amazonas)*
IPCC	Intergovernmental Panel on Climate Change
LR	Legal Reserve
MCTIC	Ministry of Sciene, Technology, Innovation and Communication *(Ministério da Ciência, Tecnologia, Inovação e Comunicação)*
MMA	Ministy of the Environment (*Ministério do Meio Ambiente*)
MP	Montoring Plan
NTFP	Non-timber forest products
PA	Project Area
PD	Project Description
PES	Payment for environmental services
POA	Annual Operational Extraction Plan *(Plano Operacional Anual de Extração)*
PPE	Personal Protective Equipment
PROARCO	Program for the Prevention and Control of Burning and Forest Fires in the Deforestation Arc ***(****Programa de Prevenção e Controle às Queimadas e aos Incêndios Florestais no Arco do Desflorestamento)*
PROBUC	Program for Monitoring Biodiversity and Use of Natural Resources in Conservation Units (*Programa de Monitoramento da Biodiversidade e Do Uso de Recursos Naturais em Unidades De Conservação Estaduais do Amazonas*)

PRODES	Program to Calculate Deforestation in the Amazon ***(****Programa de Cálculo do Desflorestamento da Amazônia)*
PSP	Permanent sample plots
RDS	Reservas de Desenvolvimento Sustentável
RPDS	Private Reserves for Sustainable Development *(Reserva Particular de Desenvolvimento Sustentavel)*
RPPN	Private Natural Heritage Reserve *(Reserva Particular do Patrimônio Natural)*
SAD	Deforestation Alert System *(Sistema de Alerta de Desmatamento)*
SDS	Environment and Sustainable Development Secretary of the State of Amazonas *(Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável do Amazonas)*
SEUC	State System of Conservation Units *(Sistema Estadual de Unidades de Conservação)*
SFM	Sustainable Forest Management (*Manejo Florestal Sustentavel -* MFS)
SFMP	Sustainable Forest Management Plan (*Plano de Manejo Florestal Sustentável - PMFS*)
UC	Conservation Unit *(Unidade de Conservação)*
UEA	State University of Amazonas *(Universidade Estadual do Amazonas)*
UFAM	Federal University of Amazonas *(Universidade Federal do Amazonas)*
UNFCCC	United Nations Framework Convention on Climate Change
VCU	Verified Carbon Unit
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

1 PROJECT DESCRIPTION

1.1 Summary Description of the Project (G1.2, G1.4, G1.8)

The Amazon Rio Project consists of the conservation of a mosaic of four private areas: Amazon Rio I, II, III and IV, which add up to 18,559 hectares (ha) and are inserted in the project area consisting of primary forests, located in the municipality of Manicoré in the state of Amazonas. The project's target area is a characterized as a sedimentary Solimões Basin region, and is dominated by Alluvial Holocene, Içá Formation and Detritus-laterite. The terrain is flat and contains primary vegetation in areas of non-inundated (*terra firme*), floodplain (*várzea*), and some *igapó* formations due to the influence of Rio Manicoré.

The Amazon Rio areas are dominated by forests: Dense Ombrophilous Lowland Forests and Open Ombrophilous Lowland Forests with palm trees (79%), Dense Ombrophilous Alluvial Forests (11%), Open Ombrophilous Alluvial Forests with palm trees (8%), Pioneer Formations with fluvial and/or lacustrine influence - herbaceous and shrubby vegetation with palm trees (1%).

The main focus of the project is: (i) the conservation of forest ecosystems and biodiversity; (ii) the sustainable social development of the region, including the promotion of ecotourism and scientific research, and (iii) reductions in carbon dioxide (CO_2) emissions through the prevention of deforestation and forest degradation.

In 1998, a logging plan for was approved by the authorized environmental agencies for logging activities on 18,559 ha of land over a period of 25 years (the total area calculated does not include Permanent Preservation Areas (APPs) and bodies of water). Between the years 1999 and 2010, 5,429 ha were degraded due to authorized logging operations (Annexes 1, 2, 3 and 4). In February 2011, the area was purchased by the *Empresa Brasileira de Conservação de Florestas* (EBCF) which, in order to implement the objectives of the project, made two important decisions: to suspend the logging operations that had been underway in the project areas since 1999 and; to transform them into Private Reserves for Sustainable Development (*Reservas Particulares de Desenvolvimento Sustentável* - RPDSs), supported by State Law no. 53 of June 2007 and Decree no. 30.108 of June 2010.

It is important to mention that only the Amazon Rio I area was approved in June 2013 by the Amazonas State Secretary of Environment and Sustainable Development (*Secretaria de Meio Ambiente e Desenvolvimento Sustentável do Estado do Amazonas* - SDS) through

Directive/SDS/no. 86/2013. The other private properties, Amazon Rio II, III and IV are in the process of being analyzed by the SDS for approval. The proposal is that the four areas form an integrated system of private Conservation Units (UCs) managed by EBCF through one Management Plan[1].

With this new land-use strategy, 20,387 ha of primary forest will be preserved, avoiding the CO_2 emissions that would have occurred without the implementation of the project. Revenues obtained from the carbon credits will be used to maintain the primary forest with the implementation of the activities described in the Reserve's Management Plan (Annex 9), including social programs and environmental monitoring.

The Project will ensure its financial sustainability though carbon credit sales obtained though the conservation of the area and maintenance of environmental services. The Project also expects to receive financial support though Brazilian Environmental Reserve Quotas (*Cotas de Reserva Ambiental* - CRAs)[2]. Through these two financial mechanisms, 51,469 tons of carbon dioxide emissions per year can be avoided, totaling approximately 1,852,896 tons of carbon dioxide emissions that would have been released to the atmosphere during the 36-year credentialed period.

It is important to emphasize that the project area is crucial for conservation, especially considering its characteristics such as: (i) high biological diversity and concentration of endemic and pharmacological species (Section 7); (ii) extensive plains, which are important for the reproduction and survival of many plant and animal species, especially birds and reptiles; and (iii) a great potential for ecotourism and environmental education, including scientific research.

The creation of these Private Reserves also contributes to the consolidation of a strategy to establish ecological corridors and mosaics in the region, creating a territorial connection between public and private conservation areas. This situation reduces potential conflicts between the state, landowners and residents in buffer zones, and creates opportunities for implementing integrated actions, optimizing human resources and financial investments for actions of environmental monitoring and control.

[1] Although the Management Plan (Annex 9, which has been submitted and is awaiting approval from CEUC) formally addresses the Amazon Rio I Private Reserve, the other areas, Amazon Rio II, III, IV are included for the pupose the surrounding area, so that the vision of joint management actions presented in the plan is not lost. The strategy is that with future homologations the other Reserves will be formally included in the Management Plan, creating a united document.

[2] O § 2o, Art. 15 of the New Brazilian Forest Code (Law 12.651/2012) establishes voluntary forest reserves, i.e., the amount of forest required by law on rural property. According to this law, all preserved areas that exceed the minimum required by law may be used for creation of environmental easement or Environmental Reserve Quotas in the same biome and State.

Another important fact to consider is the surrounding communities use of the project areas for their own subsistence, extracting non-timber forest products (e.g., nuts, fruits, oils, vines), fishing and hunting. In this context, community members have a direct vested interest in the conservation of the forest for the food and economic security it provides as well as for maintaining cultural practices.

The environmental benefits that the communities receive make them "guardians" of the forest, significantly contributing to the monitoring and control of illegal activities practiced in the region such as logging, fishing and poaching, as well as the supervision and control of forest fires. As such, in addition to playing a role of great environmental importance for the region, the Amazon Rio project contributes to the improvement of livelihoods of the local population and, consequently, to the conservation of the forest.

There is an estimated population of 450 families distributed among 15 communities residing around the area of the Amazon Rio project. Communities are typically *caboclo*, whose main economic activity is small-scale family farming, especially mandioc for flour production and bananas. Their relationship with the forest involves the extraction of non-wood products such as copaiba oil and Brazil nuts as well as subsistence hunting. Fishing is also a very important economic activity.

The environmental benefits provided through the implementation of this Project and the Amazon Rio I RPDS Management Plan (with subsequent inclusion of Amazon Rio II, III and IV), have a strong social development component and include several socio-economic support programs for local communities and the promotion of sustainable development in the region.

The project will be implemented starting with the introduction of participatory processes, ensuring active involvement of the local communities around the Project area, as in the aforementioned development programs and in decision-making. The community programs that aim to improve access to health, education and income generation will use the “Bolsa Floresta” program as reference, a program of great relevance for Payments for environmental services (PES) in the Amazonas state. In the medium and long term, these programs intend to significantly improve the living conditions of these communities, strengthening their organizational and institutional capacity, including their productive, environmental and financial sustainability.

General Objective

The general objectives of this project focus on a holistic approach to the region and are in alignment with the recent statement of the United Nations in the design of the seventeen goals of Sustainable Development (SDG)[3]. The project objectives are directly linked to some of the SDGs and use others as a source of inspiration for the implementation of activities in partnership with local communities. These guidelines will be key elements in the local discussion process around the project activities.

Consequently, the general objective of the project is to "contribute to the maintenance of global climate (goal 13), through the implementation of activities to prevent the emission of greenhouse gases locally by replacing the forest management system of selective logging for a forest biodiversity conservation project (goal 15), preserving the traditional culture of the population in surrounding communities (goal 3), promoting income generation (goal 1, 8) and contributing to local social development (goals 2, 5, 4, 6, 7)".

Specific Objectives

The project has the following specific objectives:

1. Implement alternative economic activities to generate revenue for the project, benefiting at least 300 families surrounding the target area and ceasing logging practices
2. Reduce approximately 1,85 million tons of carbon dioxide as a result of project activities;
3. Contribute to the maintenance of regional biodiversity through the preservation and conservation of the forest;
4. Contribute to improving educational processes and attention to regional health;

[3] The seventeen Sustainable Development Goals at the United Nations are: (1) End poverty in all its forms everywhere; (2) End hunger, achieve food security and improved nutrition and promote sustainable agriculture; (3) Ensure healthy lives and promote wellbeing for all at all ages; (4) Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all; (5) Achieve gender equality and empower all women and girls; (6) Ensure availability and sustainable management of water and sanitation for all; (7) Ensure access to affordable, reliable, sustainable and modern energy for all; (8) Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all; (9) Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation; (10) Reduce inequality within and among countries; (11) Make cities and human settlements inclusive, safe, resilient and sustainable; (12) Ensure sustainable consumption and production patterns; (13) Take urgent action to combat climate change and its impacts; (14) Conserve and sustainably use the oceans, seas and marine resources for sustainable development; (15) Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss; (16) Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels; (17) Strengthen the means of implementation and revitalise the global partnership for sustainable development.

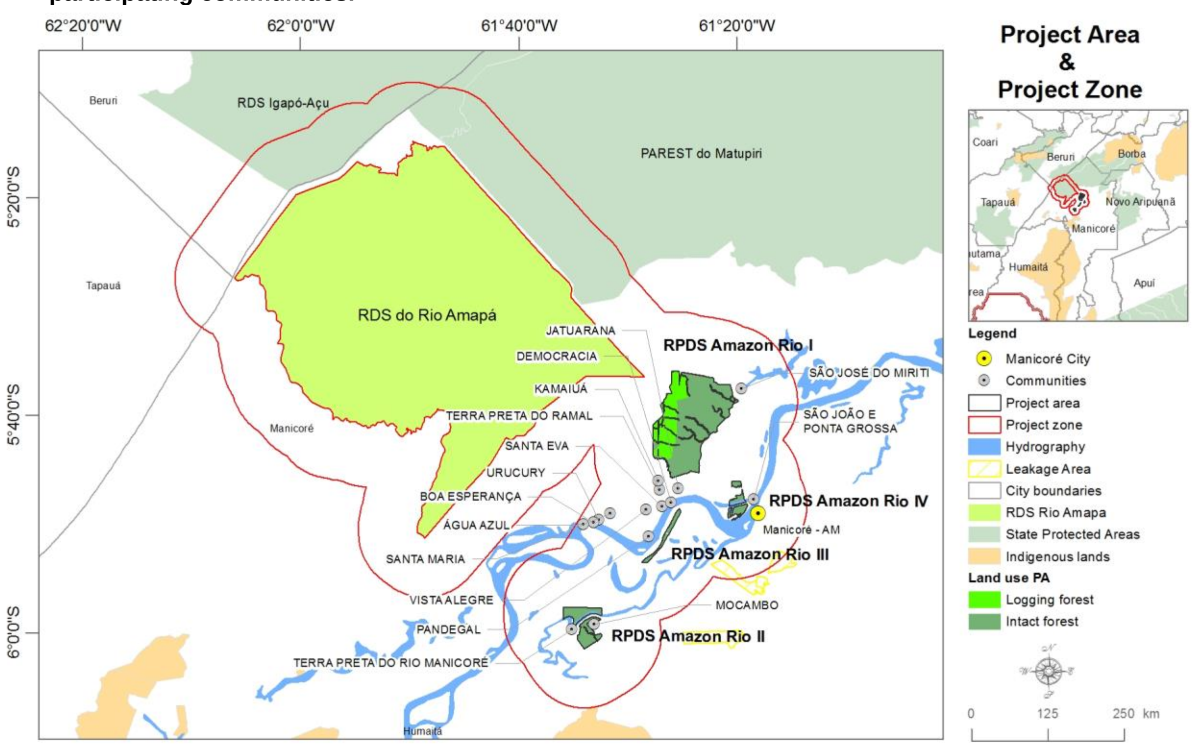
5. Promote inclusion and empowerment for women, youth and social groups in the communities in the project area.

1.2 Project Location (G1.3, G1.4)

Location

The Amazon Rio Project is located in the southern region of the Amazonas state, in the municipality of Manicoré. The location can be accessed through the waterway or by air with approximate distances of 427 km by river and 333 km by air from the state capital, Manaus. The project areas are near the Madeira River and between the Sustainable Development Reserves (RDS) Rio Madeira and Rio Amapá (Figure 01). The four project areas include 15 surrounding communities (buffer zones), with a population of more than 450 families. The populations living in the buffer zones of the Amazon Rio areas are known as caboclos and are distributed in fifteen communities: Urucury; Água Azul; Vista Alegre; Boa Esperança; Santa Eva; Santa Maria; Pandegal; Democracia; Jatuarana; Terra Preta do Ramal; Kamayuá and São José do Miriti; São João; Ponta Grossa; Terra Preta do Rio Manicoré and Mocambo.

Figure 1. Map identifying the EBCF REDD project area, including the project zone and participating communities.



Geology and geomorphology

Amazonas state is characterized by an extensive phanerozoic sedimentary layer (Paleozoic Era), distributed among the Acre, Solimões, Amazonas and Alto Tapajós basins, deposited on a Precambrian bedrock of igneous, sedimentary and metamorphic rocks (CPRM, 2013).

The Amazon Rio project areas are located between the Rio Amapá RDS and the municipality of Humaitá and are located in the same sedimentary basin as the Solimões River, with similar soil characteristics: Holocenic alluvial soils, Içá and Dendritic-Laterite formations.

The regions where Holocenic alluvial soils predominate are characterized by recent detrital deposits of a fluvial, lacustrine or marine nature, consisting of gravel, sand, silt and clay, and transported by water flows over the floodplain. These deposits can be found along the rivers of the region, especially along the Madeira River. In turn, the regions where the Içá Formation prevails are covered by wind-driven deposits, whose rocks and sediments are an important part of the far southeast Amazon depression morphostructure. The dendritic-laterite sediments are covered by layers or levels of sand and clay soil types which form layers of deep weathered red latosols.

The project area also stands out because it is located in a row of plateaus with NE-SW directional structures. This aspect contrasts with the plateaus in the southern depression (NNW-SSE directional structures), demonstrating that the Madre de Dios – Itacoatiara segment, which governs the entire Madeira River fluvial subsystem – has been an important tectonic agent in controlling the flood accumulation areas since the Cenozoic age (IGREJA & CATIQUE, 1997).

Topography and soil

This region is characterized by a flat topography and primary vegetation consisting of areas of dry land (*terra firme*), floodplains (*várzea*), and some black-water flooded Amazonian forest formations (*igapó*) due to the influence of the Manicoré River. Plains predominate and are characteristically flat and usually rise only a few meters above sea level, but they may also rise to higher altitudes. In this form of topography, more materials are deposited than eroded.

The specific composition of the Amazon Rio areas are: Dense Ombrophilous Lowland Forests and Open Ombrophilous Lowland Forests with palm trees (79%), Dense Ombrophilous Alluvial Forests (11%), Open Ombrophilous Alluvial Forests with palm trees (8%), Pioneer Formations with fluvial and/or lacustrine influence - herbaceous and shrubby vegetation with palm trees (1%) (Annex 5).

According to the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* - IBGE) soil database (2000), the Manicoré region is formed mainly of Latosols and Argisols. Gleysols, Spodosols, Alluvial soils, Neosols, Planosols, Plinthosols and Nitosols can also be found. The Brazilian Soil Classification System, produced from surveys by the Brazilian Agricultural Research Corporation (EMBRAPA), between 2001 and 2006, corroborates the classification information for this region.

Latosols are deep mineral soils that have suffered heavy weathering and are therefore virtually void of primary and secondary minerals, and they present low nutrient reserves. As a consequence of the high degree of weathering and poor source of material, these soils are generally very acidic, low in available nutrients and feature high exchangeable aluminum content. Like most weathered soils, organic matter plays a fundamental role in the process of plant nutrition and nutrient cycling.

Argisol soils generally vary with respect to depth. Their drainage quality can vary from high to poorly. Morphologically, they feature yellowish or reddish tones, but can also be brown or gray. They have a very low pH levels and lack mineral nutrient reserves.

Alluvial soils are also very common in this region. These soils are found mainly on the banks of the Madeira River. They are located in flat terrain their fertility levels are dystrophic. Agricultural and livestock activities are almost always practiced along the main alluvial stretches of the region. The most fertile soils that occur on the floodplains (*várzea*) are widely cultivated for temporary crops such as beans, rice, watermelon and mandioc.

Climate and hydrography

The Madeira River region has a humid equatorial climate (IBGE, 2011), with an average temperature of 27°C, relative humidity ranging between 85 and 90% and annual rainfall between 2,200 to 2,800 mm/year (RADAMBRASIL, 1974). Studies from the Rio Amapá RDS area indicate that rainfall intensity is greater from January to March, with monthly rainfall between 300 and 350 mm, while the driest months are July and August, with monthly averages around 50 mm.

Geographically, the Amazon region is defined by watersheds formed by the rivers which flow into the Amazon Rio and its mouth, along the entire Eastern coast of Brazil (RIBEIRO et al., 1999). Manicoré is mainly influenced by the Madeira and Manicoré rivers which are whitewater and blackwater rivers respectively. These rivers contribute to the local climatic conditions along with the characteristics of the vegetation including forests, meadows, savanna (*cerrado*) and floodplains (*várzeas*).

The Madeira River drains three main morphostructural units: the Andes (15%), the Brazilian shield (41% of the basin) and the Amazon plain (44%). The Manicoré River is located in the Brazilian shield and the Amazon plain. The smaller rivers, or tributaries of the Madeira River are: Manicoré River, Aripuanã River, Marmelos River and Canumã River, all located along its right bank.

1.3 Conditions Prior to Project Initiation (G1, indicator 3, indicator 4) (B1, indicator 1)

Before the conservation project, the most important economic activity in the area was timber logging using a sustainable logging plan that was authorized by government environmental agencies in 1998 (Annexes 1, 2, 3, 4 and 6).

This activity began in 1999 after authorization for selective logging was granted on 97% of the property for a period of 25 years and concluded in 2010 with the initiation of discussions about the creation of Private Reserves for Sustainable Development (RPDS). At the time that the timber logging plan was approved, the project proponent (EBCF) had no knowledge of the area, nor did it plan to purchase the land for conservation purposes or non-timber forest management. Therefore, the timeline and duration of events described above rule out any doubts with regard to a scenario where the timber logging plan would have been implemented to create a baseline scenario for Greenhouse gas (GHG) emissions for the subsequent development of an emissions reduction project.

Economic context of land-use

The southern part of the Amazonas state is strategically important for preventing advances in deforestation in the Amazon. However, in recent years, the region has been suffering successive deforestation pressures from increasing farming activities, contributing to the growth of the "deforestation arc" toward the state of Amazonas. Historically, the "arc of deforestation" has advanced with the expansion of agriculture in the states of Pará, Mato Grosso, Rondônia, Tocantins and Maranhão. In recent years, pressures on the forests have increased with the globalization of markets for meat and soybeans in the Amazon and international development policies for the region (IDESAM, 2011).

Against this backdrop of increasing deforestation, the forests in the southern region of the Amazonas State are critically endangered, together with the great biological diversity harbored within the heterogeneous environments, including endemic species of extreme relevance for the conservation of Amazonian biodiversity (IDESAM, 2011).

Timber companies from the states of Rondônia and Mato Grosso have migrated into the region near the Project area in the municipality of Manicoré, spurring the construction of unofficial roads and contributing to the local economy of the municipality. The migratory flow of people from Rondônia to Manicoré also greatly contributes to the expansion of illegal activities and land conflicts in the region (IDESAM, 2011).

In the Amazon, the timber market is highly influential, particularly pertaining to land-use and occupation which directly impacts the conservation of natural resources. The Brazilian Amazon is among the main producers of tropical wood in the world, along with Malaysia and Indonesia. Timber production in Brazil is concentrated in the states of Pará, Amazonas and Mato Grosso. Production remains relatively stable: approximately 24.5 million m^3 between the years 2010 and 2011 (ITTO, 2011). Logging and industrial wood processing, along side with mining and farming are the main economic activities in the region (LENTINI et al., 2005). The timber sector is a direct economic driver for dozens of municipalities in the Amazon, including Manicoré. According to Lentini et al. (2005), in 2004 this sector generated almost 400,000 jobs in the region, equivalent to 5% of the working population, and its gross revenue was US$ 2.3 billion.

The latest survey on the Amazon timber market, performed by SFB/IMAZON (2010) reveals significant changes in the market for processed wood. In 1998, only 14% of the total volume produced was exported. In 2004, factors such as a favorable exchange rate and the increased demand for Amazonian wood in the European, North American and Asian markets raised the percentage of timber exported to 36%. In 2009, however, Amazonian wood in foreign markets decreased to 21% of the total production. In that year, the timber market was essentially domestic: approximately 79% of the volume produced was destined for Brazilian markets. The state of São Paulo (17%) and Southern Brazil (15%) were the largest consumers of wood from the Amazon. Another 16% was consumed within the producer states (rising from 11% in 2004).

In this context, preventing deforestation on private lands through conservation mechanisms is a major challenge and is vitally important for sustainable development in the Amazon.

The four properties that make up the project area were acquired in February 2011 by the EBCF with the main objective of implementing forest conservation activities for the protection and enhancement of biodiversity and the improvement of quality of life for communities living nearby. These communities have used the non-timber forest resources, in and around the project area, for generations, as part of their subsistence. Up until 2011, and for more than a decade, the project area was used for wood extraction through a sustainable forest logging plan, on a 25-year cycle. In 1998 selective wood harvesting was allowed on 97% of the property, respecting the 25-year cycle. By 2010, 5,429 hectares had been logged and, if the scenario were to continue, an estimated 2,20 million tons of CO^2 would be released into the atmosphere over the next 36 years.

Biological characteristics of the region [4]

The Amazon is a geographic region that consists of the Amazon tropical rainforest covering most of the Amazon basin in South America, and is distributed across nine countries. It is the largest watershed on the planet. The Amazon Rio basin itself is approximately 6.9 million km^2, and drains 1/3 of South America's waters. The Amazon region is also home to the largest rivers in the world: the Amazon Rio, Solimões River, Negro River, Madeira River and the Tapajós River. This profusion of rivers holds 15% of the liquid freshwater on the planet's surface – the world's largest reserve (MEIRELES FILHO, 2006).

The Amazon also has immense biological diversity. It is estimated that its forests and rivers harbor approximately 25% of the known species on the planet, with approximately 60,000 plant species (of which 30,000 are higher plant species, including 2,500 species of trees and representing 10% of the world's plant species), 2,000 species of fish, 300 species of mammals (ALBAGLI, 2001), and over 1,000 species of birds (10% of the world).

The Amazon Rio Reserves are located in the Purus-Madeira interfluve, a region of intense historic human activity, including agriculture, livestock rearing and timber extraction which compromise the quality of terrestrial and aquatic ecosystems, such as rivers and streams. However, areas protected by private conservation units are still in an excellent state of preservation, with high levels of plant and animal diversity.

Regional studies carried out in the southwestern Amazon, particularly near the Madeira River, have shown some of the highest levels of biodiversity in the world. Surveys and biological inventories conducted in the Rio Amapá RDS, located near the areas in question, were used to provide details on animal diversity for the Amazon Rio project area and its surroundings.

[4] This topic is thoroughly discussed in Section 7 of this document.

The data used to analyze the plant biodiversity of the Amazon Rio areas were previously collected from forest inventories for logging practices on the properties in 2007 (Annex 7), as well as from an expedited forest inventory (Annex 8), conducted in 2013 to record forest species richness, following the recommendations of Filgueiras et al., (1994). The existing trail system was used to conduct the inventory.

For analysis of fauna biodiversity, biological inventory information was used from the Rio Amapá RDS, conducted in 2009 by the Amazonas State Secretary of Environment and Sustainable Development (SDS) accessible in the Management Plan (GOVERNO DO ESTADO DO AMAZONAS, 2010).

FLORA

Dryland (terra firme) forest

Forest inventory 100% reported in the Annual Production Unit (*Unidade Produtiva Anual* - UPA) for the Amazon Rio I area (Annex 7) registered 100% of trees in the dryland (*terra firme)* logged area and identified 87 species belonging to 30 families and 26 occurrences of an unidentified species. The expedited forest inventory carried out on a dryland area about four kilometers long, west of Amazon Rio I, yielded 43 species in 20 families: predominantly Fabaceae (16%), Sapotaceae (15%), Arecaceae (12%), Burseraceae (9%) and Lecytidaceae (8%). Within these families, the main tree species of copal (*Protium* sp.) and abiurana (*Pouteria* sp.) are abundant and frequently found throughout the region.

The inventory reports the following species as most commonly found in the *terra firme* area: abiurana branca (*Micropholis mensalis*), acariquara (*Minquartia guianensis*), cedrinho (*Erisma uncinatum*), maparajuba (*Manilkara paraensis*), masaranduba (*Manilkara huberi*), pau marfim (*Calycophyllum acreanum*) and tacacazeiro (*Sterculia speciosa*). There are also noteworthy species of great ecological importance such as: Brazil nut (*Bertholletia excelsa*), copaíba-jacaré (*Eperua oleifera Ducke*), "tento" Red Beadtree/Red Sandalwood (*Adenanthera pavonina L*.), fava (*Abarema* sp.), pajurá (*Licania laevigata Prance*), tauarí (*Couratari guianensis Aubl*.), arurá (*Osteophloeum platyspermum*) and jutaí (*Pterocarpus* sp.).

Of these species, the Brazil nut has significantly contributed to the economy of local residents due to the large-scale commercialization of the seed, which is conducted through a cooperative agreement, COVEMA, and which will be described in a later section.

Palms are also noted in the inventory: açaí *(Euterpe precatoria*), babassu (*Attalea speciosa*), caramuri (*Pouteria elegans*) and patawa (*Oenocarpus bataua*), widely used as food and caranaí palm poktamui (*Lepidocaryum tenue*), whose seeds are used for making handicrafts and its leaves used for roofing in the interior of Amazonas. Overall, the palm tree species significantly contribute to the plant diversity of the entire region where the Amazon Rio areas are situated.

Floodplain (várzea) forests

The expedited inventory in floodplain (*várzea*) areas reveals heterogeneous forest formations which include tree and shrub species. There were 103 forest species in 29 families identified, including 27 trees (not necessarily of the same species) and not identified by the local residents.

On the floodplains, the most abundant plant families are: Arecaceae (18%), Euphorbiaceae (15%), Moraceae (9%), Myristicaceae (7%), Chrysobalanaceae (6%), Fabaceae (6%), Sapotaceae (4%), Meliaceae (4%) and Lecythidaceae (4%), mainly represented by seringa or rubber trees (*Hevea pauciflora*), seringa barriguda (*Hevea spruceana*), jataúba (*Guarea guidonia*), apuí (*Ficus* sp.), assacu (*Hura crepitans*), andiroba (*Carapa guianensis*), cedro (*Cedrela odorata*), muirapiranga (*Brosimum angustifolium*), muiratinga (*Maquira sclerophylla*) and virola (*Virola cuspidata*), also known as ucuúba. These species are all tree species and are used for various purposes such as construction, shipbuilding, furniture, packaging and seeds for handicrafts.

Large rubber plantations exist in the floodplain areas. The history of rubber tapping is evident as both old and new cuts can be seen in the same tree. Also notable is the occurrence of other species which were logged in the past for their timber value, such as paricá (*Schizolobium amazonicum*), copaíba mari-mari (*Copaifera reticulata*), envira de cutia (*Scleronema micranthum*), garrote (*Brosimum utile*) and copaiba jacaré (*Eperua oleifera*). They represent approximately 89% of the volume of harvested species, according to the 2006 report of the currently suspended post-exploratory logging plan (Annex 6 - Vald. II T05 POA, POS, REV. 2006).

Threats to local flora

Forest species of economic interest in the Amazon Rio project areas have suffered successive removals through selective logging, mainly *Eperua oleífera* (copaíba jacaré), *Brosimum utile* (garrote); *Scleronema micranthum* (envira cutia), *Copaifera reticulata* (copaíba mari-mari), *Schizolobium amazonicum* (paricá), *Simarouba amara* (marupa), *Parkia paraenses* (paricarana), *Brosimum parinarioides* (amapá), *Couratari guianensis* (tauari branco) and *Anacardium giganteum* caju-açu). These were the 10 most logged species in 2006, in the areas that are now part of the

Amazon Rio I RPDS. These 10 species accounted for 96% of all wood removed from the total 19 species logged.

FAUNA

Regarding animal species, biological inventories carried out in the Rio Amapá RDS in the immediate vicinity of the project area indicate the presence of 29 species of mammals, 210 species of birds, 18 species of amphibians and 85 species of fish (GOVERNO DO ESTADO DO AMAZONAS, 2010). Pacas, agoutis, armadillos, deer, spider monkeys, howler monkeys, capuchin monkeys, tapirs, peccaries and catitus are among the main species of animals mentioned by the community during the participatory workshops.

Mammals

From an area of 82 km of dryland forest, records of 47 medium to large mammals were obtained through visual observation and collected material such as tracks, droppings, and skulls. The presence of 29 species distributed among seven orders were confirmed, as presented in the Rio Amapá RDS Management Plan (2010).

The presence of large carnivores, such as jaguars (*Panthera onca*) and cougars (*Puma concolor*), indicates high environmental quality, and may be linked to low anthropic pressure, allowing viable populations of these carnivores to thrive (CULLEN JR. & VALLADARES-PÁDUA, 1999). Moreover, the presence of giant otters (*Pteronura brasiliensis*) in surrounding rivers, such as the Rio Amapá, can be considered a good indicator of environmental balance and water quality.

Bird Species

In the Rio Amapá RDS, 210 species of birds have been recorded, four of which are new species: a hawk (*gavião* in Portuguese) (*Leucopternis* sp), the antwren (*chororozinho* in Portuguese) (Herpsilochmus sp.), the tody-tyrant (*maria* in Portuguese) (*Hemitriccus* sp), and a jay (*gralha* in Portuguese) (*Cyanocorax* sp). The geographic distribution of these four new species is limited, probably due to the small interfluve of the Madeira-Purus.

Another important result is the extent of the distribution of five species along hundreds of kilometers of forest: ocellated crake (*maxalalagá* in Portuguese) (*Micropygia schomburgkii*), least nighthawk (*bacurauzinho* in Portuguese) (*Chordeiles pusillus*), black antbird (*chororó-preto* in Portuguese) (*Cercomacra serva*), citron-bellied attila (*tinguaçu-de-barriga-amarela* in Portuguese) *(Attila* *citriniventris*) and wedge-tailed grass finch (*canário-do-campo* in Portuguese) (*Emberizoides herbicola*), indicating the heterogeneity of the area and the availability of resources throughout the area. According to Menger (2011), in a study of the interfluve area of the Purus-Madeira, the inequality in species distribution can be explained in part by their sensitivity to environmental variations. This is represented by the composition of palm trees, which are abundant throughout the region, as seen in floristic inventories for the region.

Herpetofauna (reptiles and amphibians)

In the Rio Amapá RDS, 18 amphibian species belonging to five families were recorded, most frequently *Hylidae* and *Leptodactylidae*. The dryland forest harbors a wealth of poison dart frogs. *Colostethus caeruleodactylus* had previously been found in the Autazes region and more recently along the Purus River. It was found in large numbers on dryland containing Brazil nut trees, near the Amapá River. The record of occurrence of the species in this area has expanded its area of occupancy about 210 km to the south.

Three species of snakes were also identified in the dryland forests: brown-banded water snake (*Helicops angulatus*), *Dendrophidion dendrophis* and the pitviper *Bothrops* sp (*jararaca* in Portuguese). The smooth-fronted caiman (*Paleosuchus trigonatus*) was registered on the banks of the Amapá River, a species that lives in dryland *igarapés* (seasonally flooded streams) and near larger rivers.

Fish species

The biological inventory of fish in the Rio Amapá RDS surveyed 11 *igarapés*, nine of which are small streams (1st/2nd order) and two intermediate-sized streams (3rd/4th order).

Spot checks were undertaken on the Amapá River, divided into five parts. 133 species were found, belonging to seven orders and 28 families. These include Characiformes (73 species), Siluriformes (27 species), Gymnotiformes (15 species), Perciformes (14), Beloniformes (2 species), Synbranchiformes (1 species) and Cyprinodontiformes (1 species).

Six species were highly abundant, representing 46.26% of all individuals collected. The most notable were *Physopyxis ananas* and *Hypopygus lepturus*, representing 11.28% and 10.99% respectively, followed by *Hyphessobrycon* sp. (9.49%), *Apistogramma cf. agassizii* (6.09%), butterfly fish (*Carnegiella strigata*) (4.54%) and *Hemigrammus gr. Belottii* (3.88%). There were 16 to 45 species recorded in each stream sampled. It is worth noting that at least three previously undescribed species were recorded: *Gladioglanis* sp. n., *Gymnotus* sp. n. and *Synbranchus* sp.

The diversity and distribution pattern of these individuals in relation to their species were very high, and dominance was extremely low, indicative that the water bodies surrounding the Rio Amapá RDS, in proximity to the Amazon Rio areas, are in an excellent state of conservation. In addition, the inventory confirms the presence of several species considered rare and even new species with genetically viable populations, including confirmed areas for reproduction and juvenile development.

However, according to studies by Cardoso (2008), the great diversity of fish species in Manicoré significantly contributes to the local economy. The main destinations for fishing expeditions are the Madeira (29.5%), Manicoré (16.2%) and Atininga (8.0%) rivers; the Acará (9.8%) and Boquerão (8.8%) lakes; and the Matupiri igarapé (8.1%). The most frequently commercialized species are *Semaprochilodus* spp (*jaraqui* in Portuguese), the silver mylossoma (*pacu* in Portuguese) (*Mylossoma duriventre*), streaked prochilod (*curimatá* in Portuguese) (*Prochilodus nigricans*), sardine (*Triportheus* spp.), jatuarana (*Brycon* spp.), *Curimatidae* (*branquinha* in Portuguese), gilded catfish (*dourada* in Portuguese) (*Brachyplatystoma rousseauxii*), tiger sorubim (*caparari* in Portuguese), (*Pseudoplatystoma tigrinum*), *Anostomidae* (*aracu* in Portuguese) and barred sorumbim (*surubim* in Portuguese) (*Pseudoplatystoma fasciatum*). The first 5 species listed are the most heavily commercialized, representing 75% of the fish sold in the region.

Medium and long-term projections of these numbers indicate a potential threat for the conservation of fish species in the region. Management strategies will be necessary for selective fishing for most heavily consumed species.

Threats to local fauna

According to the Chico Mendes Institute for Biodiversity Conservation (ICMBio), Brazil has the largest biodiversity in the world. There are more than 100,000 invertebrate species and approximately 8,200 vertebrate species: 713 mammals, 1,826 birds, 721 reptiles, 875 amphibians, 2,800 freshwater fish and 1,300 saltwater fish. Within this list, a significant number (627) are listed as endangered species.

The participatory mapping of systems of natural resource use for communities around the Amazon Rio areas, conducted by EBCF in 2013, shows that the most serious threat to local wildlife is overharvesting by local populations, mostly through commercial fishing and hunting.

According to the mapping, the fish most commonly caught in streams and lakes are: tucunaré (*Cichla* sp), pirarucu (*Arapaima gigas*), tambaqui (*Colossoma macropomum*), pirapitinga (*Piaractus brachypomus*), silver arowana (*Osteoglossum bicirrhosum*), Matrinchã (*Brycon amazonicus*), jatuarana (*Brycon* sp) and spotted sorubim (*Pseudoplatystoma corruscans*). Monitoring the population viability of these species is fundamental for determining if overharvesting of its individuals is occurring, in order to design appropriate practices and sustainable management of fish stocks in the Amazon Rio areas.

With regard to the hunting of wild animals, the communities surrounding the RPDS mainly put pressure on primate populations such as the red howler monkey (*Alouatta seniculus*), woolly monkey (*Lagothrix* cf.), tufted capuchin monkey (*Cebus apella*); felines like the jaguar (*Panthera onca*) and cougar (*Puma concolor*); and herbivores such as tapirs (*Tapirus terrestres*), deer (*Mazama* sp.) and boars (*Pecari tajacu*). The hunting activities in the communities surrounding the Amazon Rio areas should be constantly monitored in order to facilitate the implementation of an efficient management system for wild animals. The monitoring also ensures the population viability of species that suffer intense pressures as well as a continued animal protein supply for local communities.

Socio-economic, political and cultural characteristics of the communities[5] (G1.4, CM1.1)

The population residing in the buffer zone for the Amazon Rio areas belong to two distinct traditional communities. The larger group is composed of caboclos and is made up of 14 communities. The smaller group is a self-declared indigenous group called Kamayuá

Both groups have similar cultural characteristics regarding habits and customs practiced within the context of community and day-to-day life for individuals: language, social structures and hierarchies, housing, hunting and fishing practices as well as items used in these practices, types of canoes and means of transportation, religion and agricultural practices.

None the less, the Kamayuá community is self-declared as belonging to the *Munduruku* ethnicity, in tune with public policies which promoted indigenous self-identification halfway through the last decade. There are no official records on this process to date however there are reports in present-day indigenist literature affirming the existence of these groups in the Rio Madeira area including specifically, the municipality of Manicoré.

[5] This topic is thoroughly discussed in Section 6 of this document.

The *Munduruku* are from the Tapajós River Basin and they underwent two great diasporas during the modern era, driven away by mining in the Madeira River and drawn to the rubber boom. Brought from the Rio Tapajós channel by riverboat merchants and rubber trader colonels, the *Munduruku* are reported to have occupied the territories along the navigable rivers, such as the banks of the Rio Madeira as well as the along the Transamazonian Highway[6] (ISA, 2017). (ISA, 2017). This evidence supports the self-declaratory process of the Kamayuá community. As such, the proponents of this project recognize their legitimacy in this process.

Populations residing in the buffer zone of the Amazon Rio areas are known as caboclos and are divided into fifteen communities. Twelve communities (Urucury, Água Azul, Vista Alegre, Boa Esperança, Santa Eva, Santa Maria, Pandegal, Democracia, Jatuarana, Terra Preta do Ramal, Kamayuá and São José do Miriti) are located near Amazon Rio areas I and III and in the Rio Amapá RDS on the Madeira River and its tributaries. A community formed by the residents of the São João Agroextractivist Association and Ponta Grossa is located near the Amazon Rio IV area. Two communities, Terra Preta do Rio Manicoré and Mocambo, are located near the Amazon Rio II area on the riverbank of Rio Manicoré.

Dwellings are preferentially built facing the river and are suspended about one meter above the ground. They are usually built of wood and roofed with asbestos or zinc shingles, clay or straw. Few are made of concrete and the poorest families build houses with walls and roofs of straw. In floodland areas, when the flooding is greater than expected, families suspend the floors of houses and in severe cases are forced to migrate to dry land.

The communities are predominantly Roman Catholic; the only Evangelical church is located in the community of Terra Preta do Ramal. The Catholicism practiced by these communities is traditional with emphasis on devotion of the Saints and performing rituals such as raising the flag, recitation of novenas and religious festivals of *arraias*. Many families celebrate annual festivities to honor the patron saints, who are considered to be protectors of the communities.

In June 2013, the number of households, families and populations in 14 of the 15 communities around the Amazon Rio areas was updated. There are 1,436 recorded inhabitants. The most populated communities are Vista Alegre, Jatuarana, Democracia and Água Azul. Regarding age, in 2013 there were 537 children (0 to 14 years of age), 329 adolescents (between 15 and 24 years of

[6] ISA, 2017. Povos Indígenas no Brasil. Acessed on 30/04/2017.
https://pib.socioambiental.org/pt/povo/munduruku/print

age), 484 adults (between 24 and 65 years of age) and 99 elderly (over 65 years of age) (Table 4 in Annex 9).

Almost all the communities around the Amazon Rio areas have primary schools (up until grade 4) under the responsibility of the Municipality of Manicoré. The exceptions are Santa Eva, the São João Agroextractivist Association and Ponta Grossa. The main educational centers are in Democracia and Agua Azul where night time distance high school is offered through teleclasses. Vista Alegre, Santa Maria, Urucury, Mocambo and Jatuarana have primary schools that go until grade 5. There are Youth and Adult Education programs, although frequently suspended, in four communities: Democracia, Jatuarana, São José do Miriti and Mocambo.

Community health care is provided through community health agents and midwives. Almost all the communities have healthcare workers, excluding Santa Maria, Pandegal, the São João Agroextrativist Association and Ponta Grossa. Ponta Grossa, due to its proximity to Manicoré, has easy access to health services. Jatuarana is the only community with a health clinic, but it is inoperative. Healthcare agents use their own homes to provide care, separating a room for emergency care. In more serious cases the agent accompanies the patient to Manicoré. In general, residents complain of the lack of support from the Municipal Department of Health in providing medicine and the lack of training among healthcare workers.

The communities, except for Democracia, Vista Alegra, Boa Esperança, Pandegal and Água Azul, use river or *igarapé* water for human consumption and cooking, very often any kind of treatment. This use of untreated water raises the occurrence of waterborne diseases, especially among children. Furthermore most families dig shallow wells which carry high risks of contamination. The most common diseases are related to sanitation and nutrition or are endemic.

Every community has Association of Residents, Community Association, and Church Association presidents, who are chosen by the residents. Community leaders, who can have more than one leadership position, have specifically defined obligations and are respected for their ability to mediate internal conflicts and to represent the interests of the community with external institutions. They organize parties and seek partnerships to develop social and productive projects that benefit all residents.

Just as in other regions of the Amazon, these populations engage in various activities to assist vulnerable or at risk community members, to increase food security and to improve the quality-of-live. They split their time between extractivist, agricultural, fishing and hunting activities. Their cultivation and harvesting practices are predominantly traditional and have many traces of indigenous culture.

The communities maintain strong ties to productive activities linked to agriculture, especially cultivation of mandioc for use as flour, bananas and watermelon. Extraction of non-timber forest products such as Brazil nuts is also prevalent and so is, albeit to a lesser degree, the extraction of açai, tucuman, rubber and copaiba oil. The community of Pandegal is an exception as they engage heavily in mining, though extractivism is also practiced. Aside from agriculture and extraction of forest products, governmental aid in the form of social security benefits are important sources of income for these communities.

Despite the wide variety of activities, most families consider the sale of collected Brazil nuts as their main economic activity. This is especially true for the communities of São José do Miriti, Democracia, Boa Esperança, Jatuarana, Urucury, Santa Eva and Terra Preta do Ramal, who preferentially harvest Brazil nuts from the Rio Amapá RDS and the Amazon Rio I Private Reserve.

Currently, all the communities surrounding the Amazon Rio areas have associations that form a Council of Agro-Extractivist Associations of Democracia (*Central das Associacões Agroextrativistas de Democracia - CAAD*) which in turn is linked to the Council of Agro Extrativist Associations of Manicoré (*Conselho das Associacoes Agroextrativistas de Manicoré* – CAAM) and to COVEMA[7], responsible for the purchase, processing and marketing of nuts in the region.

[7] COVEMA assists all the communities around the reserves, in addition to 40 other communities in the municipality, both inside and outside of Conservation Units and Settlement Projects. There are more than 500 registered Brazil nut harvesters, the second largest job generating institution in the city of Manicoré, only second to the municipal government. This presence grants it a preeminant position in the state of Amazonas. In 2011, COVEMA expanded its operations to the neighboring municipality of Novo Aripuanã, to purchase production within the Madeira and Juma RDSs.

1.4 Project Proponent (G1.1)

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1.5 Other Institutions Involved in the Project

Organization Name	Original Trade Consulting
Role in the Project	Update of the Project Description (PD) (V3.1) and coordination of the certification process for Projeto Amazon Rio REDD+ IFM
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Organization Name	CO2X Conservação de Florestas Ltda.
Role in the Project	Technical coordination for Version 1.0 of the PD for Projeto Amazon Rio REDD+ IFM, elaboration of Free, Prior and Informed Consent (FPIC) coordination of Expedited Forest Inventory as well as coordination and elaboration of the Amazon Rio RPDS Management Plan.
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Role in the Project	Development of Social Programs
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Organization Name	HDOM
Role in the Project	Degradation and deforestation report; Forest inventory for biomass calculation purposes in the project area and technical support for review of PD
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1.6 Project Start Date (G1.9)

The project began on June 5, 2013 with the Secretariat of Sustainable Development approval of the Amazon Rio I Reserve as a RPDS. With this designation the REDD+ IFM project is launched and EBCF's forest areas are set aside for conservation in perpetuity.

1.7 Project Crediting Period (G1.9)

The first project crediting period is 36 years, beginning on June 5, 2013 and ending on June 5, 2048.

This period is equivalent to the remaining 11 years of the first authorized management plan (25 years starting in 1998) plus another 25 years with respect to a new forest management plan that was intended, as is common practice for forestry in northern Brazil. The logging activities could continue beyond 36 years, aiming for a second crediting period.

2 DESIGN

2.1 Sectorial Scope and Project Type

- Project Scope: Project Scope: Agriculture, Forest and Other Land Use (AFOLU)
- Project Category: Emission Reductions from Avoiding Planned Deforestation and Degradation (REDD-APD)
- Type of Activity: Improved Forest Management - Logged to Protected Forest (IFM LFPF)

2.2 Description of the Project activity (G1.8)

The Amazon Rio REDD+ IFM project expects to reduce greenhouse gas emissions in the Amazon Rio I area by promoting forest conservation activities, replacing the logging activities which were licensed in August 1998 and began in 1999.

Forest conservation activities are important for the project region for the following reasons: (I) the ecologically significant landscape is well preserved, it has high biological diversity, outstanding endemism, as well as economic and pharmacological potential (II) the communal and traditional use of the conserved areas allows people to stay in the region, especially relevant for young people, maintaining cultural riberinho and indigenous practices rooted in the use of forest resources (III) maintenance of ecosystem services.

The characteristics of the project area allow for the implementation of the Amazon Rio REDD+ IFM project initiatives both directly and indirectly in synergy with RPDS management, ecological, educational and scientific tourism, as well as technical and scientific research related to natural resource management.

Sources of revenue for the project include payment for environmental services through the commercialization of carbon credits and sustainable use of non-timber forest resources (detailed in item 2.5). Part of the project management plan is to raise funds through Legal Reserve Quotas (*Cotas de Reserva Legal* - CRAs) as an opportunity to take advantage of the surplus forest cover in one area, compensating for the absence of a Legal Reserve on another property (as long as it belongs to the same biome). These offset areas are considered as securities representing vegetation cover that can be used to fulfill the obligation of a Legal Reserve on another property. This mechanism offers the possibility to add market value to the areas of forest on a property, which exceed the legal requirements (LR and APP).

The project areas are private property and do not shelter traditional communities directly on the land but the communities live adjacent to the properties and there was a deliberate decision made that they actively participate in the planning and execution of the programs and projects planned in this PD. The programs and projects are geared toward sustainable businesses development and significant improvements in quality-of-life for these populations with regard to social benefits.

The Amazon Rio REDD+ IFM project activities are planned on a specific axis for the management of the Amazon Rio REDD+ IFM in synergy with the project management of the RPDS and activities linked to 5 major thematic axes geared toward generating benefits and mitigating the impacts to climate, communities and biodiversity:

- **Project Management:** administrative and operational management, coordination of conception, studies and surveys for the design, execution and monitoring of the project, validation and verification processes together with the standards for developing carbon projects, registration and transaction of the credits and marketing of the initiative;

- **Climate:** cessation of logging activities, monitoring of land-use in and around the project area, monitoring of carbon stocks and regeneration of exploited forests.

- **Biodiversity:** participatory monitoring and technical monitoring of local biodiversity, participatory monitoring of fish and game stocks in and around the project area, promotion together with the State for the development of fisheries agreements.

- **Income Generation:** mapping the productive potential of Non-timber Forest Products (NTFPs) in and around the project area, training for sustainable agro-extractive organization and production, implementation of sustainable production processes with infrastructure support, equipment and access to markets, and new product development based on NTFPs and marketing.

- **Health and Education:** implementation of the water for life program (*água para vida* in

Portuguese) that aims to reduce diseases caused by drinking water that is not suitable for human consumption and investments in basic infrastructures of schools.

- Inclusion and Social Empowerment: inclusion of women on the Advisory Council as a strategy to promote women holding community decision-making positions, promotion and encouragement of income-generating activities aimed at women's and youth's skills, conflict mediation and resource use management for different social groups.

The activities were defined through constructing of a theory of change approach that brought to light the means to achieve the project objectives, leading to the conception of credible activities that guarantee the sustainability of the project benefits, allow for risk management and mitigate negative impacts, should they occur.

In order to evaluate the possible benefits, costs and risks of the project, an impact analysis was carried out for the project activities[8]. The activities were linked to their objectives through a cause and effect approach based on the results obtained during the socioeconomic surveys carried out to prepare the Amazon Rio REDD+ IFM project and the RPDS Management Plan. A workshop was held in April 2017 (Annex 42a) to reevaluate the possible impacts of the project and to collect the expectations of the communities that are in line with the benefits of the project and the possible costs and risks, mainly social ones, that in some way negatively affect communities, biodiversity and climate.

Consequently, causal relationships between project objectives and impacts, indicators and measurement parameters were defined. They are each addressed in specific sections to demonstrate risk management planning for maintenance of benefits[9] and the monitoring plan.

The medium-term planning schedule for project activities is presented at the end of this section. Although maintenance and monitoring activities take place throughout the duration of the project, it

[8] The matrix was developed by the board and the collaborators based on the documents, diagnoses and studies carried out to elaborate the Amazon Rio REDD+ IFM project and the RPDS Management Plan. The refinement of the results presented on the negative impacts (risks and costs) and the positive impacts (benefits) of the project were made based on the workshop sessions held April 2017, whose theme dealt with the alignment and construction of the project with the communities through public dialogues on the risks, opportunities and challenges of the project. It was possible to capture the aspirations and expectations of the communities in relation to the project in a clear, direct and transparent way. The compilation was carried out through extensive discussions between the board and employees with the objective of aligning and planning the specific activities to achieve the Amazon Rio REDD+ IFM project objectives

[9] Annex 39 - Matrix of measures to mitigate the impacts of project activities.

is our understanding that it is best for activities to be re-planned during the timeframe, allowing for execution and monitoring of real impacts. Re-planning will allow for corrective measures to be applied in a timely manner in cases where there is a distortion between what was planned and what was executed for the maintenance of the project and long-term success of the activities.

Description of activities and their causal relationships (Activities, outputs, outcomes and impacts)

- Project Management Activities

The Amazon Rio REDD+ IFM project bases its funding on the voluntary carbon credit market to consolidate the territorial management of the project area. Substituting a forestry management project based on logging for a conservation project, the first measure that was adopted was the creation of the Amazon Rio RPDS, nesting the land in a national system of conservation units. The project area remains privately owned with no guarantee for public sector investments and is therefore dependent on capital and investments.

This is the biggest challenge for management of the project, and it is necessary to obtain funds through the carbon market to consolidate the management of the Amazon Rio RPDS. Management here means executing the proposed management plan for the reserve with planned complementary activities in line with the specific activities of this project. From a broader point of view, both the project management and the RPDS are complementary, since the premises for their existence are interdependent in the search for effective conservation of forests, and consequently, of the climate, communities and biodiversity.

The management activities implemented to date have focused on the creation and ratification of the RPDS, the design of the carbon project, the promotion of this initiative and the search for partners and investors. The activities planned, with effective implementation of the project, focus on administrative and operational management, consolidation of the team and investment in a local headquarters office in Manicoré. The management team will be responsible for coordinating and executing the planned activities with the support of the communities. The communities will have the largest forum of representativeness within the scope of the project at the council meetings of the RPDS, where they can relate the needs and desires of the communities in relation to the project in a systematic way.

With the consolidation of the management team, community engagement will be fostered through the effective implementation of activities through participatory and inclusive planning and construction processes, especially for income generation activities. Workshops and training are planned to promote social empowerment of communities by encouraging sustainable forest extractivism, income generation and social organization.

Figure 2. Project Management Activities *outputs*, *outcomes* and expected impacts.

Activities

- Elaboration of Project Description (PD);
- Elaboration of RPDS Management Plan;
- Validation and Verification;
- Administrative and operational management;
- Project team for REDD+ EBCF;
- Meetings of RPDS Advisory Board.

Outputs

- Project designed, elaborated, validated and verified according to VCS and CCBA standards;
- RPDS Management Plan prepared and approved in colaboration with the appropriate agencies for UC management in the state of Amazonas;
- Implementation team for the consolidated Amazon Rio REDD+ IFM project;
- Formalization of RPDS / Amazon Rio REDD+ IFM Council.

Outcomes

- Carbon credits generated and lanched in the market within the scope of the Amazon Rio REDD+ IFM project;
- Consolidation of manangement and execution of RPDS Amazon Rio REDD+ management plan;
- Riberirinho and indigenous community engagement in participatory planning, managament and execution of Amazon Rio REDD+ IFM, RPDS Amazon Rio project.

Impacts

- Obtaining funds for the implamentation and consolidation of Amazon Rio REDD+IFM project in synergy with Amazon Rio RPDS;
- Designation of 20,000 ha of forests as a Conservation Unit (CU) to reduce GHG emissions, preserving the land for fauna and flora habitat and ensuring sustainable resource use for local indigenous and riberirinho popultions;
- Social empowerment of communities by encouraging sustainable extractivism, income generation and social organization.

- Climate Activities

To generate climate benefits, the project expects to effectively reduce approximately 2.39 million tons of carbon dioxide by preventing GHG emissions that would have been caused by logging. The reduction results will be demonstrated though annual monitoring reports of land-use that verify deforestation and forest degradation using satellite images. With the understanding of the local deforestation and degradation vectors we seek to develop strategies to reduce and control deforestation and degradation in and around the project area. The strategies are to be developed with community involvement in participatory monitoring of land-use, awareness and income generation activities, using NTFPs as an alternative to forestry.

Carbon inventory monitoring activities will be developed through continuous forest inventories in the project area with information on carbon sequestration, regeneration and resilience of previously logged areas. We hope to generate primary data on the previously logged areas within the project area as well as to refine already existing information, possibly filling information gaps for state of the art carbon sequestration, regeneration and resilience of forests exploited by logging.

Figure 3. Climate Activities, *outputs*, *outcomes* and expected impacts.

Activities

- Cessation of logging activities;
- Monitoring of land-use in and around the Project area;
- Monitoring carbon stocks and regeneration of exploited forests;

Outputs

- Avoiding degradation by interrupting logging activities in the Project area;
- Degraded areas and annual deforestation mapped in and around the Project area;
- Report from continuous forest inventories with information on carbon sequestration, regeneration and resilience of previously logged forests;

Outcomes

- Reduction of 1.85 million tons of carbon that would have been emitted into the atmosphere;
- Understanding vectors of local degradation and deforestation in and around the project area;
- Generation of primary data on carbon sequestration, regeneration and resilience of previously logged forests;

Impacts

- Improvement of climatic conditions through voluntary contributions to reduce emissions from forest degradation;
- Abrupt interruption of forest degradation, controlled deforestation in the Project area and sustainable land use in the regions surrounding the Project area;
- Refinement of information and filling in of gaps for current carbon sequestration practices and regeneration and resilience of forests exploited by logging.

- Biodiversity Activities

Implementation of the biodiversity monitoring program, implementation of hunting, fishing and forest extractive agreements and forming and training of a group of Voluntary Environmental Agents (*Agentes Ambientais Voluntários* - AAVs) are activities planned to contribute to the maintenance of local biodiversity.

Within the monitoring program, transect surveys of fauna and flora will be periodically reviewed by groups of experts and voluntary environmental agents. The inventories will be conducted during five-years periods, carried out by specialists and organized by taxonomic groups, such as mammals, chiroptera, avifauna, ichthyofauna, herpetofauna and anurans. For the AAVs, visits will be made on a bi-annual basis and animal sighting data will be recorded based on the inventory data. Forms will developed with the data for animals that have already been visualized to facilitate the activity for AAVs.

As a result, reports, diagnostics and articles will be produced based on knowledge acquired from local fauna in the project area including information about possible plant-animal interactions during the regeneration process of logged forests and the resilience capacity of some species through data for occurrence and abundance of the species.

With this plan we intend to obtain in-depth knowledge of the fauna and flora in the project area, the identification of habitats for endemic and rare species in the project area and possible understanding of the resilience of fauna and flora to logging activities to promote adaptive management for habitat preservation for endemic and rare species and maintenance of HCVs described in the project area.

The project envisions the elaboration of agreements for hunting, fishing and forest extractivism in the project area. As such, monitoring activities are planned to survey the intensity of hunting and fishing in the communities. AVVs will be responsible for collecting hunting, fishing and forest extractive data in the project area. Other planned activities involve holding specific workshops for participatory planning and the elaboration of agreements for fishing, hunting and forest extractivism in major conflict areas (internal and external). With this action, we hope not only to monitor stocks, but also to ensure the sustainability of their use for successive generations.

Finally, AAV training is planned for the biomonitoring activities of the project. We hope to have at least two environmental agents capable of participatory monitoring of biodiversity in each community. Through the AVVs we hope to promote the growth of concepts of natural resource conservation, raising awareness for the conservation and preservation of habitats that shelter fauna and flora and the promotion of rational use of natural resources.

Figure 4. Activities focused on biodiversity, *outputs*, *outcomes* and expected impacts.

Activities

- Implementation and Management of the Biodiversity Monitoring Program;
- Implementation of inventory transects and bio-monitoring;
- Wildlife inventory in the project area (in and around the RPDS);
- Implementation of hunting, fishing and plant extractivism agreements in the PA;
- Training of the AAVs for the bio-monitoring of the project activities.

Outputs

- Reports, diagnoses and articles on the local fauna and possible ecological interactions with regeneration processes for forests exploited by logging activities;
- Diagnosis hunting and fishing intensity and maintenance of fishing and hunting stocks;
- At least two environmental agents trained in participatory monitoring of biodiversity in each community.

Outcomes

- In-depth knowledge of the fauna and flora of the Project area, in-situ identification of habitats of endemic and rare species in the Project area and understanding of the potential resilience of fauna and flora to logging activities;
- Participatory planning of hunting and fishing activities to maintain stocks;
- Dissemination of conservation of natural resources concepts promoted by environmental agents.

Impacts

- In-depth knowledge of the fauna and flora of the Project area, in-situ identification of habitats of endemic and rare species in the Project area and understanding of the possible resilience of fauna and flora to logging activities;
- Participatory planning of hunting and fishing activities to maintain stocks;
- Dissemination of concepts of conservation of natural resources promoted by environmental agents.

- Activities for Communities

Income Generation

We propose the creation of an extractive productive arrangement, creating a Community Entrepreneurship Network, composed of all solidary enterprises, such as associations of producers and gatherers, fishermen, cooperatives and work groups. The enterprises need alternatives for better means of production, transportation and marketing of their products. In collaboration we can develop skills in social organization, community living and solidarity.

The Community Entrepreneurship Network encourages decentralization and shared decision-making between cooperative managers and associations, when all can benefit from the synergy generated by intra-organization productive and commercial relations, as well as the possibility of obtaining support from private and public stakeholders.

It is understood that in order to obtain enterprise cooperation it is necessary to establish criteria that guarantee the sustainability of the Network, through management mechanisms such as governance. The articulation process can run into problems when there is lack of commitment and sustainability of involved parties, causing distrust and disarticulation in the Network. The creation of a council, the Council of Public and Private Organizations of Associated Ribeirinhos (*Conselho de Organizações Públicas e Privadas de Empreendimentos Ribeirinhos Associados* - COOPERA), would exercise its governance for the Network. A development stimulus is not merely the role of the government or local authorities, but of all the actors involved, including public and private institutions, non-governmental organizations, citizens and others.

Governance policies should establish the criteria which will strengthen the Network's relationships and interactions with existing development mechanisms in the region. Governance consists of the ability of all Network actors to agree on a single vision for development in which their skills and endeavors share investments, finance, and human resources to achieve their goals.

The Coordination Council is proposed for the governance of the Network but it can also be considered as an ongoing process by which conflicts will be regulated and cooperation can be negotiated. The coordination process includes the formation of a formal council capable of strengthening interorganizational relations and the understanding of agreements.

Structuring activities are planned to work toward this project management expectation. The basis of this proposal is the mapping, together with communities, for NTFP productive potential in and around the project area. We expect to generate maps and reports that outline the area of occurrence, stock and productivity of at least five species of NTFPs with economic value and real market access, developed jointly with the communities, such as Brazil nut, Açai, Andiroba, Copaiba and Cumaru. With this information in hand, we hope to boost production planning and access to markets, as well as to optimize collection activities, reducing work accidents, operational costs and improving access to markets.

In the next stage, biannual training is planned for the organization of sustainable agro-extractive production (e.g., associativism, cooperativism, good practices for the collection and management of NTFPs). In addition to providing training for people involved in income generating activities, it is expected that these actions will increase the participation of community members in these activities and promote the improvement of income distribution and opportunities generated through NTFPs exploration.

Finally, the plan includes the implementation of sustainable production processes by supporting associations, cooperatives and communities in infrastructure, equipment, access to markets and development of new products based on NTFPs and marketing. The investment funds are resources from the sale of the generated carbon credits. These actions seek to improve the products, though pricing and access to markets.

The Community Entrepreneurship Network's income-generating activities will be strengthened by generating jobs and income, improving the distribution of income from the development and commercialization of NTFPs and by promoting the community empowerment of associations and cooperatives focused on sustainable NTFP production.

Figure 5. Activities focused on income generation, *outputs*, *outcomes* and expected impacts.

Activities

- Mapping the productive potential of NTFPs, together with the communities, in and around the Project area;
- Capacity building for sustainable agro-extractive organization and production;
- Implementation of sustainable production processes with support in infrastructure, equipment, access to markets and development of new products based on NTFPs and marketing.

Outputs

- Maps and reports, including the area of occurrence, stock and productivity of at least five NTFP species of economic value with real market access developed jointly with the communities (Chestnut, Açaí, Andiroba, Copaíba and Cumaru);
- Development of bi-annual trainings for community organizations (associativism and cooperatism), optimization operations for developing NTFPs mapped together with communities and access to markets;
- Associations, cooperatives and communities supported with infrastructure, equipment and facilitation of access to markets through the invesment of resources from the sale of generated carbon credits.

Outcomes

- Enhancements in production planning and access to markets;
- Optimized operating activities, reduction of work related accidents and operating costs;
- Increased participation of community members in NTFP activities;
- Improvements in product price and access to markets;
- Improvements in production infrastructure including processing, storage and disposal.

Impacts

- Consolidation of the Community Entrepreneurship Network;
- Generation of jobs and income;
- Improvements in income distribution from collection and commercialization of NTFPs;
- Community empowerment of associations and cooperatives focused on sustainable production of NTFPs.

Health and Education

Some of the communities included in the project are located in *várzeas* (floodplain areas)where community members face serious problems of access to water during the *vazante* (dry season). In these communities, the main source of water is artesian wells that have high concentrations of iron and other metals during the dry season. To reduce consumption of metals, community members often let water "rest" to decant excess iron, making the water more palatable. However, during this “resting” period, water is contaminated by other pathogenic organisms. Diseases related to the consumption of contaminated water are common in these communities. Dysentery caused by amebiasis and stomach pain caused by the excessive of iron are commonly reported. We do not yet have records of diseases caused by the accumulation of iron in the blood. In light of these health issues, the project foresees the implantation of the "water for life" program (*água para vida*) to distribute water filters, initially for communities identified as a priority. Distribution is planned for 100% of houses and schools with the highest incidence of identified illnesses in at least five communities. The distribution of filters in schools aims to raise awareness about their use and the harm of improper water consumption through the education of children who can bring the information to their families. It is hoped that these actions will reduce illness and disease caused by consumption of non-potable water, consequently improving quality of life in the communities.

With regard to education, the project is committed to promoting better education in primary schools in the communities. Activities such as investments in school infrastructure are planned: with the construction of at least one daycare center - in the community of Democracia - and the improvement of school environments - renovations and investment in equipment - to improve education in the communities within the project. It is hoped that these improvements will lead to advances in teaching quality and attract the attention of children and young people to schools with more pleasant environments for educational and social interactions as well as to provide access for early childhood education in the most populated communities around the project area.

Another aim within the context of education is to provide lectures and courses on environmental issues in high schools. Through these actions we hope to raise awareness in adolescents regarding environmental issues such as biodiversity, conservation of natural resources and ecosystem services.

Figure 6. Activities focused on education and health care, *outputs*, *outcomes* and expected impacts.

Activities

- Implantation and expansion of the "Water for Life" program;
- Distribution of filters in communities identified as priority;
- Monitoring health benefits;
- Investments in school infrastructure for education.

Outputs

- Consolidation of the "Water for Life" program;
- At least five priority communities fully included in the program with installation of filters in all homes and schools;
- Construction of one daycare center in the Democracia community and improvements in school environments for communities included in the project;
- Lectures and participation in classes on environmental issues in high schools.

Outcomes

- Reduction of illnesses and diseases related to the consumption of non-potable water in várzea areas in communities surrounding the project area;
- Early childhood education in the most populous communities surrounding the project area;
- Adolescents are sensitized and knowledgeable about environmental issues, such as biodiversity, conservation of natural resources and ecosystem services.

Impacts

- Improvement in quality-of-life due to reduced illness and disease;
- Improvement of education related to environmental issues in communities around the Amazon Rio RPDS.

Inclusion and Social Empowerment

The project proposes inclusion and social empowerment not only for individual emancipation, but to move toward a collective consciousness of social interdependence between different groups within a single community, of gender, age or ethnicity. The idea is to broaden the context of individuals beyond their families and communities, linking them to broader nations at the macro level, and to develop actions that promote their egalitarian insertion, living as members of society, in this case, the communities and region where they live.

Among the actions planned to promote inclusion and social empowerment is the inclusion of women in the Advisory Council of the RPDS as an initiative for acquiring collective awareness of the role of women in decision-making processes in the communities. Because it is a political action, we believe that promoting the occupation of decision-making positions by women, in addition to directing female perspectives on aspirations and expectations for the conduct of the project, is capable of raising levels of self-esteem that can in turn encourage of other women to take leadership roles within their communities, such as the presidency of community associations and the community itself. In this way we hope to promote gender equality in decision-making processes.

Another issue perceived during the surveys and field workshops is the potential for income generation as a means to promote independence for women and girls. The point of view of some of the women from the communities included in the project is that increasing income among women promotes their inclusion and empowerment. To this end, activities are planned to identify and plan income-generating activities geared to women's skills, as well as the preparation and support of implementing at least one common activity with as many communities as possible.

Lastly, conflicts between different ethnic groups due to resource use in the project area can generate or exacerbate preexisting prejudices, especially with regards to the indigenous community of Kamayuá. To deal with this situation, agreements will be established for the use of resources between the Jatuarana community and the indigenous community of Kamayuá, particularly for Brazil nuts. During this process, there will be discussions about differences and mutual respect between social groups in the project area to promote ethnic equality and the goal of different social groups living together in peace and harmony.

Figure 7. Activities for social inclusion and empowerment, *outputs, outcomes* and expected impacts.

Activities

- Inclusion of women in the deliberative council of the RPDS and Amazon Rio REDD+ IFM Project;
- Promotion and incentives for the development of income-generating activities geared towards women's and young people's skills;
- Mediation of conflicts between the Kamayuá indigenous community and the Jatuarana riberinho community for the use of natural resources in the Project area.

Outputs

- At least one female representative elected by the community and appointed as a council member of the RPDS and the Amazon River REDD+ IFM Project;
- Income-generating activities geared to mapped women's skills, as well as designing and supporting the implementation of at least one activity in common with as many communities as possible;
- Agreement for natural resource use between the indigenous community of Kamayuá and the riberinho community of Jatuarana

Outcomes

- Women's empowerment in consultative processes and community deliberations in the context of the planned Amazon Rio REDD+ IFM project activities;
- Income generation for women and youth;
- Reduction of conflicts between communities and ethnic groups residing in the Project area.

Impacts

- Gender equality in decision-making processes by community representatives within the framework of the Project activities;
- Increase in financial autonomy of women and young people;
- Different social groups living together in peace and harmony.

Matrix for Project Impact Analysis

Table 01 summarizes the impact analysis of project activities carried out by the EBCF board of directors together with collaborators, outlining the relationships between the proposed activities and the project objectives, demonstrating the positive and negative impacts identified at this stage of the project.

Table 01. Proposed activities and potential positive impacts (benefits) and negative impacts (risks and costs) for climate, communities and biodiversity in the project area.

OBJETIVES	Project Activities*	Specific Activities**	Potential Social Impacts		Potential impacts for Biodiversidade		Potential impacts for Climate	
			Negative (risks and costs)	Positive (benefits)	Negative (risks and costs)	Positive (benefits)	Negative (risks and costs)	Positive (benefits)
	0 – PROJECT MANAGEMENT							
0 – Consolidation of Amazon Rio REDD+ IFM project and Amazon Rio RPDS ***	0 – Project Management Activities	- Elaboration of Project Description (PD); - Preparation of RPDS Management Plan; - Validation and Verification; - Administrative and operational Management; - REDD+ EBCF implementation Team; - Advisory Council Meetings of Amazon Rio RPDS; - Costs for registration of credits	Unaligned expectations	Generate local work	Not applicable	Not applicable	Not applicable	Not applicable
	1- CLIMATE							
1 - reduction of 3.2 million tons of GHGs through suspension of logging activities	1.1 - Suspension of selective logging forest management activities	- Cessation of logging activities	Loss of local jobs related to logging	Conservation of extractive species of community use (e.g. Copaiba)	Not applicable	Conservation of species exploited by logging activities	Not applicable	Reduction of GHG emissions
	1.2 - Monitoring deforestation and forest degradation in the project area	- Participatory monitoring of deforestation and degradation in PA; - Acquisition of images; - Consultants for	Decrease in income associated with unauthorized activities	Conservation of forest species of social, cultural and economic value for PA communities	Not applicable	Data and information on preserved species	Not applicable	Reduction of GHG emissions

		analysis and report on deforestation.						
2 - Contribute to the preservation of local biodiversity through forest conservation	**2 – BIODIVERSITY**							
	2.1 - Implementation of the biodiversity monitoring program	- Management services for the biodiversity monitoring program; - Implementation of inventory and biomonitoring transects; - Inventory of fauna in the project area (RPDS and surrounding area); - Implementation of hunting, fishing and forest extractivism agreements in the PA; - Training AAVs for project biomonitoring activities; - Consultant services for management of the monitoring program (data collection and processing).	Conflict between communities for resource use (hunting and forest extraction)	Learning and access to technical monitoring resources	Not applicable	Increased abundance of species biodiversity in the project area	Not applicable	Not applicable
	2.2 - Implementation of agreements for fishing, hunting and agroextractivism in the project area	Implementation of fishing, hunting and agroextractivism agreements in PA	Conflict between communities for use of resources	Maintenance of stocks of valuable species for community use	Not applicable	Maintenance of species of value for community use	Not applicable	Not applicable

	3 - INCOME GENERATION							
3 - Implement alternative economic activities to generate revenue for the project, benefiting at least 300 families surrounding the target area	3.1 - Mapping the productive potential of the NTFPs of major economic importance	Mapping the productive potential of the NTFPs of major economic importance	Not applicable	Planning for community production	Not applicable	Data on species of interest for management	Not applicable	Not applicable
	3.2 - Training for sustainable agro-extractive organization and production	- Training for improvements in the organization and production of sustainable forest extracts	Not applicable	Learning and access to technical resources of community management and forest management	Not applicable	Reducing impact on biodiversity	Not applicable	Not applicable
	3.3 - Implantation of sustainable productive processes	- Implementation of sustainable production processes (equip./infra./market)	Clash of culture between community members and teams/clients of the implanted projects	Increase in local income	Exploitation above the regeneration limits of exploited species	Conservation of managed species	Not applicable	Not applicable
	4 - HEALTH AND EDUCATION							
4 - Contribute to improving education and regional health	4.1 - Implementation of the "water for life program" (*água para vida*)	- Management of the "water for life program" (*água para vida*) program; - Distribution of filters in communities identified as priority; - Monitoring of health benefits	Not applicable	Reduction of diseases related to water consumption	Not applicable	Not applicable	Not applicable	Not applicable
	4.2 - Improvement of school infrastructure in communities	- Supporting school infrastructure	Not applicable	Improving the school environment	Not applicable	Not applicable	Not applicable	Not applicable
	5 - SOCIAL INCLUSION AND EMPOWERMENT							

5 - Promote inclusion and empowerment for women, youth and social groups in the communities in the project area	5.1 - Inclusion of women on the Reserve's Advisory Council and suggesting women's presence on community council.	- Inclusion of women on RPDS councils/ encouragement to occupy decision-making positions in the communities	Conflicts related to *machista* (sexist) culture	Ensure gender representation in the local decision-making process	Not applicable	Not applicable	Not applicable	Not applicable
	5.2 - Identify and encourage income-generating activities aimed at women's and youth's skills	- Workshops for women's awareness and empowerment; - workshops to promote and build income-generating opportunities based on specific activities for women and young people	Conflicts related to *machista* (sexist) culture	Increasing family and female income	Not applicable	Not applicable	Not applicable	Not applicable
	5.3 - Conflict mediation for different social groups due to resource use in the project area.	- Meetings with community leaders; - planning workshops on the use of resources by communities	Worsening of conflicts between social groups	Harmonization through use of resources/Maintenance of tradition	Disorganized use of natural resources (mainly Brazil nut)	Sustainable use of forest resources	Not applicable	Not applicable

*The activities are aligned with the project objectives in order to visualize the expected impacts to achieve the project objectives within the theory of change logic presented in this section of the PD.

** Specific activities were planned to refine the means to achieve the project objectives. To this end, the specific activities were planned within a physical and financial timeline to guide the actions of the project in a medium-term planning framework with a planning horizon of five years, following the expected verification cycles. At the end of each cycle, activities should be reviewed and adjusted according to the needs that arise during the implementation and execution phases.

*** Item 0 corresponds to internal management and management activities presented in these worksheets as ways to reach the five objectives listed by the Amazon Rio REDD+ IFM project.

Timeline for Implementation of Planned Activities

Table 02 shows the implementation timeline for the activities for short and medium-terms foreseen by the Amazon Rio REDD+ IFM Project for project implementation and consolidation of the Amazon Rio RPDS. The planning was developed in six-month periods and follows the physical and financial timeline of the EBCF presented in item 2.5 specifically elaborated for the implementation of this project.

Table 02. List of REDD+ IFM AMAZON RIO I Project macro activities.

PROJECT ACTIVITIES | YEAR AND TRIMESTER	**2017**				**2018**				**2019**				**2020**				**2021**				**2022**			
	1º	**2º**	**3º**	**4º**	**1º**	**2º**	**3º**	**4º**	**1º**	**2º**	**3º**	**4º**	**1º**	**2º**	**3º**	**4º**	**1º**	**2º**	**3º**	**4º**	**1º**	**2º**	**3º**	**4º**
0 - PROJECT MANAGEMENT																								
- Project Validation and Verification		X																						
- Administrative management, operation and local maintenance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
- REDD + EBCF Project Implementation Team	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
- Reuniões do Conselho Consultivo da RPDS Amazon Rio (Planejamento e Gestão de Conflitos)				X		X		X		X		X		X		X		X		X		X		X
- Credits Registry																								
1- CLIMATE																								
1.1 Participatory monitoring of deforestation and degradation in the PA						X		X		X	-	X		X		X		X	-	X		X		X
1.2 Image capturing	X	X	X				X				X				X				X				X	
1.3 Deforestation reporting and analysis work				X				X				X				X				X				X
2 - BIODIVERSITY																								
2.1 Biodiversity monitoring program management servicese				X		X																		
2.2 Implantation of inventory transects and biomonitoring				X																				
2.3 Fauna inventory in the Project area (RPDS and surroundings)				X	X	X																		X
2.4 Implementation of agreements on hunting,			X				X				X				X				X				X	

fishing and forest extractivism in the PA																								
2.5 VEA (Voluntary Environmental Agents) training for project biomonitoring activitie					X				X				X				X				X			
2.6 Monitoring management service (data collection and processing)						X	X		X				X								X			
3 - INCOME GENERATION																								
3.1 Mapping the productive and economic potential of NTFPs					X	X																		
3.2Training for organization and production of sustainable agro-extractive products					X		X		X		X		X		X		X		X		X		X	
3.3 Implantation of sustainable productive processes (equip./infra./market)					X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.4 Product development and marketing					X		X		X			X	X			X	X		X		X		X	
4 - HEALTH AND EDUCATION																								
4.1 Management of the "Water for Life" program					X				X				X				X				X			
4.2 Distribution of filters in communities identified as priority	X	X			X				X				X				X				X			
4.3 Monitoring of health benefits						X	X			X				X				X				X		
4.4 Improving infrastructure in schools							X		X				X					X				X		
5 - INCLUSION AND SOCIAL EMPOWERMENT																								
5.1 - Inclusion of women on the RPDS councils					X				X				X				X				X			
5.2 - Identify and promote income-generating activities for women and young people					X				X				X				X				X			
5.3 - Monitoring of social impacts, conflict resolution and inclusion of social groups						X		X		X		X		X		X		X		X		X		X

Note that one of the forms of evaluation planned to measure the success and progress of these initiatives during the development of the project is the application of the Sustainability Matrix. The Matrix is meant to evaluate the implementation effectiveness of the programs proposed in the RPDS management plan together with some of the results of activities of greater impact, specific to this project, in synergy with the project management of the RPDS, as there are common objectives between the two initiatives. It was developed by the Secretariat of Environment and Sustainable Development of the State of Amazonas. The tool was applied in the 15 communities at two points in time (2013 and 2017), taking into account local socio-economic characteristics common to the *riberinho* communities of the Amazon. These socio-economic characteristics inform the elaboration of the 20 parameters for analysis and are considered of great importance for community development and are described through specific indicators. Because it is a visual tool, the Sustainability Matrix is highly suitable for traditional populations, as is the case for the *riberinho* and indigenous communities surrounding the Amazon Rio I Reserve and other areas of the project. In addition, the Matrix offers interesting discussion spaces, since its construction is done collectively.

One of the main objectives of the application of the Matrix is to obtain parameters of comparison with other State Conservation Units (*Unidade de Conservação* - UC). Since it is the first RPDS in the state, it is interesting to compare the effectiveness of the management of a private UC with the state's. In this respect, attention should be paid to the activities carried out by the state in nearby communities, where the impact perceived by community members is a result of the state's actions and not of the RPDS. Developing some actions together can lead to more effective results.

Although it is not aimed at specifically fulfilling the objectives of this project, applying the Sustainability Matrix at two points in time allowed for collaboration with communities to identify the activities needed in collaboration with the Amazon Rio REDD+ IFM project, leading to the construction of specific activities for compliance objectives of this REDD+ project. The budgets, means of verification and evaluation of the specific project activities will be detailed later within the budget constraints and in line with the medium-term implantation and physical-financial projected timelines.

History of project implementation (2010 to 1st trimester 2017)

- 2010 - The EBCF creates the first RPDS as a symbolic agreement during the SDS Seminar of Amazon State Units of Conservation Results and Perspectives *(Seminário de Resultados e Perspectiva das Unidades de Conservação Estadual do Amazonas)*.

- 2011 - The EBCF submits the formal protocol to CEUC

- 2011 - Presentation meeting of the EBCF to the communities around the Amazon Rio I, II, III and IV

- 2011 - The EBCF accepted an invitation from Silvia Elena, the manager of RDS Rio Amapá and representative of CEUC-Manicoré, to participate in the training and delivery of identification cards for state Volunteer Environmental Agent (*Agente Ambiental Voluntário Estadual*), held in the community of Boa Esperança

- 2011 - At the invitation of CAAD, the EBCF participated in an event organized by CAAD with the following agenda: General Assembly, CAAD accountability in 2009/2010, RDS-Rio Amapá Management Plan, Bolsa Floresta, Municipal Management, IDAM Contribution, Covema Contribution, IEB Contribution and delivery of an açaí pulp extractor. The event sessions were held on March 24, 2011, in the community of Democracia, and March 25, 2011 in the community of Boa Esperança

- 2011 - CEUC inspection on farms for RPDS validation.

- 2011 - EBCF board makes its first visit to the communities and farms

- 2011 - In partnership with the Municipality of Manicoré, the EBCF recovers approximately 20 km of back roads, linking Democracia to Jatuarana, Terra Preta do Ramal, Santa Eva and Vista Alegre

- 2012 - EBCF president and directors visit the communities surrounding the reserves, together with the president of PATAC, Mr. Marcelo Marder and the president of *Renascer Desenvolvimento Humano,* André Albuquerque. *Renascer Desenvolvimento Humano* produces a socioeconomic diagnosis of the communities for the elaboration of a report.

- 2012 - Approval of the Business Plan project and EBCF shareholders' agreement, authorizing the commencement of the REDD project

- 2013 - Workshop I - Diagnostics for the development of the Management Plan for Amazon Rio I, II, III & IV.

- 2013 - Visits to communities in addition to Workshop I for interviews with residents.

- 2013 - Meeting at CEUC after the second Workshop to update the work with the communities and the progress of validation of the areas.

- 2013 - Technical meeting in Curitiba with the CO2X team, *Renascer Desenvolvimento Humano* and EBCF for the review and evaluation of the first part of the Management Plan (diagnostics); definition of programs and subprograms for the plan; identification of the main problems, potential, threats and opportunities with the creation of the RPDSs; definition of future vision and action strategy.

- 2013 - The first Private Reserve for Sustainable Development (RPDS) of Amazonas was officialized by the Environment and Sustainable Development Secretary of the State of

Amazonas (*Secretaria de Estado de Meio Ambiente* - SDS) on World Environment Day with ordinance number 86, recognizing the start date for the REDD+ IFM AMAZON RIO I project.

- 2013 - Workshop II - presentation of results and presentation of the carbon project with one of the fundraising programs for the implementation of the plan.
- 2013 - Fieldwork undertaken by biologist Rodrigo Freire (mapping of biodiversity as well as hunting and fishing sites) together with communities and farms.
- 2013 - EBCF carries out a complete socio-economic census (door to door) in the communities surrounding the RPDS (13 communities with the exception of Terra Preta do Ramal and Kamayuá).
- 2013 - Meeting with CEUC for delivery and presentation of the preliminary version of the Amazon Rio I RPDS Management Plan.
- 2013 - Additional meeting for communities that could not participate in Workshop II & Workshop III on Creation of the Advisory Council for the Amazon Rio I RPDS.
- 2013 - EBCF carries out the socio-economic census (door to door) in the Kamayuá community (Note no-one was at home in the Terra Preta do Ramal community).
- 2015 - Implementation of field activities for Inventory-Based Estimation of Biomass (*Estimativa de Estoque de Biomassa).*
- 2016 - Vitor Belfort Expedition and inception of income generation initiatives.
- 2016 - Distribution of Medical Kits to Community Health Agents and launch of Amazon Health Program (*Programa Saúde na Amazônia*).
- 2016 - Deforestation Report.
- 2016 - Review of PD and preparation of monitoring report.
- 2016 - Start of REDD+ project certification process (VCS and CCV).
- 2016 - Drafting of project for structuring the supply chain of certified vegetable oils.
- 2017 - Funding from the REDD project.
- 2017 - Preparation of ecotourism project.
- 2017 - Workshop on Update and Participatory planning project activity for REDD+ EBCF (*Oficina de atualização e Planejamento participativo de atividade do Projeto de REDD+ EBCF*)

2.3 Risk Management for Project Benefit (G1.10)

- CLIMATE

Authorized logging

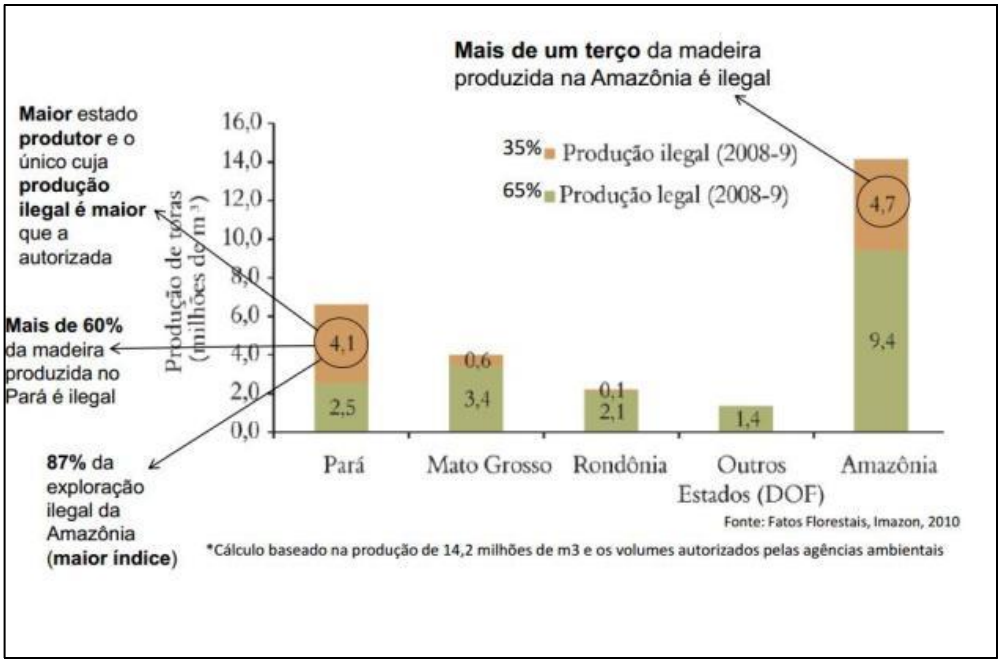
Authorized logging should not be considered a risk to the project since the transformation of logging areas into conservation units was the very idea proposed by the applicant, the legal owner of the areas. Legal recognition and framing as a UC, both in the state and federal public spheres, makes the RPDS the target for actions of land conservation planning in the region. This includes control and command tools, which generate an independent analysis of the proponent regarding the suspension of logging activities.

In 1998, a 25-year forestry management plan was approved for the four areas of the project, totaling 18,559.8 licensed hectares. Between 1999 and 2010, approximately 5,429.69 ha were managed and degraded as a consequence of the logging operation. For conservation purposes, this same area (18,559.8 ha) was donated to the EBCF in 2011 by the owner Valdenor Campos da Costa, who also became a founding partner of EBCF. The purpose of this donation was to preserve the region's forests, transforming the four areas into a mosaic of Private Reserves for Sustainable Development. In this way, the GHG emissions associated with logging activities (the baseline scenario) were avoided and since logging is not included in the activities planned by the EBCF or the Reserve Management Plan, there is no expectation that emissions from this activity will reoccur for the duration of the project and *ad aeternum* under the continued guardianship as a Conservation Unit.

Illegal logging

Illegal logging is one of the major risk factors in maintaining carbon stocks in medium-scale conservation projects in the Amazon, as is the case with the Amazon Rio project. According to data from SFB/IMAZON (2010), illegally logged wood represents 35% of total production from the Amazon. However, legally produced wood also has the difficulties of inspection and controlling documents of forest origin (DOF). It is important to consider that "hot" wood using falsified DOFs may, in practice, lead to the underestimation of the actual volume of illegally harvested wood. Data from ADEOTADO et al. (2011) show that 33% of the Amazonian wood consumed in the State of São Paulo - the largest consumer in the domestic market - is of illegal origin. In the case of the Amazon Rio areas, the approach is that, in the medium and long term, the carbon certificates (VCUs), CRAs and NTFPs sustainable use activities will, as a result of the Project activities, subsidize monitoring investments and the development of sustainable income generation programs, as envisaged in the project activities.

Figure 8. Illegal logging in the Amazon (2009). SFB/IMAZON (2010)



In this context, the RPDS Management Plan foresees the involvement of communities, public sector environmental defense agents and voluntary environmental agents to create an active staff force to protect and monitor the Private Reserves. The fact that the project area is located near the public domain of Rio Amapá RDS contributes to activities of protection and monitoring for the Private Reserves. In addition, the implementation of floating bases is planned, allowing for observation of the boat movement in the vicinity of the Reserves, thus helping in the fight against illegal logging.

Forest fires

Forest fires pose a frequent risk to Agriculture, Forestry and Other Land Use (AFOLU) projects, and they also pose a major threat to surrounding communities and their livelihoods. In addition to natural and criminal sources, fires can be triggered by the traditional activities of opening and cleaning new areas of pasture for renewal and cultivation. For this reason, new management systems should be adopted.

The fact that the project area is located next to the Rio Amapá RDS means there are expected synergies in terms of monitoring illegal activities in the region as a whole, especially illegal logging and forest fires. In addition, there are provisions in the Management Plan for the training of local populations in agricultural techniques that exclude the use of fire for opening and cleaning cultivated areas, as well as the installation of an efficient forest fire prevention and control system, including trained teams, the installation of observation towers and environmental education programs.

- COMMUNITIES

Impacts on surrounding communities

All external support projects, however well-intentioned and planned, interfere with local systems of use and appropriation of natural resources, especially of traditional populations. This is probably the greatest risk assumed with the implementation of the activities of the Amazon Rio REDD+ IFM Project. It should be treated carefully with support from specialists in sustainable rural development and social scientists.

In order for the project to contribute to more equitable sharing of resources and its benefits, it is essential that external actors recognize local systems of use and distribution of resources so that they do not reinforce internal conflicts, rather, they choose actions that favor the collective interests of the groups involved. REDD+ projects when they can introduce new conflicts or accentuate existing ones. Conversely, projects that involve community members in their early stages of development and that consider conflicts in systems of land division and resources use of can help reduce and prevent disputes.

As it is planned to search for improvements in traditional production and management systems, adaptations and adjustments will need to occur at specific points in traditional systems of non-timber forest product extraction. Despite being implemented carefully, these activities will affect local institutional arrangements involved in systems of production and management, and may modify the way they function. These changes should be closely monitored so that local populations do not suffer any negative impacts on their livelihoods.

- BIODIVERSITY

Predatory use of natural resources: flora and fauna

Predatory exploitation of natural resources is an imminent risk to biodiversity, especially fish stocks, hunted animals, timber and non-timber forest resources. This risk will be mitigated through the implementation of the Biodiversity and Natural Resource Use Monitoring Programs in State Conservation Units of Amazonas (ProBUC), and the Voluntary Environmental Agent program (AAV), in addition to hunting and fishing and agreements to be implemented in the main entry points for these resources in the Amazon Rio project area.

These initiatives will help in monitoring the most used natural resources, in evaluating their availability, and therefore allowing for the proposal of best practices and management systems. Best practices and management systems respect information regarding viable minimum populations, animal and fish reproductive periods and the capacity support timber and non-timber forest resources.

2.4 Measures to Maintain High Conservation Values (HCV)

The concept of HCV was originally introduced for forest management certification by the FSC, with the objective of defining forest areas of extraordinary importance, mainly primary and intact forests. However, due to the significant direct and indirect impacts caused by human activities on natural environments, the concept had to be adjusted. It is virtually impossible to find a forest that has not undergone any kind of anthropogenic change. Currently the HCV approach refers to six key attributes related to the forest area, involving biological, ecological, social value and cultural materials of extraordinary significance or critical importance on a national, regional or global scale, as explained below. The HCVs identified in the project area during the design phase are presented below, together with measures that are necessary for their maintenance.

Description of High Conservation Value (HCV) present in the project area and its surroundings (CM1.2) (B1.2)

The methodology used by the Ministry of the Environment (MMA) - National Secretariat of Biodiversity and Forests to define the priority areas for conservation, sustainable use and benefit sharing of Brazilian biological diversity considered:

- Biodiversity targets: endemic, limited distribution or threatened species; exceptional or rare biological phenomena;

- Sustainable Use Targets: species of economic, medicinal or phytotherapeutic importance; areas/species important for traditional populations and for the maintenance of their knowledge; flag species that can provide incentives to conservation and sustainable use actions; key species on which the sustainable use of biodiversity components depends; areas that are important for conservation-based development; areas providing environmental services to agricultural areas (such as crops that depend on pollination and biological control); areas that are important to the cultural and social diversity associated to biodiversity;

- Resilience and Process Targets: areas important for maintaining environmental services

(climate maintenance, bio-geochemical cycles, hydrological processes, aquifer recharge areas); areas with high endemism rate and evolutionary processes; areas important for clustering, migratory and pollinating species; climatic refuges; connectivity and gene flow areas; areas protecting watersheds; areas important for maintaining the flood regime of wetlands; extensive areas for long-ranging species.

After identifying the priority areas for the conservation of Brazilian biodiversity, the MMA (2007) indicated the following priority actions for better management of land-use and sustainable use of natural resources:

- Creation of protected areas, expansion of existing protected areas, establishment of no-fishing zones, incentives for the establishment of mosaics of protected areas, enforcement and control.

- Implementation and consolidation of existing protected areas, management of hydraulic systems and resources, establishment of ecological corridors, sustainable management of natural resources, management of pests or invasive species, conflict resolution on the management of protected areas, enforcement and control,

- Execution of biological inventories, biodiversity monitoring, studies on specific population dynamics, long-term research.

- Ratification of indigenous lands, recognition of quilombo lands, implementation of watershed committees, ecological-economic zoning, implementation of environmental education programs, implementation of economic mechanisms to support biodiversity conservation

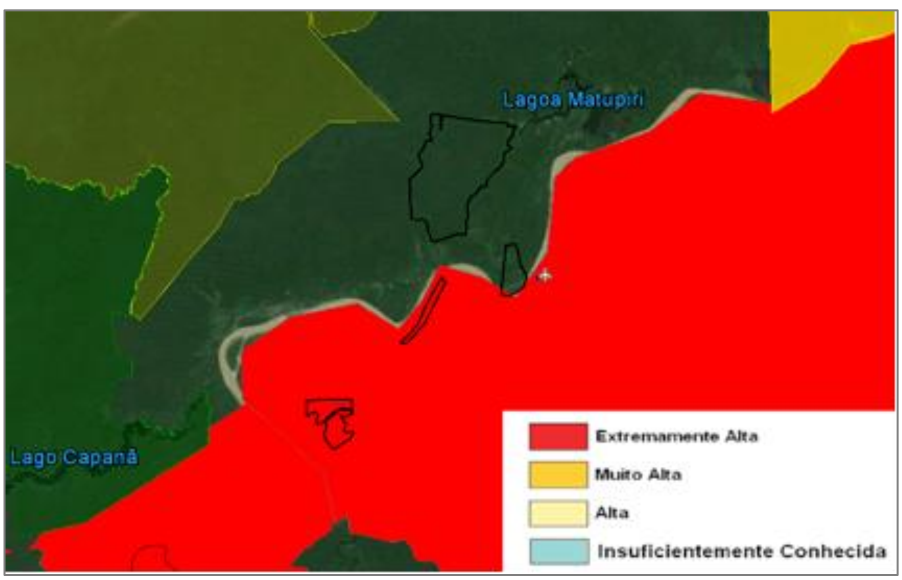
The MMA defines the creation of Sustainable Use Protected Areas as a priority action, followed by the creation of Protected Areas for other categories: territorial planning, formation of mosaics or ecological corridors and recuperation of degraded areas.

I. Protected Areas

The objective of the Amazon Rio project areas is to contribute effectively to the maintenance of the forests in the central south region of the state of Amazonas. They are therefore established as priority areas to be protected for nature conservation, through the creation of Private Sustainable Development Reserve (RPDSs), provided for by the Amazonas State System of Conservation Units (SEUC). The areas of the Amazon Rio project are strategic for environmental conservation because, in addition to sheltering approximately 20,000 hectares of well-preserved forests, they guarantee the connectivity and formation of PA mosaics between large Federal Government areas of protected forest (Lago do Caparanã Grande RDS) and Amazonas State Government protected areas (Rio Amapá RDS, Madeira RDS, Matupiri State Park and Juma RDS). For this reason, the reserves have High Conservation Value over an ecologically varied landscape, facilitating gene flow between animals and plants through these protected forest tracts, especially in light of possible future scenarios of intensive land occupation and the conversion of forests for agriculture and livestock production lands.

The location of the Amazon Rio II and Amazon Rio III areas is also of importance within a macro-region of the municipality of Manicoré, on the right bank of the Madeira River, which the Ministry of the Environment considers to be of extremely high biological significance and a priority area for conservation in Brazil (MMA, 2007), as demonstrated in Figure 9. The identified areas are classified according to their degree of importance for biodiversity and the urgency to implement the recommended actions. The classifications are: Extremely High, Very High, High, Insufficiently Known.

Figure 9. Amazon Rio II and Amazon Rio III areas located in the macro-region, classified as extremely high for conservation of biodiversity in accordance with MMA (2007) (G1, Indicator 7).



It should be noted that the project area is located along the BR-174 highway, at the junction of two transportation channels important for the flow of people and goods. There is increased risk for deforestation along the BR-174, especially with the federal government's plan to recover and asphalt the highway which brings projections of increased deforestation in the region. Given the projection for risk of future deforestation in the region, the project area has a strategic role in containing deforestation.

The measures that need to be taken for maintenance these HCVs are: (i) formal creation of the Amazon Rio RPDS; (ii) drafting of this project as a fundraising tool via REDD+ IFM for investment in the consolidation of Amazon Rios RPDS activities; (iii) promoting initiatives for the formation of Protected Area mosaics in conjunction with the relevant public bodies for the management of the PAs in the area and (iv) supporting the State of Amazonas in monitoring, command and control actions in the region where the Amazon Rio REDD+ IFM project is located.

II. Endangered Species

FLORA

About 5% of the tree species identified in the project areas are on the Red List of endangered species, according to the International Union for Conservation of Nature (IUCN). They are either critically endangered (CE) with extremely high risk of extinction in the wild; endangered (ED) with very high risk of extinction; or vulnerable (VU) with a high risk of extinction in the wild. The following table lists the endangered species of trees in the Amazon Rio project region:

Table 03. Endangered plant species in the Amazon Rio project areas (using expedited forest inventory information compiled by EBCF and the Red List of endangered species (footnote IUCN)).

Kingdom	Order	Family	Species	Common Name (Portuguese)	Common Name (English)	Status* Red List	Year accessed
PLANTAE	EBENALES	SAPOTACEAE	Chrysophyllum superbum	Abiurana	-	CE	1998
PLANTAE	EBENALES	SAPOTACEAE	Micropholis grandiflora	Abiurana	-	CE	1998
PLANTAE	LAURALES	LAURACEAE	Aniba rosaeodora	Pau rosa	Brazilian rosewood	ED	1998
PLANTAE	FABALES	LEGUMINOSAE	Inga suberosa	Inga	Shimbillo	ED	1998

PLANTAE	EBENALES	SAPOTACEAE	Pouteria fulva	Abiurana	-	ED	1998
PLANTAE	EBENALES	SAPOTACEAE	Pouteria juruana	Abiurana	-	ED	1997
PLANTAE	EBENALES	SAPOTACEAE	Pouteria tarumanensis	Abiurana	-	ED	1998
PLANTAE	MAGNOLIALES	MYRISTICACEAE	Virola surinamensis	Ucuuba, virola	Baboonwood	ED	1998
PLANTAE	LECYTHIDALES	LECYTHIDACEAE	Bertholletia excelsa	Castanheira	Brazil nut tree	VU	1998
PLANTAE	LAURALES	LAURACEAE	Aniba ferrea	Louro fofo	-	VU	1998
PLANTAE	LAURALES	LAURACEAE	Aniba santalodora	Louro rosa	-	VU	1998
PLANTAE	LECYTHIDALES	LECYTHIDACEAE	Cariniana integrifolia	Castanha de macacao	-	VU	1998
PLANTAE	LECYTHIDALES	LECYTHIDACEAE	Cariniana pachyantha	Castanha de macacao	-	VU	1998
PLANTAE	LECYTHIDALES	LECYTHIDACEAE	Cariniana uaupensis	Castanha de macacao	-	VU	1998
PLANTAE	LECYTHIDALES	LECYTHIDACEAE	Eschweilera rhododendrifolia	Ripeiro branco	-	VU	1998
PLANTAE	EBENALES	SAPOTACEAE	Pouteria lucens	Abiu, abiurana, abiurana-abiu, jaraí,	-	VU	1998

				abiurana bacurl			

* CE: critically endangered, ED: endangered, VU: vulnerable.

These species are endangered because of their productive and cultural importance for local communities. In general, all the parts of plants are used for a variety of purposes including construction (timber species) or uses related to their properties, resin, bark, peel, fruit and tannin (multiple use species).

Measures for the maintenance of the HVCs include: (i) periodic inventories of the flora to identify changes in the structure and population dynamics of the listed species; (ii) mobilization of participatory biomonitoring actions in conjunction with AAVs; (iii) identification of the intensity of use and extraction of the listed plant species; (iv) implementation of specific procedures for the establishment of sustainable and rational use of listed species, including exploitation agreements with communities and the prohibition of exploitation of critically endangered species; (v) seed collection for the production of seedlings and enrichment plantings in the project area to promote in situ conservation and provision of genetic material for ex situ conservation initiatives such as plantations, botanic gardens, research institutions and germplasm banks and (vi) habitat maintenance through the consolidation of Amazon Rio RPDS.

FAUNA

According to the MMA (2008) 627 animal taxa are considered endangered in Brazil, including 61 Amazonian species, using IUCN methodologies, classifications of vulnerable (VU), endangered (EN) and critically endangered (CE). Of the 627 endangered taxa, 69 are mammals (11% of the total); 160 are birds (25.5%); 20 are reptiles (3.2%); 16 are amphibians (2.5%); 154 are fish (24.6%), and 208 are invertebrates (33.2%).

Within these endangered animals, mammals - especially primates and carnivores - are proportionally more endangered. Forests are the exclusive habitat of primates and therefore they exhibit very low tolerance to forest destruction. Carnivores, which are predominantly predators, have low population densities and large habitat requirements. Both suffer pressure from hunting: primates as a food source and carnivores for the losses they supposedly cause ranchers and other livestock breeders (MMA, 2008).

The following table lists the endangered animals in and around the Amazon Rio project areas, using the biological inventories of Rio Amapá RDS and the endangered species database available from the IUCN[10] and ICMBio[11] references.

Table 04. Endangered animal species in and around the Amazon Rio project areas

Kingdom	Order	Family	Species	Common Name (Portuguese)	Common Name (English)	Status* Red List	Year accessed
ANIMALIA	CARNIVORA	MUSTELIDAE	Pteronura brasiliensis	Ariranha	Giant Otter, Giant Brazilian Otter	ED	2008
ANIMALIA	CARNIVORA	FELIDAE	Puma concolor	Onça parda	Puma, Montain lion, Cougar, Red Tiger, Deer Tiger	Least Concern	2008
ANIMALIA	PASSERIFORMES	DENDROCOLAPTIDAE	Dendrocolaptes certhia	Arapaçu-da-taoca	Amazonian Barred Woodcreeper, Amazonian Barred-Woodcreeper	EN	2008
ANIMALIA	PASSERIFORMES	DENDROCOLAPTIDAE	Dendrocincla merula	Arapaçu-da-taoca	White-chinned Woodcreeper	EN	2012

[10] http://www.iucnredlist.org/
[11] http://www.icmbio.gov.br/portal/biodiversidade/fauna-brasileira/lista-de-especies.html

ANIMALIA	PERISSODACTYLA	TAPIRIDAE	Tapirus terrestris	Anta	Lowland Tapir, South American Tapir, Brazilian Tapir	VU	2008
ANIMALIA	PILOSA	MYRMECOPHAGIDAE	Myrmecophaga tridactyla	Tamanduá-bandeira	Giant Anteater	VU	2007
ANIMALIA	PRIMATES	ATELIDAE	Ateles belzebuth	Macaco aranha	Long-haired Spider Monkey, White-bellied Spider Monkey	ED	2008
ANIMALIA	PRIMATES	PITHECIIDAE	Pithecia albicans	Parauacu, macaco-velho	White Saki, Buffy Saki, Buffy Saki, White Sakia	VU	2008
ANIMALIA	PRIMATES	ATELIDAE	Lagothrix cana	Macaco barrigudo	Woolly Monkey, Geoffroy's Woolly Monkey	ED	2008
ANIMALIA	PRIMATES	ATELIDAE	Alouatta juara	Guariba	Juruá Red Howler Monkey, Juruá Red Howling Monkey	Least Concern	2008

ANIMALIA	PRIMATES	ATELIDAE	Alouatta macconnelli	Guariba	Guianan Red Howler Monkey, Trinidad Howling Monkey	Least Concern	2008
ANIMALIA	PSITTACIFORMES	PSITTACIDAE	Guaruba guarouba	Ararajuba ou guaruba	Golden Parakeet, Golden Conure	VU	2013

As shown in Table 04, 12 endangered animals threatened with extinction were identified in and around the Amazon Rio project area, of which nine are mammals and three are birds. The carnivores and primates are most noteworthy among the threatened species. Among the carnivores, the presence of the giant otter is particularly important as an indicator of inland aquatic ecosystem quality since it feeds on large quantities of fish, small mammals, birds, reptiles and invertebrates and as such, it is easily impacted by local ecological disturbances (ROSAS et al., 2008). In addition, it is easily captured by hunters who can recognize its loud vocalizations over long distances.

It is also worth highlighting the presence of the tapir, a mammal species that suffers severe pressures from hunting and is consequently at risk of extinction. It is a herbivore and its meat is particularly appealing to local populations and therefore much sought after. The Golden Conure (*Guaruba guarouba*) has always been a much coveted species by illegal bird traders, who have contributed significantly to the reduction of their populations in Brazil and the Amazon, including the project area.

Measures for the maintenance of the HCV listed fauna are: (i) raising awareness in local communities about the importance of protecting endangered species; (ii) participatory monitoring of hunting and fishing to verify which species are being impacted by use and exploitation; (iii) in the case where maintenance of HCVs is deteriorating, conciliatory measures will be taken through community hunting and fishing agreements; (iv) in extreme cases (such as hunting for illegal trade in leather and meat of wild animals), vigorous measures will be taken such as activating the battalion of local environmental police and relevant government bodies for the control of environmental crimes and (v) habitat maintenance through consolidation of Amazon Rio RPDS.

III. Endemic and/or rare species

Endemic species have not yet been identified in the Amazon Rio project area, however, according to the World Wildlife Fund (WWF), in the south-western Amazon (Amazonas, Acre and Rondônia states) 42 endemic species have been identified, as shown in the following table.

Table 05. Endemic species in the southwestern Amazon

	Scientific name	Common name	Class
1	Eleutherodactylus skydmainos	Rã	Amphibia
2	Leptodactylus didymus	Rã da várzea	Amphibia
3	Hyla walfordi	Perereca	Amphibia
4	Osteocephalus pearsoni	Perereca	Amphibia
5	Bufo castaneoticus	Sapo cururu	Amphibia
6	Hyla allenorum	Perereca	Amphibia
7	Epipedobates simulans	*Epipedobates simulans*	Amphibia
8	Caecilia marcusi	Villa Tunari Caecilian	Amphibia
9	Scinax pedromedinai	Perereca	Amphibia
10	Dendrobates biolat	Biolat Poison Frog	Amphibia
11	Eleutherodactylus buccinator	Rã	Amphibia
12	Epipedobates macero	Manu Poison Frog	Amphibia
13	Altigius alios	*Altigius alios*	Amphibia
14	Scinax parkeri	Perereca	Amphibia
15	Scinax ictérica	Perereca	Amphibia
16	Thryothorus griseus	Garrincha-cinza	Aves
17	Eubucco tucinkae	Capitão de colar amarelo	Aves
18	Cacicus koepckeae	Tecelão-do-acre	Aves
19	Conioptilon mcilhennyi	Anambé-de-cara-preta	Aves
20	Formicarius rufifrons	Pinto-do-mato-de-fronte-ruiva	Aves
21	Simoxenops striatus	Limpa-folha	Aves
22	Todirostrum pulchellum	Ferreirinho	Aves
23	Nannopsittaca dachilleae	Periquito-da-amazônia	Aves
24	Grallaria eludens	Tovacuçu-xodó	Aves
25	Picumnus subtilis	Pica-pau-anão-de-barras-finas	Aves
26	Lophotriccus eulophotes	Maria topetuda	Aves

27	Percnostola lophotes	Formigueiro do bambú	Aves
28	Myrmeciza goeldii	Formigueiro de Goeldi	Aves
29	Micronycteris matses	Morcego-orelhudo-de-Matses	Mammalia
30	Scolomys ucayalensis	Rato-espinhoso-de-Ucayali	Mammalia
31	Neusticomys peruviensis	Rato-pescador-peruano	Mammalia
32	Apostolepis tenuis	Ruthven's Burrowing Snake	Reptilia
33	Helicops yacu	Cobra d'água	Reptilia
34	Apostolepis nigroterminata	Cobra coral falsa	Reptilia
35	Stenocercus scapularis	Calango	Reptilia
36	Neusticurus ocellatus	Calango	Reptilia
37	Neusticurus juruazensis	Calango	Reptilia
38	Atractus nigricaudus	Black-headed Ground Snake	Reptilia
39	Bothrops sanctaecrucis	Bolivian Lancehead	Reptilia
40	Anolis dissimilis	Lagarto	Reptilia
41	Anolis scapularis	Lagarto	Reptilia
42	Mabuya nigropalmata	Lagartixa	Reptilia

IV. Areas that contain significant concentrations of species during any period of their life cycle (e.g. migration, feeding grounds and nesting areas)

According to the information from the Rio Amapá RDS Management Plan (GOVERNO DO ESTADO DO AMAZONAS, 2010) the lakes and streams in the areas surrounding the Amazon Rio project are rich in fish biodiversity. This was demonstrated by obtaining 1,675 specimens distributed across 85 different species belonging to six orders and 19 families, carried out in 25 sampling points.

The acidic blackwater lakes are important shelters for the reproduction and development of the local fish species during the summer. In the winter (October to March), the rising waters establish links between the lakes and the local *igarapés* (seasonally flooded streams), enabling a great diversity of fish which breed and mature on the banks to disperse and populate bodies of running water. The lakes and streams located within and around the Amazon Rio project areas are in excellent states of conservation and fishing activities appear to be controlled, limited to providing subsistence for local residents.

Measures to maintain the HCVs include: (i) support the government in widespread dissemination of the closed season in the listed lakes; (ii) fishing agreements signed between communities and (iii) recording complaints of conflicts between community members and commercial fishers regarding the use of resources in lakes identified as HCVs.

V. Rare or endangered ecosystems

There were no rare ecosystems identified in the project area (such as campinarana formations or Amazonian fields). However, tropical forests are considered rare and endangered global ecosystems. The Brazilian Amazon forests along with the tropical forests of Asia suffer the greatest pressure from deforestation due to logging and subsequent conversion into agricultural and livestock raising landscapes.

The Amazon Rio project areas located in the vicinity of the municipality of Manicoré, the municipality with the third highest rates of deforestation in the state of Amazonas (INPE/PRODES, 2012), with approximate clear-cutting rates of 61 Km^2 of the forest per year. This deforestation pressure in the municipality is due to the movement of livestock, especially beef cattle, into the territory from the states of Rondônia, Acre and Mato Grosso. The greatest pressure for deforestation is located in the south of the municipality, on the BR-230 transamazonic highway at junctions between the BR-163 and BR-174 which provide access to the aforementioned states. To stop these deforestation fronts, it is essential to consolidate the PA mosaic, both in the public and private domain, in the south central region of the State of Amazonas.

VI. Critically Important Ecosystem Services

The Amazon Rio project promotes the conservation of large areas of primary forest with climatic benefits such as the carbon dioxide (CO_2) sequestration. The project will also provide a range of other critically important ecosystem services, including:

- Soil erosion control by maintaining the forest integrity, including the banks of bodies of water;
- Cycling, filtering and storing of water;
- Oxygen production;
- Nutrient recycling and improvement of soil quality;
- Important environmental services such as pollination and seed dispersion;
- Gene bank for medicinal plants;
- Food for the 15 surrounding communities, through the continuous provision of fishing, hunting and extracting resources from the forests. The most important food items obtained from the

forest are:

- ✓ Forest extractivism: Brazil nuts, açai, pataua, tucuman, bacaba, pupunha, and honey.
- ✓ Hunting: paca, agouti, armadillo, deer, monkeys (spider, howler monkey, capuchin), tapir and wild boar. The locals also traditionally hunt alligators and turtles on the banks of rivers and lakes;

- Habitat for an extraordinary diversity of plants and animals;

VII. Hydrological services

The rivers, streams and lakes in and around the Amazon Rio project areas are essential resources for sustaining the basic needs of the 15 local communities, as well as the traditional cultural identity. The communities also depend on the Madeira and Manicoré rivers for drinking water, cooking, personal hygiene, and as the primary means of transportation.

The Madeira and Manicoré rivers are the two main sources for fish for the communities around the project areas and the municipality of Manicoré. The most abundant fish species are: Surubim, Pacu, Piau, Jaraqui, Branquinha, Sardinha, Pirapitinga, Caparaí, Jatuarana, Matrinxã, Pirapitinga, Curimatá, Traíra, Dourada and Mandii. In lakes the main fish are: Tucunaré, Pirarucu, Tambaqui, Pirapitinga, Pacu, Aruanã, Jaraqui, Branquinha, Curimatá, Cará, Matrinchã, Sardinha, Aracu, Jatuarana, Traíra, Jeju and Surubim.

Measures to maintain the HCVs include: (i) fishing agreements between communities; (ii) supporting the state for widespread dissemination of seasonal fishing closures and the species included in the closures, and (iii) compiling reports of unauthorized commercial vessels that lack authorization or fishing licenses in the region.

VIII. Medicinal Use

Using the forest as a source of medicine is a cultural trait of traditional Amazonian communities. Many families use a wide variety of medicinal plants found in the forests in and around the Amazon Rio project areas. The following most commonly used plants are highlighted as HCVs for traditional medicinal use:

- Copaiba oil: used for anti-inflammatory treatments;
- Andiroba oil: used as a mosquito repellent and as treatment for gastrointestinal problems;
- Jatobá: used to combat anemia, increasing red blood cells;

- Cedar bark: used to relieve toothaches and to reduce fevers.

Measures for the maintenance of these HCVs include: (i) monitoring of forest extractivism; (ii) identification of the maximum sustainable yield for these species and (iii) agreements for management and use of these resources with the communities.

IX. Traditional Cultural Significance

The natural resources and environments used by the communities around the Project areas have great cultural significance for the populations in the project area. In addition to providing HVRs as detailed in Section 6.1, many portions of forests, lakes and rivers are home to entities with supernatural powers, according to local tales and legends. This is the case for *curupira*, a mystic entity known as the "mother of the forest", who protects animals from "bad hunters" (those who hunt excessively), causing them to become disoriented and lost in the woods for hours, or even days, unable to return to their homes. There is also a belief that some people are *panemas*, for behavioral reasons as well as for various unknown reasons, they are unlucky in hunting and fishing activities.

The indigenous community of Kamayuá claims areas of native forest for use for food production practices as well as for traditional practices rooted in the forest resources. There is a connection between the resources, identity and cultural preservation. The resource use areas are recognized as HCVs, since the areas are of relevant interest for maintaining traditions of the Kamayuá community.

To maintain these HCVs, the project will establish a specific initiative to understand the cultural needs of the community, especially in the area of the RPDS; and to resolve conflicts between different ethnic groups in the project area. For this purpose, a conflict mediation process will be initiated under the EBCF conflict resolution protocol (Annex 44).

2.5 Project Financing (G1.11, G1.12, G4.3)

The Carbon Project integrates a broad vision of territorial management as part of the Management Plan of the Amazon Rio Private Reservation I. Accordingly, it stipulates that all actions necessary to implement this Plan should be come from resources obtained as payments for environmental services, such as carbon credits and CRAs.

The idea is for the plan to serve as a management tool to provide technical and political support for negotiations together with institutions to receive investments that can make the projects and programs viable. The expected revenues, in the short and medium-term, for implementation of the Management Plan, will come mostly from payments for environmental services such as negotiated carbon credits and CRAs. Revenues are also expected for projects that generate long-term income exclusively for the communities, such as: harvesting of non-timber forest products, ecotourism and scientific research.

In this context, the main difference between a permanent protection private reserve (e.g. RPPN) and a private sustainable development reserve (e.g. RPDS) is that the long-term financial viability of the sustainable development reserves comes from the marketing of non-timber forest products with high added-value and other sustainable operations such as compensation for environmental services. This flow of resources is expected to occur during and after the implementation period. The proposal is that with this initial external support, local communities, through their political representatives, will be able to establish partnerships and contracts with companies, cooperatives and industries interested in supporting social and environmental initiatives in the project areas.

The initially offered external support, referred to in the previous paragraph, basically consists of the voluntary contribution of the project partners, which in turn believe in the proposition and the potential of the project to provide a return on the investment, both monetary and especially in less tangible dividends, such as corporate marketing and institutional visibility. At the time of the preparation of this document, an initial contribution of R$ 3,963,000 was made to the project for the first 3 years, which will be used to pay for initial expenses such as the preparation of technical documents, management and implementation of the first activities.

As for the revenues obtained from the market for greenhouse gas emissions reductions, a projection using two prices for carbon credits was considered, considering "futures" (USD 4/VCU) and issued credits (USD 7/VCU).

These items are briefly listed below with their respective values regarding the implementation and execution of the project, part of which will be initially financed by contributions from the partners, as mentioned above.

Table 06. Project implementation and operational costs[12]

Component	Value (R$)	Share (%)
Pre-Operating expenses	546,000	1,0%
Administrative expenses	17,023,000	32,0%
Costs of VCS + CCB certification	456,670	0,9%
Climate Activities	2,800,000	5,3%
Biodiversity Activities	2,202,000	4,1%
Income Generation Activities	10,665,000	20,0%
Education & Health Activities	4,111,000	7,7%
Inclusion and social empowerment Activities	2,145,000	4,0%
Carbon trading	1,530,163	2,9%
Taxes on income	1,869,314	3,5%
Taxes on profit	5,572,091	10,5%
10% interest return on shareholder investment	4,359,300	8,2%
TOTAL	53,279,538	**100,0%**

2.6 Employment Opportunities and Worker Safety (G3.6, G3.7, G3.9, G3.10)

Despite the considerable local knowledge of the region's ecosystems and environments, there is a lack of technology available for adding value to agroextrativist products and for environmental conservation projects. In addition to these difficulties, public service agents frequently recommend the use of techniques and management practices that require high external inputs and sizeable investments.

To overcome these limitations the project intends to promote specific and culturally appropriate training sessions that include workshops, meetings, courses and continued technical assistance to improve the knowledge and skills of community leaders, residents and project employees. Together with these training sessions, we intend to install diversified agroforestry systems, to restore and reuse degraded areas, to encourage handicrafts and tourism, and to improve the management of non-timber forest products, with emphasis on Brazil nuts, andiroba, copaiba and açai. As a result management practices are expected to improve in the long term, as well as and the fostering of local culture, combining technical and scientific knowledge with traditional knowledge.

[12] Annex 16

In addition to the technical knowledge geared toward production and management, the project will promote organizational and administrative training in participatory and democratic management based on the Amazon Rio REDD+ IFM and RPDS Management Plan, including training in accounting, conflict management, techniques and procedures for obtaining consensus and greater participation in decisions.

Additional efforts will be made to empower groups that have traditionally held less power and had less visibility such as women and young people. Attention will be paid to providing equal opportunity for women and young people in training events, programs and projects to be developed, including activities related to environmental monitoring, such as the Volunteer Environmental Agent Program, and other programs related to fishing and fauna. It is important to mention that all endeavors should meet the social requirements of labor legislation for health and worker safety.
The Amazon Rio REDD+ IFM project has an anti-discrimination policy and policies for the inclusion and empowerment of women and young and vulnerable populations, defined in ATA (Annex 43). The project has hiring policies for generating equal opportunities in employment openings for the implementation of Amazon Rio REDD+ EBCF project activities and unrestricted equal inclusion of women on the RPDS consultation councils as an initiative for the political engagement of women in the consultative and deliberative processes of the project activities, especially in the construction of planned women's empowerment activities which include income-generating activities geared to women's skills and identified by women.

Specific training in worker safety will be offered to avoid situations that put workers at risk during activities and assignments. This training will include a series of operating procedures to minimize accidents on the job, especially in occupations that require the use of production equipment and machinery for extraction and processing. In addition, workers will receive first aid training and will be required to use personal protective equipment: boots, helmets, special clothing, tools, medications, etc. (G3, indicator 12)

2.7 Stakeholders (G1, indicator 5, indicator 6) (G3.1, G3.2, G3.3)

Consultation prior to the beginning of the project

The populations involved in the Carbon Project are direct users of forest resources in the Amazon Rio I, II, III & IV areas, extracting plants and animals. Initially they were listed by the Council of Agro-Extrativist Associations of Democracia (*Central das Associações Agroextrativistas de Democracia* -

CAAD), which gathers associations of residents from ten communities located near the Amazon Rio I Reserve. Following this identification, the EBCF contracted the services of the CO2X Conservação de Florestas Ltda consulting company to perform a series of workshops and meetings to prepare the Amazon Rio I Management Plan (Annex 9) and to develop the Amazon Rio REDD+ IFM project. Different forms and spaces for the participation of the community members and governmental and non-governmental institutions were discussed in these meetings to support the development and implementation of the Management Plan, culminating in the creation of Advisory Council.

During these events, conservation and fundraising strategies were presented to the community, among them the marketing of avoided emissions resulting from the suspension of logging. The Free, Prior and Informed Consent (FPIC) process was undertaken in the communities surrounding the Amazon Rio I, II, III and IV areas in 2013 with three inclusive and participatory workshops. This document, as well as the minutes of the workshops, participatory mapping, Sustainability Matrix, questionnaires and powerpoint presentations are available in Annex 10[13]. Invitations to the workshops were widely distributed to community leaders and representatives in the communities through trades and mobilizations prior to FPIC. invitations to the workshops can be viewed in Annex 47.

During all the workshops held in the communities surrounding the project area, the program content included information regarding the certification process that the project will be subjected to, including the role of certification organizations.

Stakeholder Identification

To identify stakeholders were held a series of workshops during the design phase of the project where the stakeholders were identified with the support of experts in driving engagement processes of social actors in social and environmental projects. These activities culminated in the development of Free Prior Informed Consent, which provides details on the engagement process and community consultation and is available in Annex 10. In addition to these meetings, there was a great effort by the tenderer for the preparation of a census in the communities involved with the project, which can be accessed in annex 26.

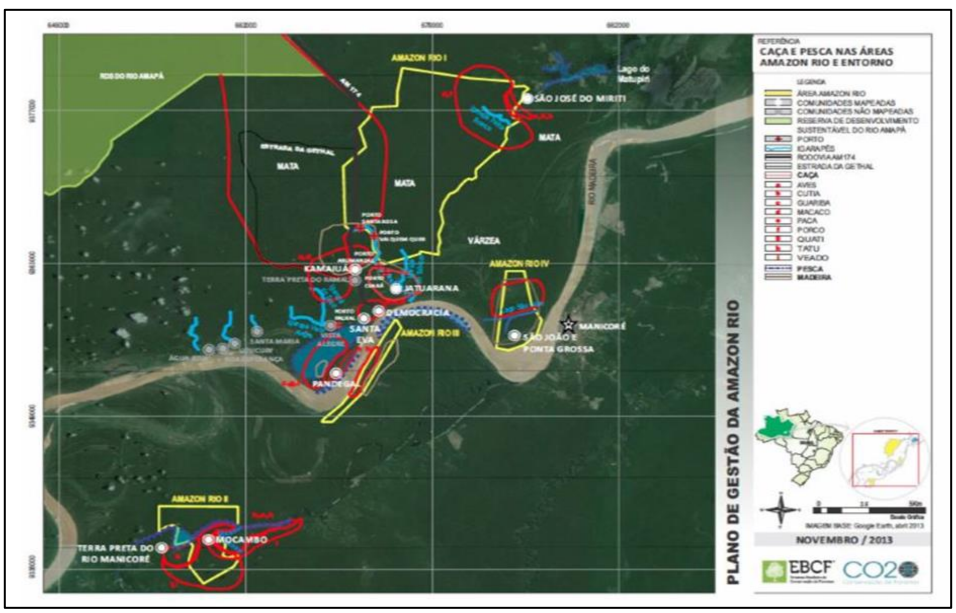
There are 15 communities that will benefit from the project activities and 12 of them (Urucury, Água Azul, Vista Alegre, Boa Esperança, Santa Eva, Santa Maria, Pandegal, Democracia, Jatuarana,

[13] Topic discussed in more detail in Section 3.7 of this document.

Terra Preta do Ramal, Kamayuá and São José do Miriti) are located in the areas region surrounding Amazon Rio I and III areas and the Rio Amapá RDS area, on the Madeira River and its tributaries. One of the communities is formed by residents from the São João Agroextractivist Association and Ponta Grossa, which is located near the Amazon Rio IV area. Two communities, Terra Preta do Rio Manicoré and Mocambo, are located near the Amazon Rio II region on the banks of the Manicoré River (Figure 05). In the communities surrounding the project areas there are two groups of traditional communities, the Kamayuá community formed by the *Munduruku* indigenous ethnicity, and the other 14 formed by traditional riberinho communities.

Except for Terra Preta do Rio Manicoré, Mocambo, and São José do Miriti, all of the communities utilize the Rio Amapá RDS area, either on a sporadic or seasonal basis, to meet their food needs (collecting various fruits, fishing and hunting); for household and medicinal use (bark, leaves and plant parts considered medicinal by traditional use and knowledge); and primarily for the sale of various non-timber products, especially the harvesting of Brazil nuts, açaí and copaíba oil. However, the backroads, roads and paths that provide access to the Rio Amapá RDS and Amazon Rio areas are in a poor state of repair, which hinders extraction practices, especially for Brazil nut production (Figure 10).

Figure 10. Location of communities surrounding the Amazon Rio I, II, III and IV areas and participatory zoning.



In addition to the 15 communities surrounding the Amazon Rio areas, government organizations directly involved with environmental issues in the region, such as SDS, the National Indian

Foundation (Fundação Nacional do Índio - FUNAI), Town Hall and the Town Council of Manicoré, the Secretary of Environment and Sustainable Development of Manicoré, ICMBio and non-governmental organizations, such as FAS, IEB, CAAD, CNS, UFAM, UEA were identified and contacted to participate in the entire process of preparation of the Management Plan. The invitations can be found in Annex 47.

Stakeholder meetings

To present and conduct in-depth discussions on the project with representatives of the 15 communities surrounding the project area and the supporting institutions, workshops were conducted in three different locations. The subjects were presented in clear language, in a culturally appropriate way so that community representatives could understand relatively complex and unusual concepts such as climate change, greenhouse gas effect and payments for environmental services.

The importance of forests for the mitigation and adaptation to climate change was emphasized to convey the main objectives of the project to community representatives, and in particular their role in: (i) absorbing carbon dioxide and releasing oxygen; (ii) helping control climate processes on a regional scale; (iii) regulating the flow of rivers and controlling erosion; and (iv) providing shelter and food for most animals and plants on the planet. The fact that 20% of global greenhouse gas emissions come from the destruction of forests and in Brazil 70% of emissions come from deforestation was also mentioned.

During the workshops participants learned that steps can be taken to reduce the emissions of greenhouse gases by investing in renewable energy sources such as solar energy, wind energy, hydroelectric power plants, as well as electric and more efficient cars. Another option that mitigates climate change was also highlighted, especially in relation to the Amazon: forest conservation and the restoration of degraded areas through reforestation, management of agricultural land, and establishment of agroforestry systems.

After the concepts were discussed, the proposed project for the Amazon Rio I RPDS, recently approved at the time, was explained to those present. It was conveyed that the Amazon Rio I RPDS and the creation of the other Reserves have essentially one goal: to financially reward those who preserve and protect forests threatened with deforestation and degradation. The two main objectives of the project are: (i) raise funds for the implementation of the Management Plan programs and (ii) conservation of the forest and its associated biodiversity. It was also stated that the project is part of a new vision for a business strategy, since a logging plan was operational until 2010, associated with the emissions of greenhouse gases. In 2010 the practice was suspended by the owner, who began investing in the creation of a project focused on conservation and payment for environmental services, with emphasis on the voluntary carbon market.

Comunication plan

The EBCF understands that to achieve success the expected impact with the implementation of the project it is necessary the engagement of local actors participate effectively in the implementation of activities, which mainly depends on the establishment of an ongoing communication plan focused on this engagement through stimulate the deliberate participation of the social actors involved in the project.

Among innumerable means of communication between managers, executors of conservationist projects and riverside communities of Amazonia, we must consider the media that best suit the reality of the communities, considering not only the technological limitations, but also their potential. In a way, geographic and technological isolation maintains the need for personal and face-to-face communication among people, especially when it comes to interpersonal issues that affect community life.

This creates a favorable environment for holding meetings with real deliberative and consultative assemblies, where people representing the interests of a given community are called upon to participate, usually being assigned to democratically elected community leaders and representatives with endogenous and specific rules for each community. These representatives, in turn, act as information bearers and capillary agents of decision-making that will in some way affect the lives of the social actors involved with the project.

In view of the above, the EBCF maintains as a backbone of the communication plan with the communities the holding of periodic thematic meetings aimed at engaging people in the project activities structured in five thematic axes: Climate; Biodiversity; Income generation; Education and health care; and Inclusion and social empowerment.

The management team will be responsible for coordinating and executing the planned activities with the support of the communities, which will have in the meetings of the council of the RPDS its largest forum of representativeness within the scope of the project, bringing in a systematic form the suggestions and wishes of the communities in relation to the project. The record of the deliberations will be materialized through guidelines, minutes and reports.

The communication plan is transversal to the project activities, and specific activities have specific communication strategies inherent to each activity, as described in item 2.2 related to the project activities. For example, in the context of education activities, the project provides for lectures and participation in classes on environmental issues in high schools. These actions are expected to promote the awareness of adolescents about environmental issues, such as biodiversity, conservation of natural resources and ecosystem services.
In relation to the gender issue, activities are planned to identify and plan income-generating activities geared towards women's skills, as well as the elaboration and support in the implementation of at least one activity in common with as many communities as possible.

Regarding the use of natural resources, the project foresees the elaboration of agreements of hunting, fishing and vegetal extractivism in the area of the project. To this end, monitoring activities are planned to survey the intensity of hunting and fishing in the communities and to intermediation the dialogue among the users of this resource, including the managers of the Conservation Units around the reserve.

It should also be noted that, in addition to the communication directed to the implementation of the project activities, the EBCF has a conflict resolution protocol for the communication necessary to manage possible conflicts.

Conflict Resolution (G3.8)

The mediation and conflict resolution strategy was presented and validated with community leaders and representatives during the workshop sessions held in April 2017 that dealt with updating and redrafting the Amazon Rio REDD+ project (Annex 42a).

Conflicts and complaints should be reported immediately to the board or project management team through the most appropriate means to be adequately addressed following the EBCF Protocol for Mediation and Conflict Resolution, in Portuguese: *Mediação e Resolução de Conflitos da EBCF* (Annex 44). The protocol is based on three stages of conflict resolution: (i) amicable settlement; (ii) third party mediation; and (iii) arbitrary decisions within applicable legal limits.

The mediation and conflict resolution strategy is presented in the following 5 steps:

Step 1 – complainant contacts the EBCF board through the communication channels made available and widely disseminated in the communities through the leaders and EBCF workshops. The complaint must be sent by e-mail or telephone call with the member of the board of directors/project management designated to receive the complaint. Complaints will be received during the workshops by any collaborator in attendance representing the EBCF.

Contacts for reporting complaints:

Telephone numbers: Valdenor Costa: (92) 99803-9119 | Leonardo Barrionuevo: +1 (305) 205-4577

e-mail: ouvidoria_rc@ebcf.com.br

During workshops: any collaborator in attendance representing the EBCF

Step 2 – EBCF board analyzes the nature of the complaint with the initial intention of verifying, in principle, whether the complaint concerns the REDD+ EBCF Project and/or management of the Amazon Rio RPDS. After this is decided measures can be taken:

a) in the event that there is no relationship with the REDD+ EBCF Project and/or management of the RPDS, the board may deny receipt of the complaint or refer the complainant to the bodies responsible for mediation and resolution of the conflict (e.g. robberies, theft, murders and death threats, sexual harassment, historical land conflicts and family conflicts). In this case, the EBCF will only maintain the records of the complainant;

b) In the event that there is a relationship with the REDD+ Project and/or the management of the RPDS, the board will determine the nature, magnitude, involved parties and relevant bodies/institutions for mediation and resolution of the conflict or complaint.

Step 3 – In the case of acceptance of the complaint by the EBCF, the board will propose a amicable solution for the parties involved through extrajudicial agreements, without the involvement of a third party mediator or judicial formalization. In this case, the records, the responses to the complaints, and the proposed measures for mediation and resolution will be kept.

Step 4 – In cases where conflicts are not amicably resolved, a third party will be appointed to resolve the conflict. In this case, the EBCF board will address the complaint:

a) depending on the magnitude and urgency of the complaint, the EBCF Board will take the case to the Advisory Council of the RPDS. It will be placed on the agenda of the bi-annual meetings for analysis and the referral of necessary actions and mediations for resolution of the conflict, respecting the quorum for holding meetings;

b) if the nature and magnitude of the conflict are of an emergency nature, the EBCF Board may convene an extraordinary meeting of the Advisory Council of the RPDS convening the parties involved and also the bodies/institutions responsible for resolving the conflict (e.g.: illegal logging - engage IBAMA);

c) for cases where it is not the purview of the EBCF and RPDS management to resolve the complaint, the process will be forwarded to the responsible body/institution and closed, keeping its record in minutes for follow-up and incase of need for direct intervention in the future.

Step 5º – for cases where there is no agreement or amicable solution reached between the conflicting parties, even after intervention and application of the Advisory Council actions, the complaint will be sent to:

a) arbitrary decision, to the extent permitted by the laws in the jurisdiction, or

b) to the competent jurisdictional courts, without prejudice for submitting the complaint to an International adjudicatory body, if appropriate.

2.8 Commercially Sensitive Information

The EBCF considers information commercially sensitive to the Cash Flow Analysis of the Amazon River Project REDD + IFM and the agreement signed by the shareholders represented by the documents: " *Anexo 16 - Análise de Fluxo de Caixa Amazon Rio Vs Final* " and " *Anexo 27_Plano de negócios e Acordo de Acionista EBCF* ", respectively.

2.9 Sustainable Development

The EBCF REDD+ IFM project is proposed in the context of safeguards of a Private Sustainable Development Reserve and it is subject to federal and state legal frameworks for PA including the foundational commitment to sustainable development in and around the project area. These conditions are documented in the Reserve's Management Plan (Annex 9) and come to fruition in the confirmed objectives. As a form of conceptual alignment, the Sustainable Development Objectives proposed by United Nations were noted in the context of the objectives.

The project area was acquired by EBCF to implement a new development approach. Two important decisions were made: to suspend the logging operations that had been underway in the project areas since 1999 and; to transform them into Private Reserves for Sustainable Development (*Reservas*

Particulares de Desenvolvimento Sustentável - RPDSs), supported by State Law no. 53 of June 2007 and Decree no. 30.108 of June 2010.

This new development approach based on the conservation and valorization of environmental assets to benefit the local populations is perfectly aligned with the most relevant national environmental policy, the Nationally Determined Intended Contributions (iNDC) (*Contribuições Nacionalmente Determinadas Pretendidas*) as presented during the new agreement of the Conference of the Parties (COP- 21), UNFCCC in Paris, December 2016.

According to the official iNDC report, "iNDC takes into account the role of conservation units and indigenous lands as managed forest areas, in accordance with the applicable IPCC guidelines on the estimation of emission removals." The document affirms that “Brazil considers adaptation to be a fundamental element of the global effort to tackle climate change and its effects. The implementation of policies and measures to adapt to climate change contributes to building resilience of populations, ecosystems, infrastructure and production systems, by reducing vulnerability and through the provision of ecosystem services”.

Finally, the document considers that, “specifically concerning the forest sector, the implementation of REDD+ activities and the permanence of results achieved require the provision, on a continuous basis, of adequate and predictable results-based payments in accordance with the relevant COP decisions”, which is in line with the VCS/CCB standards in terms of generation and commercialization of VCUs.

In terms of social benefits and sustainable income generation, it is worth mentioning the population of 450 families distributed in 15 communities living around the Amazon Rio project area. Communities are typically caboclo, whose main economic activity is small-scale family farming, especially mandioc for flour production and bananas. The relationship with the forest is the extraction of non-wood products such as copaiba oil and Brazil nuts as well as subsistence hunting. Fishing is also a very important economic activity. The environmental benefits provided through the implementation of this project and the Amazon Rio I RPDS Management Plan, with subsequent inclusion of Amazon Rio II, III and IV, have a strong social development component and include several socio-economic support programs for local communities that promote sustainable development in the region.

This project explores socio-economic solutions to support the substitution a logging management project with a formally instituted biodiversity conservation project (RPDS). The consolidation of the project in the Amazonian environment, as an income generation strategy associated with forest conservation, with value provided by carbon credits, the creation of a private reserve, stimulating income generation and local production, could result in an innovative development model for the region that pursues economic, social and environmental viability. In this sense, the project is integrally inserted in the modeling process of projects for sustainable development of the region.

3 LEGAL STATUS

3.1 Compliance with Laws, Statues, Property Rights and Other Regulatory Frameworks (G3.11, G.5, G.6, G.7)

Considering that the project is based on the conservation activities and sustainable use of non-timber forest products, there is no conflict between these activities and any legislation (municipal, state or federal), international laws and regulations for the implementation of the activities proposed by the project. Relevant laws and regulations that support the activities are listed below:

- State Law no. 4406 of 2016 - Establishes the State Policy for Environmental Regularization, stipulated in the Rural Environmental Registry (*Cadastro Ambiental Rural* - CAR), the Rural Environmental Registry System (*Sistema de Cadastro Ambiental Rural* - SISCAR-AM), Environmental Regulation Program (*Programa de Regulamentação Ambiental* - PRA), in the State of Amazonas
- Federal law no. 12.651 of 2012 - establishes the new Forest Code and the Rural Environmental Registry
- Federal law no. 12.187 of 2009 - establishes the National Climate Change Policy and Federal Decree no. 7390 of 2010 - regulates the National Policy Climate Change
- Federal Law No. 9.985 of 2000 - establishes the Private Natural Heritage Reserve (*Reserva Particular do Patrimônio Natural* – RPPN)
- Federal law no. 6.938 of 1981 - establishing the National Environmental Policy
- Brazil's commitment to the UNFCCC, ratified by Decree no. 1 of 02/03/1994
- State law no. 53 of June 2007 - establishes the State System of Conservation Units (*Sistema Estadual de Unidades de Conservação* - SEUC) and Decree No. 30.108 of June 2010 - regulates private Private Reserves for Sustainable Development (*Reserva Particular de Desenvolvimento Sustentável* - RPDSs)
- State law no. 3135 of June 2007 - establishes the National Climate Change Policy, environmental

conservation and sustainable development in the state of Amazonas

- CONAMA Ruling - no. 406/2009 - establishes technical parameters to be adopted in the preparation, presentation, technical evaluation and implementation of the Plan for Sustainable Forest Management (*Plano de Manejo Florestal Sustentável*) for the logging of native forests and their forms of succession in the Amazon
- Decree 5.975/2006 - regulates forestry through forest logging plans, following Art. 19 of Law 4771/1965, as well as the implementation of Articles 15, 16, 20 and 21
- Ruling No. 5 11/12/2006/MMA, Ministry of the Environment - provides for all the technical procedures for the preparation, presentation, implementation, and technical assessment of forest logging plans and sustainable forms of succession in the Amazon
- Decree-Law No. 5452/1943 - approves the Consolidation of Labor Laws (*Consolidação das Leis do Trabalho* - CLT)

To date, no legal framework at the national or international level has established laws, legislation and policies related to REDD+ mechanism. There are some active processes which were considered in this study.

The current negotiation in the UNFCCC indicates implementation of the REDD+ mechanism with a gradual approach, in which pilot projects will also be considered. The Amazon Rio REDD+ IFM project is a pilot initiative and the first of its kind in Brazil due to the fact that it is being carried out on a private reserve for sustainable use, therefore it is the first private area in the country using this approach. The new model will likely assist in the construction of a national REDD+ mechanism. The total project area is made up of 12 distinct properties, which together represent four adjacent areas. Twelve public deeds were issued on behalf of the project proponent EBCF (Annex 11).

The Brazilian labor system is governed by the rules set by Decree-Law No. 5.452, May 1, 1943, approving the Consolidation of Labor Laws (CLT). This is the main piece of legislation relating to Brazilian labor law and it establishes the rules governing individual and collective labor relations (G3, indicator 11).

In the specific case of the Project, hiring of community residents to perform various activities and functions under the Management Plan will be a priority. Labor will be contracted from the associations of communities/CAAD and EBFC, which manages the Amazon Rio I Reserve. The contracts will be established according to the appropriate mode (CLT, temporary contract, consulting, etc.) in accordance with Brazilian law. When engaging the residents of Kamayuá

Indigenous Community, FUNAI will be the intermediary. In both cases, those contracted will be informed of their rights at the time of contracting.

Approval from appropriate authorities, including formal authorities and/or traditional authorities required by the communities (G5, indicator 7)

The project has been widely discussed with the Government of the State of Amazonas, through the Amazonas State Secretary of Environment and Sustainable Development (*Secretaria de Meio Ambiente e Desenvolvimento Sustentável do Estado do Amazonas* - SDS) under the Amazonas State System of Conservation Units (*Centro Estadual de Unidades de Conservação* - CEUC) and has the support of the State Government (Annex 12). FUNAI is also following the process, and has appointed a local representative from the municipality of Manicoré to participate in workshops and meetings with the Kamayuá Indigenous Community.

Formal authorization was obtained from riberinho and indigenous representatives from surrounding communities traditional through a consultation process. At the end of this process we obtained the approval and signature of a "Free, Prior and Informed Consent" document (Annex 10) by the representatives of the 15 neighboring communities who participated in the workshops that addressed the objectives, activities and forms of participation and monitoring of the project.

3.2 Evidence of Right of Use (G5.1, G5.2, G5.5)

For nearly four decades the project area was in the possession of Valdenor Campos da Costa's family. In 2011, the properties were transferred to the Empresa Brasileira de Conservacão de Florestas (EBCF), in which Valdenor Campos da Costa Junior became a founding partner, with the goal of transforming these areas into four Private Sustainable Development Reserves (RPDSs). The land titles and other documents are registered at the Land Registry Office of the Municipality of Manicoré, Amazonas, with the following registration numbers: 2045, 2046, 2047, 2048, 2049, 2050, 2052, 2053, book 2-6, pages 116-123 (Annex 11).

The land-use rights within the limits of the project are set by the Amazonas State System of Conservation Units (Centro Estadual de Unidades de Conservação - SEUC), in the category of conservation for sustainable use, establishing the Private Sustainable Development Reserve, and regulated by Decree 30.108 of June 2010. This category is defined as a private conservation area created by voluntary manifestation on the part of the owner with the intent to promote the conservation of natural resources and the practice of sustainable development. The right to use these areas may also be granted to the communities who use their natural resources for their production, economic and cultural mediums.

From a legal point of view regarding the carbon credits generated by the project, EBCF benefits exclusivity from the ownership and commercialization of reduced emission certificates, i.e. the VCUs, since the baseline activities, the property deed, the emission reduction activities and the process of creation of the RPDS are concentrated on the legal form of the Company.

From the point of view of land-use and natural resources, although the communities surrounding the Amazon Rio areas occupy a common territory (unoccupied private areas) and share the use of existing resources there, this does not imply that all resources are communally managed. The right to use the space and the resources are complex and varied: the land is owned by the State and/or private owners, but the resident families retain traditional rights over them. Internally, the resources are appropriated according to local rules and agreements.

There are basically three types of rights of possession and use of resources in these communities: single use, common use and open access. The single use areas are family-owned areas and include gardens, fields, pastures, cottages, Brazil nut and rubber tree groves, and secondary forests and woodlands (used for extracting straw, oils, timber for building houses, boats and canoes), and the expansion or establishment of new gardens or management units. The common use areas include forest reserves, açaí and buriti planting grounds, lakes, flooded forests and streams, and are appropriate for all residents of the same community that are governed by the agreed-upon rules and procedures.

However, not all common use areas have the same level of control and restriction as other communities and external users. Generally more distant areas are more difficult to control and, in certain circumstances, are considered open access areas, characterized by little or no control or restrictions on use and access. This is the case for some of the Amazon Rio IV areas of use. The areas adjacent to Lake São João, for example, whose surrounding residents cannot control fishing, logging and gathering of acai. These activities are conducted in a predatory manner by outsiders due to the area’s proximity to Manicoré.

This over-harvesting compels residents to walk more than two hours in the forest in search of forest products and "good wood" for making boats, canoes and houses. According to the leaders, residents have filed several complaints and signed several "petitions" and submitted them to the municipal authorities but they have not taken any action. These areas are rich in rubber trees, açai and wood (such as cedar, andiroba, virola, itaúba, angelim, marupá, among others) and thus subject to invasion. Illegal logging occurs especially during the flooded period, when planks and boards cut by chainsaws at the extraction site, can be floated downstream. According to the residents, no families commercially harvest Brazil nuts due to the distance to the trees.

3.3 Emissions Trading Programs and Other Binding Limits

Brazil does not belong to Annex I group of the Kyoto Protocol and as such did not make compulsory commitments to reduce greenhouse gas emissions under the UN Climate Convention. Likewise, EBCF, as a Brazilian company, does not have any mandatory requirements to reduce greenhouse gases. Any VCUs generated by the project activities will be the result of a voluntary initiative, unrelated to mandatory target programs for the reduction of GHG emissions.

3.4 Participation under Other GHG Programs

Not applicable.

3.5 Other Forms of Environmental Credit

One of the strategies to generate revenue to finance the Management Plan activities is the sale of Environmental Reserve Quotas (CRA)[14], arising from the surplus forest cover in the RPDS and subject to negotiation in the legal reserve compensation market.

3.6 Projects Rejected by Other GHG Programs

Not applicable.

3.7 Respect for Rights and No Involuntary Relocation (G3.4, G3.5, G5.3, G5.3)

The eight REDD+ principles and the social and environmental safeguards were presented in the three workshops explaining the Carbon project to the 15 communities. Those safeguards were

[14] Art. 15 of the New Brazilian Forest Code (Law 12.651/2012) provides for voluntary forest reserves, i.e., surplus forest then that required by law on rural properties. According to this law all preserved areas that exceed the minimum required by law may be used for the creation of environmental easements or Environmental Reserve Quotas in the same biome or State.

previously established in a series of meetings throughout the Amazon between 2009 and 2010, and included several Civil Society Organizations.

It was emphasized in the workshops that compliance with these principles and safeguards under REDD+ projects, such as the Amazon Rio Carbon Project, contributes to improving local governance, transparency of information, public participation in decision-making, coordination of actions among different actors and respect and recognition of the rights of indigenous peoples and traditional populations.

More directly, it was explained that these eight principles and safeguards guarantee that the rights of local populations (*ribeirinhos*, rubber tappers, indigenous peoples, farmers, and others) involved in REDD+ projects are respected, especially with respect to their right to use the natural resources. It was also reinforced that these principles ensure that no community will be displaced and/or prevented from continuing to practice their traditional extractivist activities.

Emphasis was placed on the fact that REDD+ actions should respect Brazilian law, especially labor rights and laws relating to environmental conservation. Furthermore, international agreements ratified by Brazil must be respected. Also fair and equitable sharing of benefits arising from the implementation of REDD+ project must also be ensured, focusing on disadvantaged groups in communities, such as women, youth and elderly and low income families.

Finally, the importance of ensuring the effective participation of communities in all steps of the REDD+ project, especially decision making, was stressed. Communities must have access to information related to the project, in a language that is easy to understand, including permitted and prohibited activities, and the main results.

Free, Prior and Informed Consent (FPIC)

During the project workshops the concept of "Free, Prior and Informed Consent" was presented to the participants, as well as the importance of social and environmental safeguards to ensure the rights of communities in designing and developing the REDD+ project, explained in the eight principles. The participants were asked whether they were in agreement and if there were other principles or rights that should be included. Some community individuals expressed their agreement to the safeguards. All participants at the three workshops raised their hands in support of REDD+ project. The consent was unanimous. A separate document describing the whole process of the "Free, Prior and Informed Consent" has been prepared and is available in Annex 10.

Figure 11. Workshop I: Free, Prior and Informed Consent Vote for the development of the REDD+ project by the community leaders of Democracia, Água Azul, São José do Miriti, Vista Alegre, Jatuarana, Terra Preta do Ramal, Pandegal, Santa Maria, Santa Eva and Terra Preta do Rio Mancoré.

Figure 12. Workshop II: Free, Prior and Informed Consent Vote for the development of the REDD+ project by the community leaders of Urucury, Mocambo, Boa Esperança and São João & Ponta Grossa.

Figure 13. Workshop III: Free, Prior and Informed Consent Vote for the development of the REDD+ project by the Kamayuá indigenous community

3.8 Illegal Activities and Project Benefits (G5.4)

Some illegal activities performed by some residents of the surrounding communities, such as the sale of game meat and wood, may negatively affect the project. Although these events are sporadic and localized, they will be restrained by the awareness and environmental control campaigns provided in the Management Plan.

Other more widespread and intense negative impacts may occur with the paving of State Highway AM-174 planned by the government in the near future in order to link Federal Highway BR-319 to the municipality of Manicoré and region. While this initiative represents an opportunity for the flow of production and facilitates supervision of the project, it poses a threat if the access to the Amazon Rio I Private Reserve is not strictly controlled. In this situation the RPDS may be subjected to pressures such as land grabbing, forest arson, deforestation, timber extraction, capture of animals for sale and other environmentally harmful activities.

Therefore, it is essential to invest in a control and surveillance system for the project that is effective and permanent. This system should rely on a modern system of capturing and updating images to identify any environmental damage, as well as a land-based patrol system using 4WD vehicles. Surveillance and control based on participation and direct involvement of voluntary environmental agents should also be implemented. Such actions will bring direct and indirect benefits to the project area, both from an environmental point of view and a social point of view.

4 APPLICATION OF METHODOLOGY

4.1 Title and Reference of Methodology

VCS VM0011: Methodology for Improved Forest Management – Logged to Protected Forest (LtPF): Calculating the GHG Benefits from Preventing Planned Degradation, version 1.0

4.2 Applicability of Methodology

The project activity is in full compliance with each of the applicability criteria stated in v.1 of the VM0011 methodology, as follows:

Table 07. Methodology applicability criteria

Criteria	Conditions of applicability of Methodology	Justification
Project Type	Improved Forest Management - Logged to Protected Forest; with no removals (e.g. harvesting, planned biomass burning) occurring in the project area upon implementation of the actual project (with the exception of felling sample trees for validating or deriving project-specific parameters presented in Section 7.2.4).	The project activity consists of complete cessation of the selective logging plan activities, operational between 1999 and 2009 (11 years for the purpose of baseline calculations).
Condition of the Forest	Intact forest or previously logged forest (also known as forest degraded due to logging). Land within the project area must have qualified as forest at least 10 years before the project start date.	The project area (which had a license for the logging plan) encompasses 18,559.8 hectares of primary Amazon rainforest, of which 5,429.69 hectares were degraded due to the logging operations between 1999 and 2009. Nonetheless the project area was forested 10 years before the project

		start date. See following paragraph, Table 8 and Figure 16.
Type of Forest	Tropical forests including evergreen tropical rainforests, moist deciduous forests, tropical dry forests and tropical dryland forests (see Annex A for definitions), except peat swamp forests.	The vegetation cover in the project area is Tropical Ombrophilous Forest (Amazon Rainforest).
Forest Product Type	Harvested wood products i.e., lumber, wood pulp, and commercial fuelwood.	The logging plan approved in 1998 harvested timber for commercialization of wood products. The harvested wood was sold as lumber to be used in civil construction.
Driver of Degradation	Legally sanctioned logging (timber and commercially harvested fuelwood) undertaken in accordance with the relevant laws, regulations and codes of practice of the country in which the methodology is being applied.	The project area was legally sanctioned for selective logging in accordance with the relevant Brazilian regulations and laws approved in 1998 by IPAAM[15] and IBAMA[16] (Annex 5).
Baseline	Legally sanctioned selective logging for specific forest product types presented above.	The project area is legally sanctioned for selective logging for commercial timber purposes.
Project Area	Must be designated, sanctioned or approved by the relevant authority in the host country for selective logging.	The project area was designated, sanctioned and authorized by the relevant authorities in Brazil for the selective logging of 18,559.8 ha, which represents the project area.

[15] Environmental Protection Institute of Amazonas State (*Instituto de Proteção Ambiental do Amazonas*), http://www.ipaam.am.gov.br/
[16] Brazilian Institute of the Environment and Renewable Natural Resources (*Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis*), www.ibama.gov.br

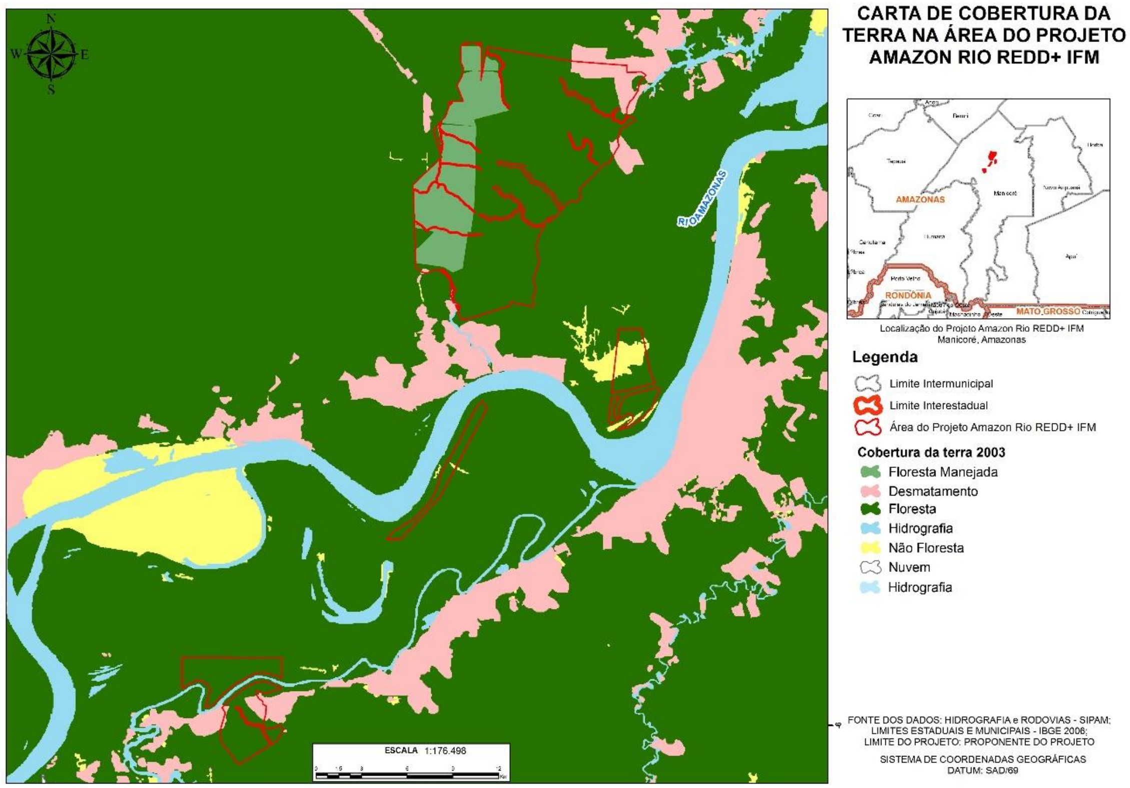
Carbon Pools	country • Harvested wood products (HWPs) based on domestic production not domestic consumption • Deadwood (DW) Carbon Pools considered: • Above-ground biomass (AGB) of all trees as defined by the relevant authority in the host country • Harvested wood products (HWPs) based on domestic production not domestic consumption • Deadwood (DW) Carbon Pools not considered: • Above-ground biomass (non-trees) • Below-ground biomass • Litter • Soil organic matter	The only carbon pools considered are: above-ground biomass (AGB), harvested wood products (HWPs) based on domestic production not domestic consumption, and deadwood (DW).

Data from the Satellite Monitoring Program for Deforestation in the Legal Amazon (PRODES/INPE) were used to generate information on forest cover in the project area. The 2003 year was used to demonstrate the qualification of the area as forest 10 years before the project start date. Table 08 and Figure 14 below show the land-use in the project area in 2003, according to PRODES/INPE data.

Table 08 – Data for land-use coverage in the project area in 2003

Land-use	Area (ha)
Intact Forest	4,131.68
Logged Forest	14,428.12
Total	**18,559.80**

Figure 14. Land-use in the Amazon Rio REDD+ IFM project area 3m 2003



4.3 Methodology Deviations

Although it is a requirement of VM0011 to use forest inventory reports conducted in less than 5 years for the use of existing forest inventory data in the project area, it was used as a basis for baseline and avoided project emissions measurement the forest inventory data for the licensing of the logging operation with information over five years. In this sense, it was necessary to use a methodological deviation that refers to the methodological criterion "3.2.1 - Pre-existing Inventory Data Path", which establishes the use of inventories more than five years.

Considering that the logging licensing documents, AUTEX and POAs, issued by the competent government agency in the state of Amazonas are valid official documents capable of supporting the project baseline projection, and since both data from the forest inventory carried out in the form of a 100% census where all trees to be explored are measured, we understand that there is no way to disconnect the project baseline from the results of the forest exploitation inventory, since these documents bring the exact volume of licensed wood that would be explored, estimating with greater precision the volume of emissions avoided when considering the exact volume of each tree explored. Therefore, the project proponent judges to be the most adequate and faithful data to the real volume of wood, and consequently of the avoided emissions, even with data five years prior to the beginning of the project activities.

Although the proposed deviation is an integral part of the project's primary data measurement sphere, this approach is considered conservative, since the biomass pool today - just as it was five years before the project starts - is certainly greater than the stock measured on the date of the inventory 100%. This is due to the fact that the trees selected for the selective cutting, as well as the forest exploited as a whole, gained an annual increase in biomass.

A second methodological deviation was necessary for converting the volume of marketable timber to carbon, since most of the commercial species are presumed to be hardwoods with higher densities than the default standard adopted by VM0011. For this purpose, the specific densities of each species were obtained from the Global Wood Density Database (Annex 23) for commercial species and were applied for the species whose density was found for the species (considering genre and scientific name). For species whose density is represented in the database for the genre, the default value reported by VM0011 was adopted, and the same default value was applied to the species whose density was not found in the database.

Finally, a methodological deviation was applied to demonstrate that there was no market leakage after the logging stoppage in the project area, demonstrating the reduction of the licensed timber supply in the state of Amazonas in the years following the logging stoppage in the Amazon Rio REDD + project area.

The data that support the argument about the absence of market leakage were directly measured and published by the government agency responsible for the licensing of logging activities in the state of Amazonas. At the time, data from the estimate of wood supply in the market were also used by the Brazilian Institute of Geography and Statistics (IBGE) for the same exploration period adopted as a basis for calculating baseline emissions, concluding that the supply of timber in the project area is insignificant given the supply of wood in the national, regional and meso-regional markets (southern region of the state of Amazonas). Details of proof of absence of leakage are described in section 5.5, under the topic market leakage.

4.4 Project Boundary[17] (G1.4)

Project Area and Leakage Areas

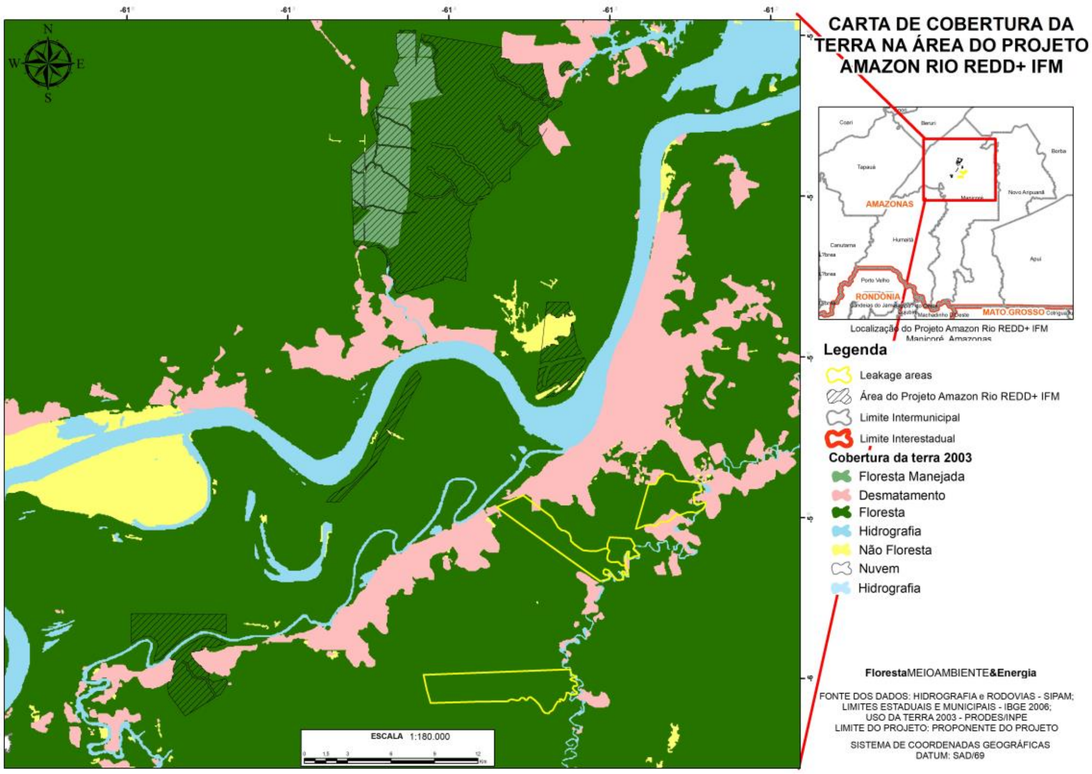
Only land with forest cover where logging is permitted, having been granted permission by Operating Licenses and Exploration Authorizations, is used to define the 18,559.8 ha[18] of the Project area (for purposes of calculating the emissions reductions called the Project Area or PA). To define the PA, the areas covered by forests are considered and the Permanent Preservation Areas (*Áreas de Preservação Permanente* - APPs), bodies of water and no forest areas defined by the PRODES project are excluded.

There is no direct leakage expected from the planned project activities, since there will not be any shifting of logging activities to other areas controlled and owned by the Management Plan and project proponent. The project Management Plan includes the monitoring of possible unanticipated leakages around the project area, as well as the need to report to the relevant authorities whenever logging activities are identified in these areas. For more information on leakage, see chapters 5.2 and 5.5 of this document.

Figure 15. Project Boundaries: Project Area and Leakage Area

[17] Reference: section 2.2 of VM0011

[18] The GIS Project database has developed the project boundary shapefile using the land ownership documents of all properties. The main hydrograph of the Project Area used to elaborate the Permanent Preservation Areas was from the detailed information of the Forest Inventory Studies that were submitted to the Environmental Agency to obtain permits related to the area. The data were verified with the SIPAM database, one of the most detailed sources for digital data that exists for the State of Amazonas and the database of the project proponent.

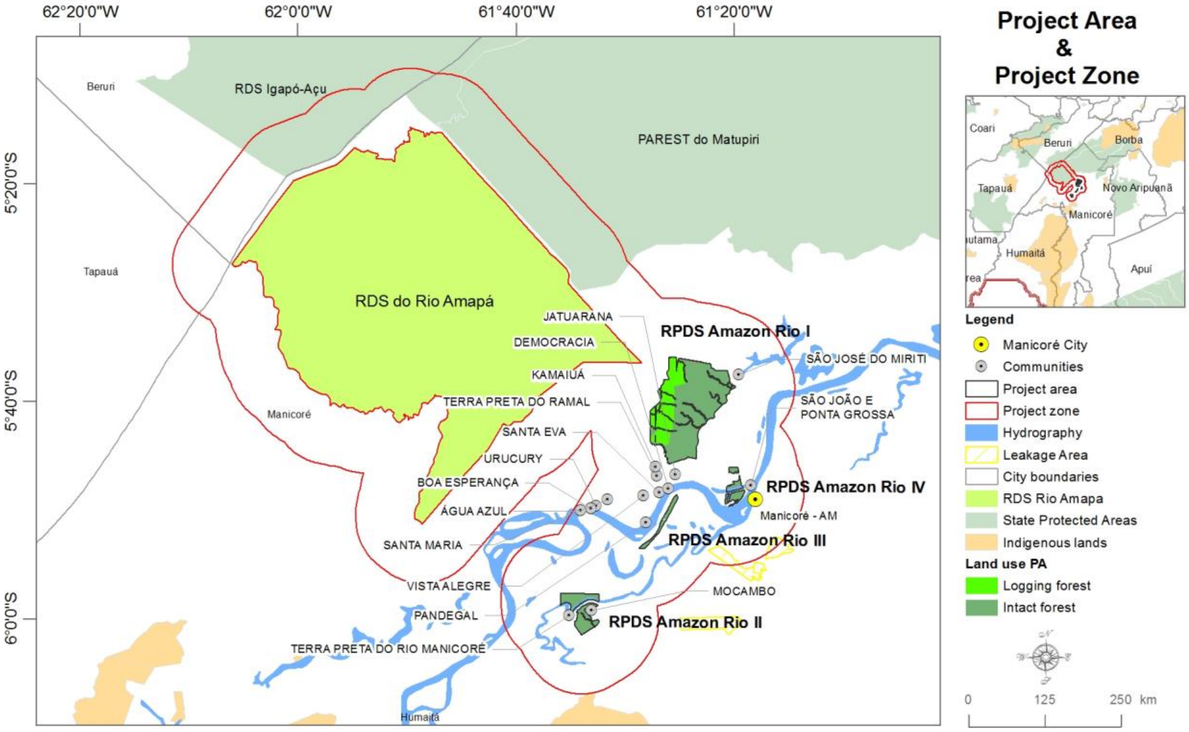


Project zone

Planned activities will be implemented in order to provide positive impacts, not only in terms of climate, but for communities and biodiversity, in the project zone and area of influence. The zone where the project activities will be undertaken was defined to include the communities around the project area as well as the Rio Amapá RDS.

The inclusion of the Rio Amapá RDS took into account the overlap with the Immediate Surroundings Zones (10 km Buffer) between the Amazon Rio RPDS and the Rio Amapá RDS. Since the UC is planned according to SNUC (National System of Conservation Units), it was included for the purpose of aligning conservation actions between the Amazon Rio REDD+ IFM Project and State actions, allowing for the flow and exchange of strategic information, scientific knowledge and management experiences. Serving the purpose of mutual buffer zones, overall (Figure 16).

Figure 16. Project zone



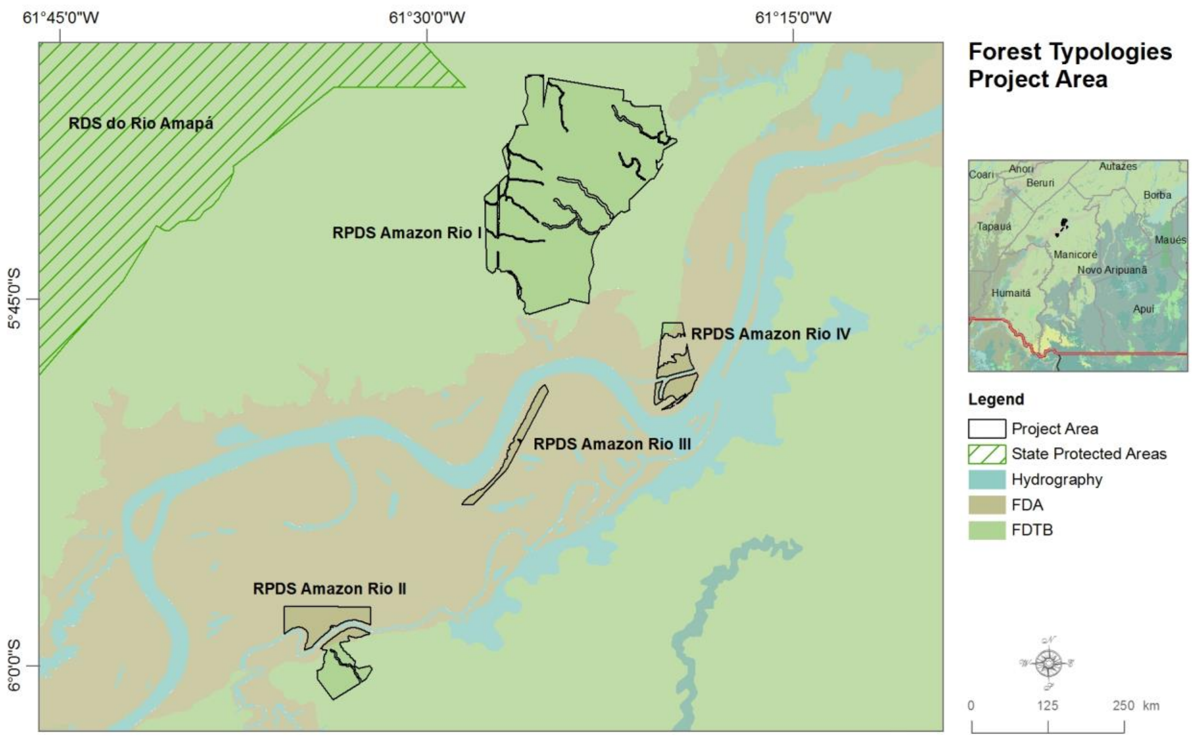
Stratification of the Project area

For purposes of inventorying local carbon stocks and for project management, the project area was stratified into 2 different groups of forest typology, as indicated by the VM0011, according to the IBGE vegetation map (IBGE/DGC, 2004). The forest types present in the area are rain forest types, divided into 2 categories (Figure 17):

- Dense Ombrophilous Alluvial Forest (*Floresta Ombrófila Densa Aluvial Dossel emergente*) (FDA): forest formations with areas of temporarily flooded forests during floods of the main rivers forming *igapós* or known locally as *Várzea* Forests. The FDA covers an area corresponding to 14.4% of the project area.

- Dense Ombrophilous Lowland Forest (*Floresta Ombrófila Densa Terras Baixas Dossel emergente*) (FDTB): forest formations with forest areas that do not flood seasonally, regardless of river dynamics, locally known as *Terra Firme* Forests. FDTB covers 85.6% of the entire project area.

Figure 17. Forest typologies in the Project Area



Temporal Boundaries **(G1.9)**

Crediting period of the project

The first crediting period of the project is 36 years, beginning on June 5th, 2013 and ending on December 31st, 2048. This period corresponds to the remaining 12 years of the first management authorized plan approved by IPAAM and IBAMA (25 years starting in 1998) plus another 25 years that correspond to a new forest logging plan, according to standard Brazilian forestry practices. The logging activities could continue beyond this period into a second crediting period.

Monitoring and Reporting Period

a) Monitoring of Baseline Emissions

The monitoring of Baseline Emissions must demonstrate that the protected forest area is in accordance with the one specified in the PD. The project limit will be monitored before each verification throughout the crediting period through new inventory information and remote sensing and GIS, as applicable. Thus, the project will be able to update the baseline calculations based on the actual remaining forest area (in case of loss of forest cover by natural disasters, for example) and that would be subject to forest management under a "without project" scenario.

b) Monitoring of Project Emissions

Project emissions will be monitored annually and compiled in every monitoring report. The scope of the monitoring will consist of:

- Monitoring of possible illegal harvesting of timber;
- Monitoring of areas subject to natural disturbances (see section 5.4.4);
- Monitoring and quantification of emissions related to air and land travel related to project activities (see section 5.4.3).

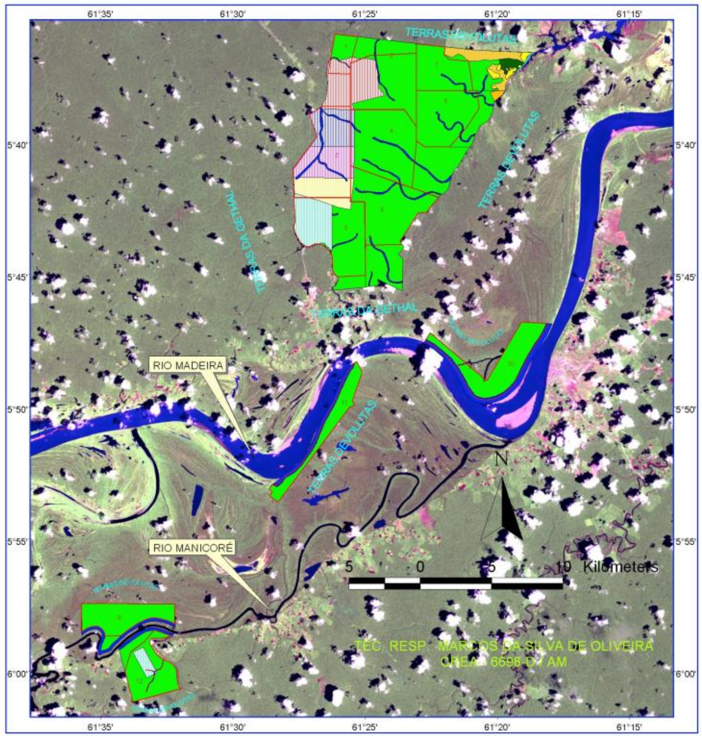
c) Monitoring of Leakages

Since there will be no leakages according to the VM0011 and AFOLU Requirements, no leakage monitoring will be necessary. However, the project intends to monitor any disturbances that might affect the carbon reservoirs (see section 5.4.4). Once a disturbance is registered, the project will report the incident to the relevant authorities and make the necessary adjustments to the baseline. For more details specifically regarding the monitoring of leakages, see chapters 5.2 and 5.5 of this document.

Historical reference period

The approval of the timber management plan in the project area occurred in 1998. By the end of 2009, six Annual Production Units (UPAs) had been logged. Thus, the historical reference period (baseline) of the project is 11 years. However, the project start date is June 5, 2013, when the Amazon Rio I Reserve with the approval of the Amazon Rio I Reserve by the Environment and Sustainable Development Secretary (SDS) as an RPDS.

Figure 18. Map of managed UPAs



During the seven-year period from 1999 to 2005, more than 50% of the timber extracted from the area was sold by the company Gethal to overseas markets as plywood (Annex 13, page 51, Annex 14 and Annex 15, Table 4). The logging plan was certified by Smartwoods with annual reports and audits, as shown in the document gethal.pdf[19] (Annex 14). Given that less than 5% of timber production is certified in Brazil and less than 2% of the wood is sold in Brazil[20], it follows that the wood from this area was sold at a very early stage and to very restricted domestic market. During the next harvest cycle from 2006 to 2009[21], 100% of the timber was sold in the domestic market without certification.

Carbon stocks

The biomass reservoirs considered by the project are related to above-ground and below-ground biomass.

[19] Forest Management Public Summary for Gethal Amazonas S.A.: Industria de Madeira Compensada
[20] http://www.institutocarbonobrasil.org.br/noticias6/noticia=119796 or http://www.greenpeace.org.br/amazonia/face_destruicao.pdf
[21] Since the Autex (ACOF) of UPA 5 and 6 were issued in February 2008, for two-year periods, forest management continued to the end of 2009.

Sources and sinks of GHGs (CL3.3)

Table 09 below describes the emission sources and sinks of greenhouse gases associated with the baseline activities and the project

Table 09. Greenhouse gas emissions sources and sinks associated with baseline and project activities

Source of GHG		Gas	Included ?	Rationale/Explanation
Baseline	Biomass	CO_2	Yes	Considered the main source of emissions for the Project. Forest degradation, extracted and commercialized timber, deadwood and natural increase of forest biomass were considered.
		CH_4	No	Conservatively excluded
		N_2O	No	Conservatively excluded
		Others	No	-
	Fuel consumption	CO_2	Yes	Main source. Through fossil fuels used by machinery and in log transport and routing vehicles.
		CH_4	Yes	Conservatively included
		N_2O	Yes	Conservatively included
		Others	No	-
	Electric power consumption	CO_2	Yes	Main source.
		CH_4	No	-
		N_2O	No	-
		Others	No	-
Project	Biomass	CO_2	Yes	Main source of emission in cases of unplanned forest disturbances, such as illegal degradation within the area, and natural disturbances such as forest fires, blown down etc. ...
		CH_4	Yes	Included, but subject to importance analysis.
		N_2O	Yes	Included, but subject to importance analysis.
		Others	No	–
	Fuel consumption	CO_2	Yes	Main source. Fossil fuels used in flights and land transport.
		CH_4	Yes	Included, but subject to importance analysis.
		N_2O	Yes	Included, but subject to importance analysis.

Source of GHG		Gas	Included ?	Rationale/Explanation
		Others	No	_
	Electric power consumption	CO_2	Yes	Main source.
		CH_4	No	_
		N_2O	No	_
		Others	No	_

4.5 Baseline Scenario (G2.1)

The choice of the baseline from alternative scenarios was taken together with the analysis of additionality using the latest version of the VCS Tool for the demonstration and assessment of additionality in "Agriculture, Forestry and Other Land Use" VCS projects, VT0001[22,23] (VCS, 2012a). All possible scenarios, as well as the analysis of methodology barriers (Steps 2.1.1 and 2.1.2 of VM0011), are described in the following steps:

Step 1) Identification of alternative scenarios and proposed land-use activities in AFOLU projects

Sub-step 1a) Identification of credible alternative scenarios for land-use activities proposed in the REDD+ project

Scenario 1 - Maintenance of Pre-Project Activities (Sustainable Forest Management - SFM)
This is the most probable land-use scenario, since before the start of the REDD+ project the area in question was subject to a forest management regime since 1999 and was suspended entirely in 2010 to give rise to the conservation project (REDD+). Under this scenario forestry activities would continue throughout the areas to sell timber in accordance with the Sustainable Forest Management Plan (SFMP) and their Annual Operational Plans (Plano Operational Anual de Extração - POAs), already approved by the environmental agencies (Annexes 1, 2, 4 and 6).

The suspension of logging activities was a non-definitive management decision, that occurred due to the interruption of sales with the traditional buyer. At that time, the project proponent began looking

[22] Tool for the demonstration and assessment of additionality in Agriculture, Forestry and Other Land Use (AFOLU) (V 3.0)
[23] Adapted from *"Tool for the Demonstration and Assessment of Additionality in A/R CDM Project Activities"* (V.02)

for new markets to diversify purchasers.

However, the management plan was officially suspended after the approval of the business plan in 2013 (see annex 27).

Scenario 2 - Sustainable Forest Management (SFM) and Farming

The sale of timber in accordance with the Sustainable Forest Management Plan (SFMP) and the Annual Operational Plans (POAs) on 80% of the PA and the clearing of forest cover on the remaining 20%[24], for agricultural activities.

Scenario 3 - Farming without Forest Management

Complete cessation of the Sustainable Forest Management activities on 80% of the PA, removal of forest cover on the remaining 20% allowed by law for farming and grazing activities, and use of wood harvested from cleared land.

Scenario 4 - Environmental Conservation Unregistered in VCS

Complete cessation of the Sustainable Forest Management activities and incentive of environmental conservation activities in a Private Sustainable Development Reserve (RPDS) without being registered as a VCS AFOLU project.

Sub-step 1b) Consistency of possible alternative scenarios with applicable legislation and standards

All of the four scenarios described in the previous step are sanctioned by Federal and State law. All of these options were available to the applicant at the time the decision was made to create the RPDS. All four scenarios were therefore legally supported by regulations of the Forest Code in force at the time, and the publication of the new Forest Code[25] in 2012 has not changed this fact. It is important to remember that the Forest Code regulates precisely what can and what cannot be done with respect to land-use on private properties.

The logging activities, represented by scenarios 1, 2 and 4 are also in perfect accordance with the Federal Decree that regulates logging activities[26] (Chapter II) and clear-cutting practices and alternative land-use (Chapter III).

[24] The New Brazilian Forest Code permits clearing on 20% of a property (multiple use area), within the Amazon biome.
[25] Federal law no. 12.651 of May 25, 2012
[26] Decree No. 5.975 of November 30, 2006

As demonstrated, the four alternatives listed in Sub-step 1a do not conflict with any requirements or legal regulations of the host country, and are therefore plausible and applicable under the additionality analysis options.

Step 2: Determine alternative baseline scenarios.

Sub-step 2a: Identify barriers that prevent the implementation of at least one alternative baseline scenario

a) Investment barriers

The proponent of the project did not have equity capital to invest in alternative activities, such as livestock or agricultural production. Due to the nature of the forest management activity, the area is covered by forests. Any alternative activity to forest management requires the significant contribution of resources for deforestation and preparation of the area of cultivation, which involves the costs of acquiring inputs, herd formation or the formation of permanent or temporary crops.
As an alternative to the lack of investment capital, it is common practice in Brazil to contract investment credits or bank loans, which is not interesting to the project proponent due to:

a) Loans and access to investment credit are usually subject to investment guarantees by banks and credit institutions, with the most common and most robust being the property as collateral for the payment of loans and investments. In this case, the creation of the RPDS makes it difficult to accept property as collateral for loans, financings and investments by banks and financial institutions, given the peremptory nature of the land through the decree creating the RPDS Amazon River; and

b) Brazil is today, internationally known as a country where banks practice the highest interest rates in the market, which makes the search for credit a risk to the rural producer.

An alternative to access to credit and bank loans for investment in the deforestation model for agricultural production would be to use part of the profit obtained from the timber forest management activity to invest in deforestation and the formation of agricultural areas. However, most of the revenue from the management activity is for the maintenance of working capital, as it is a primary activity with high operating costs, which induces the manager to work with narrow profit margins and low capital for investment.

Regarding the scenario that considers the conservation project, because it is a Project that depends on a single source of revenue, which is still quite uncertain, it makes the return on investment low and risky. For this reason, it has been very difficult for the bidder to find investors interested in supporting this Environmental Conservation Project. Initially the EBCF had plans to invest in sponsorship quotas for the areas under its management, as is the case of this Project, in order to finance socio-environmental programs and activities, however, the strategy did not attract the interest of investors as originally planned. In this case, it is believed that the visibility generated from the Project registration in the VCS / CCB can partially reverse this frame.

b) Institutional barriers

When analyzing the current situation of other protected areas in the state of Amazonas, the institutional setting is revealed as unfavorable for the creation of new conservation units. According to a recent State Court Audit report (TCE/TCU[27]), the management and implementation of 41 Amazonas State Conservation Units created and implemented since 2003 lack adequate financial resource allocations from the state. The amount transferred by the State government was R$540,300, leaving them highly dependent on external resources. Between 2008 and 2012, these Conservation Units received 90.7 million reias from public-private partnerships despite the fact that the government is responsible for their management.

The transfer amount has not been sufficient to meet the needs of the State Conservation Units. The lack of staff and infrastructure are among the most serious problems, resulting in reduced effectiveness in the process of regularization of landholdings and shortcomings for control and protection, leading to land grabbing, especially in protected areas located in the south of the State of Amazonas.

In addition to these difficulties, there are shortcomings in biodiversity monitoring mechanisms and insufficient access to public policy. The river bases that support the supervision of conservation units have been abandoned and are in disrepair. Such abandonment scenarios in conservation areas reveal the challenges that the project will face. Although some of the institutional barriers listed above are associated with their lack of priority in political spheres, the lack of resources emerges once again as basis for creating (or increasing) new barriers. In this case, as in the previous one, carbon credits would emerge as an element with the power to "compensate" through revenue, some barriers

[27] http://www.tce.am.gov.br/portal/?p=8848 ;
http://portal2.tcu.gov.br/portal/page/portal/TCU/imprensa/noticias/detalhes_noticias?noticia=4913062

of institutional character.

In the political-institutional context, the discontinuity of actions and policies to support the maintenance and creation of conservation units (public and private) is also apparent, mainly due to the change of governments, focus and objectives. Another barrier that is political in nature and already affects the project, is the incipient National and Subnational regulation regarding incentives and financing programs aimed at climate change mitigation and valuation of environmental services.

Laws concerning the establishment of a REDD+ mechanism and a compensation system for environmental services have been discussed for some time with the civil society and the state governments, but they are still under consideration by the National Congress and the Federal Senate, with no definite date for approval.

c) Technological barriers

The technological barriers referenced herein are associated mainly with the difficulties in managing the non-timber activities of traditional communities, as well as strategies for managing conflicts that may arise within and among communities. In this case, it is believed that the registration of the project under the CCB standard and the subsequent activities in line with the guidelines of this standard will serve as an important tool to overcome this barrier.

d) Barriers related to local traditions

Because it is a pioneering initiative, the project is subject to a number of adverse situations which, due to the lack of similar projects for reference, cannot be fully planned. The adverse situations arise mainly because of the unfamiliarity of the communities involved, as well as the proponent, regarding the new management dynamic which includes, among other challenges:

- Regulation of non-timber management, devoid of any prior control;
- Social and biodiversity monitoring and carbon stock activities;
- Tighter control of non-timber extraction activities;
- Compulsory use of personal protective equipment (PPE) in field operations;
- Suspension of forest clearing and *coivara*[28] within the project area;

[28] Use of fire as a management tool for clearing new areas

- Mediation of conflicts between different social groups for the use of natural resources in the project area.

e) Barriers related to common practice

Since it is the first initiative of its kind (converting a SFM area to RPDS), it is expected that the project will face all kinds of problems because of not conforming to common practices in the region. Unlike other activities (SFM, for example), the project cannot rely on other reference cases to offer solutions to the conflicts and problems that may arise from the creation of RPDS and/or the implementation of the Management Plan.

The creation of four private sustainable use reserves in the Amazon, the first private areas designed to be follow a sustainable use program, resists common practices in that region, which includes illegal logging[29,30], among other activities. Even the most recent activities introduced in recent years in the region, such as SFM, can be considered commonplace (though it has a learning curve) in the context of the state, when compared to the initiative to create a RPDS.

Thus, the project will be a conservation "island" with activities regulated by a Management Plan within a context of logging (legal and illegal) and uncontrolled non-timber management to which community residents have become accustomed.

However, the management of this conservation unit is expected to be more efficient, especially due to the fact that the market revenue from the carbon market and CRAs will be managed by a company – whose main business is reinvesting in conservation activities – and not by public institutions that usually lack infrastructure and adequate staffing.

It is important to note that the sale of CRAs has only recently been regulated with the enactment of the new Forest Code in 2012, and on that account it is not yet widespread nor can it be considered established practice, reinforcing the importance of the sale of VCUs as a source of revenue.

f) Barriers due to social conditions and land-use practices

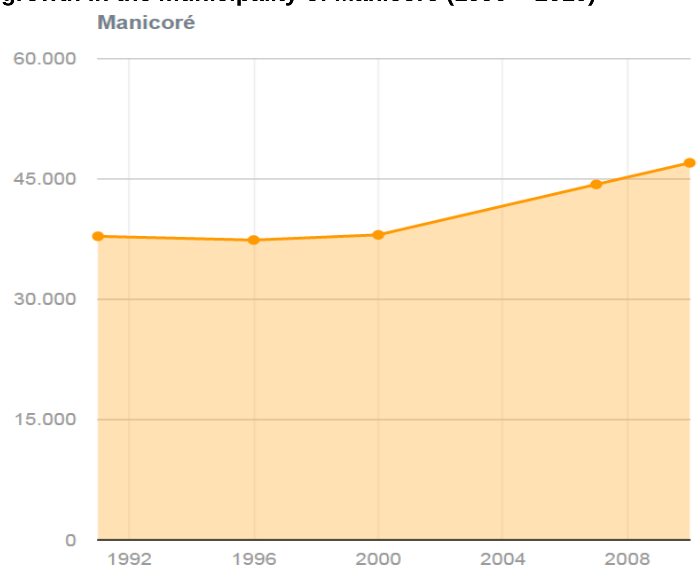
Finally, besides the barriers described above, others of a more comprehensive social nature are

[29] http://www.amazonas.am.gov.br/2011/05/lbrea-humait-e-manicor-recebem-aes-contra-desmatamento/
[30] http://acritica.uol.com.br/noticias/Governo-Forca-Nacional-Manicore-AM_0_566943618.html

highlighted, such as: the tendency for the local population to increase which will lead to greater demand for goods and services in the project areas and will intensify activities (legal and illegal), such as land grabbing, logging, harvesting of NTFPs, fishing, among others.

The assumption presented is reinforced with the analysis of official statistics. After more than a decade with no large fluctuations in the number of inhabitants, from the year 2000 Manicoré began to present a significant population increase. The population increased from approximately 40,000 in 2000 to 47,017 people in 2010 (Figure 19), and according to IBGE projections, the population in 2016 will be approximately 53,890 people. Thus, the population density in the municipality changed from 0.82 person/km² in 2000 to approximately 1.12 person/km² in 2016, representing a 37% increase in population density in just over 15 years.

Figure 19. Population growth in the municipality of Manicoré (1990 – 2010)



This increase in the demand for products and services currently offered by the project areas, tends to generate and enhance future conflicts between beneficiaries and communities. Thus, strengthening the project management capacity which, in turn, is directly related to the VCS/CCB registration and the revenue from VCU sales, is critical so that such conflicts will not undermine the implementation and continuity of the project.

Sub-step 2b: Eliminate the baseline scenarios that are avoided by the identified barriers.

Among the baseline scenarios identified in sub-step 1a, scenarios: 2 - Sustainable and Agricultural

Forestry Management; 3 - Agriculture without Sustainable Forest Management and; 4 - Environmental Conservation without registration in VCS; have at least one barrier, and scenario 1 - Maintenance of Pre-project Activities (Sustainable Forest Management) is most likely to sustain the baseline. In the list below, the scenarios prevented by at least one barrier are highlighted.

- Scenarios prevented by barriers:

Scenario 2 - Sustainable Forest and Agricultural Management: impeded by investment barriers, since the project proponent did not have investment capital from the sustainable forest management activity.

Scenario 3 - Agriculture without forest management: prevented by the investment barrier since the proponent did not have capital to invest in the formation of areas for agricultural activities and does not intend to raise capital through bank loans or financing lines to invest in pasture or agriculture formation permanent / temporary.

Scenario 4 - Environmental Conservation without Registration in VCS*:* prevented by institutional barriers and common practices due to social conditions and land use. The lack of resources of the competent environmental agencies for the management of the Conservation Unit in the state of Amazonas. Common deforestation practices associated with logging and land use in the region for income generation constitute barriers to the conservation project scenario without resources from carbon credits.

Sub-step 2c: Determine the baseline scenario.

The baseline scenario for the project identified as the most likely to occur was selective logging[31] (continuation of Business As Usual - BAU). The reference scenario assumes 37 years of selective logging, according to the 25 year logging plan, approved in August 1998 (Annex 6 - document: "Vald.II T01 POA 1998") that in the absence of project activities would be renewed in 2024 for another 25 years until 2048.

Under this scenario, the full implementation of the timber logging plan occurs. It has already resulted in the degradation of 5,429.69 ha (see Table 10 below). The area would be selectively harvested for timber to be sold in lumber markets. Below is a summary of the managed/logged areas. Between

[31] Additional information on choosing the baseline is presented in section 4.6 (Steps 1 and 2).

1999 and 2010, 5,429.69 ha were degraded due to the authorized logging (Annexes 1, 2, 3 and 4).

Table 10. Summary of managed areas since 1999

Date	Managed/logged areas (ha)
1999	586.69 (Plot 1)
2000	688.00 (Plot 2)
2001 – 2002	831.50 (Plot 3)
2003 – 2004	750.00 (Plot 3 and 4)
2005 – 2007	1082.00 (Plot 5)
2008 – 2009	1,491.50 (Plot 5 and 6)
TOTAL	4.347.69

In terms of logged area per year, the baseline scenario was defined as an average calculated from logging permit records from the last 11 years. This approach is necessary, since in practice it was not possible for the project proponent to establish, in advance, the exact area to be explored each year. Logging permits are issued periodically, on request, with specific management plans, predefined areas and operational timelines defined on a case-by-case basis, usually between 1 and 2 years with an average of 395.24 ha per year.

This means that in the baseline scenario, the project proponent would degrade 5,534 ha by the end of the first 25-year harvest cycle and another 9,918 ha during the second 25-year cycle, based on all licensed logging areas. These two areas together with the already degraded area (5,429.69 ha) represent the totality of the project area: 18,559 ha. Nevertheless, permits for management plans permit management cycles to return to a given area every 30 years, which means that once an area is logged, the same area would be available for a new management cycle after 30 years. In practice, the project area is much larger than assumed by the baseline scenario for timber management. In this sense, the baseline scenario is quite conservative in terms of potential carbon credit generation.

4.6 Additionality (G2.2, G5.8)

The additionality analysis of the Amazon Rio project REDD+ IFM was conducted with the latest version of the VCS Tool for the demonstration and assessment of additionality in Agriculture, Forestry and Other Land Use VCS projects, VT0001 (VCS, 2012a).

To generate the reductions in GHG emissions for the project, the planned baseline activities (sustainable forest management) were terminated by the project proponent, and supplanted by environmental conservation activities. In this sense, the Project will be managed by EBCF, with the goal of creating a fund for administrative and accounting management, especially to promote environmental management and monitoring activities of carbon pools within the project area.

The valuation of provisioning environmental services via carbon credits (VCUs) in conjunction with the sale of Environmental Reserve Quotas (CRAs) are alternative activities planned for in the Project.

The evaluation and determination of additionality of the project are shown in the "step-by-step" instructions below:

Step 1) Identification of alternative scenarios and proposed land-use activities in AFOLU projects

Sub-step 1a) Identification of credible alternative scenarios for land-use activities proposed in the REDD+ project

Scenario 1 - Maintenance of Pre-Project Activities (Sustainable Forest Management - SFM)
This is the most probable land-use scenario, since before the start of the REDD+ project the area in question was subject to a forest management regime since 1999 and was suspended entirely in 2010 to give rise to the conservation project (REDD+). Under this scenario forestry activities would continue throughout the areas to sell timber in accordance with the Sustainable Forest Management Plan (SFMP) and their Annual Operational Plans (Plano Operational Anual de Extração - POAs), already approved by the environmental agencies (Annexes 1, 2, 4 and 6).

The suspension of logging activities was a non-definitive management decision, that occurred due to the interruption of sales with the traditional buyer. At that time, the project proponent began looking for new markets to diversify purchasers.
However, the management plan was officially suspended after the approval of the business plan in 2013 (see annex 27).

Scenario 2 - Sustainable Forest Management (SFM) and Farming
The sale of timber in accordance with the Sustainable Forest Management Plan (SFMP) and the Annual Operational Plans (POAs) on 80% of the PA and the clearing of forest cover on the remaining

20%[32], for agricultural activities.

Scenario 3 - Farming without Forest Management

Complete cessation of the Sustainable Forest Management activities on 80% of the PA, removal of forest cover on the remaining 20% allowed by law for farming and grazing activities, and use of wood harvested from cleared land.

Scenario 4 - Environmental Conservation Unregistered in VCS

Complete cessation of the Sustainable Forest Management activities and incentive of environmental conservation activities in a Private Sustainable Development Reserve (RPDS) without being registered as a VCS AFOLU project.

Sub-step 1b) Consistency of possible alternative scenarios with applicable legislation and standards

All of the four scenarios described in the previous step are sanctioned by Federal and State law. All of these options were available to the applicant at the time the decision was made to create the RPDS. All four scenarios were therefore legally supported by regulations of the Forest Code in force at the time, and the publication of the new Forest Code[33] in 2012 has not changed this fact. It is important to remember that the Forest Code regulates precisely what can and what cannot be done with respect to land-use on private properties.

The logging activities, represented by scenarios 1, 2 and 4 are also in perfect accordance with the Federal Decree that regulates logging activities[34] (Chapter II) and clear-cutting practices and alternative land-use (Chapter III).

As demonstrated, the four alternatives listed in Sub-step 1a do not conflict with any requirements or legal regulations of the host country, and are therefore plausible and applicable under the additionality analysis options.

Sub-step 1c) Selection of the Baseline Scenario

According to IBGE Cidades (2013), the main economic activities of the municipality of Manicoré are

[32] The New Brazilian Forest Code permits clearing on 20% of a property (multiple use area), within the Amazon biome.
[33] Federal law no. 12.651 of May 25, 2012
[34] Decree No. 5.975 of November 30, 2006

linked to Plant Extraction and Forestry[35] and the municipality is one of the main leaders in the production of wood logs and fuelwood in the state, also corroborated by IDESAM[36] (Vianna, 2013).

As it would be going against the EBCF business strategy and statute (Annex 19), the project proponent is not expected to exercise his right to clear the forest cover on 20% of the property for agricultural activities, and so scenarios 2 and 3 are unlikely both in terms of a business strategy and profitability and may be discarded[37].

Given this context and the associated historical activities in the PA (licensed SFM), the most likely future scenario, in the absence of the IFM project, would be the continuation of logging activities (scenario 1) and the GHG emissions associated with it.

In Steps 2 and 3 below, the additionality of the project compared to the baseline scenario will be verified judiciously, and evidence will be presented to support this scenario as the most likely to occur if the project could not rely on the VCS/CCB certification and revenues from the sale of VCUs.

Step 2) Investment analysis to determine that the project activity is not the most economically or financially attractive of the identified land-use scenarios

Sub-step 2a) Analysis of the Appropriate Comparison Method

Whereas the project provides for the revenue generation from commercialization of CRAs, as well as VERs (Verified Emission Reductions), the option that makes the most sense under the VT0001 v.3, is Option II (economic investment comparison analysis).

Sub-step 2b) Option II - Application for Investment Comparison Analysis

The IRR (Annual Internal Rate of Return) was chosen as the economic indicator, as this is a consolidated economic indicator and one of the most widely used indicators for making investment decisions. NPV (Net Present Value) was chosen as the corroborating indicator. Thus, the project IRR was compared without the revenue from VERs (Annex 16), with the SFM economic activity in a scenario without the project (Annex 17).

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

[35] IBGE Cities - Plant Extraction and Forestry (2011)
[36] Forest diagnosis of the state of Amazonas - 2010 and 2011
[37] As a premise, it is assumed in this case that the most common agricultural activities alternatives in the region offer lower profitability than SFM.

The comparative analysis between scenarios was done by comparing the IRR and NPV economic indicators of the IFM project (Annex 16) and the SFM obtained from pre-project historical data (Annex 17).

In scenario 1, baseline scenario, the only monetary income is the sale of timber in logs. As input data for the financial economic model were used in scenario 1: Volume of harvested wood, average price of timber marketing, cost of land in the initial year, operating expenses, investments, taxes, payroll, among others.

In scenario 4, a conservation project without the sale of carbon credits, the area corresponding to the sale of legal reserve quotas, the average price of each quota per unit of area and the initial investment of the partners were used for the calculation of revenues. considering a trading period of 38 years, adopted to enable the comparative analysis of this project considering the carbon credits trading. Conservation project costs used include operating expenses, administrative expenses, area monitoring, taxes and revenues, and income taxes.

The summary of revenue sources, revenues and costs used to model the shared economic viability analysis considering the forest management project and the conservation project are presented in table 11.

Table 11. Internal Rate of Return (IRR) and Net Present Value (NPV) of various SFM and REDD+ project activities

Scenario	Item	unity	Sustainable Forest Management	Project Conservation
Source of revenue				
1	Annual production of roundwood	m^3/year	20.358	-
1	Price of wood in the yard with valuation of 2.5% per year	R$/$m^3$	215	-
1	Holding period	Years	19	-
4	Assigned area the marketing of CRAs (From the year t = 5)	ha/year	-	4
4	Price CRAs	R$/ha	-	120
4	design life	years	19	38
Revenues				
1	Sale of timber (19 years old)	R$	104,812,514	0
4	Operating income from the sale of CRAs (38 years)	R$	0	12,960,000
4	Initial investment of partners	R$	0	3,963,000
Costs				
1	operating costs on exploration and transport + initial investment considering the price of land in year t = 0 + taxes (19 years)	R$	39,705,748	-
4	Cash outflows: Operating expenses + administrative expenses + monitoring of the area + Taxes and taxes (38 years)	R$	-	25,851,388

The cash flow and NPV comparative analysis considered a discount rate of 12% for the two projected scenarios, as it is considered as the possible financial return to be achieved given the current interest rate in practice in the country. An analysis of the IFM project was conducted considering the 38-year and 19-year life span for the projected SFM based on logging operation and log marketing data recorded by the company over its lifetime.The analysis revealed a NPV of R $ 11,117,123 for baseline scenario (scenario 1) and a negative NPV of R $ -1,086,893 for scenario 4 for the IFM project without trading carbon credits, showing that it is less attractive, with a high risk of unfeasibility when compared to scenario 1. Scenario 1's internal rate of return is 22.2%, considering the initial 19-year projected land cost investment, while the projected IRR in scenario 4 is negative (Table 12).

In order to improve the robustness of the comparative analysis and its conclusions, references to IRR/NPV from other SFM projects were included, obtained from an extensive literature review on the subject. Table 11 presents a comparison of financial indicators from the REDD+ project and the baseline scenario (SFM).

Table 12. Internal Rate of Return (IRR) and Net Present Value (NPV) of various SFM and REDD+ project activities

Activity	IRR (%)	NPV	Scenario	Discount rate	design life	Source
Forest Management designed at baseline (with the cost of land) *	22.2	11,117,123	1	12	19 years old	EBCF (2013) - Annex 18
REDD+ Project without VCS (Conservation Project Implementation without the sale of carbon credits)	Negative	-1,086,893	4	12	38 years	EBCF (2013) - Annex 16
Forest Management (with the cost of land)	5.9	-	-	-	-	FSM (2012)
Forest Management (with the cost of land)	1.7	-37,083,362	-	12	25	Senior et al (2008)
Forest Management (without the cost of land)	27.5	3,857,823	-	12	25	Senior et al (2008)
Forest Management (without the cost of land)	22.9	2,328,833	-	12	25	IFT (2010)
Forest Management (with the cost of land)	5.1	-6,650,133	-	12	25	IFT (2010)

As shown in the table 12, the economic attractiveness varies greatly in an IRR and NPV analysis in different possible SFMPs. However, the table clearly shows that economic analysis of SFM activities without exception, are more attractive with respect to return on investment, compared to Scenario 4, or without sale of VERs (only CRAs). This is because, while unregistered in VCS, the project relies exclusively on the revenue from the sale of CRAs and investment of resources by the partners, which is the least economically attractive scenario of those analyzed.

Therefore the most likely SFM baseline scenario for the RPDS appears to be the activity with the highest financial returns. With regard to sources of expenditure and revenue, it is important to note the absence of non-timber forest products (NTFPs) in the cash flow and investment comparison analysis.

The reason why the internal rate of return in the investment comparison analysis does not consider

NTFP revenues (and expenses) is the fact that NTFP's expense and or revenues are present in both the baseline and the VCS/CCB project scenarios. For more information on baseline scenario management activities, see the community sustainability Matrix - Annex 3 of the Management Plan: "_ANEXOS_Amazon River I_DRAFT-small Plan".

Although not very strong from an economic point of view, Brazil nut management and, to a lesser extent, açaí, tucuman, rubber and copaiba oil were already present in the baseline scenario. These activities would have continued to be developed and expanded to other products naturally as new markets emerged. It is worth mentioning that they are included in the range of activities that can be developed (without the need for a management plan for approval, as in the case of Brazil nuts) within the scope of sustainable timber management.

Just as the timber management plan allowed for the extraction of up to 30m² of wood/ha and in practice the proponent extracted only 20 m²/ha on average, the management of non-timber forest products was also well below its potential. Both in terms of volume produced and species used.

As such, it is understood that if NTFP were included in both scenarios in the investment comparison analysis, they would not affect the comparative analysis of the scenarios between them, even if they altered the absolute values of IRR and NPV, because they would be incorporated in both.

Finally, it is important to emphasize that for the economic modeling of non-timber forest products, it is still difficult to obtain solid references on logistics costs, processing, storage and disposal, and there are market uncertainties for most products. In most cases, the collection, processing, storage and disposal efforts depend on demands guaranteed by previously agreed on purchase and sale agreements. This further hinders revenue prognosis and which products will be marketed when, for cash flow generation.

In general, it is understood that the prospecting of markets for these products would occur gradually in a second phase, subsidizing and guiding management activities, in both cases: for the baseline scenario and for the project scenario. The accepted premise in this case is that in both scenarios this activity would not undergo a change in its dynamics. It would naturally be organized and expanded as the market demands for fibers, food and forest oils appeared.

The comparative analysis presented in this section clearly shows that without carbon credits (VERs), the project is economically unsustainable, and will be eclipsed by the alternative scenarios. In other words, the project depends entirely on the VCS/CCB registration to become minimally attractive[38] and competitive in relation to possible alternatives. To confirm this hypothesis, the next step presents a sensitivity analysis for CRA price changes and the project's administrative expenses, in order to verify whether value fluctuations interfere in the outcome of this analysis.

Sub-step 2d) Sensitivity Analysis

For the sensitivity analysis, variations in prices for CRAs (main source of income) were used along with administrative expenses in the RPDS (main source of costs), since this value was the main parameter determining project costs (approximately 70%).

This variation was applied to the cash flow in Scenario 4 (CRAs sold without VERs), identified as the most likely baseline scenario. The results of the sensitivity analysis are presented in Tables 13 and 14:

Table 13. Sensitivity analysis under different scenarios with variations of +5%, +10% and +20% in CRA prices[39]

Sensitivity Analysis	IRR (30 years)	NPV (12%)	CRA price (R$/ha)	Scenario
Variation in the CRA price	-*	-R$ 1.086.893,61	R$ 120.00	Current
	-*	-R$ 1.028.141,58	R$ 126.00	+5.0%
	-*	-R$ 969.389,55	R$ 132.00	+10.0%
	-*	-R$ 851.885,48	R$ 144.00	+20.0%

* IRR could not be calculated, since the project is not profitable.

The sensitivity analysis demonstrated above showed no impact on the project IRR, since even in a scenario where CRAs are sold at a value 20% higher than the one adopted, the project still remains economically unfeasible, preventing an analysis via IRR. On the other hand, NPV allows variations resulting from increased CRA values to be explored. Even in the best case scenario (+20% in value), the project remains economically unfeasible, even if it is "less unfeasible."

Table 14. Sensitivity analysis given variations of -5%, -10% and -20% in the project's administrative costs[39]

[38] It is important to emphasize that in 2010, at the time the decision was make to create the RPDS to replace the SFM, the voluntary carbon market was much more attractive than it is now, with prices and demand for VCUs, much more favorable than current ones.
[39] See Annex 16

Sensitivity Analysis	IRR (30 years)	NPV(12%)	Administrative Costs Price (R$)	Scenario
Variation in Administrative Costs	-*	-R$ 1.086.893,61	R$ 17.023.000,00	Current
	-*	-R$ 969.552,32	R$ 16.171.850,00	-5.0%
	-*	-R$ 852.211,03	R$ 15.320.700,00	-10.0%
	-*	-R$ 617.528,45	R$ 14.554.665,00	-20.0%

* IRR could not be calculated, since the project is not profitable.

Similar to the previous approach, reductions in -5%, -10% and -20% in administrative costs were analyzed, in order to explore the viability of the project against reductions in fixed costs of greater impact on the activities' total costs (70% of total). Even in the face of a 20% reduction scenario in this item of expenditure, the project still cannot achieve a minimum IRR with which to compensate its investors.

It is clear from the sensitivity analysis shown above that a project not registered with VCS/CCB has no chance of becoming economically viable, and in fact represents a loss to its investors. A project configuration that prioritizes the marketing of CRAs without carbon credits sales, is not feasible, nor is it able to compete with the economic attractiveness of the baseline scenario based on the continuity of the SFMP (see Annex 17).

Step 3) Barrier analysis

In purely economic and financial terms – as presented in Step 2 (Investment Analysis) – the activities proposed by the project (environmental conservation and CRA sales) are not economically attractive. This is especially clear when the project scenario is compared with the baseline scenario (already licensed logging management - Scenario 1), which from an economic point of view, emerges as the most likely scenario. Additionally, there are a number of non- economic barriers that render the REDD+ project implementation more difficult without carbon credits. This was widely discussed by members of EBCF members, the project proponent and is detailed in Annex 20.

Therefore, the main identified barriers that may prevent the continuation of the project by the proponent, which could be mitigated once the project is registered to VCS/CCB standards are: i) investment barriers; ii) institutional barriers; iii) technological barriers; iv) barriers related to local traditions; v) barriers related to common practices.

Sub-step 3a) Identification of barriers that may prevent implementation of proposed project activities

a) Investment barriers

As this is a project that relies on a single source of revenue, which is still rather uncertain[40], the investment profitability, aside from being low, is risky. For this reason, the applicant has encountered difficulties in finding investors interested in supporting this environmental conservation project. Initially, EBCF had plans to invest in sponsorship for areas under its management, as is the case of this project, to fund socioenvironmental programs and activities, however, the strategy has not attracted investors as originally planned. In this case, it is believed that the visibility generated from the project registration in VCS/CCB can partially reverse this situation.

Another investment barrier is the fear potential investors have in participating in a pioneering project. The project includes the first Private Sustainable Development Reserve in the world, according to information released by the Government of the State of Amazonas[41]. As such, there are no case studies to serve as models or examples, making the initiative more risky from the point of view of investment return. In this case, it is also believed that registration with VCS and CCB standards would bring more credibility to the project as a whole, since the carbon credits would emerge as an additional source of revenue, in addition to providing increased visibility (and greater marketing appeal) to the project.

b) Institutional barriers

When analyzing the current situation of other protected areas in the state of Amazonas, the institutional setting is revealed as unfavorable for the creation of new conservation units. According to a recent State Court Audit report (TCE/TCU[42]), the management and implementation of 41 Amazonas State Conservation Units created and implemented since 2003 lack adequate financial resource allocations from the state. The amount transferred by the State government was R$540,300, leaving them highly dependent on external resources. Between 2008 and 2012, these

[40] Despite already having a legal framework, there is still no consolidated market for CRAs, so there is great uncertainty about the value and liquidity of shares.
[41] http://www.amazonas.am.gov.br/2010/11/amazonas-o-pioneiro-na-criao-de-reserva-particular-de-desenvolvimento-sustentvel/ ; http://acritica.uol.com.br/amazonia/manaus-amazonas-amazonia-Reserva-Particular-Desenvolvimento-Sustentavel-meio_ambiente-Governo_0_932906709.html
[42] http://www.tce.am.gov.br/portal/?p=8848 ;
http://portal2.tcu.gov.br/portal/page/portal/TCU/imprensa/noticias/detalhes_noticias?noticia=4913062

Conservation Units received 90.7 million reias from public-private partnerships despite the fact that the government is responsible for their management.

The transfer amount has not been sufficient to meet the needs of the State Conservation Units. The lack of staff and infrastructure are among the most serious problems, resulting in reduced effectiveness in the process of regularization of landholdings and shortcomings for control and protection, leading to land grabbing, especially in protected areas located in the south of the State of Amazonas.

In addition to these difficulties, there are shortcomings in biodiversity monitoring mechanisms and insufficient access to public policy. The river bases that support the supervision of conservation units have been abandoned and are in disrepair. Such abandonment scenarios in conservation areas reveal the challenges that the project will face. Although some of the institutional barriers listed above are associated with their lack of priority in political spheres, the lack of resources emerges once again as basis for creating (or increasing) new barriers. In this case, as in the previous one, carbon credits would emerge as an element with the power to "compensate" through revenue, some barriers of institutional character.

In the political-institutional context, the discontinuity of actions and policies to support the maintenance and creation of conservation units (public and private) is also apparent, mainly due to the change of governments, focus and objectives. Another barrier that is political in nature and already affects the project, is the incipient National and Subnational regulation regarding incentives and financing programs aimed at climate change mitigation and valuation of environmental services.

Laws concerning the establishment of a REDD+ mechanism and a compensation system for environmental services have been discussed for some time with the civil society and the state governments, but they are still under consideration by the National Congress and the Federal Senate, with no definite date for approval.

g) Technological barriers

The technological barriers referenced herein are associated mainly with the difficulties in managing the non-timber activities of traditional communities, as well as strategies for managing conflicts that may arise within and among communities. In this case, it is believed that the registration of the project under the CCB standard and the subsequent activities in line with the guidelines of this standard will serve as an important tool to overcome this barrier.

h) Barriers related to local traditions

Because it is a pioneering initiative, the project is subject to a number of adverse situations which, due to the lack of similar projects for reference, cannot be fully planned. The adverse situations arise mainly because of the unfamiliarity of the communities involved, as well as the proponent, regarding the new management dynamic which includes, among other challenges:

- Regulation of non-timber management, devoid of any prior control;
- Social and biodiversity monitoring and carbon stock activities;
- Tighter control of non-timber extraction activities;
- Compulsory use of personal protective equipment (PPE) in field operations;
- Suspension of forest clearing and *coivara*[43] within the project area;
- Mediation of conflicts between different social groups for the use of natural resources in the project area.

i) Barriers related to common practice

Since it is the first initiative of its kind (converting a SFM area to RPDS), it is expected that the project will face all kinds of problems because of not conforming to common practices in the region. Unlike other activities (SFM, for example), the project cannot rely on other reference cases to offer solutions to the conflicts and problems that may arise from the creation of RPDS and/or the implementation of the Management Plan.

The creation of four private sustainable use reserves in the Amazon, the first private areas designed to be follow a sustainable use program, resists common practices in that region, which includes illegal logging[44,45], among other activities. Even the most recent activities introduced in recent years in the region, such as SFM, can be considered commonplace (though it has a learning curve) in the context of the state, when compared to the initiative to create a RPDS.

[43] Use of fire as a management tool for clearing new areas
[44] http://www.amazonas.am.gov.br/2011/05/lbrea-humait-e-manicor-recebem-aes-contra-desmatamento/
[45] http://acritica.uol.com.br/noticias/Governo-Forca-Nacional-Manicore-AM_0_566943618.html

Thus, the project will be a conservation "island" with activities regulated by a Management Plan within a context of logging (legal and illegal) and uncontrolled non-timber management to which community residents have become accustomed.

However, the management of this conservation unit is expected to be more efficient, especially due to the fact that the market revenue from the carbon market and CRAs will be managed by a company – whose main business is reinvesting in conservation activities – and not by public institutions that usually lack infrastructure and adequate staffing.

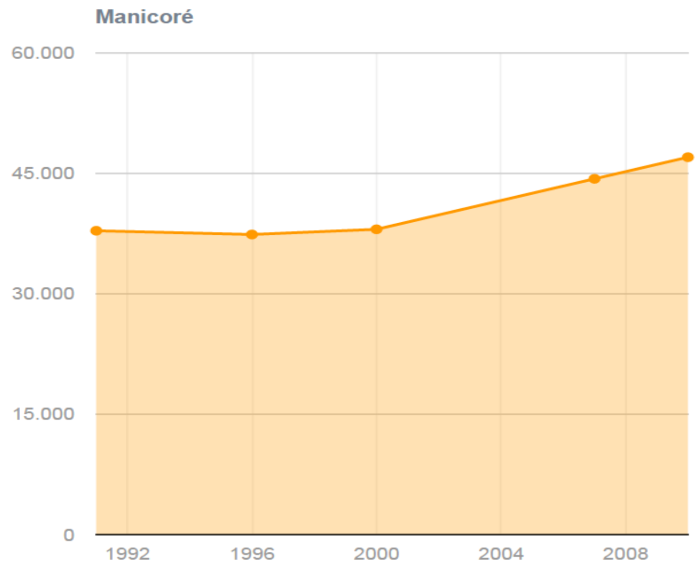
It is important to note that the sale of CRAs has only recently been regulated with the enactment of the new Forest Code in 2012, and on that account it is not yet widespread nor can it be considered established practice, reinforcing the importance of the sale of VCUs as a source of revenue.

j) Barriers due to social conditions and land-use practices

Finally, besides the barriers described above, others of a more comprehensive social nature are highlighted, such as: the tendency for the local population to increase which will lead to greater demand for goods and services in the project areas and will intensify activities (legal and illegal), such as land grabbing, logging, harvesting of NTFPs, fishing, among others.

The assumption presented is reinforced with the analysis of official statistics. After more than a decade with no large fluctuations in the number of inhabitants, from the year 2000 Manicoré began to present a significant population increase. The population increased from approximately 40,000 in 2000 to 47,017 people in 2010 (Figure 20), and according to IBGE projections, the population in 2016 will be approximately 53,890 people. Thus, the population density in the municipality changed from 0.82 person/km² in 2000 to approximately 1.12 person/km² in 2016, representing a 37% increase in population density in just over 15 years.

Figure 20. Population growth in the municipality of Manicoré (1990 – 2010)



This increase in the demand for products and services currently offered by the project areas, tends to generate and enhance future conflicts between beneficiaries and communities. Thus, strengthening the project management capacity which, in turn, is directly related to the VCS/CCB registration and the revenue from VCU sales, is critical so that such conflicts will not undermine the implementation and continuity of the project.

Step 4) Common practices analysis

As previously discussed, the creation of an RPDS does not constitute common practice in the Legal Amazon, and it is in fact the first initiative of its kind in the country[46]. Thus, the project as a whole, composed of an RPDS to replace previously licensed logging activities, not only contradicts common practice in the country, but it is pioneering and therefore innovative.

Moreover, efforts to combat deforestation and forest degradation are still rare in the project region, a claim reinforced by Soares-Filho et al. (2010)[47] who demonstrate heavy deforestation pressures to which the UCs of the Legal Amazon UCs are subject.
The urgent need for investments for the maintenance of the biodiversity and forests with the objective of reducing deforestation and forest degradation, especially in the arc of deforestation[48], is another

[46] http://www.ebcf.com.br/blog/2013/06/24/criacao-da-primeira-reserva-particular-de-desenvolvimento-sustentavel-do-mundo-na-floresta-amazonica/
[47] Role of Brazilian Amazon Protected Areas in Climate Change Mitigation
[48] O arco de desflorestamento na Amazônia: da pecuária à soja

factor that illustrates the discrepancy between the project activities and common practice in the region.

An IDESAM study (VIANNA, 2013) also concludes that the city of Manicoré contributes significantly to the timber industry in the state and has been considered a strategic hub mainly due to its geographical location and accessibility. An IBGE survey (2013) also corroborates the claim that Scenarios 1, 2 and 3 are common practices (Step 1), since the agricultural sector was an important contributor to the GDP of the city in 2010 (approximately R$ 170,000.00.) Domingues et al. (2012) lists the most common practices in the area:

a) selective logging and subsequent deforestation for farming activities;
b) itinerant agriculture, with a low technological level that uses fire to clear pasture;
c) low technical level and damaging ranching.

The above elements demonstrate the project's additionality, aligning Step 4 findings with those obtained in Steps 2 and 3.

5 QUANTIFICATION OF GHG EMISSIONS REDUCTIONS AND REMOVALS (G5.9)

5.1 Project Scale and Estimated GHG Emission Reductions or Removals

Table 15. Scale of greenhouse gas emissions reduction project

Project	X
Large Project	

5.1.1 Reduction of Net Anthropogenic GHG Emissions (G5.8,CL2.2)

Greenhouse gas (GHG) emissions reduction is first calculated by estimating the emissions associated with the baseline scenario and then subtracting that number from the project emissions, replacing selective extraction activity with a protected forest and adding further leakage emissions, as shown in the following equation:

$$C'_{IFM\_LtPF,t} = C'_{baseline,t} - C'_{actual,t} - C'_{leakage,t}$$

Equation 1 –Calculation of emissions reductions from the replacement of selective extraction activities for the permanent protection of forests.

In which:

$C'_{IFM\_LtPF,t}$ – Total net annual reduction in anthropogenic GHG emissions in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{baseline,t}$ – Total annual carbon emissions associated with the baseline in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{actual,t}$ – Total annual carbon emissions associated with the project activities in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{leakage,t}$ – Total annual carbon emissions associated with leakage in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

The calculation of the emissions reductions assumes the harvest period approved in the EIA RIMA related to the environmental licensing of the Sustainable Forest Management Plan (SFMP) in the first 25-year cycle – from 1999 to 2023 (Annexes 1, 2, 3, 4 and 6), followed by the renewal of another 25-year management cycle, from 2024 to 2048.

The Operating Authorizations - AUTEX and Annual Operational Plans - POAs (Annex 6) cover the period from 1999 to 2010. Within this period six POAs were utilized in the project area, during six different years. Thus, we assumed that the carbon emitted due to the forestry operations in each UPA was the same as the average value for that period. Thus, the continuity of the common practice of forest management based on historical licensing data in the project area was assumed for the duration of the project (2013-2048).

Therefore, the area would continue to be logged at the same historical rate, hence the annual avoided emissions were equal to the calculated average emissions that occurred in the 11 years of extraction, as explained above. The Avoiding Planned Deforestation (APD) project activities began in 2013. Therefore the remaining time in the first licensed period and the second period (25 years) were considered in the calculation of emissions reductions, for a total crediting period of 36 years.
The results obtained by Equation 1 are presented annually for the entire credentialed period of the project.

Table 16. Estimated ex ante net reductions in GHG emissions[49] in tons of CO2e

Years	$C'_{baseline}$	$C'_{actual,t}$	$C'_{leakage,t}$	$C'_{IFM\_LtPF,t}$

[49] See section 5.6 and Annex 18.

Year 2013	51,469	50	0	51,419
Year 2014	51,469	50	0	51,419
Year 2015	51,469	50	0	51,419
Year 2016	51,469	50	0	51,419
Year 2017	51,469	50	0	51,419
Year 2018	51,469	50	0	51,419
Year 2019	51,469	50	0	51,419
Year 2020	51,469	50	0	51,419
Year 2021	51,469	50	0	51,419
Year 2022	51,469	50	0	51,419
Year 2023	51,469	50	0	51,419
Year 2024	51,469	50	0	51,419
Year 2025	51,469	50	0	51,419
Year 2026	51,469	50	0	51,419
Year 2027	51,469	50	0	51,419
Year 2028	51,469	50	0	51,419
Year 2029	51,469	50	0	51,419
Year 2030	51,469	50	0	51,419
Year 2031	51,469	50	0	51,419
Year 2032	51,469	50	0	51,419
Year 2033	51,469	50	0	51,419
Year 2034	51,469	50	0	51,419
Year 2035	51,469	50	0	51,419
Year 2036	51,469	50	0	51,419
Year 2037	51,469	50	0	51,419
Year 2038	51,469	50	0	51,419
Year 2039	51,469	50	0	51,419
Year 2040	51,469	50	0	51,419
Year 2041	51,469	50	0	51,419
Year 2042	51,469	50	0	51,419
Year 2043	51,469	50	0	51,419
Year 2044	51,469	50	0	51,419
Year 2045	51,469	50	0	51,419
Year 2046	51,469	50	0	51,419
Year 2047	51,469	50	0	51,419
Year 2048	51,469	50	0	51,419
Total estimated ERs	1,852,896	1,803	0	1,851,093

Average annual ERs	51,469	50	0	51,419

5.1.2 Required Data Sources

The calculation of the project reduction in emissions is linked to the emissions of the baseline activities, which depends on the emissions related to the implementation of such activities, as well as the degradation caused by the implementation of the baseline activities. Because the calculation also depends on the amount and quality of available information, it can follow two paths - that which relies on an existing inventory or that which relies on measurement collected in the field. The use of both of these paths in each calculation are explained below.

5.1.3 Significance

A tool was used to test the significance of GHG emissions sources considered in the development of this PDD (Tool for testing significance of GHG emissions in A/R CDM project activities) by the UNFCCC (Annex 18 - Significance Analysis tab). The main parameters of the equations that calculate emissions caused by the degradation resulting from baseline activities, emissions from the baseline activities, as well as the emissions related to the project activities were transformed into tCO_2-e, when necessary and ranked in descending order with respect to their emissions. The values must then sum to 0.95. All those below the 5% significance level are considered non- significant. The non-significant parameters are featured in their own sections.

5.1.4. Uncertainty, VCUs and Percentage of Non-Permanence Risk Buffer

Uncertainty assessment

- Total IFM-LtPF project uncertainty

Having calculated the reduction in net anthropogenic GHG emissions due to the project actions, the overall uncertainty associated with it must be calculated by propagating the error using the following equation:

$$\sigma_{IFM\_LtPF,t} = \sqrt{(\sigma_{baseline,t})^2 + (\sigma_{actual,t})^2 + (\sigma_{leakage,t})^2}$$

Equation 2 –Calculation of the uncertainty related to the net GHG anthropogenic emissions reduction by the project activities.

In which:

$\sigma_{IFM\_LtPF,t}$– Annual uncertainty (absolute error) for the total amount of IFM-LtPF in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{baseline,t}$– Annual uncertainty in the annual total of GHG emissions as a result of the baseline scenario in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{actual,\ t}$– Annual uncertainty in the actual (project) activities in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{leakage,t}$– Annual uncertainty in carbon leakage in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

The absolute error is defined as the absolute difference between the exact value and its mean approximated value. It is always a positive number. To track changes in the uncertainty associated with the project activities relative error instead of the absolute error should be used, which is calculated using the following equation:

$$U_{IFM\_LtPF,t} = \frac{\sigma_{IFM\_LtPF,t}}{C'_{IFM\_LtPF,t}} * 100$$

Equation 3 – Calculation of the uncertainty related to the project IFM-LtPF activities.

In which:

$U_{IFM\_LtPF,t}$– Annual uncertainty (relative error) for the overall IFM-LtPF project in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in %.

$\sigma_{IFM\_LtPF,t}$– Annual uncertainty (absolute error) for the overall IFM-LtPF in year *t* where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{IFM\_LtPF,t}$– Annual net anthropogenic in GHG emission reductions in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

- Uncertainty in Baseline Accounting

The total uncertainty related to the baseline is calculated according to the degradation related uncertainty caused by the baseline activities and the uncertainty in estimates from emission sources related to the implementation of baseline activities, and is expressed using the following equation:

$$\sigma_{baseline,t} = \sqrt{(\sigma_{degradation,t})^2 + (\sigma_{emissions,t})^2}$$

Equation 4 – Calculation of the uncertainty related to the activity of the baseline.

In which:

$\sigma_{baseline,t}$– Annual uncertainty in the annual total of GHG emissions as a result of the baseline scenario in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{degradation,t}$– Annual uncertainty in the annual emissions produced from degradation due to the baseline activity: selective logging in the project area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{emission,t}$– Annual uncertainty in the annual emissions from the baseline activities: selective logging operations in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

- Degradation Uncertainty

The total uncertainty associated with degradation is obtained by summing the uncertainties in each individual component that contribute to the degradation from baseline activities:

$$\sigma_{degradation,t} = [(\sqrt{(\sigma_{DWdecay,t})^2 + (\sigma_{ltHWPoxidation,t})^2 + (\sigma_{stHWPoxidation,t})^2 + (\sigma_{growth_{foregone}t})^2 + (\sigma_{regrowth,t})^2}) * \frac{44}{12}]$$

Equation 5 – Uncertainty related to degradation caused by the baseline activities.

In which:

$\sigma_{degradation,t}$– Annual uncertainty in the annual emissions produced by the degradation due to the baseline activity: selective extraction in the project area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{DWdecay,t}$– Annual uncertainty in carbon from the deadwood pool due to decay in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$\sigma_{LtHWPoxidation,t}$–Annual uncertainty in long-term harvested wood products pool due to oxidation in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$\sigma_{StHWPoxidation,t}$– Annual uncertainty in carbon from the short-term harvested wood products pool due to oxidation in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$\sigma_{growth\_foregone,t}$– Annual uncertainty in carbon lost due to growth foregone in the annual net harvest area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$\sigma_{regrowth,t}$– Annual uncertainty in the carbon increase in the biomass due to regrowth following logging in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

44/12 = Ratio of the molecular weight of carbon dioxide to carbon, in tCO_2-e to tC.

The calculation of the absolute errors in each of the components was estimated in hectares for standardization. The estimated value per year, for each parameter, minus the average of all the years resulted in an annual absolute error for each parameter. The uncertainty in degradation was obtained by taking the average of the uncertainties in each year. The $\sigma_{StHWPoxidation,t}$ member was not considered because there are no short-term wood products.

- Uncertainties in Baseline Emissions Sources

The uncertainties in emissions caused by implementing the baseline activities are calculated as follows:

$$\sigma_{emissions,t} = \sqrt{\sum_{g=1}^{G} \sigma^2_{baseline\_source,g,t}}$$

Equation 6 – Calculation of the uncertainty related to the implementation of the baseline activities.

In which:

$\sigma_{emission,t}$– Annual uncertainty in the annual emissions from the baseline activities: selective logging operations in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{baseline\_source,g,t}$ – Annual uncertainty in the greenhouse gas emissions sources *g* (Where *g*=1,2,3 ... *G* emission sources) associated with the baseline activities in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

Again the average of estimated emissions was taken. The estimated value per year, for each parameter, was subtracted from the mean. Uncertainties in emissions from the baseline activities were calculated for each year and an average was used for future estimates.

- Uncertainty in Actual Project Accounting

The uncertainty associated with emissions caused by the implementation of actual project activities are calculated from error propagation related to the individual project activity emission sources, as shown in the following equation:

$$\sigma_{actual,t} = \sqrt{\sum_{g=1}^{G} \sigma^2_{proj\_source,g,t}}$$

Equation 7 – Calculation of the uncertainty in the project activities.

$\sigma_{actual,t}$– Annual uncertainty in the actual project activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$\sigma_{proj\_source,g,t}$ – Annual uncertainty in the greenhouse gas emissions sources *g* (where *g*=1,2,3 ... *G* emission sources) associated with the actual project activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

The uncertainties in the project activities were calculated per year and an average of three years was used for the estimates from 2014 on.

- Uncertainty Deduction

The percentage of relative error of the total uncertainty in the project was less than 10% (Table 17), so no deduction is applied for uncertainty. Therefore, after reducing uncertainty parameters

(**$CC_{IFM\_LtPF,t}$**), the carbon credits are equivalent to annual anthropogenic reductions in GHG (**$C'_{IFM\_LtPF,t}$**).

The table below shows the results for total absolute error of the project (Annex 18), its relative error and carbon credits, equivalent to the net annual GHG emission reductions. Table 17.

Table 17. Annual reduction in anthropogenic GHG emissions, absolute error and relative error related to these emissions, and carbon credits available per year after reducing uncertainty parameters.

Year	C'_{IFM_LtPF}	σ_{IFM_LtPF}	$U_{IFM\_LtPF,t}$	$CC_{IFM\_LtPF,t}$
2013	51,419	1,015	2	51,419
2014	102,838	1,353	1	102,838
2015	154,258	1,692	1	154,258
2016	205,677	2,030	1	205,677
2017	257,096	2,368	1	257,096
2018	308,515	2,707	1	308,515
2019	359,935	3,045	1	359,935
2020	411,354	3,383	1	411,354
2030	874,127	6,767	1	874,127
2048	1,851,093	12,857	1	1,851,093

VCUs and the Non-Permanence Risk Withholding Buffer Percentage

In accordance with section 1.2.4 of VM0011, VCUs should be calculated considering the buffer value obtained from the non-permanence risk rating analysis, calculated as follows

$$CC_{NPbuffer,t} = NP_{buffer,t}\% \times C'_{degradation,t}$$

Equation 8 - Non-permanence risk retained buffer calculation
In which:

$CC_{NPbuffer,t}$ - Annual carbon credits deposited in the VCS non-permanence buffer withholding account in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity), in tCO_2-e.

$NP_{buffer,t\%}$ - Annual buffer withholding percentage required for the VCS buffer withholding pool in year *t*, (where t=1,2,3 ... *t** years elapsed since the start of the IFM-LtPF project activity), in %.

$C'_{degradation,t}$ - Annual total carbon emissions associated with degradation as a result of the baseline activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity).

$$VCU_t = CC_{IFM-LtPF,t} - CC_{NPbuffer,t}$$

Equation 9 - Calculation of tradable annual carbon credits

In which:

VCU_t - Annual total tradable Verified Carbon Units in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity), in tCO_2-e.

$CC_{IFM-LtPF,t}$ - Annual carbon credits post uncertainty deduction in year t, (where t=1,2,3 ... t*years elapsed since the start of the IFM-LtPF project activity).

$CC_{NPbuffer,t}$- Annual carbon credits deposited in the VCS non-permanence buffer withholding account in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity), in tCO_2-e.

In light of the fact that the project foresees a total reduction of 1,852,896 tCO_2e, after deductions for uncertainty (Annex 18, "Cap. 6 - uncertainties" tab) and an 10%, 183,689 tCO_2e buffer (Annex 22), an ex ante estimate for the total volume of VCUs throughout the project lifetime is 1,667,404 tCO_2e.

Table 18. VCUs and Percentage of Non-Permanence Risk Withholding Buffer

Years	$C'_{IFM\_LtPF,t}$	$CC_{NPbuffer,t}$	VCU_t
Year 2013	51,469	5,102	46,317
Year 2014	51,469	5,102	46,317
Year 2015	51,469	5,102	46,317
Year 2016	51,469	5,102	46,317
Year 2017	51,469	5,102	46,317
Year 2018	51,469	5,102	46,317
Year 2019	51,469	5,102	46,317
Year 2020	51,469	5,102	46,317
Year 2021	51,469	5,102	46,317

Year 2022	51,469	5,102	46,317
Year 2023	51,469	5,102	46,317
Year 2024	51,469	5,102	46,317
Year 2025	51,469	5,102	46,317
Year 2026	51,469	5,102	46,317
Year 2027	51,469	5,102	46,317
Year 2028	51,469	5,102	46,317
Year 2029	51,469	5,102	46,317
Year 2030	51,469	5,102	46,317
Year 2031	51,469	5,102	46,317
Year 2032	51,469	5,102	46,317
Year 2033	51,469	5,102	46,317
Year 2034	51,469	5,102	46,317
Year 2035	51,469	5,102	46,317
Year 2036	51,469	5,102	46,317
Year 2037	51,469	5,102	46,317
Year 2038	51,469	5,102	46,317
Year 2039	51,469	5,102	46,317
Year 2040	51,469	5,102	46,317
Year 2041	51,469	5,102	46,317
Year 2042	51,469	5,102	46,317
Year 2043	51,469	5,102	46,317
Year 2044	51,469	5,102	46,317
Year 2045	51,469	5,102	46,317
Year 2046	51,469	5,102	46,317
Year 2047	51,469	5,102	46,317
Year 2048	51,469	5,102	46,317
Total estimated ERs	1,852,896	183,689	1,667,404
Average annual ERs	51,469	5,102	46,317

5.2 Leakage Management (CL3.1, CL3.2)

As discussed in chapter 5.5, the implementation of the project should not generate any kind of leakage for the following reasons:

1. EBCF acquired the land for the sole purpose of preserving the forest, promoting income generation

without relying on timber management activities, and proposing a conservation project for the area;

2. The EBCF does not practice selective logging in any other area and the sale of wood products is not, and never was, a part of the core business of EBCF (Annex 18). As such, the company will not shift its management activities to other forest areas;
3. The EBCF does not own other properties intended for timber management;
4. The timber market in Manicoré is much more dependent on illegal logging than SFMP, following a different pattern of supply and demand and so will not be impacted by the absence of SFM
5. The regional forest sector mainly produces wood for the Brazilian domestic market, and exports to other countries such as those of Gethal's former operations is not a common practice in Manicoré and region
6. Compared with the supply of wood in the national, state and southern Brazilian Amazon scales, the commercial volume of wood legally extracted in the project area represents less than 5% of the wood commercially extracted and offered in the southern state of Amazonas for the same period of timber supply that supported the construction of the project design line. Thus, it is concluded that emissions due to potential market spills are minimal and can be neglected.

Even considering the scenario above, the project has adopted a conservative approach. According to VM0011, leakage monitoring is not necessary. Nonetheless, the project will include some specific monitoring activities and leakage mitigation techniques based on the use of remote sensing and GIS tools and auxiliary data from official disturbance databases. In addition, the RPDS Management Plan includes leakage and emission mitigation activities, such as support for small farmers from the surrounding communities to reduce the need for clearing (deforestation to open new cultivation areas).

Activities to mitigate leakage and emissions include:

1. Empowering of communities and dissemination of the project coupled with actions of environmental education and awareness raising for indirect users;
2. Creation of jobs for community members, such as rangers, environmental agents and community managers (generation of alternative income not associated with changes in land-use);
3. Technical support and agricultural extension to increase productivity in the areas of consolidated cultivation (thus reducing pressures on forests in and around the project area with expansive needs for land-used for cultivation);
4. Technical Assistance and Rural Development through two government agencies, IDAM

and ATER-AM, for all segments of the rural population;

5. Mobilization, communication and strengthening of community organizations;
6. Strengthening of the Manicoré State Plan for Prevention and Control of Deforestation and Burning[50];
7. Pressuring the State of Amazonas to implement the Amazonas State Plan for Prevention and Control of Deforestation (PPCD-AM) - *Plano de Prevenção e Combate ao Desmatamento do Amazonas*;
8. Monitoring of illegal deforestation[51], degradation[52] and hotspots[53] in the project area and surrounding regions by the project proponent. Pledging to record and report such incidents to the appropriate State authorities.

Leakage management activities from deforestation which targets local agents (communities living in the vicinity of the project area) are described in more detail in Section 6.1.

In addition, as a conservation area recognized by the state legislature of Amazonas (SEUC[54] – State System of Conservation Units), in the category of Private Sustainable Development Reserve, established by the SDS Directive no. 86 of June 5, 2013, the following procedures must be adhered to:

Art. 22. The Private Sustainable Development Reserve (RPDS) is private land, voluntarily created by the owner and recorded in perpetuity and may, or may not contain a user population, whose objective is to promote nature conservation and sustainable development through the direct use of natural resources.

§ no. 1 The establishment and functioning of RPDS is predicated on the following:

I - the encumbrance of the caput consists of Letter of Commitment signed by the owner before the Environmental Agency to certify the existence of public interest, and will be recorded in the margin of registration with the Public Registry of Property;

II - management Plan will define the areas of permanent protection,

[50] http://www.mma.gov.br/redd/index.php/informma/item/47-mma-desenvolve-acao-norte
[51] http://www.obt.inpe.br/prodes/index.php, http://www.obt.inpe.br/deter/, http://www.imazongeo.org.br/
[52] http://www.imazongeo.org.br/ & http://www.obt.inpe.br/degrad/
[53] http://www.dpi.inpe.br/proarco/bdqueimadas/
[54] State Decree n.º 30.108, June 22, 2010

sustainable use and, if possible, ecological corridors;
III – intended to be compatible with permanence and use and a contract between the owner and the traditional communities as well as the user population will be signed;
IV - the RPDS may overlap with an Environmental Protection Area (APA).
§ no. 2 Throughout the process of creating the RPDS, the Governing Body should assess, for the purpose of analyzing the viability of its proposal, the existence of conflicts between the owner and resident local populations, including in the surrounding area, making the creation of the Conservation Unit impossible.

Also according to SEUC, a RPDS is one of perpetuity and should have a Management Plan. On their own, these constraints legally ensure forest conservation and maintenance of carbon stocks

The Amazon Rio project consists of the first RPDS[46]~~[46]~~ in the country. The project was initiated by the project proponent is in perfect alignment with state and federal laws (Climate Change Law of the State of Amazonas[55], National Climate Change Policy[56], State System of Conservation Units - SEUC[57] and the National System of Conservation Units - SNUC)[58], which regulate the activities related to conservation and sustainable use of protected areas and policies on climate change.

5.3 Baseline Emissions (CL 1, indicator 1)

For the project baseline calculation, guidelines, criteria and assumptions contained in Section 3 – Baseline Accounting - from the VCS VM0011 methodology were used. The following are the equations contained in this section that were used in the calculation of emissions in this study with their respective purposes and justifications.

All calculations presented in this section were made whereas annually harvested area from the beginning of the logging project. The Amazon Rio Reserves I, II, III and IV areas, formerly belonging to the Valdenor II farm, contained 6 plots where forest management occurred. The calculations and the results of the steps presented in this section are more fully described in the emissions

[55] http://www.ipaam.br/legislacao/ESTADUAL/
[56] http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l12187.htm
[57] http://www.sema.rs.gov.br/conteudo.asp?cod_agrupador=12;
http://www.4shared.com/office/7VSHmQmDce/SEUC.html
[58] http://www.planalto.gov.br/ccivil_03/leis/l9985.htm

spreadsheet (Annex 18) and annex documents, which will served as inputs for data calculation and referenced in each parties definition that follow.

The emissions estimates of the Amazon River REDD + Project are based on the volume of wood licensed for exploration, since this evidences basic elements for the baseline projection as the company's operational capacity for future exploration, yield and productivity of the area's forests of management.

Primary parameters such as area managed and volume exploited are backed up in the original documents that are part of the legal process of licensing the forest management activity and operating authorization documents certified by the competent governmental body. Digital copies of the documents are presented in Annexes 4 and 6.

5.3.1 Estimated Emissions from Degradations

For the purposes of calculating baseline emissions, it was considered the date when the Amazon River I Reserve was approved by the Department of Development, June 2013. This is justified by the fact that the methodology VM0011 assumes that selective logging ceases only when the project activities begins. This is not the case of this project in which the last date of the logging operations was 2010[59].

To calculate the total carbon emitted associated with the baseline scenario equation 8 was used, considering emissions from the degradation of the project area plus emissions from selective exploration operations. The top level primary equation for calculating carbon emissions at baseline is given by equation 10 as follows:

$$C'_{baseline,t} = C'_{degradation,t} + C'_{emissions,t}$$

Equation 10– Calculation of carbon emitted related to the baseline activities.

In which:

$C'_{baseline,t}$ – Annual total carbon emissions associated with the baseline scenario in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

[59] License issued in 2008, but valid for 2 years (Annex 5, document entitled: *ACOF e LO PMFS Valdenor II 2008*).

$C'_{degradation,\ t}$– Annual total carbon emissions associated with the degradation due to the baseline activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{emissions,t}$ - Annual total carbon emissions associated with baseline activity operations of selective logging in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

Therefore, it was necessary to calculate the emissions generated by the degradation caused by the baseline activity, as well as the carbon emitted by the selective exploration operations separately.

To calculate the emissions from the degradation of the project area, equations 11 to 38, presented in section 5.3.3, were applied. For the calculation of emissions from selective exploration activity, equations 39 to 51 presented in section 5.3.4 were applied. Being calculated by applying the equations, the degradation emissions due to the extraction activities and the emissions caused by the operations related to these activities, obtained the total value of the baseline emissions, presented in table 19.

Table 19- **Values found for baseline emissions**

Sub areas	C'baseline	C'degradation	C'emissions,t
UPA1	112,628	112,195	434
TALHÃO 2	73,156	72,706	450
TALHÃO 3	144,573	143,698	875
TALHÃO 4	52,850	52,449	401
TALHÃO 5	89,625	88,474	1,150
UPAs 5 e 6	93,913	92,527	1,386
Total	**566,745**	**562,049**	**4,697**

To calculate the carbon generated by the degradation caused annually by baseline activity for selective extraction, equation 9 was used:

$$C'_{degradation,t}=[(C_{DWdecay,t}+C_{ltHWPoxidation,t}+C_{stHWPoxidation,t}+C_{growth\_foregone,t}-C_{regrowth,t})*\frac{44}{12}]$$

Equation 11 – calculation of annual total carbon emissions associated with degradation as a result of the baseline activity.

In which:

$C'_{degradation,t}$ – Annual total carbon emissions associated with degradation as a result of the baseline activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C_{DWdecay,t}$ - Annual carbon leaving the deadwood pool due to the decay of deadwood in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{ltHWPoxidation,t}$- Annual carbon due to the combined delayed oxidation of long-term harvested wood products and immediate oxidation of long-term harvested wood products residues in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{growth\_foregone,t}$- Annual carbon lost due to growth foregone in the aboveground biomass in the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{regrowth,t}$- Annual carbon increase in the biomass due to regrowth following logging in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

44/12 = Ratio of the molecular weight of carbon dioxide to carbon.

Carbon emissions associated with degradation resulting from baseline activity are dependent and directly proportional to the commercial volume to be explored, among other primary parameters required for estimating emissions. Following the logic and script of the applied IFM methodology, the primary parameters were calculated and are presented in section 5.3.2, which follows. The result and details of the application of sub-equations leading to the estimation of emissions associated with degradation resulting from baseline activity are presented in section 5.3.3.

5.3.2 Calculation of the Main Parameters in the Project Area

According to VM 0011, section 3, there are two ways to obtain data from the estimators that serve as inputs for the calculation of the primary parameters of the project.

1) the method that uses data from an existing inventory and;

2) the method of measuring the data in the field.

The proponent has chosen the field data measurement method, where a Forest Inventory Report is available and where the forest inventory does not distinguish between different types of forest products. The licensed volume of wood was used to calculate the commercial volume (Vmerch), since it is calculated using the 100% forest inventory method or census, which measures and identifies all tree individuals that have been exploited, giving the exact size of the volume of wood exploited in the project area, being more conservative than estimates of commercial volume for the effect of the calculation of avoided future emissions, since the measurement of all the exploited individuals is surely more accurate than sampling methods with small and extrapolated areas to the project area.

In order to calculate the carbon stock in the commercial volume, the wood density method was applied by applying a mean wood density of all exploited species. For that, the wood density data provided by the Global Wood Density Database (Chave, 2009 and Zane, 2009), made available on a web platform, were used.

For the calculation of the above-ground biomass carbon in the growth stock, the data from the forest inventory report was used to validate the pre-existing forest inventory data using the allometric equations method. The detailed forest inventory report is available in Annex 23.

The data for the determination of the annual volume exploited and the net area exploited are backed by the licensing documents of the logging activity certified by the competent environmental agency, represented by the Environmental Protection Institute of Amazonas IPAAM. The digital copies of the Forest Management Plan and authorization documents for exploitation (AUTEX) are available in annex 4.

Existing forest inventory data validation

Operating licenses were used as input for calculating the baseline for existing forest inventory data (Annex 4). In order to validate the data, data from the 2015 sample forest inventory were used, where permanent plots were installed to monitor carbon inventory in the project area (Annex 23). The estimated commercial volume, with DBH greater than or equal to 50 cm (minimum cutting diameter, established by current legislation) was used, considering:

1- A combined list of commercial species exploited by the company and the market value recognized by other companies in the regional sector;

2 - The volume of individual trees found in the plots of the sample forest inventory was calculated based on the volumetric equation adjusted from data collected "in situ". The equation and its

regression analysis statistics are available in the technical report - Annex 23;

3- Finally, the mean volume of the forest inventory, estimated at a 95% probability level, per identified stratum (96.5 ± 12.1 m³/ha & 85.5 ± 12.5 m³/ha, strata 1 and 2, respectively) and stratified mode (93.6 ± 12.1 m³/ha). Considering the lower limits of these estimated mean values, they were higher than the mean value in the pre-existing data (33.7 m³/ha). Therefore, based on item 3.2, step 7: for the present project, the mean value of the existing data for the project parameter estimates will be used conservatively. The table of mean values with their respective confidence intervals is available in the technical reports of the sample forest inventory - Annex 23.

Carbon from merchantable logs using wood density method in which inventory data do not distinguish between different types of forest products

POAs were used to obtain the volume of potentially merchantable trees. For planning purposes appropriate forest surveys were conducted to estimate the diversity and measurements of the trees in the area (Annexes 1 and 4). The commercial timber volume was taken to mean all the extracted volume allowed by the AUTEXs (Logging Permits), presented in Annexes 4 and 6.

It is worth mentioning that the area of the sampled plots is the same area licensed for the exploration, since the licensing process requires the forest inventory using the 100% sampling method where all the individuals that are to be explored within the exploration area, known as "Talhões” and “UPAs - Annual Production Units”within the scope of the legal framework that underpins the process of licensing the timber exploitation activity. This point deserves attention because for the V_{merch} obtained in volume per hectare was considered the ratio between the volume and the area authorized for exploitation.

To calculate the carbon contained in the commercial timber per hectare in the project area,the wood density method was used, a formula was applied that makes no distinction between timber products since all the extracted timber had the same purpose: construction. This equation uses the wood density and the fraction of carbon contained in it, as well as the volume of merchantable wood to obtain carbon in the logs:

$$\bar{C}_{merch,j,t=0} = D * CF_{wood} * \bar{V}_{merch,j,t=0}$$

Equation 12– calculation of the average carbon level per hectare in merchantable logs.

In which:

$\bar{C}_{merch,j,t=0}$ – Average carbon per hectare in merchantable logs in stratum *j* (where *j*=1,2,3... *j* strata), determined ex ante - before the start of the IFM-LtPF project activities, hence *t*=0 years, in tC/ha.

D – Density of wood for a tropical forest with corresponding climate region and ecological zone in (t d.m)/m^3.

CF_{wood} – Carbon fraction of wood for the tropical forest in tC/(t d.m).

$\bar{V}_{merch,j,t=0}$ – Average merchantable logs' volume per hectare in stratum *j* (where *j*=1,2,3... j strata), determined ex ante - before the start of the IFM-LtPF project activities, hence *t*=0 years, in m^3/ha.

The value of the parameter CFwood were taken from Annex B of the methodology (REYES et al., 1992 and HUGHES et al., In IPCC, 2006 apud VCS, 2011) and correspond to 0.49 tC / (t.d.m), respectively. The value of parameter D was obtained from the average of the densities of the commercial species listed in the forest census inventory carried out during the licensing process, which lists the commercial species suitable for exploitation in the project area and corresponds to 0.67 tC / (t.d.m.). The value of $V_{merch,\ j,\ t\ =\ 0}$ was obtained from the division of commercial volume exploited by the area explored to obtain the commercial volume per hectare exploited at the project baseline (Table 20).

The average carbon per hectare in the project area is then calculated by the following equation:

$$\bar{C}_{merch,t=0} = \frac{\sum_{j}^{i}\left(\bar{C}_{merch,j,t=0} * A_{project,j,t=0}\right)}{A_{project,t=0}}$$

Equation 13 – Average carbon per hectare calculation in merchantable trees throughout the project area.

In which:

$\bar{C}_{merch,t=0}$ – Average carbon per hectare in merchantable logs in stratum *j* (where *j*=1,2,3... *j* strata), determined ex ante - before the start of the IFM-LtPF project activities, hence *t*=0 years, in tC/ha.

$\bar{C}_{merch,j,t=0}$ – Average carbon per hectare in merchantable logs in stratum *j* (where *j*=1,2,3... *j* strata), determined ex ante - before the start of the IFM-LtPF project activities, hence *t*=0 years, in tC/ha.

$A_{project,j,t=0}$– Project Area within each stratum *j* (where *j*=1,2,3... *j* strata) where the IFM-LtPF project activities will be implemented; determined ex ante - before the start of the IFM-LtPF project activates, hence *t*=0 year, in ha.

$A_{project,t=0}$– Project Area where the IFM-LtPF project activities will be implemented; determined ex ante - before the start of the IFM-LtPF project activities, hence t = 0 years, in ha.

As a result the carbon contained in the marketable wood was obtained, as shown in table 20.

Table 20. Annual volume exploited, net area exploited, commercial timber volume and carbon from merchantable logs

Sub-areas	$A_{NHA\_annual,t}$	$V_{merch,t}$	$V_{merch,j,t=0}$	$C_{merch,j,t=0}$
UPA1	587	30,970	53	17
TALHÃO 2	688	21,094	31	10
TALHÃO 3	832	41,390	50	16
TALHÃO 4	750	18,794	25	8
TALHÃO 5	1,082	32,230	30	10
UPAs 5 e 6	1,492	38,895	26	9
Total	**5,430**	**183,373**	**214**	**71**

Equations 3-5, 3-6 and 3-7 from the methodology were not used because the inventory data does nos distinguish between different forest product types.

Each extraction subarea provided for in the Annual Operational Plans (POAs – Planos de Operação Anual) was considered separately. The carbon value in the tradable logs of each subarea was then multiplied by their respective extraction areas, and this value was divided by the sum of all areas of extraction. All these values, with the exception of $C_{merch,\,j,\,t=0}$, already calculated, were acquired from POAs and operating licenses (Annexes 4 and 6).

Carbon in the biomass of growing stock using the biomass allometric method

For the average carbon per hectare in the growing stock aboveground biomass, the equation for allometric method was used, where biomass is calculated from field data from which to obtain the carbon value. As explained in the previous section, biomass value was calculated using forest inventory data (Annex 23).

To obtain the carbon per hectare contained in the above-ground biomass of the growing stock, the steps proposed by the applied methodology were followed[60], as follows:

Step 1: The allometric biomass equation selected was the proposed by Silva (2007), developed in Central Amazonia in Ombrophilous Forests, similar to the phytophysiognomies found in the project area, widely disseminated and replicated in the scientific community . It is a simple input allometric equation, whose estimate of the biomass of the individual trees is given as a function of DAP only, applying a height correction factor (fc) which is estimated considering the dominant height (Hd) of the project area in relation to the dominant height of the forest canopy where the equation was developed. Finally discounted fresh biomass water for conversion to dry biomass considering the water content contained in the biomass of the trunks, branches, branches, leaves and roots (*wf*).The allometric equation was developed from the data analysis of the INPA Forest Management Laboratory, where samples were collected using destructive methods with the direct measurement of the fresh weight of 494 tree individuals and the fresh weight of thick roots by 131 arboreal individuals. All data were obtained from the experimental sustainable forest management area ZF-2. Regression models were tested to verify what best fit the estimate of fresh biomass, and as a result, the equation in form was proposed (SILVA, 2007), plus the correction factor proposed by Lima et al. (2012):

$$\bar{B}_{AGB} = a * DBH^{b} * fc * wf$$

Equation 14 - Allometric equation used for the above-ground living biomass calculation

In which:

$\bar{\boldsymbol{B}}_{\boldsymbol{AGB}}$ – Above-ground dry biomass of tree individuals

a and b = coefficients of the exponential regression model found by Silva (2007)

DBH = Diameter at breast height

fc = Tree height correction factor at different sites

wf = Fraction corresponding to the water content contained in the trunks, branches, branches and roots of individual trees

For this work, the dominant height was estimated based on Higuchi (2015), where Hd is an average

[60] To this end, the forest inventory was conducted to obtain the primary field data required to estimate biomass in the project area. The methodological details and the results with the applied values are presented in Annex 23, which contains the final report, parameter calculation spreadsheets and field-measured data and spreadsheet containing the applied wood density information.

height of 10% of the thickest trees sampled. This variable is then used to determine a correction factor (fc) to compensate for the structural difference between the sampled site and the site from which the biomass equation was adjusted (Lima et al., 2012). Dominant Height (Hd) is calculated based on the formula below:

$$\bar{X} = \frac{\sum_{i=1}^{n} X_{10\%i}}{n_{10\%}}$$

Equation 15 - Calculation of dominant height based on average height of tallest trees

In which:

$\bar{X}$ = arithmetic mean

$\bar{X}_{10\%i}$ = height of 10% of the grossest individuals sampled

$n_{10\%}$ = number of individuals representing 10% of the sample

The Tree Height Correction Factor (fc) is calculated based on the Dominant Height (Hd) of the sampled site in relation to the Hd of the site where the biomass equation was adjusted (INPA Tropical Forestry Experimental Station - ZF-2). According to Higuchi (2015), the HD of the ZF-2 is 30.2 m. The calculated fc is then incorporated into the equation to compensate for the difference between the sites. The calculation form of the correction factor is presented below:

$$fc = \frac{H_{dSA}}{H_{dZF-2}}$$

Equation 16 – Correction factor applied to estimate tree height

In which:

fc = Tree height correction factor at different sites

H_{dSA} = Dominant height of sampled site (Project Area)

H_{dZF-2} = Dominant height of ZF-2 (Site where the equation was developed)

The dominant height found in the Project Area (Amazon Rio) was estimated at 32.9 m. The correction tree height factor of the biomass equation was estimated at 1,089.

Given the above, the equation adopted for the estimation of fresh biomass (B_{AGB}) of individual trees, or growing stock biomass is given by:

$$\bar{\mathrm{B}}_{\mathrm{AGB}} = 2.7179 * \mathrm{DBH}^{1.8774} * 1.089$$

Equation 17 - General equation for above-ground biomass estimation

To obtain dry biomass for subsequent carbon conversion, the value of fresh biomass found for individual trees is multiplied by the water content found in the trunks, branches and roots and for this work the water content of 0.584 was adopted.

$$\overline{\mathrm{B}}_{\mathrm{AGB}} = 2.7179 * \mathrm{DBH}^{1.8774} * 1.089 * 0.584$$

Equation 18 - Equation applied to convert above ground dry biomass to carbon

The methodological detail of the forest inventory used for the estimation of living biomass used for the estimation of biomass in the growing stock is given in Annex 23 (HDOM#P023_Relatorio-Tecnico_v1.pdf, págs 26, 27 e 28).

Step 2: No wood density value was applied to estimate the biomass in the growth stock because the adopted allometric equation was developed from a direct field biomass measurement method from the weighing of individual trees and directly correlated with DBH of weighed individuals, that is, wood density is already considered in the relationship between DBH and weight (biomass) found for individual trees.

Steps 3 and 4: As shown in Step 1, the DBH-dependent simple input allometric equation developed by Silva (2007) was adopted for the estimation of fresh biomass of the growing stock, applying the site correction factor for height trees and discounted the water content to obtain the dry biomass of the individual trees. Applying the allometric equation adopted in this work in equation 3-12 of VM-0011, the estimate of above ground biomass in the growing stock is given by:

$$\bar{B}_{AGB_{gstock},j,t=0} = \frac{1}{A_{s,j,t=0}} * \sum_{s=1}^{S}\left\{\sum_{i=1}^{I}\left[\sum_{n=1}^{N_i} f(2.7179 * \mathrm{DBH}^{1.8774} * fc * wf)\right]\right\}$$

Equation 19 - Equation for calculating biomass in growing stock

In which:

$\boldsymbol{\bar{B}_{AGB_{gstock},j,t=0}}$ = Average above-ground fresh biomass in the growing stock in stratum j, determined after the start of project activities IFM-LtPF (t.d.m) ha^{-1}

$\boldsymbol{f(2.7179 * \mathrm{DBH}^{1.8774} * fc)}$ = Allometric equation for biomass estimation as a function of diameter at breast height (DBH) determined after IFM-LtPF project activities

DBH = diameter at breast height of individual trees n, in sample plots s, for each sampled stratum j, determined after the start of the project

fc = Tree height correction factor for the sampled site. Applied Value: 1,089

$A_{s,j,t=0}$ = Total area of the plots shown, in stratum j, determined after the start of the IFM-LtPF project activities

wf = Fraction corresponding to the water content contained in the trunks, branches, branches and roots of individual trees

During the forest inventory the influence of phytophysiognomy factors and properties was tested to verify if there was any difference between phytophysiognomies or Amazon Rio I, II III and IV properties. As a result no statistically significant difference was found between phytophysiognomies, but it was found between the Amazon Rio I Property area and the Amazon Rio II, III and IV property areas. During the forest inventory for above-ground live biomass, the area was stratified considering the difference found only between the properties. Details can be found in Annex 23 - HDOM # P023_Relatorio-Tecnico_v1.pdf, pages 36 and 37. The sampled area was 40.5 ha, distributed in 162 sample units with a size of 0.25 ha each in the EBCF properties for forest management. The above-ground living biomass values found were 271.4 ± 11.3 in stratum 1 and 290.7 ± 17.8 in stratum 2. Table 21 shows the distribution of plots in the properties and the phytophysiognomy sampled in each of them, the sampled area and the dry living biomass found.

Table 21.Properties, strata adopted, number of plots and area sampled in the forest inventory to estimate above-ground living biomass

EBCF Properties	***Stratum***	$\bar{B}_{AGB_{gstock},j,t=0}$	***forest type***	***n sample plots***	***Area (ha)***
Amazon Rio I	1	271.4 ± 11.3	Alluvial Dense forest ombrophile	37	9.25
			Rain Forest land low	4	1
				40	10
Amazon Rio II	2	290.7 ± 17.8	Alluvial Dense forest ombrophile	16	4
			Rain Forest Lowlands	16	4
Amazon Rio III			Alluvial Dense forest ombrophile	17	4.25
Amazon Rio IV				32	8
Total				**162**	**40.5**

Applying equation 20 then converts the average biomass for each stratum to the average biomass over the entire project area.

$$\bar{B}_{AGB_{gstock},t=0} = \frac{\sum_{j=1}^{J}(\bar{B}_{AGB_{gstock},j,t=0} * A_{project,j,t=0})}{A_{project,t=0}}$$

Equation 20 - Converts the average biomass for each stratum to the average biomass over the entire project area

In which:

$\bar{B}_{AGB_{gstock},t=0}$ = Average above-ground live biomass in the growing stock per hectare in project area

$\bar{B}_{AGB_{gstock},j,t=0}$ = Average above-ground live biomass in the growing stock per hectare in each stratum

$A_{project,j,t=0}$ = Area of each stratum

$A_{project,t=0}$ = Project Area

The values found for the above ground dry biomass of the growing stock in each stratum proposed in the forest inventory, as well as the area of each stratum are presented in table 22.

Table 22. Above-ground dry living biomass values in the growing stock, strata and area of each stratum and for the total area

Strata	*Area (ha)*	$\bar{B}_{AGB_{gstock},j,t=0}$
1	15,065.0	271.4 ± 11.3
2	5,322.0	290.7 ± 17.8
Total area	20,387.0	276.4 ± 11.9

The total area presented for each stratum differs from the project area because the sanctioned forest management area is considered as the project area as per the logging documentation of the logging activity, while the inventory area considered is the area of all properties contained in land documents (Land Ownership Documents).

All descriptive details of the statistical analysis and formulas used for parameter calculations and estimates by stratified sampling to arrive at the mean above ground live biomass stock are detailed in Annex 23 - HDOM # P023_Relatorio-Tecnico_v1.pdf. The details of the calculations, and results found by sample units and strata are presented in Annex 23 - "Hdom#P023_CÁLCULOS-ESTIMATIVAS-Inventário-Florestal_EBCF_201601.xlsx", tab "Strats-Est.-TOTAL".

Thus, the value applied for the above-ground dry biomass average stock in the growing stock is 276.4 t.d.m. ha^{-1}:

$$\bar{B}_{AGB_{gstock},j,t=0} = 276.4\ t.dm.ha^{-1}$$

The estimate of the biomass of the individual trees is presented in Annex 23 - "Hdom#P023_CÁLCULOS-ESTIMATIVAS-Inventário-Florestal_EBCF_201601".xlsx in the tab "Cálculos-Estra".

Step 5: The carbon fraction (CF_{AGB}) value applied is 0.47 (tdm) -1 for trees with DBH ≥ 10 cm, as suggested by the applied methodology, Appendix B, Item B.2, Table B-2, as inventory The minimum inclusion DBH = 10 cm was adopted as criterion, and tree individuals with DBH ≥ 10 cm were measured.

Step 6: Finally, the above-ground live biomass in the growing stock was multiplied by the carbon fraction adopted in step 5 for the conversion of biomass to average carbon stock per hectare contained in the growing stock live biomass, as described in equation 21.

$$\bar{C}_{AGB_{gstock},t=0} = \bar{B}_{AGB_{gstock},t=0} * CF_{AGB}$$

Equation 21 - Average carbon per hectare in above-ground biomass in the growing stock

In which:

$\bar{C}_{AGB_{gstoc},t=o}$ – Average carbon per hectare in above-ground biomass of the growing stock in the Project area, determined ex ante - before the start of the IFM-LtPF Project activities, therefore t = o years, in tC / ha.

$\bar{B}_{AGB_{gstock},t=0}$ - Above-ground biomass per hectare in the growing stock of the Project area, determined ex ante - before the start of the IFM-LtPF Project activities, therefore t = o years at t.d.m. / ha.

CF_{AGB} - fraction of carbon present in tree above-ground biomass for tropical forests. In tC by t.d.m

Thus, the value found for the average carbon stock contained in the above-ground living biomass in the Growing Stock is 129.91 tC ha^{-1}.

$$\bar{C}_{AGB_{gstock,t=0}} = 129.91\ tC\ ha^{-1}$$

Equations 3-8, 3-9, 3-10 and 3-11 from the methodology were not used because detailed FIR is available, and the biomass alometric mtehod (for B_{AGB} and C_{AGB} calculations) was chosen. The inventory data does not distinguish between diferent forest product types.

TOTAL ANNUAL CARBON IN MERCHANTABLE LOGS

As well as the value of the volume of wood harvested per hectare used to calculate the $C_{merch,\ t\ =\ 0}$, the annual harvest area (ANHA $_{annual,\ t}$) was also obtained from each of the harvesting licenses, as described above, total managed area calculated by the sum of the areas licensed for exploitation. It was considered that the whole extraction area authorized by the competent agencies was managed (Annexes 1 and 6).

These parameters were used to calculate the total annual carbon in the Cmerch,t trading volume, calculated by multiplying the Average Carbon per hectare in the trading volume by the net annual area exploited, applying equation 3-15b of the applied methodology, as Follow:

$$C_{merch,t} = \sum_{j=1}^{J} (\bar{C}_{merch,j,t=0} * A_{NHA_{annual},j,t})$$

Equation 22 - Calculation of total annual carbon in merchantable logs

In which:

$\boldsymbol{C_{merch,t}}$ = Total annual carbon in tradable logs harvested from the Project Area in year t, (where t = 1,2,3 ... t * years have elapsed since the start of the IFM-LtPF project activity) in tC.
$\boldsymbol{\bar{C}_{merch,j,t=0}}$ Average carbon per hectare in the tradable logs in stratum j (where j = 1,2,3 ... strata j) determined ex ante from the start of the IFM- project activity. LtPF, therefore t = 0 year, in tC ha^{1}.
$\boldsymbol{A_{NHA_{annual},j,t}}$ = Annual net harvest area for Project Area in stratum j, (where j = 1,2,3 ... j strata) in year t, (where t = 1,2, 3 ... t * years since the start of the IFM-LtPF project activity), in ha

The values applied for the parameters and the total annual carbon in the tradable logs harvested in the project area at the beginning of the project are presented in table 23.

Table 23. Year of extraction, area explored, carbon contained in merchantable logs, in all sub-areas and total for Project area

Sub-area	$A_{NHA\_annual,t}$	$C_{merch,j,t=0}$	$C_{merch,t}$
UPA1	587	17	10,262
TALHÃO 2	688	10	6,990
TALHÃO 3	832	16	13,715
TALHÃO 4	750	8	6,228
TALHÃO 5	1,082	10	10,680
UPAs 5 e 6	1,492	9	12,888
Total	**5,430**	**71**	**60,763**

ANNUAL TOTAL CARBON IN ABOVE-GROUND BIOMASS IN THE GROWING STOCK

In order to calculate the total annual carbon contained in the above-ground biomass of the growing stock (CAGB_gstock, t), it is necessary to multiply the average carbon per hectare in the above-ground living biomass by the net annual harvest area by applying equation 3-16b of applied methodology according to equation 23.

$$C_{AGB_{gstock},t} = \sum_{j=1}^{J} \left(\bar{C}_{AGB_{gstock},j,t=0} * A_{NHA_{annual},j,t} \right)$$

Equation 23 - Calculation of total annual carbon in above-ground biomass from growing stock

In which:

$\boldsymbol{C_{AGB_{gstock},t}}$ = = Annual total carbon in above-ground biomass from growing stock harvested annually in the Project Area in year t, (where t = 1,2,3 ... t * years have elapsed since the start of IFM-LtPF project activity), tC

$\bar{C}_{AGB_{gstock},j,t=0}$ = Average carbon per hectare in above-ground biomass of growing stock in stratum j, (where j = 1,2,3 ... strata J) determined ex ante - before start of the IFM-LtPF project activity, therefore t = year 0, in tC ha^{-1}

$A_{NHA_{annual},j,t}$ = Annual net harvest area for Project Area in stratum j, (where j = 1,2,3 ... J strata) in year t, (where t = 1,2, 3 ... t * years elapsed since the start of the IFM-LtPF project activity), in ha

The values applied to the parameters and the annual total carbon in the above ground biomass of the growing stock found for the project area are presented in table 24.

Table 24. Parameters used to calculate annual total carbon in above-ground biomass of growing stock

Sub-area	$A_{NHA\_annual,t}$	$C_{AGB\_gstock,j,t=0}$	$C_{AGB\_gstock,t}$
UPA1	587	130	76.216
TALHÃO 2	688	130	89.377
TALHÃO 3	832	130	108.019
TALHÃO 4	750	130	97.431
TALHÃO 5	1.082	130	140.560
UPAs 5 e 6	1.492	130	193.758
Total	**5.430**	**-**	**705.360**

5.3.3 Changes in Carbon Due to the Degradation Caused by the Baseline Scenario

The primary parameters calculated above are used to calculate the other parameters of equation 9 and get the value of carbon emitted due to degradation.

Net carbon from the deadwood pool

The deadwood pool of a particular area refers all the carbon in coarse woody debris, standing dead trees and other dead material not included in the litter or soil carbon pools . The methodology assumes that the proportion of deadwood accumulation to the deadwood pool and rate of decay from the pool due to natural mortality and disturbance will be the same for both the baseline and scenarios including project activities, and is therefore not included.

The difference between the selective logging baseline scenarios is the addition of branches and cuttings taken from uprooted trees and the ones that were left standing, but damaged due to forest management. In both cases there is an increase in the deadwood pool. Therefore, the biomass resulting from such damage is considered as input to the deadwood pool baseline selective logging scenario. The calculation of the carbon in this case is a function of that input of wood due to harvest damage and the respective decomposition rate as the equation 3-17 of the referenced methodology (VM 0011). The first step is therefore to calculate the carbon entering the deadwood pool using the following equation:

$$C_{Dwin,t} = C_{RSD,t} + C_{branch\_trim,t}$$

Equation 24– Calculation of the carbon input from the deadwood pool.

In which:

$C_{Dwin,t}$ = Annual total carbon input to the deadwood pool in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the project IFM-LtPF activities), in tC.

$C_{RSD,t}$ = Annual carbon in the residual stand damage in year *t* (where *t*=1,2,3... *t**years passed from the start of the project IFM-LtPF activities), in tC.

$C_{branch\_trim,t}$ = Annual carbon in branches and trimmings left over from harvesting in year *t* (where *t*=1,2,3... *t**years passed from the start of the IFM-LtPF project activities), in TC.

The values found for the total carbon input in the deadwood pool are presented in table 25.

Table 25. Total annual carbon input into the deadwood pool in year t, Annual carbon from remaining forest damage and Annual carbon on branches and cuttings from selective logging in the project area.

Sub-area	C_{RSD}	C_{branch_trim}	$C_{DWin,t}$
UPA1	24,630	3,171	27,801
TALHÃO 2	16,776	2,160	18,935
TALHÃO 3	32,916	4,238	37,154
TALHÃO 4	14,947	1,924	16,871
TALHÃO 5	25,632	3,300	28,932
UPAs 5 e 6	30,932	3,983	34,915
Total	**145,832**	**18,776**	**164,608**

To solve equation 24, a separate calculation of the carbon values resulting from damage to the standing forest by felling of trees and the carbon emitted from trimmings cut from felled logs is made, and presented in the following equations.

Carbon from residual stand damage

The remaining forest damage accounts for a ratio of 2.4 times the damage caused in the forest, ie for each ton of carbon contained in the commercial wood, 2.4 tons of carbon comes from the damage caused to the forest. The factor was obtained by Feldpausch et al. (2005). The authors of this study made several carbon analyses in low impact selective areas in southern Amazonia, the same biome and the same method used in the Amazon Rio Reserve I, II, III and IV areas. Therefore, it is reasonable to assume that the factor calculated by Feldpausch and his collaborators is applicable to the project areas.

$$C_{RSD,t} = F_{RSD,t} * C_{merch,t}$$

Equation 25 – Calculation of carbon resulting from forest damage residuals left in the forest after trimming the extracted logs.

In which:

$C_{RSD,t}$ – Annual carbon in the residual stand damage in year t, *t* (where *t*=1,2,3... *t**years elapsed since the start of the project IFM-LtPF activities), in tC.

f_{RSD} – Factor for residual stand damage, based on the fraction of quantity of carbon damaged in the residual stand to the quantity of carbon in total merchantable logs harvested, Dimensionless.

$C_{merch,t}$ - Annual total carbon in merchantable logs harvested in the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

The values found for the carbon resulting from residues left in the forest after logging and the applied parameter values are presented in table 24.

Table 26. Total carbon contained in merchantable logs, remaining forest damage factor and annual carbon from remaining forest damage in year t

Sub-area	$C_{merch,t}$	f_{RSD}	C_{RSD}
UPA1	10,262	2.4	24,630
TALHÃO 2	6,990	2.4	16,776
TALHÃO 3	13,715	2.4	32,916
TALHÃO 4	6,228	2.4	14,947
TALHÃO 5	10,680	2.4	25,632
UPAs 5 e 6	12,888	2.4	30,932
Total	**60,763**	2.4	**145,832**

Carbon in branches and trimmings left in the forest after timber extraction

The crooked branches, canopies, and trunks cut of harvested trees are also removed in log preparation at the extraction site itself. The material removed and left in the forest is accounted for in the following equation:

$$C_{branch\_trim,t} = f_{branch\_trim} * C_{merch,t}$$

Equation 26– Calculation of carbon present in the branches and trimmings removed from extracted merchantable logs.

In which:

$C_{branch\_trim,t}$ = Annual carbon in branches and trimmings left in the forest after harvesting in year t (where t=1,2,3... t*years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{merch,t}$ = Total annual carbon in the merchantable logs harvested in the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

f_{branch_trim} = The fraction of branches and trimmings in the aboveground biomass remaining after trimming of the merchantable logs transferred to the deadwood pool. Dimensionless.

The branch and trimmings factor – f_{branch_trim}- –must be derived from the ratio between the trimmed branches biomass to the total tree biomass. For this factor was adopted a ratio between canopy and aerial biomass of 30.9%, as reported by Silva (2007). At the time the author considered the average values of the biomass found and the biomass found in the crowns of all the trees sampled.

The values found for the annual carbon in branches and cuttings left in the forest after extraction in year t and the values applied for the carbon contained in merchantable logs are presented in table 27.

Table 27. Parameters used and values found for annual carbon contained in branches and cuttings left in the forest after logging.

Sub-area	$C_{merch,t}$	f_{branch_trim}	C_{branch_trim}
UPA1	10,262	0.3	3,171
TALHÃO 2	6,990	0.3	2,160
TALHÃO 3	13,715	0.3	4,238
TALHÃO 4	6,228	0.3	1,924
TALHÃO 5	10,680	0.3	3,300
UPAs 5 e 6	12,888	0.3	3,983
Total	**60,763**		**18,776**

Carbon emissions due to the decay of the deadwood pool

For the calculation of carbon in the deadwood pool, the following equations 27 to 30 were used. According to the decay rate, we calculated the remaining carbon fraction in the deadwood pool:

$$F_{DW\_remain,t} = e^{-k_{decay}*t}$$

Equation 27 – Carbon contained in the deadwood pool.

In which:

$F_{DW\_remain,t}$ - Annual fraction of carbon in the deadwood pool that would remain in the deadwood pool in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities) after applying the decomposition rate. Dimensionless.

k_{decay}– Rate of decay of the deadwood pool, per year.

t – 1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities.

The deadwood decomposition rate, k_{decay} was extracted from research performed in the Central Amazon rainforest (CHAMBERS et al., 2000) and corresponds to 0.167 per year.

Equation 3.22 in VM0011 (Equation 28 of this report) was used to calculate the carbon *input* in the deadwood pool. This equation should be used for a variable annual harvest volume as set out in the harvesting plan or equivalent document, implying a variable input into the deadwood pool (Annex 18).

$$C_{DWpool,t} = \sum_{t=1}^{t*} (F_{DW\_remain,t} * C_{DWin,t})$$

Equation 28– Carbon in the deadwood pool.

In which:

$C_{DWpool,t}$- Cumulative carbon remaining in the deadwood pool in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$F_{DW\_remain,t}$ - Annual fraction of carbon in the deadwood pool that would remain in the deadwood pool in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities) after applying the decomposition rate. Dimensionless.

$C_{Dwin,t}$- Annual total carbon input to the deadwood pool in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the project IFM-LtPF activities), in tC.

From the values of carbon entering the deadwood pool and its accumulated carbon, it is possible to calculate the amount of carbon leaving the deadwood pool and returning to the atmosphere .

$$C_{DWout,t} = \sum_{t=1}^{t*} C_{DWin,t} - C_{DWpool,t}$$

Equation 29– Carbon emitted to the atmosphere from the deadwood pool.

In which:

$C_{DWout,t}$– Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC
$C_{Dwin,t}$- Annual total carbon input to the deadwood pool in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the project IFM- LtPF activities), in tC
$C_{DWpool,t}$- Cumulative carbon remaining in the deadwood pool in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

To calculate the carbon that leaves the deadwood pool due to wood decay.

$$C_{DWdecay,t} = C_{DWout,t} - C_{DWout,t-1}$$

Equation 30– Annual carbon that leaves the deadwood pool due to wood decay.

In which:

$C_{DWdecay,t}$– Annual carbon leaving the deadwood pool due to the decay of the deadwood in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the project IFM-LtPF activities), in tC.
$C_{DWout,t}$- Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.
$C_{DWout,t-1}$ - Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year *t*-1, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

As explained above, each area that suffered selective logging has its own Annual Operational Extraction Plan (POA), and thus operates individually. Therefore carbon which leaves the pool annually (***$C_{DWdecay,t}$***) is considered the same as the carbon leaving the pool in year *t* (***$C_{DWout,t}$***), since the sub-areas underwent logging only once. Therefore t-1 (***$C_{DWout,t-1}$***) does not exist.

The values of the parameters found to estimate carbon emissions due to decomposition of the deadwood reservoir are presented in table 28.

Table 28. Parameters found to estimate carbon emissions due to decomposition of deadwood pool

Sub-area	$F_{DW\_remain,t}$	$F_{DW\_remain,t}$	$C_{DWin,t}$	$C_{DWpool,t}$	$C_{DWout,t}$	$C_{DWout,t-1}$	$C_{DWdecay,t}$
UPA1	0.1	0.1	27,800.9	3,171.1	24,629.8	0.0	24,629.8
TALHÃO 2	0.1	0.1	18,935.4	5,907.3	40,829.0	24,629.8	16,199.2
TALHÃO 3	0.2	0.2	37,154.0	11,604.5	72,285.8	40,829.0	31,456.8
TALHÃO 4	0.2	0.2	16,870.9	16,934.7	83,826.4	72,285.8	11,540.7
TALHÃO 5	0.4	0.4	28,931.9	26,794.2	102,898.9	83,826.4	19,072.4
UPAs 5 e 6	0.6	0.6	34,914.9	42,236.8	122,371.2	102,898.9	19,472.3
Total	**1.6**	**1.6**	**164,608.0**	**106,648.6**	**446,841.0**	**324,469.9**	**122,371.2**

Net carbon from the long-term wood products pool

All wood extracted from the project area was to be used for construction, so the entire extracted amount was recorded as long-term wood products, e.g., with a half-life greater than 30 years in carbon estimates emitted by wood products. Thus, short-term wood products (with a 2-year half- life or less) were not considered as carbon sources in this PD and hence the $C_{stHWPoxidation}$ parameter is absent from Equation 31.

The carbon emitted from long-term wood products is the sum of the carbon emitted by the immediate oxidization of wood processing residues and the carbon emitted by the delayed oxidization of the products themselves.

$$C_{ltHWPoxidation,t} = C_{ltHWPresidues,t} + C_{ltHWPnet\_out,t}$$

Equation 31 – Annual carbon from the oxidation of long-term wood products.

In which:

$C_{ltHWPoxidation,t}$ =Annual carbon due to the combined delayed oxidation of long-term harvested wood products and immediate oxidation of long-term harvested wood product residues in year *t* (where t = 1,2,3 ... *t**years elapsed since the start of IFM-LtPF project activities) in tC.

$C_{ltHWPresidues,t}$ = Annual carbon due to the immediate oxidation of long-term harvested wood product residues in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{ltHWPnet\_out,t}$ = Annual net carbon due to the delayed oxidation of the long-term harvested wood products, leaving the long-term harvested wood products pool in year *t* (where *t*=1,2,3 ... *t**years elapsed since the start of IFM-LtPF project activities), in tC.

$C_{ltHWPresidues,t}$ and $C_{ltHWPnet\_out,t}$ equations are properly described in the following sections.

Table 29. Values found for annual carbon from oxidation of long-term timber products

Sub-area	$C_{ltHWPresidues,t}$	$C_{ltHWPnet\_out,t}$	$C_{ltHWPoxidation,t}$
UPA1	5,439	1,247	6,686
TALHÃO 2	3,705	766	4,470
TALHÃO 3	7,269	1,481	8,750
TALHÃO 4	3,301	379	3,680
TALHÃO 5	5,660	719	6,379
UPAs 5 e 6	6,831	754	7,585
Total	**32,205**	**5,345**	**37,550**

Carbon resulting from long-term wood products residues

It is assumed that the residues from sawmills undergo oxidation in the same year they are processed, therefore the carbon they release is calculated by the following equation:

$$C_{ltHWPresidues,t} = \overline{C}_{merch,p,t=0} * (1 - f_{lumber\_recovery}) * A_{NHA\_annual,t}$$

Equation 32– Carbon released due to immediate oxidation of long-term wood product residues.

In which:

$C_{ltHWPresidues,t}$ = Annual carbon due to the immediate oxidation of residues from long-term wood products in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{merch,p,t=0}$ = Average carbon per hectare in merchantable logs of forest product type *p*=sawlog, in the Project area, determined ex ante - before the start of IFM-LtPF project activities, hence *t*=0 years, in tC/ha.

$f_{lumber\_recovery}$ = Lumber recovery factor for proportion of merchantable log converted to harvested wood product. Dimensionless.

$A_{NHA\_annual,t}$ = Annual net harvest area for the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in ha.

The lumber recovery factor was obtained from Annex B of the methodology used (VERISSIMO et al., 1992 apud VCS, 2011) and was calculated for the Amazon and corresponds to 0.47.

Table 30. Values found for carbon calculation from long-term wood products residues

LOTE	$A_{NHA\_annual,t}$	$C_{merch,t}$	$C_{ltHWPresidues,t}$
UPA1	587	10,262	5,439
TALHÃO 2	688	6,990	3,705
TALHÃO 3	832	13,715	7,269
TALHÃO 4	750	6,228	3,301
TALHÃO 5	1,082	10,680	5,660
UPAs 5 e 6	1,492	12,888	6,831
Total	**5,430**	**60,763**	**32,205**

Carbon due to the oxidation of long-term wood products reservoir

The average carbon input of long-term harvested wood products in the pool is calculated as follows:

$$C_{ltHWPin,t} = \overline{C}_{merch,p,t=0} * f_{lumber\_recovery} * A_{NHA\_annual,t}$$

Equation 33 – Annual carbon input to the long-term harvested wood products pool.

In which:

$C_{ltHWPin,t}$ **=** Annual carbon input to the long-term harvested wood products pool from sawlog in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{merch,\,p,t=0}$ = Average carbon per hectare in merchantable logs of forest product type *p*=log in the project area, determined ex ante – before the start of the IFM-LtPF project activities, hence *t*=0 years, in tC/ha.

$f_{lumber\_recovery}$ = Lumber recovery factor for the proportion of merchantable logs converted into harvested wood products. Dimensionless.

$A_{NHA\_annual,t}$ = Net annual harvest area for the project area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in ha

The recovery factor of lumber is the same used in the previous equation, obtained from Annex B of the applied methodology (VERISSIMO et al., 1992 apud VCS, 2011), calculated for the Amazon and corresponds to 0.47. The value applied for the annual carbon input to the reservoir of long-term felled wood products from lumber is 28,558.8 tC.

According to the IPCC, the individual values for oxidation of different long-term wood products do not vary significantly. A constant product disposal rate is applied to the carbon contained in the reservoir (IPCC, 2006). Therefore it is possible to use a single oxidation factor for all long-term timber products.

$$F_{ltHWP\ \ remain,t} = e^{-k_{ltHWP\_ox} * t}$$

Equation 34 – Fraction of long-term wood products that remain in the long-term wood products pool.

In which:

$F_{ltHWP\_remain,t}$**–** Annual fraction of ltHWP that would remain in the ltHWP pool in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities) after applying the rate of oxidation. Dimensionless.
k_{ltHWP_ox}**–** Rate of oxidation for long-term harvested wood products
***t* -** 1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities.

The oxidation rate of long-term wood products was obtained from the IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006) and presented in Annex B of VM 0011, corresponds to 0.023 per year. The value found for the fraction of long-term wood products remaining in the long-term timber pool is 4.9.

With these calculated parameters, it is possible to calculate the carbon that accumulates in the long-term harvested wood products pool with the following equation, for a variable harvest volume, as established in the harvesting plan or equivalent document, there is a variable entry in the ltHWP group, VM0011, Equation 3-29b:

$$\begin{aligned} C_{ltHWPpool,t} = {} & \left(F_{ltHWP_{remain},t-(t-1)} \times C_{ltHWPin,t}\right) + \left(F_{ltHWP_{remain},t-(t-2)} \times C_{ltHWPin,t-1}\right) \\ & + \left(F_{ltHWP_{remain},t-(t-3)} \times C_{ltHWPin,t-2}\right) + \left(F_{ltHWP_{remain},t-(t-t*)} \times C_{ltHWPin,t-(t*-1)}\right) \end{aligned}$$

Equation 35– Remaining carbon in the long-term harvested wood products pool.

In which:

$C_{ltHWPpool,t}$**–** Cumulative carbon remaining in the ltHWP pool in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the project IFM-LtPF activities), in tC.
$F_{ltHWP\_remain,t}$**–** Annual fraction of ltHWP that would remain in the ltHWP pool in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities) after applying the oxidation rate. Dimensionless.
$C_{ltHWPin,t}$**-** Annual carbon input to the long-term harvested wood products pool from sawlog in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.
The value found for the carbon remaining in the long-term wood pool is 75,466.8 tC

And the cumulative overall emissions leaving the long-term harvested wood products pool is calculate by equation 36:

$$C_{ltHWPout,t} = \sum_{t=1}^{t} C_{ltHWPin,t} - C_{ltHWPpool,t}$$

Equation 36– Carbon leaving the long-term harvested wood products pool.

In which:

$C_{ltHWPout,t}$– Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere from year *t*=1 to year *t* (where *t*=1,2,3... *t** years elapsed since the start of the project activities IFM- LtPF), in tC.

$C_{ltHWPin,t}$- Annual carbon input to the long-term harvested wood products pool from sawlog in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{ltHWPpool,t}$– Cumulative carbon remaining in the ltHWP pool in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the project IFM-LtPF activities), in tC.

The value found for cumulative carbon leaving the ltHWP pool and emitted into the atmosphere is 20,561.3 tC.

Finally, to calculate annual emissions leaving the long-term harvested wood products pool due to delayed oxidization, the following equation is used:

$$C_{ltHWPnet\_out,t} = C_{ltHWPout,t} - C_{ltHWPout,t-1}$$

Equation 37– Annual net carbon from the delayed oxidation of long-term harvested wood products.

In which:

$C_{ltHWPnet\_out,t}$– Annual net carbon due to the delayed oxidation of the long-term harvested wood products, leaving the long-term harvested wood products pool in year *t* (where t = 1,2,3 ... *t**years elapsed since the start of IFM-LtPF project activities), in tC.

$C_{ltHWPout,t}$– Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere in year *t*=1 until the year *t* (where *t*=1,2,3... *t** years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{ltHWPout,t-1}$– Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere in year t-1(where *t*=1,2,3... *t** years elapsed since the start of the IFM-LtPF project activities), in tC.

In the same way that there is no $C_{DW\_out, t-1}$, there is also no $C_{ltHWPout,t-1}$, as each sub-area suffered extraction only once over the years, as aforementioned. Thus, the net annual carbon due to delayed long-term wood product oxidation leaving the long-term wood product reservoir has a value of $C_{ltHWPout,t}$.

The synthesis of the values found for the estimation of carbon emissions due to the oxidation of the ltHWP pool and the necessary parameters for its estimation found in the project area, described throughout this topic are presented in table 31.

Table 31. Parameters calculated for the estimation of carbon emissions due to oxidation of the long term wood product pool

Sub-areas	$C_{merch,j,t=0}$	$C_{ltHWPin,t}$	$F_{ltHWP\_remain,t}$	$C_{ltHWPpool,t}$	$C_{ltHWPout,t}$	$C_{ltHWPout,t-1}$	$C_{ltHWPnet\_out,t}$
UPA1	17	4,823	1	3,577	1,247	0	1,247
TALHÃO 2	10	3,285	1	6,096	2,012	1,247	766
TALHÃO 3	16	6,446	1	11,061	3,493	2,012	1,481
TALHÃO 4	8	2,927	1	13,609	3,873	3,493	379
TALHÃO 5	10	5,020	1	17,910	4,591	3,873	719
UPAs 5 e 6	9	6,058	1	23,213	5,345	4,591	754
Total	**71**	**28,559**	**5**	**75,467**	**20,561**	**15,216**	**5,345**

Carbon in the growth foregone due to selective logging

Foregone carbon growth ($C_{growth\_foregone}$) is the growth that did not occur in the trees that were extracted which consequently no longer store biomass, and is calculated after two consecutive monitoring periods. The above-ground biomass of all marketable trees within the permanent sampling plots should be measured in these two periods. Further calculations should be made using a comparison of these values to obtain the annual growth of aboveground biomass per hectare ($\bar{G}_{growth\_foregone}$). Using this value it is possible to reach the carbon lost due to growth with the following equation:

$$C_{growth\_foregone,t} = CF_{AGB} * \bar{G}_{growth\_foregone,t} * \sum_{t=1}^{t*} A_{NHA\_annual,t}$$

Equation 38–Calculation of carbon in the growth foregone due to the selective logging

In which:

$_{growth\_foregone,t}$ = Annual carbon lost due to growth foregone in the aboveground biomass in the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$\overline{G}_{growth\_foregone,t}$ = Average growth per hectare per year in the aboveground biomass in the merchantable trees in the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in t d.m/ha/year.

CF_{AGB} - Carbon fraction in the aboveground biomass of trees for the tropical forest. In tC per t d.n.

$A_{NHA\_annual,t}$ = Annual net harvest area for the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in ha.

As this parameter is to be estimated by two time measurements with two monitoring periods, the parameter is not applied as there were no two monitoring periods. Therefore the value applied to the parameter is equal to 0 tC, which is a conservative approach to the project emissions.

Carbon in the regrowth after selective logging

The methodology presents a conservative approach to calculate the carbon contained in regrowth, taking into account the regrowth that occurs throughout the managed area. The calculation of the carbon present in forest regrowth after selective logging is given by the following equation:

$$C_{regrowth,t} = \left(\overline{G}_{regrowth,t} * CF_{AGB}\right) * \sum_{t=1}^{t*} A_{NHA\_annual,t}$$

Equation 39– Carbon due to regrowth

In which:

$C_{regrowth,t}$- Annual carbon increase in the biomass due to regrowth following logging in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$\overline{C}_{regrowth,\ t}$– Average regrowth per hectare per year of the aboveground biomass after logging in year *t* (where *t*=1, 2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in t d.m./ha/year.

CF_{AGB}– Carbon fraction in the aboveground biomass of trees for the tropical forest, in tC/t d.m.

$A_{NHA\_annual,t}$- Annual net harvest area for the Project Area in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in ha.

The average annual above-ground biomass regeneration after extraction per hectare ($\overline{C}_{regrowth,\ t}$) was taken from a study done in eastern Amazonia on above-ground biomass dynamics after low impact selective extraction (MAZZEI et al., 2010), that is, the same case of this study and corresponds to 2.6 t.d.m./ha/year. The carbon fraction of above-ground biomass in tropical forest trees - CF_{AGB}– was obtained from the applied methodology and corresponds to 0.47 tC/t.d.m. The applied value for regeneration carbon after selective extraction is presented in table 32.

Table 32. Estimation of regeneration carbon after selective extraction obtained for the project area.

Sub-areas	$A_{NHA\_annual,t}$	$C_{regrowth,t}$
UPA1	587	717
TALHÃO 2	688	841
TALHÃO 3	832	1.016
TALHÃO 4	750	917
TALHÃO 5	1.082	1.322
UPAs 5 e 6	1.492	1.823
Total	**5.430**	**6.635**

Finally and with all estimates made as described, it is possible to obtain the value of carbon emissions due to decay. The table below (Table 33) includes the main pools and the result from Equation 11. Notably, two pools are absent: the foregone carbon growth and carbon released by the oxidation of short-term timber products. The first one will only be calculated when monitoring activities begin. The latter is zero because there are no short-term timber products from the logging activities in the area.

Table 33. Value of carbon emissions due to decay in the Project Area (calculated from the carbon arising from the decay of dead matter, decay of long-term wood products and forest regeneration in logging areas)

Sub-areas	$C_{DWdecay,t}$	$C_{ltHWPoxidation\,,t}$	$C_{growth\_foregone}$	$C_{regrowth,t}$	$C'_{degradation}$
UPA1	24.630	6.686	0	717	112.195
TALHÃO 2	16.199	4.470	0	841	72.706
TALHÃO 3	31.457	8.750	0	1.016	143.698
TALHÃO 4	11.541	3.680	0	917	52.449
TALHÃO 5	19.072	6.379	0	1.322	88.474
UPAs 5 e 6	19.472	7.585	0	1.823	92.527
Total	**122.371**	**37.550**	**0**	**6.635**	**562.049**

$C_{DWdecay,t}$ – annual carbon leaving the deadwood pool due to the decay of deadwood; $C_{ltHWPoxidation,t}$ – annual carbon due to the oxidation of long-term harvested wood products; $C_{growth\_foregone}$ – annual carbon lost due to growth in the logged area; $C_{regrowth,t}$ – annual carbon increase in the biomass due to regrowth; $C'_{degradation}$ – annual total carbon emissions associated with degradation as a result of the baseline activity.

5.3.4 Baseline Activity Emissions

Besides the emissions produced by the logging itself, all emissions caused by the implementation of baseline activities must be taken into account, e.g., fuel consumption and electricity demands for the activities. The following equation includes all these additional emissions:

$$C'_{emissions,t} = E_{harvest,t} + E_{onsiteprep,t} + E_{hauling,t} + E_{transport,t} + E_{processing,t} + E_{distribution,t}$$

Equation 40– Carbon emissions due to the baseline activity.

In which:

$C'_{emissions,t}$ - Annual total carbon emissions associated with the baseline activity of selective logging operations in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$E_{harvest,t}$– Annual emissions due to harvesting operations such as felling and snigging in year *t(*where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{onsiteprep,t}$- Annual emissions due to on-site preparation such as trimming of tree canopy, roots, branches and defective components in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$E_{hauling,t}$– Annual emissions due to log hauling in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$E_{transport,t}$– Annual emissions due to log transport from collection site to processing site in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$E_{processing,t}$– Annual emissions due to electricity consumption in sawmill in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$E_{distribution,t}$– Annual emissions due to transport of the sawn product from the mill to the port for export or to the warehouse for local usage in year *t(where t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

The described parameters, equations and calculations are presented in the following sections.

Emissions due to harvesting operations

Logging is a mechanized process and therefore contributes to GHG emissions. In tropical forests, the most common logging method used including is the chainsaw. This is also true for the project area. The following formula is used to calculate the contribution of carbon released into the atmosphere due to selective logging operations:

$$E_{harvest,t} = FC_{harvest} * EF_{fuel} * V_{merch,t}$$

Equation 41– Calculation of emissions from harvesting operations.

In which:

$E_{harvest,t}$–Annual emissions due to harvesting operations such as felling and snigging in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$FC_{harvest}$ – Fuel consumption of equipment employed for felling and snigging per m3 of merchantable log harvested, in kL/m^3.
EF_{fuel} – Fuel emission factor, in tCO_2-e/kL.
$V_{merch,t}$– Annual volume of merchantable logs in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in m^3.

Fuel consumption for chainsaws was taken from a master's thesis, written in the Amazon, which calculated the fuel and oil used in logging operations for this biome (Campos, 2012) and corresponds to 0.15 liters / m^3 of gasoline and 0.031 liters / m^3 of oil.

Both fuel and diesel oil emission factors were taken from the table presented by the IPCC (IPCC, 2006). All VM0011 methodology instructions contained in Annex C (C.2 and C.3) for the conversion of other emitted gases (CH_4 e N_2O) due to a CO_2 equivalent (CO_2-e). were followed. For this conversion, a Global Warming Potential (GWP) value is required for each fuel, obtained from the United Nations Framework Convention on Climate Change website (UNFCCC, 2013). Transformation of the emission factor to the correct units also requires knowledge of each fuel's heating value and density. These values were also obtained from the IPCC (IPCC, 2006). The above explanation applies to all equations referring to the emission factor of a fuel (***EF_{fuel}***).
The parameters used to calculate the fuel emission factor and the values found are presented in tables 34 and 35.

Table 34. Parameters used to calculate the diesel emission factor for each gas converted to equivalent carbon dioxide.

Gas	*$EF_{default}$*	*HV_{diesel}*	*P_{fuel_diesel}*	*GWP*	*EF_{diesel}*
CO_2	74,100	0.00004	844	1	2.68892
CH_4	4	0.00004	844	21	0.00015
N_2O	29	0.00004	844	310	0.00104
Total	-	-	-	-	3.01381

Table 35. Parameters used for calculating the gasoline emission factor for each gas converted to equivalent carbon dioxide

Gas	$EF_{default}$	$HV_{gasoline}$	$P_{fuel\_gasoline}$	GWP	$EF_{gasoline}$
CO_2	69,300	0.00004	741	1	2.27394
CH_4	170	0.00004	741	21	0.00558
N_2O	0	0.00004	741	310	0.00001
Total	-	-	-	-	2.39515

Finally, applying equation 41, the value found for emissions from harvesting operations corresponds to 67.59 tCO2-e, which represents 1.4% of project emissions. This parameter was considered insignificant according to the tool explained in item 5.1.3.

Emissions due to on-site preparation

Preparation of logs in the extraction site consists of trimming branches, removing canopies and defective parts of the trunks. The use of chainsaws was also considered for all these procedures,. Thus, we adopted the same fuel consumption value for machinery presented earlier (CAMPOS, 2012). Equations 31 and 32 were used to calculate the carbon from these activities. The first equation calculates the volume of branches and trimmings removed from the logs to calculate the total emissions from site preparations using the second equation.

$$V_{branch\_trim,t} = \frac{C_{branch\_trim,t}}{CF_{wood} * D}$$

Equation 42 – calculation of the volume of branches and trimmings removed from the logs.

In which:

$V_{branch\_trim,t}$ – Annual volume of the trimmings and branches produced from harvesting in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in m^3.

$C_{branch\_trim,t}$ **–** Annual carbon in branches and trimmings left over from harvesting in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

CF_{wood} – Carbon fraction of wood for the tropical forest, in tC/(t.d.m.).

D – Wood density for the tropical forest with corresponding climate region and ecological zone, in (t d.m.)/m^3 followed and correspond to 0.49 tC / t.d.m. and 0.676 (t d m) / m ^{3}.

The carbon fraction and wood density values for tropical forests were both taken from Annex B of the Methodology and correspond to 0.49 tC / t.d.m. e 0.676 (dm / m^3, respectively. For the annual carbon calculation in branches and cuttings left after extraction, the ratio of branches and cuttings to the volume of merchantable logs found by Silva (2007) was adopted and corresponds to 0.309 (dimensionless), or a ratio of 30.9% carbon on the volume of tradable logs.

$$E_{onsiteprep,t} = FC_{trim\_equip} * EF_{fuel} * V_{branch\_trim,t}$$

Equation 43 – Emissions from the preparation of the logs at the extraction site.

In which:

$E_{onsiteprep,t}$- Annual emissions due to on-site preparation such as trimming of tree heads, butts, branches and defective components in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
FC_{trim_equip} **–** Fuel consumption of equipment employed for trimming per m3 of trimmed material, in kL/m^3.
EF_{fuel} – Fuel emission factor , in tCO_2-e/kL.
$V_{branch\_trim,t}$ – Annual volume of the trimmings and branches produced from harvesting in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in m^3.

Chainsaw fuel consumption was obtained from a master's dissertation made in the Amazon, which accounts for the gasoline and oil used in the extraction operations for this biome (CAMPOS, 2012) and corresponds to 0.15 liters / m^3 of gasoline and 0.031 liters / m^3 of oil. The fuel emission factor adopted for estimating emissions due to log preparation at the extraction site is the same as that adopted for calculating emissions due to logging operations and are presented in the previous topic. The value found for the estimated emissions due to log preparation at the extraction site was 9.55 tCO_2-e, which represents 0.2% of the total annual project emissions (Table 36). Therefore, this parameter was considered insignificant according to the tool explained in item 5.1.3 and emissions are not accounted

Table 36. Parameters used to estimate emissions due to on-site preparation.

Sub-area	$C_{merch,t}$	C_{branch_trim}	$V_{branch\_trim,t}$	$E_{onsiteprep,t}$
UPA1	10,262	3,171	4,376	2
TALHÃO 2	6,990	2,160	2,981	1
TALHÃO 3	13,715	4,238	5,849	2
TALHÃO 4	6,228	1,924	2,656	1
TALHÃO 5	10,680	3,300	4,554	2
UPAs 5 e 6	12,888	3,983	5,496	2
Total	60,763	18,776	25,913	10

Emissions due to log hauling

To calculate the emissions due to dragging logs one must know the vehicle's fuel consumption per m^3 for such an operation, in this case the *skidder*. Since it was not possible to find the value for the make and model used (skidder Muller TS 22) not even from the manufacturer, the value for a Grapple Skidder was used and correspond to 2.11×10^{-4} kl/m^{3}.
A conservative approach was adopted using the lowest value from a range of values provided in the study (SMIDT E GALLAGHER S/A). The fuel emission factor adopted for estimating logging drag emissions is the same as that used for calculating emissions due due to log hauling are presented in tables 34 and 35 in this topic.

$$E_{hauling,t} = FC_{hauling} * EF_{fuel} * V_{merch,t}$$

Equation 44 – Calculation of carbon emissions from dragging extracted logs.

In which:

$E_{hauling,t}$– Annual emissions due to log hauling in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$FC_{hauling}$ - Fuel consumption of equipment for hauling one m3 of merchantable log, in kL/m^3.

EF_{fuel} – Fuel emission factor, in tCO_2-e/kL.
$V_{merch,t}$– Annual volume of merchantable logs in year t (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in m^3.

The value found for the estimation of log hauling emissions at the extraction site was 116.61 tCO2-e, representing 2.4% of the total annual project emissions (Table 37). Therefore, this parameter was considered insignificant according to the tool explained in item 5.1.3 and emissions are not accounted.

Table 37. Parameters used to estimate emissions due to log dragging at the extraction site.

Sub-area	$V_{merch,t}$	$E_{hauling,t}$
UPA1	30,970	20
TALHÃO 2	21,094	13
TALHÃO 3	41,390	26
TALHÃO 4	18,794	12
TALHÃO 5	32,230	20
UPAs 5 e 6	38,895	25
Total	183,373	117

Emissions due to log transport

Timber was shipped either on trucks or ferries, both using diesel fuel. The transportation was performed between three points until reaching the processing site. The first transport was carried by carts from the extraction site (inside the forest) to the extraction port, from where the timber was transported to the city headquarters by ferries. In this route was considered the transportation of the whole volume of wood by the two means of transportation. From the port of Manicoré municipal headquarters, part of the timber was trucked to a sawmill in Manicoré (2%), and the rest went to the Gethal processing plant in Itacoatiara (98%) by ferry.

The calculation of the number of vehicles required for log transport is given by the equation:

$$N_{trucks\_transport,t} = \frac{V_{merch,t}}{Cap_{truck}}$$

Equation 45– Formula to estimate the number of trucks/ferries needed to transport the amount of wood extracted.

In which:

$\boldsymbol{N_{trucks\_transport,t}}$ – Number of truck trips required for log transport from collection depot to processing sites in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in number of trucks/ferries.

$\boldsymbol{V_{merch,t}}$ – Annual volume of merchantable logs in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in m^3.

$\boldsymbol{Cap_{truck}}$ – Truck load capacity, in m^3 per truck/ferry.

The load capacity of each vehicle was provided by the project proponent institution and correspond to 30 m^3 for trailers and 500 m^3 for ferries, considering the need for two means of transport, 2% of the volume transported by truck to the sawmill and 98% by ferry to the Gethal plant. Therefore the calculations are performed separately. The number of trailers and rafts required to transport the harvested wood is shown in table 38.

Table 38. Volume of tradable logs, number of trailers and rafts required to transport all timber to municipal headquarters, volume of sawmills (2%), volume of Gethal (98%) and number of trailers needed transport to processing place

Sub-area	$V_{merch,t}$	$N_{trucks\_transport,t}$	$N_{balsas\_transport,t}$	$V_{merch\_2\%}$	$V_{merch\_98\%}$	$N_{trucks\_transport,t\ 2\%}$	$N_{balsas\_transport,t\ 98\%}$
UPA1	30,970	1,032	62	619	30,351	21	61
TALHÃO 2	21,094	703	42	422	20,672	14	41
TALHÃO 3	41,390	1,380	83	828	40,562	28	81
TALHÃO 4	18,794	626	38	376	18,418	13	37
TALHÃO 5	32,230	1,074	64	645	31,586	21	63
UPAs 5 e 6	38,895	1,297	78	778	38,117	26	76
Total	183,373	6,112	367	3,667	179,706	122	359

The total kilometers driven can be subsequently calculated according to the round trip distance between the sites and the number of transport vehicles needed.

$$KM_{transport\_total,t} = KM_{transport,t} * N_{trucks\_transport,t} * 2$$

Equation 46–Total of kilometers driven in transporting logs.

In which:

$KM_{transport\_total,t}$ – Annual total log transport distance in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in km.

$KM_{transport,t}$ – Annual log transport distance from collection depot to processing location in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in km per transportation vehicle.

$N_{trucks\_transport,t}$ – Number of transportation vehicle trips required for log transport from collection depot to processing plant in year

t (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in number of trucks/ferries.

2 – Constant, indicating return trip. Dimensionless.

The distance between sites was also provided by the project proponent institution. The distance traveled by trucks between the extraction site and the extraction port is 30 km. The distance traveled by ferries between the port of extraction and the port of Manicoré for distribution is 20 km. The distance traveled from the port of the municipal headquarters to the sawmill by trailer (2% of the volume) is 3 km. The distance traveled by ferries between the port of Manicoré and the port of Itacoatiara, the municipality where the Gethal factory is located, is 330 km. The total km traveled to transport the logs to the processing site is shown in table 39.

Table 39. Total distance traveled for transporting logs by trucks and ferriers considering the round trip on each leg traveled from the exploration site to the processing site.

Sub-area	$Km_{transport\_truck}$	$Km_{transport\_balsa}$	$Km_{transport\_truck\_2\%}$	$Km_{transport\_balsa\_98\%}$	$Km_{transport\_total\_truck,t}$	$Km_{transport\_total\_balsa,t}$
UPA1	61,940	2,478	124	40,063	62,064	42,541
TALHÃO 2	42,188	1,688	84	27,287	42,272	28,975
TALHÃO 3	82,779	3,311	166	53,542	82,945	56,853
TALHÃO 4	37,588	1,504	75	24,312	37,664	25,816
TALHÃO 5	64,460	2,578	129	41,693	64,589	44,271
UPAs 5 e 6	77,790	3,112	156	50,315	77,946	53,427
Total	366,747	14,670	733	237,212	367,480	251,882

Finally, Emissions related to the transportation of logs can be calculated in terms of mileage, efficiency of vehicles and their emission factors, as shown in the following equation:

$$E_{transport,t} = \frac{KM_{transport\_total,t}}{Eff_{vehicle}} * EF_{fuel}$$

Equation 47– Calculation of carbon emissions due to extracted logs transport.

In which:

***E**transport,t*– Annual emissions due to log transport haulage from felling location to the collection depot/sawmill in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$KM_{transport\_total,t}$ – Annual total log transport distance in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in km.

$Eff_{vehicle}$ – Fuel efficiency for vehicle type, in km per kL.

EF_{fuel} – Fuel emission factor, in tCO_2-e/kL.

Truck consumption was obtained by querying the websites of several manufacturers, which indicate an efficiency of 2 km/l. Ferry fuel consumption was obtained from a study carried out in Amazonas river by Barros and Uhl (1997) and corresponds to an efficiency of 3.77 km/l. The total annual distance of log transport by trucks and ferry is shown in table 40. The emission factors for fuels applied are 2.40 tCO2-e/kL for gasoline and 3.01 tCO2-e/kL for diesel[61].

Table 40.– Emissions due to the transport of logs by trucks and ferries

Sub-area	$KM_{transport\_total\_truck,t}$	$KM_{transport\_total\_balsa,t}$	$E_{transport\_truck}$	$E_{transport\_balsa}$	$E_{transport,t}$
UPA1	62,064	42,541	94	34	128
TALHÃO 2	42,272	28,975	64	23	87
TALHÃO 3	82,945	56,853	125	45	170
TALHÃO 4	37,664	25,816	57	21	77
TALHÃO 5	64,589	44,271	97	35	133
UPAs 5 e 6	77,946	53,427	117	43	160
Total	367,480	251,882	554	201	755

Emissions from processing where grid electricity is available

The energy used in processing wood comes from the power grid and steam turbines from the burning of non-usable wood. As the wood used for the generation of steam has been accounted for in the calculation of long-term wood product residues ($C_{ltHWPresidues,t}$) it is not considered again in this section to avoid double counting.

Emissions from wood processing depend on the source of electricity available and it is a function related to the processed amount, the demand for electricity and the electricity emission in the country where the IFM project is performed. The steps for calculation are found in equations 37 and 38.

$$Q_{processing,t} = V_{merch,t} * e_{demand}$$

Equation 48 – Calculation of electricity consumption required for wood processing.

In which:

$Q_{processing,t}$ – Annual quantity of electricity consumption for processing in year *t* (where *t*=1,2,3... ... *t**years elapsed since the start of the IFM-LtPF project activities), in kWh.

$V_{merch,t}$– Annual volume of merchantable logs in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in m³.

e_{demand} – Electricity demand for processing per volume processed, in kWh m³.

[61] The description of the application of the method for calculating the fuel emission factor is presented in the topic: "Emission due to cutting operations"

The electricity demand factor (e_{demand}) was taken from Annex B of the applied methodology VCS-VM0011 (POOLE AND PINHEIRO, 2003 apud VCS, 2011) and corresponds to an energy demand of 20 kWh m^{-3}.

$$E_{processing,t} = Q_{processing,t} * EF_{electricity}$$

Equation 49 – Calculation of emissions from the harvested wood processing.

In which:

$\boldsymbol{E_{processing,t}}$ – Annual emissions due to electricity consumption in sawmill in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.
$\boldsymbol{Q_{processing,t}}$ – Annual quantity of electricity consumption for processing in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in kWh.
$\boldsymbol{EF_{electricity}}$ – Electricity emission factor for the host country, in tCO_2-e in kWh.

The electricity emission factors for Brazil for each year were obtained from the Ministry of Science and Technology website (MCTIC, 2013), and a publication from the International Energy Agency (IEA, 2012). The IEA provides values for the electricity emissions factor for the years 1990, 1995, 2000 and yearly from 2002 to 2009. As often as possible we chose the value corresponding to the logging year, when not possible we used the value of the closest year. Emissions were calculated up to the year 2003. The MCTIC website is more accurate with respect to information for Brazil, but only emission factors beginning in the year 2006 are available therefore only information from the years 2006-2008 was used.

The electricity emission factors for the project were 8.8×10^{-5} tCO2e / kWh for the year 2000, 7.8×10^{-5} tCO2e/kWh for the year 2003, 3.2×10^{-5} tCO2e / kWh for the year 2006 and 2.9×10^{-5} tCO2e / kWh for the year 2008.
The estimated emissions due to wood processing where a power grid is available found for the project emissions calculation is presented in table 41.

Table 41. Electricity emission factor adopted in Brazil for the years 2000, 2003, 2006 and 2008.

Sub-area	$Q_{processing,t}$	$E_{processing,t}$
UPA1	619,404	55
TALHÃO 2	421,881	37
TALHÃO 3	827,792	65
TALHÃO 4	375,884	33
TALHÃO 5	644,603	21
UPAs 5 e 6	777,905	23
Total	3,667,469	233

Emissions Due to Log Distribution

Harvested wood was directed to two locations, as mentioned above. The 2% transported to the sawmill in Manicoré was distributed throughout the municipality. There is no information available for the distances to local wood sellers. Conservatively, the 2% was considered to be zero, as suggested by the methodology. The calculation of emissions due to wood distribution focused on the 98% of the remaining wood, which left the Gethal factory in Itacoatiara for domestic and international destinations.

Domestic destinations included the ports of Santos in São Paulo, Paranaguá in Paraná and Itajai in Santa Catarina, receiving 50% of the wood from the Gethal factory. The information on the volume of wood sent to each of these ports is unknown, so an average distance of 313 km between these ports was considered for shipping the timber, with a maximum difference in distance from the Itacoatiara port to all the others,. The remaining 50% was exported to the United States and Germany, each receiving half of total exports. The entire plywood volume, both domestic and international, was sent in cargo ships.

Estimates for port distance were taken from the National Agency for Waterway Transportation (in Portuguese *Agência Nacional de Transportes Aquaviários*) (ANTAQ, 2004), which are more accurate. International distances were estimated in a straight line using Internet tools (http://www.cidademapa.com.br/). The ships were able to transport between 600 and 1,000 m3 of wood each trip, however, it is not known what type of ships were used and which trips and how many trips were made. Therefore a value of 1,000 m^3 was used as a conservative estimate. Ship fuel consumption was calculated based on ANTAQ data (2009). All values used as inputs for the calculation of emission parameters due to the distribution of the logs are shown in Annex 18 in the "Calculations_baseline" tab. Table 21 presents the compiled values of emissions caused by the project activities.

To calculate emissions from the distribution of the logs from sawmills to their destination, the amount of long-term wood products is first calculated by the following equation:

$$V_{ltHWP,t} = \frac{C_{ltHWPin,t}}{D * CF_{wood}}$$

Equation 50– Amount of long-term wood products.

In which:

$V_{ltHWP,t}$ – Annual volume of long-term harvested wood products in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in m^3.

$C_{ltHWPin,t}$ **–** Annual carbon input to the long-term harvested wood products pool from sawlog in year *t*, (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

D – Wood density for the tropical forest with corresponding climate region and ecological zone, in (t d.m.)/m^3.

CF_{wood} – Carbon fraction of wood for the tropical forest, in tC/(t d.m.).

The wood density values(***D***) and the wood carbon fraction in tropical forests (CF_{wood}) were taken from Annex B of the VCS-VM0011 methodology.

The value of parameter D was obtained from the average density of commercial species listed in the forest census inventory carried out during the licensing process, which lists the commercial species suitable for exploitation in the project area and corresponds to 0.49 tC/t d.m. The carbon fraction of wood in tropical forests (CFwood) was taken from appendix B of the applied methodology VM0011 and corresponds to 0.49 t d.m./m^3. The values found for the volume of long-term timber products are presented in table 42.

Table 42. Values found to calculate emissions due to log distribution

Sub-area	$C_{ltHWPin,t}$	$V_{ltHWP,t}$
UPA1	4,823	3,495
TALHÃO 2	3,285	4,534
TALHÃO 3	6,446	8,896
TALHÃO 4	2,927	4,040
TALHÃO 5	5,020	6,928
UPAs 5 e 6	6,058	8,360
Total	28,559	36,252

The number of transports (ships) required for distribution is then determined by dividing the volume of long-life products by the vehicles' carrying capacity:

$$N_{trucks_{distrib},t} = \frac{V_{ltHWP,t}}{CAP_{truck}}$$

Equation 51 - Calculation of the number of ships required to transport logs

In which:

$N_{trucks_{distrib},t}$ - Annual number of transport trips required to distribute logs from the processing plant to the distribution / export point in year t, (where t = 1,2,3 ... t * years elapsed since the beginning of the IFM-LtPF project activity);

$V_{ltHWP,t}$ = Annual volume of long-term harvested wood products in year t, (where t = 1,2,3 ... t * years elapsed since the start of the IFM-LtPF project activity) in m^3;

CAP_{truck} - Transport load capacity in m^3/transport

Then you must determine the total distance traveled using the equation

$$KM_{distribtotal,t} = KM_{distrib,t} \times N_{truck_{distrib},t} \times 2$$

Equation 52- Calculation of the total distance traveled for log transportation

In whuch:

$KM_{distribtotal,t}$ - Total annual distribution distance in year t, (where t = 1,2,3 ... t * years elapsed since the start of the IFM-LtPF project activity) km

$KM_{distrib,t}$ - Annual transport distance from the processing point to the distribution / export point in year t (where t = 1,2,3 ... t * years have elapsed since the activity began. IFM-LtPF project) km/ship^{-1}

$N_{truck_{distrib},t}$ - Annual number of transport trips required to distribute logs from the processing plant to the distribution / export point in year t (where t = 1,2,3 ... t * years have elapsed since the beginning of the IFM-LtPF project activity) in number of ships

2 - Constant, indicating return trip without dimensions

Finally, we must estimate the emissions due to the distribution of logs through the equation:

$$E_{distribution,t} = \frac{KM_{distribtotal,t}}{Eff_{vehicle}} \times EF_{fuel}$$

Equation 53 - Calculation of emissions due to log distribution

In which:

$E_{distribution,t}$ - Annual emissions due to the transportation of sawn product from the mill to the export dock or local warehouse in year t (where t = 1,2,3 ... t * years have elapsed since start of IFM Project Activity -LtPF) in tCO2-e

$KM_{distribtotal,t}$ - Total annual distribution distance in year t, (where t = 1,2,3 ... t * years elapsed since the start of the IFM-LtPF project activity) in km

$Eff_{vehicle}$ - Fuel efficiency for vehicle type in km / kL^{-1}

EF_{fuel} - Fuel emission factor at tCO2-e / kL^{-1}

The applied fuel efficiency for ships is 250 km/kl^{-1}. The emission factor for fuels applied is 3.01 tCO2-e/kL for diesel. The calculated parameters and the estimated emissions due to the distribution of logs are presented in table 43.

Table 43. Total distance traveled for log distribution and estimated emissions due to log distribution.

Sub-area	$Km_{distributtotal,t}$	$E_{distribution,t}$
UPA1	20,861	251
TALHÃO 2	27,062	326
TALHÃO 3	53,100	640
TALHÃO 4	24,112	291
TALHÃO 5	82,699	997
UPAs 5 e 6	99,801	1,203
Total	307,635	3,709

With all parameters calculated it is possible to estimate emissions due to Baseline Activities. Table 44 presents the compiled emission figures from Project activities.

Table 44. Emissions due to processes related to baseline activities.

Sub-areas	$E_{harvest,t}$	$E_{onsiteprep,t}$	$E_{hauling,t}$	$E_{transport,t}$	$E_{processing,t}$	$E_{distribution,t}$	$C'_{emissions,t}$
UPA1	11	2	20	128	55	251	434
TALHÃO 2	8	1	13	87	37	326	450
TALHÃO 3	15	2	26	170	65	640	875
TALHÃO 4	7	1	12	77	33	291	401
TALHÃO 5	12	2	20	133	21	997	1.150
UPAs 5 e 6	14	2	25	160	23	1,203	1.386
Total	**68**	**10**	**117**	**755**	**233**	**3,709**	**4.697**

$E_{harvest,t}$ – annual emissions due to harvesting operations; $E_{onsiteprep,t}$ –annual emissions due to on-site preparation;$E_{hauling,t}$ – annual emissions due to log hauling;$E_{transport,t}$ – Annual emissions due to log transport;$E_{processing,t}$ – annual emissions due to electricity consumption for processing wood;$E_{distribution,t}$ – annual emissions due to transport of wood;$C'_{emissions,t}$ – annual total carbon emissions associated with baseline activity operations of selective logging.

5.4 Project Emissions (CL2.1)

The project activities effectively begin when the logging activities end and forest carbon stocks are stored by suspending emissions from forest management. In the case of the Amazon Rio areas I, II, III and IV, the official start of the project is 2013, though logging activities were suspended in 2010.

At the start of the project, carbon emissions related to planning and implementation are generated. There are also emissions caused by natural disturbances and the illegal deforestation that may occur in the area. These emissions must also be accounted for and are considered in this section.
The general equation for emissions generated by the project is as follows:

$$C'_{actual,t} = E_{projplan,t} + E_{design,t} + E_{monitoring,t} + [(C_{natdisturb,t} + C_{illegal_{harvest,t}}) * \frac{44}{12}]$$

Equation 54 – Total annual emissions related to project activities.

In which:

$C'_{actual,t}$– Annual total carbon emissions associated with the project activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{projplan,t}$– Annual emissions due to administration and project planning in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{design,t}$ – Annual emissions from travel for design and set up in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{monitoring,t}$ – Annual emissions due to monitoring for field work in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C_{natdisturb,t}$ – Annual carbon losses due to natural disturbances in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

$C_{illegal\_harvest,t}$ – Annual carbon losses due to illegal harvesting in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tC.

44/12 – The ratio of molecular weight of carbon dioxide to carbon, in tCO_2-e tC.

The primary and secondary effects of the project activities were determined using the protocol given by the World Business Council for Sustainable Development in conjunction with the World Resources Institute (WBCSD and WRI, 2005).

The main activity of the project is to transform areas previously used for selective extraction in protected areas, i.e., a change in forest management. The primary purpose of the project is to increase the forest carbon stock, since this project activity increases the storage and reduces CO_2 emissions to the atmosphere by biological processes from the regeneration resulting from suspending extraction activities. The secondary effects of the IFM project are only *upstream*, i.e., they are related to inputs used in the activities that generate emissions. These effects include the fuel spent on transportation for the administration, planning, design and monitoring of project activities. The table 45 summarizes the annual emissions from project activities since 2011 to calculate an annual average for the three years and to project as the basis for the estimation of emissions from project activities.

Table 45. Annual carbon emissions from the project activities, since the year 2011

Ano	$E_{projplan}$	E_{design}	$E_{monitoring,t}$	$n_{atdisturb,t}$	$C_{illegal\_harvest,t}$	$C_{actual,t}$
2011	11.27	12.18	16.33	0.00	0.00	39.77
2012	10.25	8.04	16.33	0.00	0.00	34.62
2013	50.58	8.96	16.33	0.00	0.00	75.87
Total	**72.09**	**29.18**	**48.99**	**0.00**	**0.00**	**150.26**

5.4.1 Emissions Due to Project Planning

The emissions from project planning come from administrative activities and associated travel:

$$E_{projplan,t} = E_{admin,t} + E_{plan\_travel,t}$$

Equation 55– Emissions associated with project planning

In which:

***E**projplan,t*– Annual emissions due to administration and project planning in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

***E**admin,t* – Annual emissions due to electricity consumption required for administration of the project activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

***E**plan_travel*– Annual emissions due to travel for project planning in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

Emissions due to Administration

The calculation of emissions generated by administrative activities are related to the consumption of electricity and are shown in the following equation:

$$E_{admin,t} = Q_{admin,t} * EF_{electricity}$$

Equation 56 – Calculation of emissions generated by the management of project activities.

In which:

***E**admin,t* – Annual emissions due to electricity consumption required for administration of the project activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

***Q**admin,t* – Annual electricity consumption due to administration of the project activity in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in kWh.

***EF**electricity* – Electricity emission factor for the host country, in tCO_2-e in kWh.

Emissions related to the administration of the project related to electricity consumption (***Q**admin,t*), can be accounted for by summing the energy bills of the office that manages the project.

EBCF supplied the values in kWh for its office in Manaus for the monthly bills from June 2012 to July 2013, and for the office in Curitiba from December 2012 to September 2013 (Annex 21, "Admin emissions" tab). Before this period the EBCF had no office, which complicates the measurement of energy spent in planning the project previously. The values for the year 2012 and 2013 are 1,296 kWh and 2,962 kWh respectively, totaling 4,376 kWh.

The emission factor for electricity was obtained from the Ministry of Science and Technology (MCTIC 2013) website. The corresponding annual values were used. The factor for the year 2013 was calculated as the average of the values for January and September, corresponding to the months in which EBCF provided energy bills for that year (Annex 21, "Admin emissions" tab).

Emissions due to Travel

Emissions from travel for project planning are divided into aircraft and ground transportation:

$$E_{plan\_travel,t} = E_{plan\_flight,t} + E_{plan\_ground,t}$$

Equation 57 – Emissions related to trips made for project planning.

In which:

E_{plan_travel}– Annual emissions related to travel for the planning of the project in the year t (where t=1,2,3... t*years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{plan\_flight,t}$ – Annual emissions due to flights in the year t (where t=1,2,3... t*years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{plan\_ground,t}$– Annual emissions related to ground transportation in the year t (where t=1,2,3... t*years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

Emissions due to Flights

Emissions due to flights are calculated using the distance and the CO_2 emission factor per passenger, per km (Annex 21).

$$E_{plan\_flight,t} = \sum_{y=1}^{Y} (KM_{plan\_flight,y,t} * N_{plan\_flight,y,t} * EF_{flight,y})$$

Equation 58 – Calculation of emissions related to flights made for project planning**.**

In which:

$E_{plan\_flight,t}$ – Annual emissions due to flights in the year t (where t=1,2,3... t*years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$KM_{plan\_flight,y,t}$ – Annual distance traveled per trip *y* (where *y*=1,2,3… *Y* trips), in the year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in km.

$N_{plan\_flight,y,t}$ – Annual number of passengers per trip *y* (where *y*=1,2,3… *Y* trips), in the year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities).

$EF_{flight,y}$ – Flight emission factor for trip, *y* (where *y*=1,2,3… *Y* trips), in tCO_2-e per person per km.

Distances were calculated using Google Maps, with a straight line between the departure and arrival points providing the distance. EBCF specified the number of passengers on each flight segment, for each year (Annex 21, tabs "Voos_2011", "Voss_2012" and Voos_"2013"). In cases where planes were chartered for the Manaus – Manicoré segment, maximum occupancy on the flights was assumed for both outbound and inbound flights. The emission factors for flights were obtained from Ross (2009) and is shown in table 46.

Table 46. A summary of average aviation CO2e emission factors versus stage length (Ross, 2009)

Flight type	EFflight	kgCO2e/pkm	tCO2e/pkm
Domestic	0<DH<400	0.26	0.00026
Short	401<SH<1000	0.36	0.00036
Medium	1001<MH<3700	0.2	0.0002
Long	3700<LH<16000	0.23	0.00023

Emissions due to Ground Transport

Land transportation related to Project activities was calculated by car and boat, both using gasoline. The emissions were calculated with the following equation:

$$E_{plan\_ground,t} = \sum_{y=1}^{Y} (V_{fuel\_plan\_ground,y,t} * EF_{fuel})$$

Equation 59 – Calculation of the project related ground transportation.

In which:

$E_{plan\_ground,t}$ – Annual emissions due to ground transportation in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$V_{fuel\_plan\_ground,y,t}$ – Annual volume of fuel consumed per trip *y* (where y=1,2,3… Y trips), in year t (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in kL.

EF_{fuel} – Fuel emission factor, in tCO_2-e kL.

The volume of fuel consumed in trips per year was provided by the proponent institution and the calculations are presented in Annex 18, tab “transport_terrestrial_sec4”. The values for emission factors were obtained from the IPCC (2006) and correspond to 2.4 tCO_2-e / kL

5.4.2 *Emissions due to Design*

Emissions due to project design are related to stakeholders’ trips to the country where the project is developed and are divided into ground and air transportation. The volume of fuel consumed in the trips per year was provided by the proposing institution and the calculations are presented in Annex 18, tab " transporte_terrestre_sec4". The emission factor values were obtained from the IPCC (2006).

$$E_{design,t} = E_{design\_ground,t} + E_{design\_flight,t}$$

Equation 60– Emissions related to project design.

In which:

$E_{design,t}$– Annual emissions from travel for design and set up in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{design\_ground,t}$ – Annual emissions due to ground travel for the design stage in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$E_{design\_flight,t}$- Annual emissions due to air travel for the design stage in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

Emissions due to Flights

Emissions of flights related to the design of the project are calculated in the same way as emissions of flights related to planning:

$$E_{design\_flight,t} = \sum_{y=1}^{Y} (KM_{design\_flight,y,t} * N_{design\_flight,y,t} * EF_{flight,y})$$

Equation 61 –Calculation of emissions from flights related to the project design

In which:

$E_{design\_flight,t}$- Annual emissions due to air travel for the design stage in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$KM_{design\_flight,y,t}$– Annual distance travelled per trip *y* (where *y*=1,2,3… *Y* trips), in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in km.

$N_{design\_flight,y,t}$ – Annual number of passengers per trip *y* (where *y*=1,2,3… *Y* trips), in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities).

$EF_{flight,y}$– Flight emission factor for trip, *y* (where *y*=1,2,3… *Y* trips), in tCO_2-e per person per km.

Emissions from ground transportation related to project design are calculated in the same way as emissions from ground transportation related to project planning. It was not possible to separate the ground transportation activity that corresponds to each project phase. Thus, both were calculated together in planning emissions. This does not affect the final result since all the carbon emissions related to project activities result from the sum of the emissions for each component. Thus, equation 4.11 of VM0011 was not applied.

5.4.3 Emissions due to Monitoring

Monitoring activities in the Project area have not yet begun, however the parameter $E_{monitoring,t}$ for the general project emissions equation was estimated for the reference years to calculate the emissions from project activities (2011, 2012, 2013) according to the planned number of trips, distance traveled, movement of the team in the field and air travel for the coordinators responsible for developing the activities. The calculation of emissions derived from monitoring activities will be recalculated at each verification period, based on the activities carried out in each monitoring and verification period during the project and will be quantified according to section 4.3 of the VM0011 v.1 methodology, to be subsequently subtracted from the reduced ex-post emissions. The values used as inputs are evidenced in the tabs "transport_terrestre_sec4" and "Emissions project activities".

5.4.4 Emissions due to Natural Disturbances

Volcanoes, landslides, tornadoes and wildfires are the natural disturbances foreseen by the VM0011 methodology include. Among these, the only one that applies to the project areas are forest fires.

Considering that the project areas are composed exclusively of dense ombrophilous forest and that they are located in a region that experiences substantial rainfall, the probability of occurrence of forest fires is quite low, even in drier periods.

Although they are relatively frequent, the fires observed in the region rarely reach forest phytophysiognomies. This is because these fires are mainly associated with the use of fire as a means to manage pastures and clear capoeira and newly deforested areas, in order to plant new crops and sustain pasture areas. Even in cases where fires become out of control due to inefficiency or absence of firefighters, they are rarely able to overtake forest areas, mainly due to the high humidity of the forest material that could catch fire, even during the dry season.

On the other hand, the edges of forests that are systematically exposed to fire present gradual losses of biomass and a marked increase in the risk of fires of higher proportion due to the greater presence of burnable material (dead trees) left by previous fires. Thus, even if forest biomass stock losses are not expected within the project area, the boundaries of the project zones that border with areas of capoeira and pasture should receive more intense monitoring and prevention work.

Even if ex ante estimates are not considered due to low probability, emissions from forest fires will be monitored, measured and taken into account in the ex post calculations of net GHG emission reductions. Monitoring will be done remotely based on INPE's fire management system (*Programa Queimadas do INPE)*[62], followed by field verification to measure the intensity of the damage caused and GIS analysis to calculate the area damaged.

The ex-post quantification of emissions from fires, as well as the removal of GHG from natural regeneration, will follow the methodological roadmap contained in steps 1 to 8 of section 4.4 of the methodology VM0011 v.1.

5.4.5 Emissions due to Illegal Logging

Emissions due to illegal deforestation after the beginning of the project (2013) are equal to zero. Consolidated data from the 2012 Monitoring Program of Deforestation in the Legal Amazon (INPE/Prodes) were analyzed and 10 deforestation alerts within the IFM project area were found prior to 2013: 2010, 2004, 2000 and 1997.

5.5 Leakage CL3.2)

According to VM0011 methodology for quantification of leakages, the following possibilities should be considered

i) Leakages due to shifting of baseline activities (logging) to other areas;

[62] https://prodwww-queimadas.dgi.inpe.br/bdqueimadas/

ii) Market leakage due to changes in supply and demand for the products and services affected by the project activity (timber).

Thus, the leakage of the design is the combined total of leakage parameters described above:

$$C'_{leakage,t} = (CL_{activityshifting,t} + CL_{market,t}) \times \frac{44}{12} + CL'_{emissions,t}$$

Equation 62 – General calculation for quantifying leakages.
In which:

$C'_{leakage,t}$ - Annual total carbon emissions associated with leakage in year *t* (where *t*=1,2,3 ... *t** years elapsed since the start of the IFM-LtPF project activity)

$CL_{activityshifting,t}$ - Annual carbon losses due to baseline activity shifting in other lands managed or operated by the Project Proponent in year *t* (where *t* = 1,2,3 ... *t* * years elapsed since the start of the IFM-LtPF project activity)

$CL_{market,t}$ - Annual carbon due to market leakage effects in year *t*, (where *t*=1,2,3 ... *t** years elapsed since the start of the IFM-LtPF project activity)

$CL'_{emissions,t}$ - Annual emissions due to implementation of the shifted baseline activity in other lands managed or operated by the Project Proponent in year *t*, (where *t* = 1,2,3 ... *t* * years elapsed since the start of the IFM-LtPF project activity)

44/12 = The ratio of molecular weight of carbon dioxide to carbon, in tCO_2-e in tC.

Leakage due to Activity Shifting

Activity shifting leakage situations become evident where the project proponent:

(i) intensifies selective logging operations. That is, there is legal authorization to selective log and the logging increases on other lands to recover the harvest losses due to IFM-LtPF project or

(ii) selective logging activities are displaced from the project area to another forest area within the same country.

As such, the carbon losses by activity shifting can be assessed by the following equation:

$$CL_{activityshifting,t} = CL_{IH\_activityshifting,t} + CL_{SH\_activityshifting,t}$$

Equation 63 – Annual carbon losses due to the baseline activity being shifted to other lands managed or operated by the project proponent.

In which:

$CL_{activityshifting,t}$ - Annual carbon losses due to baseline activity shifting in other lands managed or operated by the Project Proponent in year *t* (where *t* = 1,2,3 ... *t* * years elapsed since the start of the IFM-LtPF project activity)

$CL_{IH\_activityshifting,t}$ - Annual carbon losses from activity shifting due to intensification of harvest volumes in year *t* (where *t* = 1,2,3 ... *t* * years elapsed since the start of the IFM-LtPF project activity).

$CL_{SH\_activityshifting,t}$ - Annual carbon losses from activity shifting due to shifting of harvest to new area in year *t* (where *t* = 1,2,3 ... *t* * years elapsed since the start of the IFM-LtPF project activity).

The project proponent (EBCF) does not own or operate any other forest areas with plans for logging management, nor is this activity featured among activities that company has proposed[63]. As such, there is no possibility of:

- Intensified logging in other areas to compensate for the activities suspended in the project area;
- Transfer of logging operations from the project area to any other forest concession in the country.

In this context equation 63~~49~~ does not apply to the project scenario. Since all the parameters are zero (0), parameter[64] of VM0011 equations 5-7 is also zero.

It is worth reiterating that EBCF acquired the areas for conservation purposes, with the intent to develop a strategy for generating revenue through conservation and total suspension of logging activities. In this context, EBCF's focus on the project area will be dedicated exclusively to emissions reduction activities and trading of VCUs and CRAs, while allowing the surrounding communities to extract non-timber forest products (NTFPs) and conduct community-based ecotourism.

Since there is no possibility of leakages due to shifting of baseline activities (logging management) to other areas, it is zero.

[63] http://www.ebcf.com.br/ebcf/quem-somos/
[64] Annual total intensification of harvest volume per year in year *t*, (where t=1,2,3 ... *t** years elapsed since the start of the IFM-LtPF project activity)

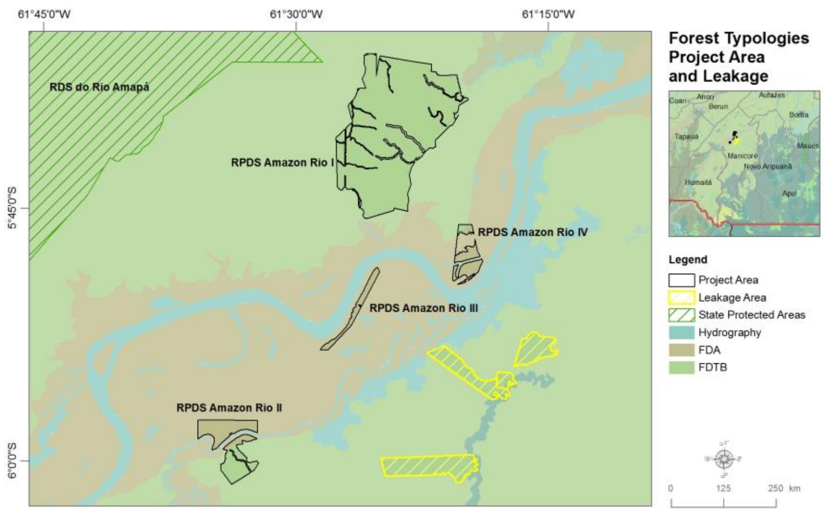
In order to comply with requirement 2.2.1.2 of VM0011, even considering the cessation of logging activites by the owner (Annex 32), a map of the potential leakage areas was created (Figure 22), due to the displacement of activities, that is, the areas that belong to the proponent (Annexes 48 - 48d) and that could be logged as a way to compensate the end of the exploration of the Amazon Rio areas.

The areas mapped in Figure 22 were created for carbon project monitoring purposes only, since Amazon Rio REDD project activities will not be moved to these other areas as defined in section 2.2.1.2. of VM0011. The project proponent, despite guaranteeing that the activities have not been moved and will not arise in the future, will monitor any changes in the forest cover of areas that have forest cover similar to those in the project area, according to the IBGE vegetation map and documentation from the proponent (Table 47 and Figure 21).

Table 47. Similarity of vegetation between the Project Area and Leakage Area

Fitofisionomia	**Fitofisiomia**	**Área do Projeto**		**Área de Leakage**	
		ha	**%**	**ha**	**%**
Dense Ombrophylous Alluvial Forest	FDA	2.626,84	14,2	205,8	4,3
Dense Ombrophylous Lowland Forest	FDTB	15911,19957	85,8	4.540,0	95,7
Total	**Total**	**18.538,03**	**100,0**	**4.745,8**	**100,0**

Figure 21. Map of vegetation types in leakage areas for potential leakage due to the displacement of activities by the proponent.



With regard to topographic similarity, the average altitude of the project area is 57.4 m and the average altitude of leakage area is 65.7 m, about a 1.2% difference. When analyzing the pixel distribution histogram in the project area, with a spatial resolution of 30 m, we observed a similar distribution between the project area and the leakage area, with the concentration of the areas around altitudes of 50-70 m (Figures 22 and 23).

Figure 22. Map of leakage areas and project area, showing the topographic similarity between the areas where leaks could occur due to the displacement of activities by the proponent.

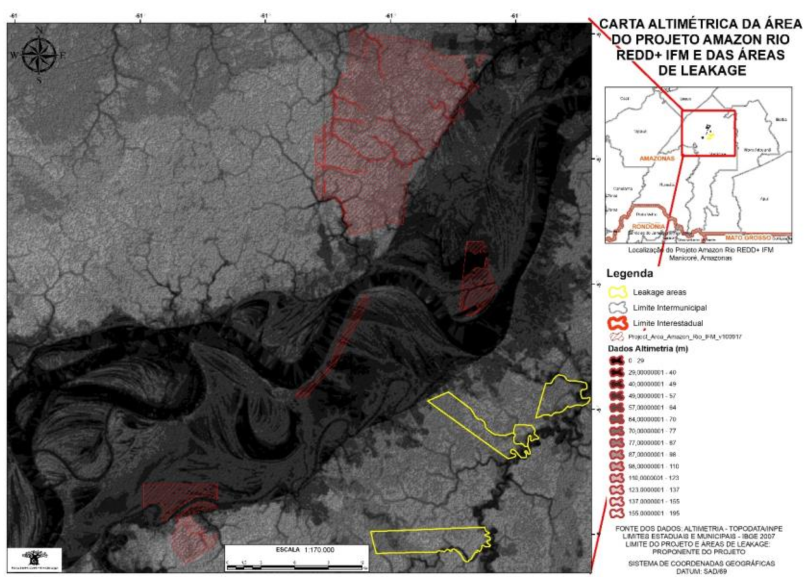
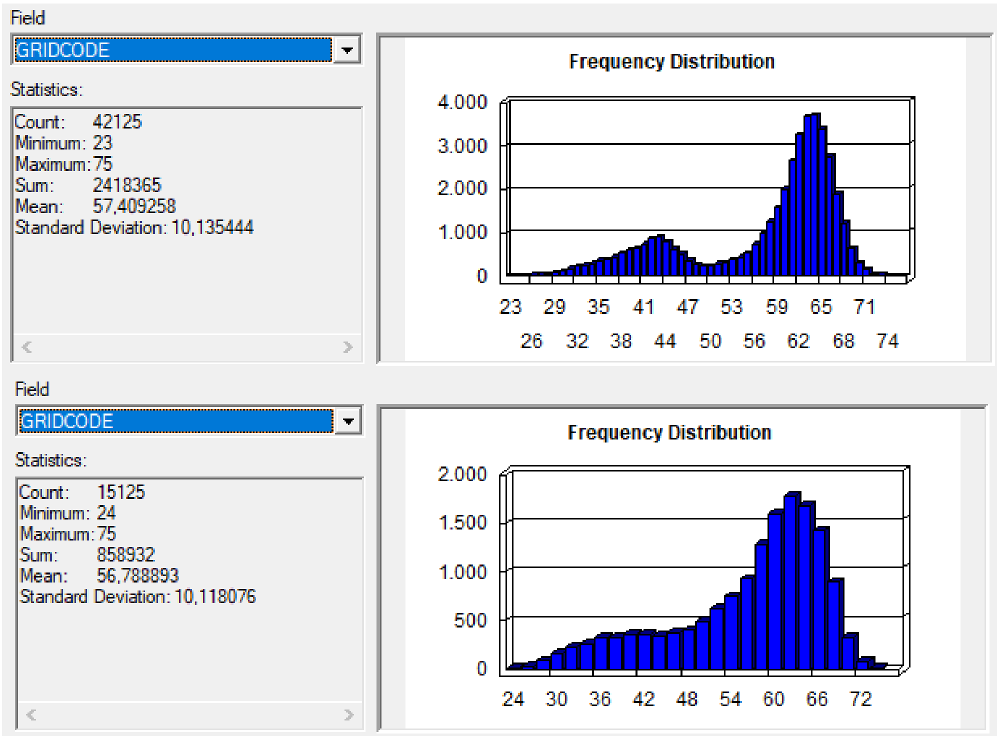


Figure 23. Frequency distribution of pixels (30 x 30m) with altimetric information in the project area (above) and Leakage area (below)



Market Leakage

Section 2.2.1.2 of the VM0011 methodology addresses the areas subject to market leakage as follows:

"The leakage area(s) is defined as the area(s) to which the activity (i.e. selective logging) has shifted. This applies to lands owned and/or operated by the Project Proponent outside the Project Boundary, as well as to other areas within the host country (caused by market leakage effects), since both activity shifting and market leakage are considered in the IFM-LtPF Methodology. Section 5 addresses leakage accounting in more detail"

While section 5.1 the methodology refers to the market leakage as follows:

"ii) Carbon from market leakage, due to shifts in supply and demand of the products and services affected by the project activity, which in this case is the supply and demand of timber".

For the case of market leaks, at regional level, it is important to point out that supply is not determined much by demand. One reason for this is that there is a plentitude of market substitutes for wood (reforested wood, steel, masonry, reclaimed wood; etc.). The regional market lacks purchasing power capable of boosting supply. It cannot match the amount paid by the international tropical timber market, especially when the supply of Asian or African tropical wood is reduced and the price of the dollar increases. In other words, the local market buys local wood when it is available, often from illegal sources, and with prices comparable to local substitutes. Thus, the factors that tend to "regulate" the decision whether or not to explore new areas for timber production in the Amazon are scarcely or not at all influenced by regional demand, but by national and global demand, where the supply of the project was still less significant.

On the other hand, the availability of areas with a regularized land situation, with licenses to log forest areas, conditions for access and logistics, agility of licensing bodies, as well as less strict inspection (in the case of illegal timber), end up being the real promoters of increases in the local demand for timber, motivated as a last option by the national and global market. In sum, the regional tropical timber market is dictated by supply rather than by demand, in addition to being subject to the prices practiced in the exterior and the southeast of Brazil.

Thus, the decrease in local wood supply due to the deactivation of the management plan by the project is insignificant against the total volume in the region and should not be characterized as the factor that induces new logging due to "decreased wood supply", precisely because this is an inelastic relationship. In this case, it is not possible to infer a direct or even indirect relation of leakages between the market aspects of the timber production chain in the Amazon forest and the decommissioning of forest management of the Amazon Rio REDD+ project.

In this sense, we assume the potential for project leakage to be minimal or insignificant when comparing the project proponent's roundwood supply with the different scales offering, representing 0.1% of the national wood supply, 0.1% of the supply of the northern region of Brazil, 1.8% of the wood offered in the state of Amazonas and 4.9% of the wood offered in the southern region of the state of Amazonas (IBGE, 2018). In this comparison we used the log supply data contained in the project proponent's operating licenses and which supported the construction of the baseline. Data on wood supply in the other scales were published by the Brazilian Institute of Geography and Statistics (IBGE – Instituto Brasileiro de Geografia e Estatística in Portuguese). Figure 24 shows the regional scale within the state of Amazonas, considered one of the regions with the largest supply of tropical wood in the world.

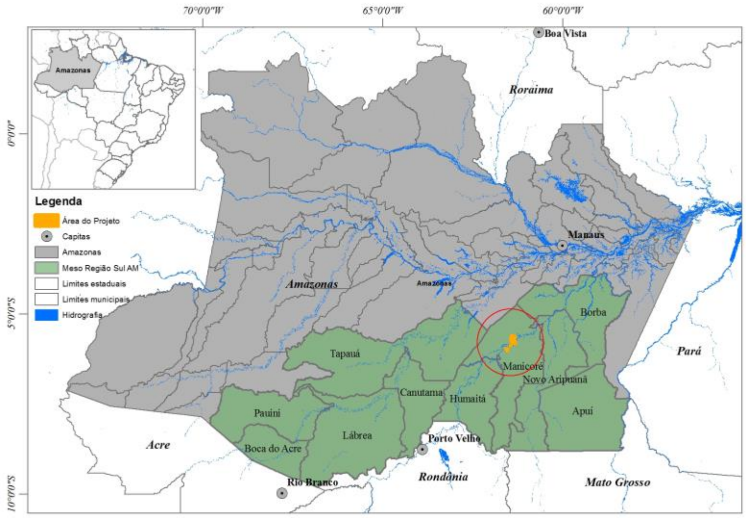


Figure 24. Description and regionalization of log supply scales showing the location of the Amazon Rio REDD + EBCF project area.

Table 48 presents an estimate of the volume of wood in logs (m^3/ha/year) offered on the market at the national scales, northern Brazil, the state of Amazonas, the southern region of the state of Amazonas and by the project proponent in the time series between 1999 and 2009, corresponding to the same period used to estimate project emissions at baseline. Table 49 shows the percentage of timber share offered by the project proponent in each of the comparison scales presented here.

Table 48. Volume of timber (m^3 / year) produced in Brazil, in the State of Amazonas, in the south of Amazonas, and by the proponent of the Amazon River REDD + IFM Project for the 1999 - 2009 exploration period.

Year	Territorial unit				
	Brazil (National scale)	Northern Brasil (Regional scale)	Amazonas state (State scale)	South Amazon State (Meso-region scale)	Amazon Rio REDD+ IFM (Project scale)
1999	21,310,243	13,287,105	792,731	264,059	30,970
2000	21,918,527	12,639,013	803,528	274,765	21,094
2001	20,069,287	12,491,574	851,946	289,568	-
2002	21,374,527	13,772,388	893,060	307,346	41,390
2003	20,663,328	14,056,127	881,975	305,280	-
2004	19,102,794	13,251,218	886,605	307,400	18,794
2005	17,372,428	12,691,252	909,879	314,399	-
2006	17,985,901	12,281,220	925,973	320,683	-
2007	16,388,609	11,873,783	1,063,425	430,657	32,230
2008	14,127,359	10,147,056	1,102,976	446,480	-
2009	15,248,187	8,962,724	1,055,928	450,945	38,895
Total	**205,561,190**	**135,453,460**	**10,168,026**	**3,711,582**	**183,373**

Table 49. Relative values of the timber supply by the project proponent compared to timber offered in Brazil, in the State of Amazonas, in the south of Amazonas, and for the period of exploration 1999 - 2009.

Year	*Territorial unit*			
	Brazil (National scale)	*Northern Brasil (Regional scale)*	*Amazonas state (State scale)*	*South Amazon State (Meso-region scale)*
1999	0,1%	0,2%	3,9%	11,7%
2000	0,1%	0,2%	2,6%	7,7%
2001	0,0%	0,0%	0,0%	0,0%
2002	0,2%	0,3%	4,6%	13,5%
2003	0,0%	0,0%	0,0%	0,0%
2004	0,1%	0,1%	2,1%	6,1%
2005	0,0%	0,0%	0,0%	0,0%
2006	0,0%	0,0%	0,0%	0,0%
2007	0,2%	0,3%	3,0%	7,5%
2008	0,0%	0,0%	0,0%	0,0%
2009	0,3%	0,4%	3,7%	8,6%
% wood market share	**0,1%**	**0,1%**	**1,8%**	**4,9%**

Even with the situation described above, in alignment with the methodological plan, section 5.3 of the methodology offers the guidelines for the eventual quantification of market leaks arising from the project activities, in summary form, as follows:

"*Market effects due to the presence of an IFM-LtPF project could occur in two main ways:*

(i) Intensification of existing harvest practices

(ii) Formation of new enterprises and hence new (or modified existing) FIRs for sanctioned selective logging

The Project Proponent must demonstrate how market leakage has been accounted for in accordance with the most recent version of applicable VCS rules"

With regard to the two points listed, it should be reiterated that the project proponent adopted, through the Amazon Rio project, the formal commitment to completely suspend its selective logging forest management activities, not only in the areas encompassed by the project, but also in all the other forest areas for which they are owner (Annexes: 32, 48).

Therefore, there will be no intensification of wood harvesting practices in other areas, nor the formation of new companies, or new forest inventories to obtain licenses for selective harvesting of wood, as the methodology text suggests. In other words, the proponent simply suspended, in a voluntary manner, any and all operations of that type of activity.

Nevertheless, in order to maintain the accuracy of the analysis in the absence of a step-by-step process, and since the methodology does not go into detail on how to analyze or quantify possible market leaks, the project proponent opted to follow the analysis based on what is available and most recent within the methodological framework of the VCS for this case.

Still, it can be credibly stated that no market leakage has occurred due to project activities. According to data presented by the official environmental agency responsible for the licensing of Amazonian timber exploration activity (IPAAM - Instituto de Proteção Ambiental do Amazonas), the volume of timber harvested in the municipality of Manicoré in which the project is located, and in the Amazonas state as a whole has declined since logging operations were disrupted in the project area, particularly in the first two years (Table 50).

Table 50. Volume of tropical wood in logs offered in the state of Amazonas and in the municipality of Manicoré, showing the reduction in wood supply in the years following the interruption of logging in the project area.

Year	State of Amazonas (m^3/ano)	Municipality of Manicoré (m^3 /ano)	Project proponent (m^3/ano)
2009	358,709.5	98,643.3	38,895.24
2010	189,063.8	40,330.7	
2011	209,043.9	45,511.5	
2012	320,193.7	71,352.6	
2013	557,721.2	76,070.5	

The original documents containing the data presented here can be independently evaluated through the links on this site: http://www.ipaam.am.gov.br/estatisticas-ipaam/

Base year 2009: http://www.ipaam.am.gov.br/wp-content/uploads/2018/04/6-Volume-de-Madeira-Autorizada-para-Manejo-2009.pdf
Base year 2010: http://www.ipaam.am.gov.br/wp-content/uploads/2018/04/5-Volume-de-Madeira-Autorizada-para-Manejo-2010.pdf
Base year 2011: http://www.ipaam.am.gov.br/wp-content/uploads/2018/04/5-Volume-de-Madeira-Autorizada-para-Manejo-2011.pdf
Base year 2012: http://www.ipaam.am.gov.br/wp-content/uploads/2018/04/5-Volume-de-Madeira-Autorizada-para-manejo-2012.pdf
Base year 2013: http://www.ipaam.am.gov.br/wp-content/uploads/2018/04/5-Volume-de-Madeira-Autorizada-para-Manejo-2013.pdf

Based on the above and following the guidance of AFOLU_Requirements_v3.6, regarding the analysis and quantification of market leaks, it is concluded that the activity of suspending timber management in the project areas as a result of the MFI activities, does not have effect, or minimally affects the total volume of harvested wood, so the risk of market leakage can be considered null and the leakage factor equal to zero.

5.6 Net GHG Emission Reductions and Removals (G5.8, CL2.2)

The ex ante calculation of Greenhouse Gas (GHG) emissions reductions was made according to the steps and equations presented in sections 5.1 to 5.4: from estimated baseline emissions, from which the project emissions were subtracted (Annex 18), according to equation 50 below:

$$C'_{IFM\_LtPF,t} = C'_{baseline,t} - C'_{actual,t} - C'_{leakage,t}$$

Equation 64 – Calculation of emissions reductions from the replacement of selective logging activities for the permanent protection of forests.

In which:

$C'_{IFM\_LtPF,t}$ – Total net annual reduction in anthropogenic GHG emissions in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{baseline,t}$ – Total annual carbon emissions associated with the baseline in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{actual,t}$ – Total annual carbon emissions associated with the project activities in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

$C'_{leakage,t}$ – Total annual carbon emissions associated with leakage in year *t* (where *t*=1,2,3... *t**years elapsed since the start of the IFM-LtPF project activities), in tCO_2-e.

The following ex ante values were calculated using the above equation and data from the Emissions Calculation Spreadsheet (in Portuguese, *Planilha de cálculos de emissões* - Annex 18):

Table 51. Summary of ex ante estimates and project generation of VCUs

Years	$C'_{baseline}$	$C'_{actual,t}$	$C'_{leakage,t}$	$C'_{IFM\_LtPF,t}$	$CC_{NPbuffer,t}$	VCU_t
Year 2013	51,522	50	0	51,472	5,110	46,363
Year 2014	51,522	50	0	51,472	5,110	46,363
Year 2015	51,522	50	0	51,472	5,110	46,363
Year 2016	51,522	50	0	51,472	5,110	46,363

Year 2017	51,522	50	0	51,472	5,110	46,363
Year 2018	51,522	50	0	51,472	5,110	46,363
Year 2019	51,522	50	0	51,472	5,110	46,363
Year 2020	51,522	50	0	51,472	5,110	46,363
Year 2021	51,522	50	0	51,472	5,110	46,363
Year 2022	51,522	50	0	51,472	5,110	46,363
Year 2023	51,522	50	0	51,472	5,110	46,363
Year 2024	51,522	50	0	51,472	5,110	46,363
Year 2025	51,522	50	0	51,472	5,110	46,363
Year 2026	51,522	50	0	51,472	5,110	46,363
Year 2027	51,522	50	0	51,472	5,110	46,363
Year 2028	51,522	50	0	51,472	5,110	46,363
Year 2029	51,522	50	0	51,472	5,110	46,363
Year 2030	51,522	50	0	51,472	5,110	46,363
Year 2031	51,522	50	0	51,472	5,110	46,363
Year 2032	51,522	50	0	51,472	5,110	46,363
Year 2033	51,522	50	0	51,472	5,110	46,363
Year 2034	51,522	50	0	51,472	5,110	46,363
Year 2035	51,522	50	0	51,472	5,110	46,363
Year 2036	51,522	50	0	51,472	5,110	46,363
Year 2037	51,522	50	0	51,472	5,110	46,363
Year 2038	51,522	50	0	51,472	5,110	46,363
Year 2039	51,522	50	0	51,472	5,110	46,363
Year 2040	51,522	50	0	51,472	5,110	46,363
Year 2041	51,522	50	0	51,472	5,110	46,363
Year 2042	51,522	50	0	51,472	5,110	46,363
Year 2043	51,522	50	0	51,472	5,110	46,363
Year 2044	51,522	50	0	51,472	5,110	46,363
Year 2045	51,522	50	0	51,472	5,110	46,363
Year 2046	51,522	50	0	51,472	5,110	46,363
Year 2047	51,522	50	0	51,472	5,110	46,363
Year 2048	51,522	50	0	51,472	5,110	46,363
Total estimated ERs	**1,854,803**	**1,803**	**0**	**1,853,000**	**183,943**	**1,669,057**
Average annual ERs	**51,522**	**50**	**0**	**51,472**	**5,110**	**46,363**

5.7 Climate Change Adaptation Benefits (GL1.1, GL1.2, GL1.3)

There is a relatively widespread understanding in the scientific community that balanced ecosystems have greater ecological and social resilience and adaptability to climate change, whether through protection of water bodies and regulation of river flows during peak flood and drought, or through the regular supply of food, products and environmental services.

Thus, since the project is designed to conserve an area of native forest, which in the absence of the project scenario would be subject to the pressures of selective logging (baseline) and the consequent degradation resulting from these activities, it is understood that mere protection of these areas alone would provide communities and the ecosystem itself with better adaptability conditions compared to the baseline scenario.

The project's Activity Management Plan (Annex 40), specific to the Amazon Rio REDD+ IFM project, works in a complementary and synergistic way with the RPDS Management Plan (Annex 9), promoting the sustainable use of ecosystem resources, through direct support for some activities related to income generation and conservation, along with community training, and other initiatives. Thus, it is believed that in addition to ensuring a more balanced and consequently more resilient environment, the project will expand options for generating income among the communities, making community members more resilient and more prepared to face the already discernable challenges posed by climate change.

6 COMMUNITY

6.1 Positive Community Impacts (CM1.3, CM2.3, CM2.4, CM3.3)

Scenario without the project

See Section 1.3 - Conditions Prior to Project Initiation, description of "*Socio-economic, political and cultural characteristics of the communities*".

Scenario with the project

The project aims to contribute to self-realization and individual and community reflection, as well as to the political, economic and organizational self-management of communities. Together with the communities, the project intends to address the relationship between environmental conservation and production practices, cultural practices, social welfare and social organization for Socio-biodiversity sustainable resource products (*Produtos da Sociobiodiversidade* - PNBSB).

The creation of the RPDS and its intrinsic link to the actions of the Amazon Rio REDD+ IFM project ensure the protection of non-timber forest products for community use. The continuation of community use of non-timber forest products such as Chestnut, Copaíba, Andiroba, Açaí and Cumaru hold social, cultural and economic value. For its maintenance, the project will contribute to the participatory planning of the use of resources, building together with communities the means for sustainable use, distribution and direct access to the resources.

The aim of the project is to create economic opportunities complementary to agroextractivism through community production planning and promotion of learning and access to technical resources for community management and forest management. Stimulating the active involvement of local populations in the various activities related to sustainable production. Encouraging the development of enterprises based on community organization that use non-timber forest products. Contributing to the reduction of pressures on the forests; preserving sensitive areas leading to benefits from ecological, social and cultural points of view; and to improve the family income of extractive communities and indigenous populations.

Although created for the economic opportunities, biodiversity activities also promote learning and access to resources and techniques for monitoring the territory. Likewise, community involvement in monitoring activities encourages participatory planning of resource use through the monitoring of hunting and fishing activities and the use of extractive resources. This enables the maintenance of stocks of species of economic, social and cultural value to the riberinho communities and indigenous population included in the project.

Considering the poor health conditions in the communities surrounding Amazon Rio areas, like many others in the Amazon, due to the lack of adequate public investment in sanitation and the high logistical costs of sending SUS health teams there, the project intends to invest in preventive care for simple diseases of primary origin, such as malnutrition and child mortality as well as diarrhea and infectious diseases.

Actions to improve the education for the communities include three main interventions in partnership with the municipal government and local communities: (i) construction of new schools and renovation of existing school buildings, providing school supplies and educational materials appropriate for the local culture and reality; (ii) improvement of school transportation, given that many children and youth travel to other communities to study in unsafe vessels and (iv) construction of Study Centers with vocational courses adapted to the local reality, guided by the appreciation of the natural potential and socio-cultural needs of the region.

In the context of social inclusion and empowerment, the project will promote gender equality in community decision-making processes and increase the financial autonomy of women as a necessary means to implement sound initiatives that lead to full empowerment. Through the encouragement and development of income-generating activities that come naturally to women, we hope to create the means not only to increase income, but also to boost self-esteem, competency and women's value in family units and within the community environment.

In the different social groups, the mutual involvement of indigenous and *ribeirinho* populations the project activities is a catalyst for harmonious and constructive social interaction between the communities who live close to each other. Although they belong to distinct social groups their many common customs, practices and traditions create an environment conducive to harmony.

In a broader scope, in addition to the direct impacts resulting from the carbon project activities, indirect positive impacts are expected as a result of the consolidation and implementation of the programs foreseen in the RPDS Management Plan. For example: income generation through the promotion of activities for ecological and scientific tourism; improved cultivated land management practices and production systems; improvement and construction of community and health infrastructure; in addition to other foreseen indirect positive impacts as outlined in Table 8 of the RPDS Amazon Rio Management Plan (Annex 9). It should be noted that the Amazon Rio REDD+ IFM Carbon Project is part of a broader strategy for the creation and consolidation of the Amazon Rio RPDS, consequently a catalyst for the effective implementation of the programs outlined in the RPDS Management Plan.

All programs and actions will be documented and systematized in different levels of precision throughout the Carbon Project through the development of an efficient monitoring system capable of supporting planning and decision-making by providing information and adjustments to changing situations.

Maintaining High Conservation Values (HCVs) related to community well-being

During the preparation of the Management Plan several participatory mapping workshops were conducted (Annex 10). Preferred areas that are used for forest extraction were identified: including Brazil nuts, andiroba, copaíba, acaí and seringa, in addition to strategic areas used for subsistence hunting. We concluded that priority conservation for areas for with high conservation values in the social context and within the scope of the project are directly associated with the use of forest resources. In general, these activities are performed by communities in extensive management systems, throughout most of the project area (Figure 25).

The most robust measure adopted to maintain and conserve the social HCVs identified at the project's planning stage was the establishment of zones in the RPDS (Annex 9 and Figure 26). Delineating the areas that are used by the communities as a *sustainable use zone* allows for continuation of common caboclo and indigenous traditions while ensuring the conservation of the territory and forests of high conservation value for traditional use.

Figure 25. Areas of natural resources use in the project area identified by community members

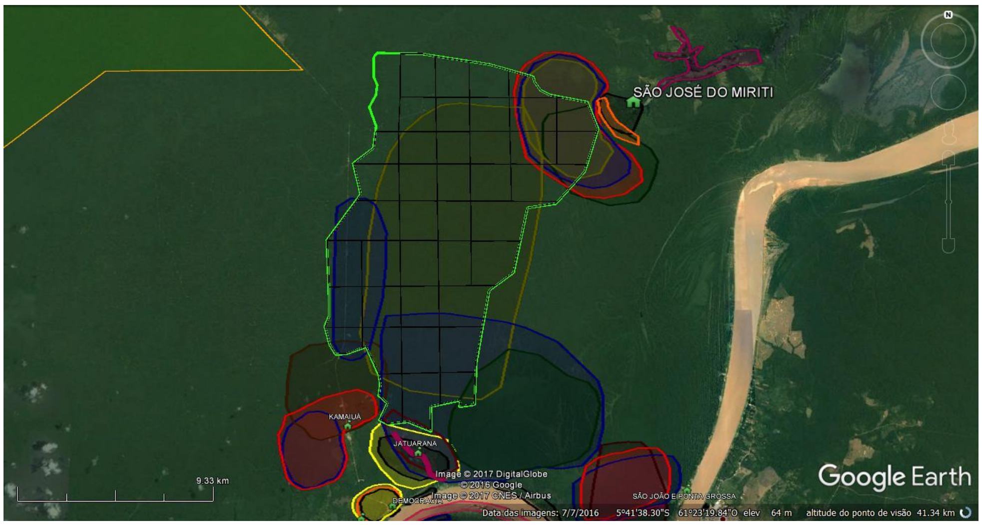
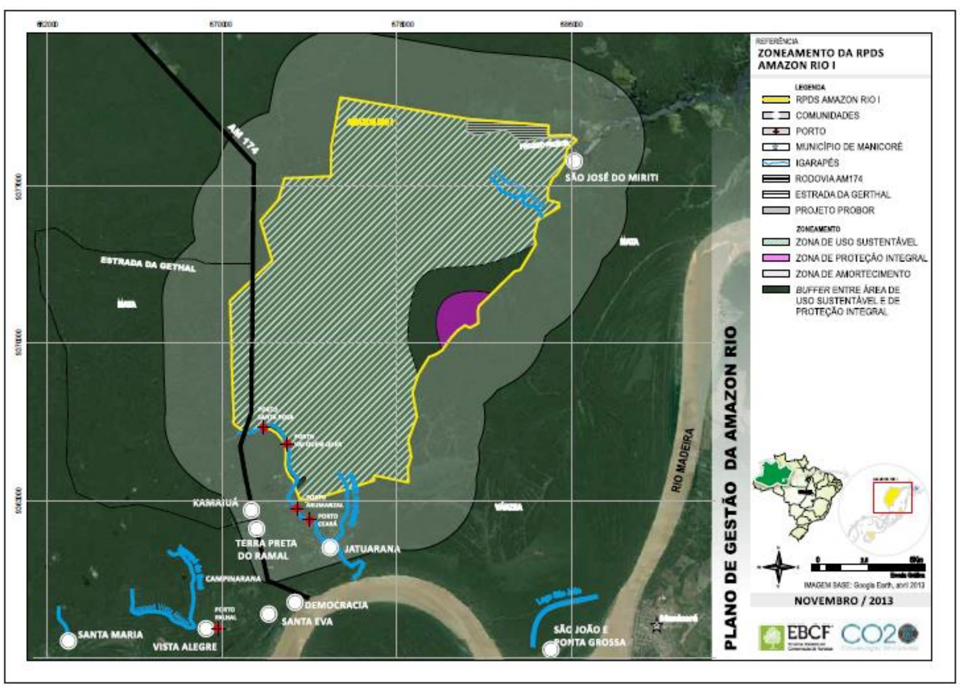


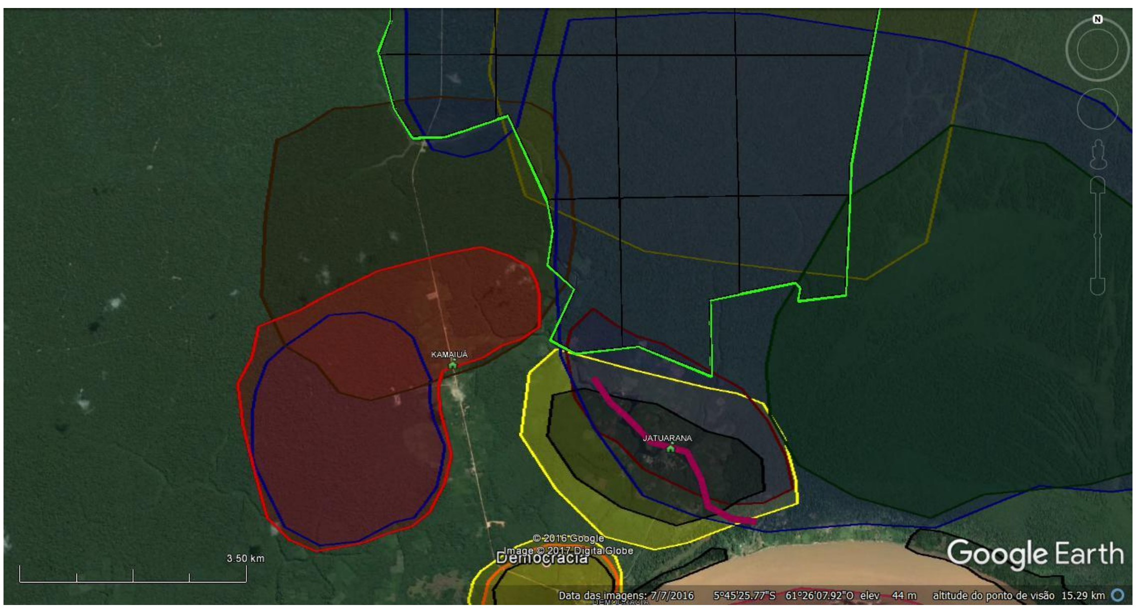
Figure 26. *Consolidated zoning of Amazon Rio RPDS*



Although these areas have high conservation value for processes of economic, cultural and social reproduction of these populations, for the purpose of this document for which the concept of High Conservation Value Forests (HCVF) is relevant, priority has been given to areas with scarce and/or strategic resources. Areas for water supply, floodplain agriculture and fishing were identified through workshops and conversations with community members. These ecological attributes should be protected with additional safeguards to ensure that their value is not degraded or adversely affected during the Project.

During the construction workshops of the Management Plan, conflicts of overlapping areas of use for extractivism between different communities of different cultural groups were identified and mapped. This is the case for the resource use areas between the Kamayuá indigenous community and the Jatuarana *ribeirinho* community, where overlapping areas of forest resource use have been identified (Figure 27).

Figure 27. Overlapping areas of resource use between the Kamayuá indigenous community and the Jatuarana *ribeirinho* community.



We conclude that the areas highlighted as being used by the indigenous community of Kamayuá represent HCVs, providing the resources necessary for their subsistence and maintenance of their cultural identity. This fact is supported by their migration history from their land of origin, belonging to the *Munduruku* people, originating from the Tapajós River. The ancestors and probable founders of the Kamayuá community occupied this new territory sandwiched between other cultural groups that include caboclos and settlers from other parts of the Amazon and Brazil that settled along the banks of navigable rivers during the process of occupation of the Amazon. We understand that the preservation of the indigenous culture inherent to the community of Kamayuá is linked to the conservation of forests and their resources as a way of maintaining the habits and customs rooted in the forest for generations to come.

In this sense, measures to maintain the attributes of high conservation values for the indigenous culture involve: a) legitimate right to the use of non-timber forest resources within the limits of the reserve; b) mediation of conflicts between the interests of different cultural groups; and c) establishment of rules and areas of use for each community constituted through the EBCF and in full joint construction with the parties involved.

In areas where floodplain forests and campinaranas predominate, communities tend to use agricultural crops, such as cacao, banana and açaí. Since there are few floodplain areas near villages suitable for commercialization and income generation, these areas can be considered High Conservation Value Forests (HCVF).

In general, local communities have difficulty obtaining clean water for drinking and food preparation. Many community members take the water directly from the Madeira River and streams near the villages. As such, places where there are springs protected by adjacent forests are considered as priority areas for conservation. Such is the case in the Boa Esperança Community which captures water for consumption from a spring close to a forest area (Figure 28).

Figure 28. *Spring in Nova Esperança community*

This spring feeds a lake that is protected by the residents during the *vazante* (dry season). During this period, residents do not fish to prevent the fish stuck there from "fleeing" towards the Madeira River. At the beginning of the flooding, a time when fish are scarce, the residents use the lake as a way to supplement their protein needs.

Figure 29. *Lake Boa Esperança*

Areas with an abundance of lakes should also be protected as High Conservation Value Forests (HCVF). Such is the case around São José do Miriti where the complex of lakes interconnected by canals and streams represent valuable fishing resources. There are similar situations near the Jatuarana community, whose productive areas are divided by a river, which in some places forms expanded lakes where fish are plentiful.

Another area of ecological importance is the Lago São José, located near Associação Ponta Grossa, whose use is disputed with "outsiders", people and groups called "invaders" by the inhabitants, who practice fishing, logging and açai extraction in predatory forms. The Project's environmental monitoring programs will help control this type of unsustainable use.

At the beginning of the implementation phase of the project, other areas with High Conservation Value Forests (HCVF) and social HCVs will be identified through technical surveys and prior consultations with stakeholders and/or directly affected groups. These areas are fundamental for the adequate protection of the subsistence livelihoods of local communities as well as protection of their identity and forms of cultural reproduction, especially considering the existence an indigenous community near the Amazon Rio I Reserve.

6.2 Negative Impacts for External Stakeholders (CM3.1, CM3.2 CM3.3)

One of the main results to be obtained through implementation of the project is the effective conservation of the Amazon Rio areas, only allowing for the activities which have previously been in use by the surrounding communities and proposing and improving upon others. It is important to highlight that these activities should be linked to the management systems of non-timber forest products, ecotourism, agro-ecological practices, environmental education, and environmental control and monitoring systems. Therefore, these changes may cause impacts to external social actors that do not depend on the project areas for their economic and social reproduction, but practice sporadic extraction, most often in a predatory way without the prior permission of the communities. The groups and people known to the communities as "invaders", who engage in the illegal sale of bush meat and timber will also be affected.

The negative impacts relate to the prohibition of illegal activities (both from the viewpoint of environmental legislation and tacit internal agreements). Therefore, it makes little sense for the project to be responsible for their mitigation. The proposal is that the project will serve as a regional model for other similar experiences, whose appropriate technical and legal procedures, with their corresponding prohibitions and limitations should be supported and encouraged.

The systems for monitoring, control and surveillance are one of the most complex and important components of the project. These systems involve various actions, including surveys, mapping and assessments of external actors that are directly and indirectly linked to the project areas, as well as their strategies for management and production. This information will enrich the formulation of risk management and negative impact mitigation programs by the Advisory Council and the project administration. In addition, the information will take note of external demands that can be translated into sustainable projects and programs for external groups in conjunction with local and state governments and other supporting and research institutions.

6.3 Exceptional Community Benefits (GL2)

In general, social-environmental projects envision rural communities as undifferentiated social units, lacking a diversity of interests and needs, especially the most remote ones, as is the case for the communities surrounding Amazon Rio I Reserve. Based on this assumption, equal power and resources are attributed to residents and hence the same level of opportunities are provided. Without the recognition of differences, projects fail to propose alternatives to meet the needs and expectations of disparate groups, especially those who are marginalized, less visible and hold less power, such as women, the elderly and indigenous people.

In general, environmental projects perceive rural communities as undifferentiated social units, without a diversity of interests and needs, especially the most remote ones, as is the case of the communities surrounding Amazon Rio I Reserve. Based on this assumption, they attribute equal power and resources, and therefore, the same level of opportunities to all residents. Without the recognition of differences, however, projects fail to propose alternatives to meet the needs and expectations of disparate groups, especially marginalized and less visible or weaker ones, such as women, elderly and indigenous people.

To ensure an equitable distribution of resources and benefits, the project technical team will take courses on the recognition of various local use systems and the appropriation of natural resources. They will also be suitably trained to identify the different income and employment opportunities that local populations have access to so that project activities do not reinforce internal conflicts over resource use, but rather, establish actions that favor the interests and needs of the groups involved.

7 BIODIVERSITY

7.1 Positive Biodiversity Impacts (B2.1, B2.5, B2.7)

The Amazon Rio I, II, III and V areas support potentially valuable timber, non-timber and fauna resources. According to MMA (2001, 2007), it is a high priority area for biodiversity, especially for birds, aquatic biota, mammals, reptiles, amphibians and invertebrates. Therefore, the main recommendations for protection of these environments and their associated plant and animal species are: the creation of protected sustainable use areas, surveys and biological inventories, sustainable use of natural resources and environmental education.

Timber and non-timber forest products are used by fifteen *ribeirinho* communities with one indigenous community in and around the project area. These products are the main source of income for these populations, especially Brazil nuts, whose sale is supported by associations and cooperatives. This aspect contributes greatly to the conservation of forests, since the communities depend on natural resources to maintain their livelihoods.

With the Amazon Rio project, positive net ecological impacts are expected, maintaining forests and thus protecting and naturally increasing biodiversity, including areas of high conservation values. The project will not use invasive species, or genetically modified organisms (GMOs).

Another net positive impact of the project refers to the biodiversity monitoring process. Currently, monitoring initiatives of the Amazon rainforest are still rudimentary and fragmented (FEARNSIDE, 2006). With the implementation of the project, there will be an additional effort in this direction, including periodic and precise collection of information on biodiversity and ecological processes of the project, which is located in a region with strong deforestation pressures.

Estimated changes in biodiversity resulting from the implementation of the project and its positive impacts (B1.3, B2.2)

The project uses the VM0011 Methodology to reduce greenhouse gas emissions through committing to forest management alternatives, and focusing on land-use change. The "without project" scenario involves the continuity of forest degradation due to the selective logging of merchandisable timber species, the construction of roads to extract the timber, overharvest of forest species of high commercial value, local hunting and fishing, driven by the communities surrounding the protected areas, thus reducing local biodiversity for plants and animals.

In contrast, positive impacts for biodiversity are expected in the project scenario, with the conservation of tropical forests. For example:

- Reduced pressures on timber species of high commercial value with the cessation of selective logging activities under the forest management plan, especially the *Eperua oleífera* (copaíba jacaré), *Brosimum utile* (garrote); *Scleronema micranthum* (envira cutia), *Copaifera reticulata* (copaíba mari-mari) and *Schizolobium amazonicum* (paricá) species, which account for 89.2% of the timber, according to the Sustainable Forest Management Post-Exploration Report in 2006;
- Effective reduction in pressure on the fish communities of great interest for local consumption and commercial fishing, especially tambaqui and pirarucu, by fishing agreements among local fishermen. This will ensure the sustainable use of fishing resources with direct benefit to traditional communities surrounding the private reserves;
- Reduction of hunting pressure on biological communities of mammals and birds which have traditionally been over-exploited by the surrounding communities. This will occur through the establishment of hunting and monitoring the population variation of the species of interest by the communities themselves (ProBUC Program), thus ensuring sustainable management of wildlife;
- Ensuring greater preservation of biodiversity as a whole through the training of community volunteers as Environmental Agents, whose engagement will assist with protection and monitoring of natural resource activities. This measure is expected to effectively reduce pressures on resources and promote the growth in the diversity of local plant and animal species, thereby

promoting environmental stability in the project area.

High Conservation Values (HCV) related to biodiversity (B2.3, B2.4)

The project is based on environmental conservation, and so precludes any negative effects to the environment or feature of high conservation value. Regarding the High Biodiversity Conservation Values (HCVs), the project features several qualities that include the promotion of technical and legal mechanisms that protect endangered species, endangered or rare ecosystems, critically important ecosystem services, and the conservation of essential areas for the basic needs of the communities.

With the cessation of the selective timber harvest, the Amazon Rio areas will gradually undergo a process of ecological improvement. In the process the trees and canopy zones over time may recover structures similar to their original state, approaching those of preserved or mildly disturbed forests. This permits the maintenance of local biodiversity, increased nutrient cycling and the promotion of key environmental services such as the provision of food and forest products for the ways of life of the traditional communities in the area.

To ensure the maintenance of HCVs in the Amazon Rio areas, a monitoring system for biodiversity will be deployed through biological inventories using the RAPELD methodology (rapid surveys of several taxonomic groups (RAP) for long-term ecological studies) (MAGNUSSON et al, 2005).

After deploying this methodology, continuity of these observations will be ensured via community monitoring of the plant and animal biodiversity by AAV and ProBUC programs, including all native species described in the project and others of ecological interest yet unidentified.

Possible adverse effects of non-native species used by the project (B2.6)

Exotic species will not be introduced in the project areas and their surroundings since the main focus of the activities is to maintain the existing native forests by halting selective logging of trees set forth in the timber management plan and the promotion of better management of non-timber natural resources.

7.2 Negative Offsite Biodiversity Impacts (B3.1)

The Amazon Rio project does not promote any direct negative impact on the biodiversity in the area surrounding the Reserves, as it features a robust monitoring proposal throughout the area as well as surrounding areas.

However, possible negative indirect impacts on biodiversity can occur through the leakage of logging, hunting and fishing from the protected areas into the surrounding area. For example, logging activities previously occurring in the Amazon Rio areas may displaced to surrounding areas once the monitoring of the project areas prevents the entry of local residents for logging.

To minimize these potential impacts, the project proponent has committed to monitor illegal logging, hunting and fishing within the project areas, as well as in the surrounding area. This initiative will include the effective participation of community residents as previously mentioned.

Programs to mitigate potential negative impacts outside the Project area (B3.2)

The project proposes: i) training; ii) participatory management; iii) implementation of monitoring projects.

I Training events on best practices for the use of timber and non-timber forest resources will be stimulated, as well as for hunting and fishing in the communities surrounding the project areas, to link forest extractivist practices with environmental and social sustainability;

II The project proponent intends to pursue a collective and adaptive system of management to address any additional negative impacts for offsite biodiversity that are subsequently identified;

III The project foresees the implementation of projects and initiatives for biodiversity monitoring in Amazon Rio area, which can intervene in real time to curb any kind of predatory activity on natural resources through the use of remote sensing and terrestrial surveillance technologies.

Impact of the Project on biodiversity in relation to the original conditions (scenario "without Project")(B3.3)

In general terms, the effects of the Amazon Rio project, both within it's areas of focus and it's surroundings, should be very positive for the local and regional biodiversity. The 'with-project' scenario is a forest conservation proposal, which aims to reduce forest degradation over nearly 20,000 ha, that would have occurred in the 'no-project' scenario between 2013 and 2048.

The suspension of logging activities reduces forest degradation and restores the environmental integrity of the area over the medium and long terms. Such a proposition will significantly contribute to nutrient cycling, soil conservation, restoration of the plant biomass, revival of plant species that were removed or plants with no commercial value, return of local animals, among other benefits and ecologic services in the project area and region.

Use of Fertilizers (B2.8)

The use of fertilizers or agrochemicals of any nature is not foreseen in the project activities, since there are no planned activities related to the planting of conventional agricultural species. The project activities are focused on extractivism of non-timber forest products, that do not include cultural habits involving the use of fertilizers or pesticides.

Solid Waste (B2.9)

There are no planned activities that would generate solid wastes causing any kind of negative impact on biodiversity. The extractive activities of PFMNs only generate organic residues derived from the raw material, such as açaí stock, nut shells and other byproducts of a similar nature. It should be noted that there are cultural traditions of applying these byproducts in gardens and plantations.

7.3 Exceptional Biodiversity Benefits

High Conservation Values (HCV)

The Amazon Rio project has various High Conservation Value (HCV) qualification attributes including the protection of endangered species, threatened or rare ecosystems and critically important ecosystem services. On a global scale, the project significantly contributes to the conservation of plant and animal diversity and to the reduction in CO_2 emissions. The project area is located within the Municipality of Manicoré, in the south of Amazonas state, which along with the cities of Apuí, Lábrea, Boca do Acre and Canutama form an extremely critical, threatened area subjected to the expansion of indiscriminate logging.

Endemic and/or rare species

The project proposes to protect the Amazon Rio area and its surrounding area through an efficient environmental control system that will feature trained staff and specific inspection equipment, as well as through the effective participation of surrounding communities. Therefore real gains will be made in maintaining the population viability of threatened species previously identified as being of High Value Conservation.

Protected Species

The Ministry of the Environment prohibits the logging of forest species protected by federal law. They are: Brazil nut (Bertholetia excelsa), rubber tree (*Hevea* spp) (Decree 5.975/2006)[65];and mahogany (*Swietenia macrophylla*) (Decree 6.472/2008)[66]. Naturally distributed Brazil nut and seringa species were identified in the forests of the project area; mahogany was not. In the surrounding areas, aside from their natural occurrences, the species form large continuous areas due to successive plantings by community residents. These species have great economic and social importance for the local population. The Brazil nut is marketed in cooperatives and latex from rubber trees is currently used for household consumption, although it was widely harvested in the recent past.

8 MONITORING

8.1 Description of the Monitoring Plan

Due to its innovative, comprehensive and integrative character, the project needs to be monitored regularly so that its actions, activities and impacts can be constantly measured and evaluated. To meet this requirement, the monitoring process must meet three main objectives:

i. To serve as an internal management project tool;

ii. To collaborate as an instrument of collective learning with the communities and social groups directly involved, focusing on adaptive management;

iii. To work as a means of communicating results and impacts to interested institutions and society in general. Furthermore, it is important to consider that monitoring, if successful, will transcend the managerial aspects of the project reaching for capacity building.

To facilitate the monitoring process, instead of having a reference line (to compare interventions before and after), the first year of monitoring will serve as the starting point, this information will be regularly and systematically compared throughout the project.

The following section details the initial plans for monitoring benefits to the climate, the community and biodiversity. The community is committed to participatory principles and to technical and scientific rigor, able to follow the positive and possible negative impacts on environmental and social aspects in the project area and its surroundings.

[65] http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2006/Decreto/D5975.htm
[66] http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2008/Decreto/D6472.htm

8.1.1 Monitoring Climate Impacts (G1.9, CL4.1)

The Monitoring Plan (MP) aims to provide security in the periodic estimates of emissions reductions, especially in monitoring changes in carbon stock. Therefore emissions from the implementation of the project, ex post estimates of the activities and emissions from any leakages and isolated disturbances (e.g., blowdowns, fires, pests and diseases, among others) can be calculated.

The construction of the MP of the climate benefits made in full compliance with the methodological framework provided by VM0011 – IFM LPF (VCS 2011) and CCBA (2008), which consists of four specific actions to be monitored:

i. Implementation and execution of the project;
ii. Dynamics and stock of the forest biomass;
iii. Deforestation and forest degradation;
iv. Periodic reviews of ex post emissions.

Remote monitoring and Project area surveillance

Measurement of alterations and biomass loss quantification present in the PA using land-use change detection is critical to make accurate estimates of GHG emissions that account for forest biomass increases and losses.

Thus, the use of remote sensing of medium spatial resolution satellite images can be readily applied in the PA and surrounding areas in order to monitor land-use dynamics over time, particularly to identify risks and threats to forested areas. In situ verification will complement landscape analysis in a GIS environment with the aim of quantifying, spatializing and identifying conversion of forest areas into other land-uses, environmental degradation and other possible changes that may occur during the term of the project.

As a complementary monitoring source, the project will rely on the database and information provided by Monitoring Program of the Brazilian Amazon Forest by Satellite[67,68](Prodes Digital), conducted by the National Institute for Space Research (*Instituto Nacional de Pesquisas Espaciais* - INPE), according to the Plan for Prevention and Control of Deforestation in the Amazon[69,70]

[67] http://www.obt.inpe.br/prodesdigital/metodologia.html
[68] http://www.obt.inpe.br/prodes/metodologia.pdf
[69] http://www.mma.gov.br/florestas/controle-e-preven%C3%A7%C3%A3o-do-desmatamento
[70] http://www.mma.gov.br/images/arquivo/80120/PPCDAm/_FINAL_PPCDAM.PDF

(PPCDAm) under the National Policy on Prevention and Control of Deforestation. This information is available online[71] in digital vector files for the general public.

Other tools will provide complementary information for the monitoring, such as indicators of forest degradation and hotspots (fires and wildfires) obtained from DETER[72], SAD[73] and PROARCO[74].. Information is available for free, in vector format online. These results will be systematically applied to field data for validating or discrediting the event, so that the centers of deforestation and degradation can be identified, remediated, reported, and consequently avoided as much as possible.

A surveillance system that allows for permanent territorial monitoring and prevents intruders from entering, controlling the transportation flow with surveillance point stations in the PA, In addition, it will be used to investigate and identify risks and threats, e.g., mapping hotspots and areas vulnerable to fire, illegal logging, hunting and poaching, and intrusions by third parties, among others.

At first, we estimate an effective demand for structuring the electronic monitoring system, which includes the hiring of skilled professionals, field equipment, electronic equipment (digital cameras, GPS, desktops and laptops, smartphones, printers, geoprocessing software and GIS, among others), vehicles and/or motorcycles, motorized boats for transportation and moving around and the collection of high resolution satellite images. Empowerment and training of all involved staff and the surrounding communities[75] will be necessary to make the system effective, and a constant stream of information directed to regional actors, and other stakeholders.

Strategic monitoring and access points to RPDS roads will also provide support to other MPs, including aspects of social and biodiversity conservation, especially for logistic support of planned field activities.

Procedures for determining the permanent sample plots (PSPs) and measurement

The calculation of the stock and increase in forest biomass will be subsidized through the installation of PSPs in the PA and its temporal monitoring through the Continuous Forest Inventory (CFI). The methodology proposed by VCS (2011) suggests the use of permanent and/or temporary plots, however, it confirms the efficiency and accuracy of sample plots.

[71] http://www.obt.inpe.br/prodes/index.html
[72] http://www.obt.inpe.br/deter/dados/
[73] http://www.imazongeo.org.br/doc/downloads.php
[74] http://www.dpi.inpe.br/proarco/bdqueimadas/
[75] Linking community monitoring to national Measurement, Reporting and Verification for REDD+

In order to demonstrate the procedural and statistical rigor used, all the sampling procedures, the PA forest stratification, sampling design, calculation of sampling intensity, and other parameters measured in PSPs to monitor biomass balance due to ingress/mortality of individuals, growth in DBH and height will be presented in detail in the Annex (Annex 23 - Forest Inventory 2014).

To promote reliable forest biomass estimates, standard operating procedures (SOPs) (Section 8.2) will be used by the team executing the CFI.

The project provides standardized procedures and routines to improve primary data collection, recording, analysis and quality control, interpretation and systematization, as well as improvements for storing and querying in an integrated database, with the clear objective of promoting transparency in the measurement and documentary traceability for all activities planned. The frequency of the monitoring review will depend on the monitoring parameter, as shown in Section 8.2.

Stratification of the project area

In order to increase the sampling accuracy and precision, the PA was divided into three different strata to reduce both initial FI and monitoring sampling intensity and operating costs. The stratification was based on different vegetation types present in the project area. According to the IBGE classification (IBGE, 2004), 2 different vegetation types were identified:

A. Dense Ombrophilous Alluvial Forest (FDA);
B. Dense Ombrophilous Lowland Forest (FDTB);

The characterization of each type of vegetation is shown in Section 4.4 and in the Management Plan (Annex 9).

Procedures for determining the permanent sample plots (PSPs) and measurement

As shown in Annex 23, plots will be rectangular measuring 125 x 25 meters. Higuchi (1982) affirms that rectangular plots are the ideal size for forest sampling in the Amazon, and provides practical and economical guidelines in choosing plot size for this purpose.

Sampling intensity and number of PSPs

The completion of a preliminary inventory will determine the sampling intensity per stratum to obtain a sample with less than 10% error and 95% confidence. The CFI will be guided through Steps 1-9 described in section 7.1.2.3 (VCS 2011), culminating in the application of equation 7.3 to calculate the optimal number of samples per stratum.

PSP sampling design

The methodology is flexible with respect to the sampling design, which can be chosen from the most common practices, such as random, stratified, stratified systematic, among others. More information is available in Annex 23.

Parameters measured in the PSPs

The monitoring will be carried out in different stages of succession (different DBH intervals). Parameters for both trees and palms to be monitored are as follows:

- Record of each individual measured by numbered aluminum tags;
- DBH measurement of individuals within each PSP;
- Location, size and georeferencing of PSP vertices.

All parameters will be recorded in the field in digital spreadsheet and/or paper format. To ensure transparency in the process, responsibilities and obligations shall be clearly defined among the parties involved, especially for recording and presenting all methodological procedures used primarily in the implementation of measurement activities in the field. Besides clarity in processing and data entry, an accessible data systematization model will be crucial for future verification of the database.

The calculation report will also be presented in Annex 23 with all applied formulas and respective statistical parameters derived from sampling (error, confidence interval, mean, standard deviation, optimal number of plots, etc.) for verification and traceability of accuracy of the average biomass estimate. The Annex will also include the photographic record, list of materials used, references and values applied, as well as other relevant information.

Monitoring frequency

The monitoring frequency parameters measured in the PSPs will be no greater than 5 years from the first measurement. Other relevant parameters for monitoring in PSPs, like changes in land-use in and around the PA, such as deforestation, forest degradation, hotspots and natural disturbances will be regularly monitored as a project routine operation, organized and archived annually.

QA/QC – Measurement activities in the field

The CFI measurement activities in the field will be performed by staff with expertise in the Amazon region. One EBCF staff member will be responsible for the initial monitoring field activities to verify consistency of procedures and general patterns of allocation and sizing of PSPs, identification and DBH measurement of individual trees within the PSPs. Successively, CFI best practices[76] will be adopted as outlined in the Standards of Operational Procedures (*Padrão de Procedimentos Operacionais*) developed by the company HDOM in partnership with INPA's *laboratório de Manejo Florestal* (LMF) (Annex 46) .

QA/QC - Selecting values from the literature

This document was developed by a multidisciplinary team with extensive technical experience on this subject. The parameters applied derived from the literature were widely discussed and grounded in an extensive literature review and conservative estimates were always sought. Section 7.2.1 of the VM0011 methodology lists and describes the auxiliary parameters and their technical and scientific sources, which served as the basis for drafting this MP.

QA/QC - Data entry and filing

Usually the input data for estimating biomass are recorded by hand (printed sheets) or digital (tablet+ODK) in field sampling. We intend to hire a team with extensive experience using ODK to train EBCF staff. The staff member in charge of this activity should have experience in forest inventories. After field activities, collected data will be taken to the office for data entry and processing.

The possibility of using digital spreadsheets will also be verified[77][78] in the field, thus enabling preliminary analysis of the data collected before returning to the office, adjustments in procedures during data collection activities to be made in real-time.

The proponent of the project will also be responsible for the processing, systematization and digital (spreadsheets, photos, GIS files) and analog storage (spreadsheets field books) of information in the appropriate database for at least 2 years after the end of the crediting period, promoting transparency and availability of data in the audit process.

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[76] Detailed methodology in Annex 46 - HDOM#P023_Standard-Operating-Procedures_v1.
[77] Open Data Kit - http://opendatakit.org/
[78] ODK Collect - http://opendatakit.org/use/collect/

Risk analysis and non-permanence

Creation of the buffer zone was undertaken using the AFOLU Non-Permanence Risk Tool V.3.2 (VCS, 2012b)[79] considering the risks for leakage and increased emissions. Annex 22 shows the analysis and respective internal, external and natural weights of the various activities of the project risks.

Ex-post calculations of anthropogenic GHG emissions reductions

The baseline calculation should be updated, if applicable, during the verification processes, along with project activity emissions and possible leakages. In this context, any changes in land-use, changes in the dynamics of forest carbon, or catastrophic events, will be monitored and recorded. In general, the behavior of actors and vectors potentially related to forest degradation or any other aspects which may impact the flow of carbon in the PA will also be monitored.

Calculation updates for ex post accounting follow the procedures contained in 1-10 of section 7.4 in the VCS (2011).

8.1.2 Monitoring Impacts to Biodiversity (G1.9, B4.1)

Since inventories for fauna have not been conducted in Amazon Rio project areas, a biodiversity monitoring system that follows the RAPELD methodology (Rapid surveys of various taxonomic groups (RAP) for long-term ecological studies) will be used (MAGNUSSON et al, 2005).

Methodologies like RAPELD contribute to long-term research using rapid inventory assessments, biotic complementarity, and land-use planning in the Amazon. This method increases adequate sampling probability of biologically diverse communities, which require large areas and at the same time minimizes variation of abiotic factors that affect these communities with smaller sampling areas.

After the methodology is applied in the Project areas, observations will be continued through community monitoring of plant biodiversity, which is to be implemented through coordination of the project. This should occur after the proposal is presented and consented to with effective involvement of the surrounding communities that use natural resource reserves for hunting, fishing and forest extraction.

The biodiversity monitoring plan of the Amazon Rio REDD+ IFM project is supported by the Program

[79]http://www.v-c-s.org/sites/v-c-s.org/files/AFOLU%20Non-Permanence%20Risk%20Tool,%20v3.2.pdf

for Monitoring Biodiversity and Use of Natural Resources in Conservation Units (ProBUC) from the Secretary of Environment of the State of Amazonas (SDS), created in 2005 by the Amazonas State System of Conservation Units (CEUC) (MARINELLI, et al., 2006). Since it is a Private Conservation Unit, approved by the State System of Conservation Units, the goal of the project biomonitoring program in PROBUC is to obtain parameters for comparing the status of biodiversity in other Conservation Units under different management categories. This allows for the evaluation of the impact of Private Reserves within a system for biodiversity protection formed by State Conservation Units.

The ProBUC model[80], supported by ARPA[81], is being implemented in some Conservation Units of the State of Amazonas, and has proven to be an innovative initiative. This program minimizes costs, provides rapid answers and results, and generates reliable and concise data storage. This is because it is conducted by local populations in their day-to-day work, thus facilitating all the logistics involved in biodiversity monitoring, as well as the social improvement of the communities near the Reserves.

Like ProBUC, the project's community monitoring system will have the following objectives: 1) raise awareness in communities using the project area about the relevance of monitoring the use of natural resources, with a focus on sustainability; 2) train leaders and interested people to act as biodiversity monitors; 3) monitor species that have potential use for communities; 4) monitor species of special interest (critically endangered, endangered or vulnerable with a high risks of extinction), and 5) monitor land-use and forest cover changes.

According to the objectives above, field work is directed toward a better understanding of the use of natural resources by the logic of the dynamics of the vegetation cover changes and local animal use of the PA and in places of possible leakages. These measures will strengthen the enforcement of existing legislation, ensuring successful implementation of the project activities.

Evaluation and selection of indicators will be conducted in accordance with the ProBUC model, and adapted to apply to the local reality, results will be updated periodically from the first survey. PROBUC biodiversity indicators are being designed and planned, as suggested in the Social and Environmental Monitoring System of Protected Areas in the Brazilian Amazon (*Sistema de Monitoramento Socioambiental das Unidades de Conservação da Amazônia Brasileira*) [82,83] and the

[80] PROBUC
[81] Áreas Protegidas da Amazônia - ARPA
[82] Construção de Indicadores
[83] Sistema de Monitoramento Socioambiental das Unidades de Conservação da Amazônia Brasileira

Methodology for Rapid Assessment and Prioritization of Protected Areas Management [84] (*Metodologia para Avaliação Rápida e Priorização do Manejo de Unidades de Conservação* - RAPPAM) in line with the experiences gained and disseminated by CEUC and ICMBIO previously described. Thus, the parameters and indicators of impacts on biodiversity were defined based on the expected (positive and negative) impacts on biodiversity with implementation of specific activities of the project, as shown in section 8.1.5 which specifically addresses this theme.

The empowerment, accountability and shared management of biodiversity conservation is the main focus of the methodological model adopted. These actions create high expectations for environmental management of the area, as the biodiversity monitoring will be conducted by the community members themselves along with the project proponent, stimulating a local multiplier effect. It is worth mentioning that strict compliance with these procedures is in EBCF's interest since it considers them to be key to the success of the project.

Although there is no intention on the part of the proponents to promote any activity that will have negative impact on biodiversity within the project area, risks, costs and threats were anticipated. This is detailed in section 2.2 with the description of project activities and in section 8.1.5 proposing monitoring indicators based on the expected impacts for each activity, both positive and negative. Impact matrixes, their causal relationship with proposed objectives, mitigation and maintenance measures, as well as indicators and parameters to be monitored are presented in Annexes 38 and 39.

8.1.3 Monitoring Social Impacts (G1.9, CM2.1, CM4.1)

The monitoring of social aspects includes both the collection of numerical data, such as quantity, volume, weight (quantitative indicators), and information expressing opinions and experiences (qualitative indicators), remembering that these measures are compatible and interchangeable. Data collection should be systematic and have a pre-established intake rate. A single indicator will likely require several data collection instruments such as plans, field records, reports etc.

Social information will be monitored through the use of participatory methodologies. In this sense, the preparation process of the Amazon Rio I RPDS Management Plan was a first step. For the socioeconomic characteristics of communities, several community meetings, land-use mapping workshops, and interviews with focus groups were held, in addition to field visits (Annex 10). The main activities of the project were presented and discussed at these events, emphasizing the importance and opportunity for valuation of local environmental services, as well as strategies for

[84] Metodologia para Avaliação Rápida e a Priorização do Manejo de Unidades de Conservação (RAPPAM)

raising funds to implement other projects and improvements in social well-being of communities around the PA.

A Participatory Rural Diagnostic (*Diagnóstico Rural Participativo*) (DRP)[85] must be carried out once in possession of information related to social characterization to complement the socioeconomic analysis of local communities. This diagnostic process will collect historical, social, environmental, economic and institutional information from the communities surrounding the Reserves, including indicators and related to social conflicts and grievances that have arisen from implementing the project parameters. This set of information will provide the "starting point" for monitoring of various production, economic, social, environmental and cultural aspects of the communities around the PA.

Since participatory monitoring is a procedural activity, new collection and analysis skills and tools will be required. Adopting the principles of adaptive management, the monitoring plan will begin simply and include only some aspects of the project and, to the extent that the experience evolves and capacities are built up, monitoring may be slowly expanded to allow a more comprehensive assessment of social impacts.

In order to adopt this adaptive management strategy, this first version of the monitoring plan should be modified throughout the project. However, the indicators and parameters considered essential for the measurement of the impacts of the project should be maintained throughout the project and new indicators added as project activities are refined, especially for in the social sphere, as they have a direct impact on the lives of the individuals that make up the communities. For this reason, not all parameters and their respective collection methods have been defined.

In light of these considerations, the social impacts monitoring plan should consider the following as fundamental premises to be followed throughout the implementation of the project activities:

- Available budget, in view of the high costs in terms of logistics of this activity;
- Location/mapping of community groups that are users that have an interest to participate in the project;
- Sampling intensity and frequency of assessment;
- Methodological adaptation according to local reality and project objectives;
- Parameter identification and indicators to be analyzed.

[85] Diagnóstico Rural Participativo – Guia Prático - http://comunidades.mda.gov.br/o/890598

Although there is no intention on the part of the proponents to promote any activity that will have negative impact on the communities within the project area, risks, costs and threats were anticipated. This is detailed in section 2.2 with the description of project activities and in section 8.1.5 proposing monitoring indicators based on the expected impacts for each activity, both positive and negative. Impact matrixes, their causal relationship with proposed objectives, mitigation and maintenance measures, as well as indicators and parameters to be monitored are presented in Annexes 38 and 39.

8.1.4 Identification of the Organizational Structure and Responsibilities (G4.1, G4.2)

The implementation and execution of the proposed project will be directly managed by EBCF staff and will be implemented only with prior agreement between the responsible technical commission, social actors and leaders involved. For the project implementation, a timeline was defined in a detailed physical financial work plan for the activities and actions, prepared and adjusted to meet the project objective for medium-term planning, whose review and adequacy should accompany the schedule of verifications provided throughout the project with a five-year periodicity. The work plan will be rigorously carried out and periodically revisited in order to assess the achievement of its indicators, focused on managing the budget in a way that maintains the financial health of the project. Table 52 shows the actors involved in the design and implementation of the Amazon Rio REDD+ IMF project and their respective representatives and responsibilities.

Table 52. Description of the organizational structure and actors involved in the project

Institution	Representative	Responsibilities
Original Trade Consultoria Especializada	João Tezza Neto	Coordinating the review and update of PD (V3.1) Amazon Rio REDD+ IFM project and conducting the certification process
CO2X Conservação de Florestas Ltda.	Rosana Della Méa	Coordination and drafting of Version 1.0 of Amazon Rio REDD+ IFM project and Management Plan for Reserves
EBCF Curitiba	Leonardo Barrionuevo	Management of the Reserves and Project Implementation
EBCF Manaus	Valdenor da Costa Junior	Coordination and Implementation of the Plan for Climate Social and Biodiversity Monitoring

EBCF Manaus	Heberton H. D, Barros	Management and Project Implementation
Renascer Desenvolvimento Humano	André Albuquerque	Implementation of socio-environmental programs
HDOM	Francisco Higuchi	Forest Inventory and technical support for project review
Communities	Community Leaders	Users and implementers
RPDS Advisory Council	Communities, women's representatives, local NGOs, and government agencies.	Counseling, Facilitators Facilitating and Monitoring Project Deployments

PROJECT DESIGN

The development of the PD Version 1.0 was carried out by the CO2X Conservação de Florestas Ltda and Associated Consultants and included the following professionals:

Rosana Della Méa – Environmental Technologist, MSc – General Coordination
Virgílio Viana – Forestry Engineer, PhD – Revision and Guidance
Mariano Cenamo – Forestry Engineer, MSc – Revision and Guidance
Renata Freire – Agriculture Engineer, PhD
Diego Serrano – Forestry Engineer, MSc
Bruno Matta – Environmental Engineer
Pablo Pacheco – Biologist, MSc
Thais Megid – Agriculture Engineer
Rodrigo Freire – Biologist, MSc
Priscila Barros - Forestry Engineer, MSc
Lucas Rosa – Geographer

Revision and updating of Version 3.1 of PD, was performed by Original Trade Consultoria Limitada and included the following professionals:

João Tezza Neto – Economist, MBA – Revision and General Coordination

Heberton Henrique Dimas de Barros – Forestry Engineer, MSc, Revision and Technical Coordination

Diego Serrano – Forestry Engineer, MSc

Bruno Matta – Enviromental Engineer, MSc

Francisco Higuchi – Forestry Engineer, Dr.

The project has a governance structure formed by the EBCF board that executes the strategic guidelines of the board of directors. These guidelines are defined on the basis of the main objectives of the project and the advice of the advisory council (see composition in annex 25).

For the composition of the advisory council that will seek the balance of representativeness among the different social groups of the project, promoting the participation of women in an equitable way.

8.1.5 Methods for Generation, Recording, Storage, Organization and Verification of Monitored Data and Parameters (G4.2, CL3.2, GL4.4, CM4.1, CM4.2, CM4.3, B4.1)

EBCF will also be responsible for centralizing all the documented information of the project, including the respective MPs. In this sense, EBCF commits to conducting training events for the technical teams involved in creating primary data as well as to applying methodological verification procedures and benchmarks. The EBCF will also be responsible for the subsequent systematic archival storage of analog and digital information and general documentation (reports, spreadsheets and field notes, digital spreadsheets, photos, GIS files, bibliographies and other information) in an appropriate database. Due to the prolonged duration of the project, the systematization and storage of this information is essential for monitoring actions and their outcomes, whose transparency and accessibility is essential to ensure credibility, engagement and confidence in social actors directly and indirectly involved in the project.

Internal audit procedures and non-conformities

An internal audit and evaluation of the MP activities will be performed in the field by the EBCF team. Standardized routines and procedures will be applied to improve primary data collection and recording, analysis and quality control. The routines and procedures will also contribute to promoting transparency and traceability for project activities related to GHG emission estimates, biodiversity conservation and improving well-being in local communities. This will require a technically equipped specific team to carry out the management of the MP. This team will be responsible for ensuring the continuous improvements in techniques and procedures of data collection and measurement methods in the field, always seeking to standardize data, as well as the restriction of nonconformities and their adjustments, if necessary.

All the information collected, from communities, consulting firms and research, is intended to contribute to the database managed by EBCF. This information will be evaluated, recorded and then stored and made available for consultation aimed at validating internal and external audits.

Initial plan for choosing social and biodiversity indicators that will be monitored (CM2.1, CM2.2)

Focusing on adopting the principles of adaptive management, we note that this first version of the monitoring plan should be modified throughout the project. However, presented in this section are indicators and parameters considered essential that should be maintained throughout the project. New indicators should be added as project activities are refined, especially for in the social sphere, as they have a direct impact on the lives of the individuals that make up the communities.

First, a survey was undertaken to collect secondary information about the plant and animal resources presented in the Amazon Rio I RPDS Management Plan. In a complementary manner, information was obtained from scientific articles, government websites and doctoral theses in addition to various other sources. In addition, data from the 100% forest inventory, conducted in 2007, in a *terra firme* field, was referred to for the selective logging management plan and an expedited forest inventory conducted in 2013, covering floodplains and dry land (EBCF, 2013) was used to support the Amazon Rio I Management Plan.

Secondly, the matrixes of analysis of the impacts of the project activities and of mitigation measures, maintenance of benefits and monitoring of the impacts of the project were elaborated, based on studies, diagnoses, management plan of RPDS and during the revision of the project description. The objective was to outline the strategy for the adoption of mitigation measures and maintenance of expected benefits with the implementation of the activities foreseen in the Amazon REDD+ IFM project. At this point, the monitoring parameters, activity impact indicators and the necessary timelines to obtain robust and reflective information for the expected impacts to reach the project objectives within the causal model of the project described in section 2.2 - Description of Project Activity.

Community-based participatory biomonitoring is focused on monitoring logging impacts on the conservation of species and the dynamics of regeneration, occurrence and abundance of fauna and flora species in the project area and the species exploitation above regeneration limits (resilience), especially for species of commercial interest and rare or endemic species, as HCVs.

As a monitoring strategy, information should be collected on the most hunted and consumed animal groups that inhabit vegetative areas and aquatic environments (such as mammals, birds, fish, reptiles and others). This information is gathered to provide greater understanding of population dynamics, social behavior, breeding sites, diet, etc., and for plant species, with emphasis on timber products and non-timber forest products of social, cultural, economic and environmental interest in their various ecological aspects, such as the growth dynamics of individuals and the mortality of different tree species. Tables 53 and 54 show the Sustainability Matrixes of positive and negative impacts on biodiversity, proposals for mitigation measures, indicators and monitoring parameters according causative model design of the project.

Table 53. Matrix of negative impacts on biodiversity (risks, threats and costs), mitigation measures, indicators and reporting frequency for monitoring

Project Activities	Potential negative impacts for biodiversity (biodiversity risks and costs)	Mitigation measures	Monitoring	Indicators	Reporting frequency
0 - PROJECT MANAGEMENT					
0 - Project Management Activities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
1- CLIMATE					
1.1 - Cessation of logging activities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
1.2 - Monitoring deforestation and forest degradation in the project area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
2 – BIODIVERSITY					
2.1 - Implementation of the biodiversity monitoring program	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
2.2 - Implementation of agreements for fishing, hunting and agroextractivism in the project area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
3 - INCOME GENERATION					
3.1 - Mapping the productive potential of the NTFPs of major economic importance	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

3.2 - Training for improvements in the organization and production of sustainable forest extracts	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
3.3 Implantation of sustainable productive processes	Harvesting above the regeneration limits of the desired species	Preparation of non-timber products Management Plan	Natural Regeneration	Annual production	Annual
4 - HEALTH AND EDUCATION					
4.1 - Implementation of the water for life program (*água para vida)*	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
4.2 - Improvements in school infrastructure in communities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
5 - INCLUSION AND SOCIAL EMPOWERMENT					
5.1 - Inclusion of women on the Reserve's Advisory Council and suggesting women's presence on community council.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
5.2 - Identification and encouragement of income-generating activities aimed at women's and youth's skills	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
5.3 - Conflict mediation for different social groups due to resource use in the project area.	Harvesting above regeneration limits of exploited species	Developing resource-use agreements	Production	Annual production	Annual

Table 54. Matrix of positive impacts on biodiversity (benefits and gains), maintenance measures, indicators and monitoring frequency for reporting

Project Activities	Potential positive impacts for biodiversity (benefits and gains)	Maintaining Benefits	Monitoring	Indicators	Reporting frequency
0 - PROJECT MANAGEMENT					
0 - Project Management Activities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
1- CLIMATE					
1.1 - Cessation of logging activities	Conservation of species exploited by selective logging/ Maintenance of HCVs	RPDS for HCV maintenance	Density and abundance of target species	Number of individuals/number of species	Five years

1.2 - Monitoring deforestation and forest degradation in the project area	Habitat Conservation	Consolidation of the RPDS	Reduced deforestation and degradation in the project area	Deforested area/number of fire outbreaks and degradation	Annual
2 – BIODIVERSITY					
2.1 - Implementation of the biodiversity monitoring program	Increased abundance of biodiversity species in the project area	Maintenance of the monitoring program	Biodiversity Reports	Number of individuals and species sighted	Biannual
2.2 - Implementation of agreements for fishing, hunting and agroextractivism in the project area	Maintenance of species of value for community use	Implementation of agreements	Signed agreements for land-use and production	Number of agreements signed	Biannual
3 - INCOME GENERATION					
3.1 - Mapping the productive potential of the NTFPs of major economic importance	Data on species of interest for management	Periodic NTFP Forest inventory	Productive potential	Potential production data	Five years
3.2 - Training for improvements in the organization and production of sustainable forest extracts	Reducing impact on biodiversity	Periodic training	Good environmental practices	Number of families adopting good practices	Biannual
3.3 Implantation of sustainable productive processes	Conservation of managed species	Good operational practices	Good environmental practices	Number of families adopting good practices	Biannual
4 - HEALTH AND EDUCATION					
4.1 - Implementation of the water for life program (*água para vida*)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
4.2 - Improvements in school infrastructure in communities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
5 - INCLUSION AND SOCIAL EMPOWERMENT					
5.1 - Inclusion of women on the Reserve's Advisory Council and suggesting women's presence on community council.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
5.2 - Identification and encouragement of income-generating activities aimed at women's and youth's skills	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

5.3 - Conflict mediation for different social groups due to resource use in the project area.	Sustainable use of natural resources	Developing resource-use agreements	Production	Annual Productivity	Annual

Social monitoring is focused on monitoring the impacts on creation and loss of local jobs related to non-timber activities (job generation) and timber activities (job loss); income generation for families; community production planning; social organization; learning and access to technical resources of community and forest management; conservation of forest species that have social, cultural and economic value for communities in the project area (HCV maintenance); maintenance of stocks for hunting and fishing as well as forest extracts; resolution of use of natural resources conflicts and promotion of social inclusion and women's empowerment. The proposed monitoring indicators are related to the number of staff hired; family and community income generated; number of people trained and participating in biomonitoring programs; number of signed resource-use agreements; number of conflict occurrence records; number of women acting on councils; and number of people involved in production activities. Tables 55 and 56 show the matrixes of positive and negative impacts on biodiversity, proposed mitigation measures, indicators and the reporting frequency of monitoring according to the causative model of the project.

Table 55. Matrix of positive impacts on communities (benefits), proposed measures for maintaining benefits, indicators and reporting frequency for monitoring

Project Activities	Potential negative SOCIAL impacts (social risks and costs)	Mitigation measures	Monitoring	Indicators	Reporting frequency
0 - PROJECT MANAGEMENT					
0 - Project Management Activities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
1- CLIMATE					
1.1 - Cessation of logging activities	Loss of local jobs related to logging	Generation of work opportunities in non-timber activities	Economic activities	Jobs; Income	Annual
1.2 - Monitoring deforestation and forest degradation in the project area	Decrease in income associated with unauthorized activities	Generation of new income opportunities for communities in the PA	Economic activities	Family income	Annual
2 – BIODIVERSITY					

2.1 - Implementation of the biodiversity monitoring program	Conflict among communities for resource use (hunting and forest extractivism)	Implementation of the EBCF Conflict Resolution Protocol	Recording conflicts	Number of conflicts recorded	Annual
2.2 - Implementation of agreements for fishing, hunting and agroextractivism in the project area	Conflict among community members over resource use	Implementation of the EBCF Conflict Resolution Protocol	Recording conflicts	Number of conflicts recorded	Annual
3 - INCOME GENERATION					
3.1 - Mapping the productive potential of the NTFPs of major economic importance	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
3.2 - Training for improvements in the organization and production of sustainable forest extracts	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
3.3 Implantation of sustainable productive processes	Clashes of culture between community members and teams/clients of the implanted projects	Training with project management team to understand work environment in *ribeirinho* communities in the Amazon	Recording conflicts	Number of conflicts recorded	Biannual
4 - HEALTH AND EDUCATION					
4.1 - Implementation of the water for life program (*água para vida*).	Generating expectations	Not applicable	Not applicable	Not applicable	Not applicable
4.2 - Improvements in school infrastructure in communities	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
5 - INCLUSION AND SOCIAL EMPOWERMENT					
5.1 - Inclusion of women on the Reserve's Advisory Council and suggesting women's presence on community councils.	Conflicts related to *machista* (sexist) culture	Include the gender theme on the agenda of community meetings	Participation of women in councils	Number of women acting on councils and committees	Annual
5.2 - Identification and encouragement of income-generating activities aimed at women's and youth's skills	Conflicts related to *machista* (sexist) culture	Carry out specific training for female audience	Participation of women in family income	Number of women with local economic activities	Annual

5.3 - Conflict mediation for different social groups due to resource use in the project area.	Increased conflict for the use of natural resources and prejudice among social groups	Conflict mediation through resource use planning and resource-use agreements	Existence of conflicts	Agreements signed / number of recorded conflicts	Annual

Table 56. Matrix of positive impacts on communities (benefits), proposed measures for maintaining benefits, indicators and reporting frequency for monitoring

Project Activities	Potential positive SOCIAL impacts	Maintaining benefits	Monitoring	Indicators	Reporting frequency
0 - PROJECT MANAGEMENT					
0 - Project Management Activities	Generation of local work opportunities	Efficient Project Management	Hiring local employees	Number of employees hired	Annual
1- CLIMATE					
1.1 - Cessation of logging activities	Conservation of extractive species of community use (e.g. Copaiba)	Participatory resource planning	Economic activities resulting from species included in the MP	Income generated	Annual
1.2 - Monitoring deforestation and forest degradation in the project area	Conservation of forest species of social, cultural and economic value for PA communities	Conservation of habitat through a UC	Economic activities resulting from species included in the MP	Income generated	Annual
2 - BIODIVERSITY					
2.1 - Implementation of the biodiversity monitoring program	Learning and access to technical monitoring resources	Consolidation of the biodiversity monitoring program	Trained individuals	Number of trained individuals and people participating in monitoring	Annual
2.2 - Implementation of agreements for fishing, hunting and agroextractivism in the project area	Maintenance of stocks of valuable species for community use	Agreements on hunting, fishing and extractive activities signed and reviewed	Agreements signed	Number of agreements signed	Annual
3 - INCOME GENERATION					

3.1 - Mapping the productive potential of the NTFPs of major economic importance	Community production planning	Development of NTFP harvesting activities	Species with economic potential for the project and local communities	Number of species	Five-year
3.2 - Training for improvements in the organization and production of sustainable forest extracts	Learning and access to technical resources of community management and forest management	Ongoing training and knowledge recycling	Trained individuals	Number of trained individuals and people participating in monitoring	Biannual
3.3 Implantation of sustainable productive processes	Increase in local income	Development of NTFP harvesting activities	Income	Family income	Biannual
4 - HEALTH AND EDUCATION					
4.1 - Implementation of the water for life program (água para vida)	Reduction of diseases related to water consumption	Awareness workshops (mainly in schools)	Diseases	Number of cases	Annual
4.2 - Improvements in school infrastructure in communities	Improvements in school environments	Investments in improving school environments	Structures	Quality	Biannual
5 - INCLUSION AND SOCIAL EMPOWERMENT					
5.1 - Inclusion of women on the Reserve's Advisory Council and suggesting women's presence on community council.	Ensure gender representation in the local decision-making process	Maintenance of councils	Women's participation in councils	Number of women acting on councils and committees	Annual
5.2 - Identification and encouragement of income-generating activities aimed at women's and youth's skills	Developing family income and women's income	Advancement and support for income-generating activities geared to women's and youth's skills	Women's participation in family income generation	Number of women with local economic activities	Annual
5.3 - Conflict mediation for different social groups due to resource use in the project area.	Conflict resolution	Conflict mediation through resource use planning and resource use agreements	Existence of conflicts	Agreements signed/number of recorded conflicts	Annual

As a way to monitor the exceptional benefits of the project to communities associated with the implementation of the RPDS management plan in a broader sense, as well as a way to compare the performance of RPDS management with other types of protected areas, social indicators will be analyzed through the of the Matrix of Sustainability methodology developed by the Secretariat of Environment and Sustainable Development of the State of Amazonas. At the time the Management Plan was drafted, more than twenty socioeconomic parameters were defined. These parameters are considered of great importance for community development and are described through specific indicators.

The Sustainability Matrix is a visual tool to help communities track their socioeconomic performance in a constructive way that allows for understanding of the changing processes and paths to be followed, based on their own criteria for judgment and evaluation. It will also provide an overview of the situation for each community in terms of development (parameters), such as agriculture, extraction, marketing, access to credit, processing, management and technology, education, health, energy, water, sewage, etc. With this overview, it will be possible to see the level of sustainability the communities want to achieve for each parameter considered.

With the identification of the current situation and the desired situation, it will be possible to measure the evolution of community development and the social and economic gains during the project. This methodology will also be used to regularly assess the intensity and extent of negative and/or positive impacts arising from the project, based on the following levels of sustainability:

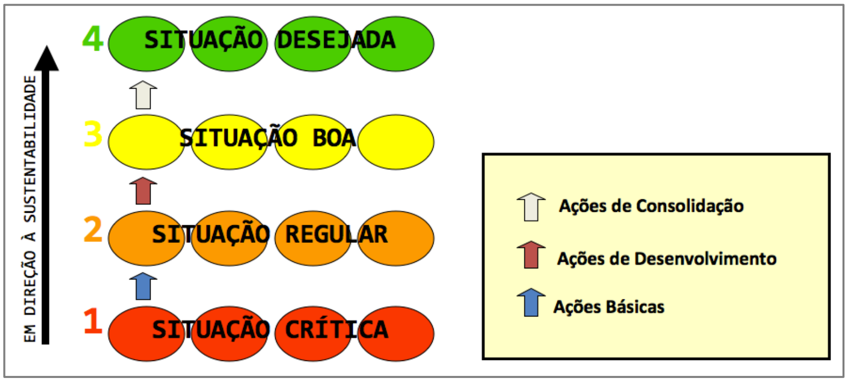
LEVEL 1 –Indicative of an exclusion situation, with incipient and precarious forms of organization, production and social welfare. This is an extreme situation. Subsistence is the only motivation at this level.

LEVEL 2 –Indicative of a basic situation, with simple forms of organization, production and social welfare. This is a situation where social and productive requirements are met on a regular basis.

LEVEL 3 –Indicative of a situation of community development, with more structured forms of organization, social welfare and production. This is a promising development situation.

LEVEL 4 –Indicative of a situation of community independence, with developed and autonomous forms of organization, social welfare and production. This is a desired situation to be reached in the long run.

Figure 30. *Sustainability Matrix Sustainability levels*



Initial plan of how the monitored variables will be used to evaluate the effectiveness of the measures employed to maintain or extend High Conservation Value (HCV) areas and the well-being of existing communities in the Project zone with regard to global biodiversity, regional or national relevance (CM2.1, CM2.2, B4.2)

To assess the effectiveness of the measures used to maintain HCVS and community well-being at the regional level, the results of climate monitoring, biodiversity and social aspects are obtained through methodologies based on State policies for monitoring, soon to be replicable in other protected areas or HCVs. The PROBUC and the Sustainability Matrix are introduced as tools for the comparison of broad performance, within a maintenance approach of global HCVs, such as the State System of Conservation Units of Amazonas and this initiative to replace a logging project with an ecosystem and environmental services conservation project.

Results obtained for family income, number of workers working with income generation activities in the community and number of women active in the council, are examples of indicators that can be compared with the performance of other communities benefiting from programs of partnership between third sector and public policies. One program for comparison is the *Bolsa Floresta* Program developed by the Amazonas Sustainable Foundation, whose scope exceeds the regional scale, reaching a global scale given the number of conservation units benefited by the program and its proposal of impact in line with the objectives the UN and this project.

Monitoring and monitoring frequency and plans for publishing and dissemination to communities and other actors (CL3.2, CL4.2, B4.3)

The dissemination of the monitoring program results will be carried out in a participatory manner through formal and frequent meetings, such as meetings, workshops and council meetings for assessments, improvements and necessary adjustments. Only during a second phase will the results be published with the objective of broad dissemination and replication in the surrounding communities, to actors and institutional partners.

The monitoring frequency will be a variable factor among the monitored parameters. As shown in Section 8.2 below, where each parameter is described and characterized.

8.2 Data and parameters available in validation

Parameters Obtained from Literature / Reports to be Reviewed / Verified (Not Monitored)

Parameter	CF_{Wood}
Unit	tC (t d.m.)$^{-1}$
Description	Fraction of carbon in wood in the tropical forest
Source of the parameter:	VCS (2011)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	0.49
Comments:	Application of the parameter in equations 3-3; 3-5; 3-41; 3-51 in (VCS, 2011)

Parameter	CF_{AGB}
Unit	tC (t d.m.)$^{-1}$
Description	Fraction of carbon in above-ground biomass of rainforest trees
Source of the parameter:	VCS (2011)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	0.47
Comments:	Application of the parameter in equations 3-8; 3-14; 3-37a; 3-37b; 3-38; 4-15; 4-17a; 4-21; 4-22; 5-8; 5-9 in (VCS, 2011)

Parameter	D
Unit	(t d.m.) m^{-3}
Description	Wood density for tropical forest with corresponding climate and ecological zone
Source of the parameter:	VCS (2011)
Measurement methods and procedures to be applied:	Literature review and verify or obtain the local value where necessary
Value Applied:	0.6
Comments:	Application of the parameter in equations 3-3; 3-5; 3-41; 3-51; 4-21; 5-8; 5-9 in (VCS, 2011)

Parameter	fV(DBHn,i,s, j,t=0,Hn,i,s, j,t=0)
Unit	Non-dimensional
Description	Allometric equation of volume as a function of diameter at breast height and height; t = 0 years
Source of the parameter:	Adjusted based on regression analysis with the site's sampled data
Measurement methods and procedures to be applied:	Literature review and verify or obtain the local value where necessary
Value Applied:	Not applicable
Comments:	Application of the parameter in the equations 3-10; 3-11 in (VCS, 2011)

Parameter	fB (DBHn,i,s, j,t=0,Hn,s,i, j,t=0,D_i)
Unit	Non-dimensional
Description	Allometric equation of biomass as a function of diameter at breast height and height; t = 0 years
Source of the parameter:	Obtained from the literature.
Measurement methods and procedures to be applied:	Literature review and verify or obtain the local value where necessary
Value Applied:	To be provided by HDOM

Comments:	Application of the parameter in equations 3-12 in (VCS, 2011)

Parameter	k_{decay}
Unit	yr^{-1}
Description	Deadwood storage yearly decomposition rate
Source of the parameter:	Chamberset al. (2000)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	0.167
Comments:	Application of the parameter in the equations 3-17; 3-21 in (VCS, 2011)

Parameter	f_{RSD}
Unit	Non-dimensional
Description	Damage factor to the remaining forest, based on the fraction of the quantity of carbon resulting from the damage to the remaining forest by the amount of carbon in the marketable logs extracted.
Source of the parameter:	Feldpauschet al. (2005)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	2.4
Comments:	Application of the parameter in equations 3-19; 4-21; 5-8, 5-9 in (VCS, 2011)

Parameter	f_{branch_trim}
Unit	Non-dimensional
Description	Fraction of branches and remaining trimmings in the above-ground biomass after logging the

	marketable timber and transferring it to the deadwood reservoir.
Source of the parameter:	Silva (2007)
Measurement methods and procedures to be applied:	Literature review and, where necessary, verify or obtain the local value
Value Applied:	0.309
Comments:	Application of the parameter in equations 3-20 in (VCS, 2011)

Parameter	$\mathbf{f_{lumber\_recovery}}$
Unit	Non-dimensional
Description	Lumber recovery factor for the proportion of marketable logs converted into harvested wood products.
Source of the parameter:	Veríssimo (1992) apud VCS (2011)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	0.47
Comments:	Application of the parameter in equations 3-26; 3-27 in (VCS, 2011)

Parameter	**kltHWP_ ox**
Unit	yr^{-1}
Description	Yearly oxidation rate for long-term harvested wood products.
Source of the parameter:	IPCC (2006) apud VCS (2011)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	0.023
Comments:	Application of the parameter in equations 3-28 in (VCS, 2011)

Parameter	$G_{regrowth,\ t}$
Unit	(t d.m.) ha^{-1} yr^{-1}
Description	Average regeneration per hectare per year of above-ground biomass after selective logging per year t, in t d.m./ha/year.
Source of the parameter:	Mazzeiet al. (2010)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	2.6
Comments:	Application of the parameter in equations 3-38 in (VCS, 2011)

Parameter	$EF_{fuel\ –\ Gasolina}$
Unit	tCO_2-e kL^{-1}
Description	Emission of fuels factor
Source of the parameter:	IPCC (2006)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	2.395
Comments:	Application of the parameter in equations 3-40; 3-42; 3-43; 3-46; 3-50; 3-54; 4-8; 4-11; 4-14 in (VCS, 2011)

Parameter	$EF_{fuel\ –\ Diesel}$
Unit	tCO_2-e kL^{-1}
Description	Emission of fuels factor
Source of the parameter:	IPCC (2006)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event

Value Applied:	3.013
Comments:	Application of the parameter in equations 3-40; 3-42; 3-43; 3-46; 3-50; 3-54; 4-8; 4-11; 4-14 in (VCS, 2011)

Parameter	$\mathbf{FC_{harvest-Gasolina}}$
Unit	kL m^{-3}
Description	Fuel consumption of the equipment used to cut and drag per m3 of merchantable timber harvested
Source of the parameter:	Floresta Viva Amazonas
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	0.01
Comments:	Application of the parameter in the equations 3-40 in (VCS, 2011)

Parameter	$\mathbf{FC_{harvest-Diesel}}$
Unit	kL m^{-3}
Description	Fuel consumption of the equipment used to cut and drag per m3 of merchantable timber harvested
Source of the parameter:	Floresta Viva Amazonas
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	0.05
Comments:	Application of the parameter in the equations 3-40 in (VCS, 2011)

Parameter	$\mathbf{CAP_{truck\ Carreta}}$
Unit	m^3 $truck^{-1}$
Description	Truck load capacity

Source of the parameter:	EBCF (2013)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	30
Comments:	Application of the parameter in the equations 3-44; 3-52 in (VCS, 2011)

Parameter	**$CAP_{truck\ Balsa}$**
Unit	m^3 $truck^{-1}$
Description	Truck load capacity
Source of the parameter:	EBCF (2013)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	500
Comments:	Application of the parameter in the equations 3-44; 3-52 in (VCS, 2011)

Parameter	**$Eff_{\_vehicle\ Balsa}$**
Unit	km kL^{-1}
Description	Fuel efficiency in each type of vehicle
Source of the parameter:	Barros &Uhl (1997)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	3,770
Comments:	Application of the parameter in equations 3-46; 3-52; 3-54; 4-7; 4-11; 4-14 in (VCS, 2011)

Parameter	**$Eff_{\_vehicle\ Carreta}$**
Unit	km kL^{-1}
Description	Fuel efficiency in each type of vehicle
Source of the parameter:	Barros &Uhl (1997)

Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	2000
Quality control procedures to be applied:	
Comments:	Application of the parameter in equations 3-46; 3-52; 3-54; 4-7; 4-11; 4-14 in (VCS, 2011)

Parameter	e_{demand}
Unit	kWh m^{-3}
Description	Power demand for processing volume processed
Source of the parameter:	VCS (2011)
Measurement methods and procedures to be applied:	Literature review for the appropriate value during the monitoring event
Value Applied:	20
Comments:	Application of the parameter in equations 3-47 in (VCS, 2011)

Parameter	**EFelectricity**
Unit	tCO_2-e kWh^{-1}
Description	Power emission factor in the country of origin
Source of the parameter:	IEA (2011) and MCTIC (2013)
Measurement methods and procedures to be applied:	Annual review of specific value
Value Applied:	0.000088 (2000), 0.000079 (2003), 0.00003223 (2006), 0.0000293 (2008)
Comments:	Application of the parameter in equations 3-48; 4-4 in (VCS, 2011)

Parameter	$EF_{flight,y}$
Unit	tCO_2-e $(passenger.km)^{-1}$
Description	Emission factor of the flight for trip y

Source of the parameter:	Value from literature
Measurement methods and procedures to be applied:	Emission factor of the flight for trip y
Value Applied:	0.00026 - Domestic 0.00036 – Short 0.0002 – Medium 0.00023 –Long
Comments:	Application of the parameter in equations 4-6, 4-10; 4-13 in (VCS, 2011)

Parameter:	$V_{historical\_ harvest,l,k}$
Data unit:	m^3
Description:	Total volume of harvest for the land (l), which is owned and/or operated by the proponent of the project during the historical reference period
Data source:	Records and licensing documents of project proponent, Operating License (OL) and Exploration Authorizations (AUTEXs).
Description of measurement methods and procedures to be applied:	Validated/verified before the start date of the IFM-LtPF project
Monitoring Frequency and data collection:	-
Quality control procedures to be applied:	-
Monitoring Equipment:	Values of environmental licensing shown in the AUTEXs. Pre-project historical records
Value Applied:	-
Calculation Method	Sum of all annual AUTEXs
Comments:	Application of the parameter in equations 5-3 in VCS (2011)

Parameters to be measured once

Parameter	**$Aproject_{,t=0}$**
Unit	Hectares
Description	Project area at time t=0
Source of the parameter:	Field validation using GPS, GIS thematic maps and satellite images
Measurement methods and procedures to be applied:	Validated/verified before the start date of the IFM-LtPF project
Monitoring Frequency:	NA (not applicable)
Value Applied:	18,598 hectares
Equipment:	Computational resources and appropriate softwares
Quality control procedures to be applied:	Georeferencing following national land regulations
Calculation method:	Computational resources with appropriate softwares using SAD 1969 datum and metric projection.
Comments:	Application of the parameter in equations 2-1; 3-4; 3-6; 3-9; 3-13; 3-36b in VCS (2011)

Parameter	**$Aproject_{, j ,t=0}$**
Unit	Area in hectares
Description	Project area within each stratum (j) at time t=0
Source of the parameter:	IBGE, 2004
Measurement methods and procedures to be applied:	Analysis in GIS platform with complement of official thematic databases Project
Monitoring Frequency:	Validated / verified before the start date of the IFM-LtPF

<table>
<tr><td rowspan="5">Value Applied:</td><td rowspan="5"></td><td rowspan="2">Phytophysiognomy</td><td colspan="2">Project Area</td><td colspan="2">Leakage Area</td></tr>
<tr><td>ha</td><td>%</td><td>ha</td><td>%</td></tr>
<tr><td>FDA</td><td>2.626,84</td><td>14,2</td><td>205,8</td><td>4,3</td></tr>
<tr><td>FDTB</td><td>15.911,20</td><td>85,8</td><td>4.540,0</td><td>95,7</td></tr>
<tr><td>Total</td><td>18.538,03</td><td>100,0</td><td>4.745,8</td><td>100,0</td></tr>
<tr><td>Equipment:</td><td colspan="6">Computational resources and appropriate software</td></tr>
<tr><td>Quality control procedures to be applied:</td><td colspan="6">A team in charge of the RPDS surveillance and the remote monitoring will be trained and specialized in geoprocessing technologies</td></tr>
<tr><td>Calculation method:</td><td colspan="6">Stratification of the PA was conducted using a thematic map of IBGE/DGC, 2004 vegetation types where the PA was extracted. Procedure in a GIS environment</td></tr>
<tr><td>Comments:</td><td colspan="6">Application of the parameter in equations 2-1; 3-4; 3-6; 3-9; 3-13 in VCS (2011)</td></tr>
</table>

Parâmetro	$A_{s,j,t=0}$
Unidade	hectares
Descrição	Total area of plots sampled in stratum (j) at time t = 0
Fonte do dado:	Forest management plan and operating authorizations
Método de mensuração e procedimentos a serem aplicados:	The area of the sampled plots is the same area licensed for exploration, as the licensing process requires the forest inventory using the 100% sampling method where all individuals are sampled and will be explored within the exploration area, known as "Plots" and "UPAs - Annual Production Units" within the scope of the legal framework that underpins the process of licensing the timber exploitation activity.
Frequência:	Before the start date of the project.

Valor a ser aplicado:	At least 30 (thirty) installments
Equipamento:	GPS and Track
Controle de qualidade procedimentos aplicáveis:	The IFC will be implemented by a technical team with extensive knowledge of practices in IFC activities following the standard procedures below: - ensure a measurement and allocation of PSPs is standardized and without deviations from procedures and mainly oriented the reliability to verify the field activities, - use of appropriate measurement equipment and utilities (eg, trena, GPS navigation, compass, red paint, pipes and others); - georeferencing of vertices of PSPs; - demarcation and cleaning of access and georeferencing tracks;
Método de cálculo:	Review of literature for application of relevant methodology
Comentários:	Application of the parameter in equations 3-10; 3-11; 3-12 in VCS 2011

Parâmetro	$DBH_{n,i,s,j,t=0}$
Unidade	cm
Descrição	Diameter at breast height t = 0 year
Fonte do dado:	Ex ante field measurement in sample plots
Método de mensuração e procedimentos a serem aplicados:	Measurement procedures in the field as described in Annex 46.
Frequência:	Validated / Verified before project start date IFM-LtPF
Valor a ser aplicado:	*DAP> 10 cm for adult trees and DBH> 2,5 cm for young trees in natural regeneration--*
Equipamento:	Diameter tape and metric tapes

Controle de qualidade procedimentos aplicáveis:	Annex 46
Método de cálculo:	On-site measurement in PSPs
Comentários:	*Application of the parameter in equations 3-10; 3-11; 3-12 in VCS 2011*

Parâmetro	$H_{n,i,s,j,t=0}$
Unidade	M
Descrição	Height for individual tree, t = 0 year
Fonte do dado:	Ex ante field measurement in sample plots
Método de mensuração e procedimentos a serem aplicados:	Measurement procedures in the field as described in Annex 46.
Frequência:	Validated / Verified before project start date IFM-LtPF
Valor a ser aplicado:	-
Equipamento:	Diameter tape and trenas
Controle de qualidade procedimentos aplicáveis:	Annex 46
Método de cálculo:	On-site measurement in PSPs
Comentários:	-

Parameter	$A_{NHA\_annual,t}$
Unit	Hectares
Description	Net logged area for the Project area in year t
Source of the parameter:	Obtained from the Corporate Sustainable Management Plan. Spatial delimitation of Annual Production Units (UPAs)
Measurement methods and procedures to be applied:	Validated/verified before the start date of the IFM-LtPF project

Value Applied:	Variation by year
Quality control procedures to be applied:	According to the Environmental Licensing Annual Operating Plan
Calculation method:	N/A (not applicable)
Comments:	Application of the parameter in equations 3-15a; 3-16a; 3-26; 3-27; 3-33; 3-35; 3-37a; 3-38 in VCS (2011)

Parameter	$A_{NHA\_annual,t}$
Unit	Hectares
Description	Net harvest area for the Project area in year t
Source of the parameter:	Obtained from the Sustainable Business Management Plan. Spatial delimitation of the Annual Production Units (PAU)
Measurement methods and procedures to be applied:	Documentary analysis of forest management operation licenses
Monitoring Frequency:	Validated / Verified before the start date of the IFM-LtPF Project
Value Applied:	According to the Environmental Licensing of the Annual Operational Plan
Equipment:	NA (not applicable)
Quality control procedures to be applied:	Application of the parameter in equations 3-15a; 3-16a; 3-26; 3-27; 3-33; 3-35; 3-37a; 3-38 in VCS (2011)
Calculation method:	Obtained from the Sustainable Business Management Plan. Spatial delimitation of the Annual Production Units (PAU)

Comments:	Validated / Verified before the start date of the IFM-LtPF Project

Parameter	$KM_{transport,t}$
Unit	km
Description	Annual distance from log shipping from the collection depot to the processing plant
Source of data:	Digital maps
Method of measurement and procedures to be applied:	Analysis of digital maps and cartographic bases in GIS environment with the aid of logistical information made available on the WEB.
Frequency:	Validated / Verified before project start date IFM-LtPF
Value to be applied:	The values used as input for the calculation of the emissions parameters due to the distribution of the logs is shown in Annex 18, in the "Calculations_baseline" tab.
Equipment:	Analysis in GIS platform with the aid of official cartographic databases
Quality control applicable procedures:	Validation and Verification before project start date
Method of calculation:	Estimates in GIS environment with the aid of operational data of exploitation complemented by survey of secondary data for the estimation of the consumption of logistic inputs.

Comments:	-

Parâmetro	$KM_{distrib,t}$
Unidade	km
Descrição	Annual distance of transport from the processing point to the point of distribution / export
Fonte do dado:	Digital maps
Método de mensuração e procedimentos a serem aplicados:	Analysis of digital maps and cartographic bases in GIS environment with the aid of logistical information made available on the WEB.
Frequência:	Validated / Verified before project start date IFM-LtPF
Valor a ser aplicado:	All values used as inputs for the calculation of emission parameters due to the distribution of the logs are shown in Annex 18 in the "Calculations_baseline" tab.
Equipamento:	Analysis in GIS platform with the aid of official cartographic databases
Controle de qualidade procedimentos aplicáveis:	Validation and Verification before the start date of the project.
Método de cálculo:	GIS Analisys and electronic tables
Comentários:	-

Parameter	$V_{historical\_harvest,l,k}$
Unit	Volume in cubic meters (m3)

Description	Total volume of harvest for the land (l), which is owned and/or operated by the proponent of the project during the historical reference period
Source of the parameter:	Proponent project records through licensing of the Annual Operating Plan (POA). Only ex ante information
Measurement methods and procedures to be applied:	Validated/verified before the start date of the IFM-LtPF project
Monitoring Frequency:	183,373.46 m^3
Value Applied:	
Equipment:	N/A (not applicable)
Quality control procedures to be applied:	Pre-project historical record
Calculation method:	Pre-project historical record
Comments:	Application of the parameter in the equations 5-3 in VCS (2011)

8.3 Data and Parameters to be monitored

Parameter	$\mathbf{DBH}_{n,i,s,j,t}$
Unit	Cm
Description	Diameter at chest height
Source of data:	Field Measurement in PSPs
Method of measurement and procedures to be applied:	Measurement procedures in the field as described in Annex 46.
Frequency:	At no greater intervals after the first field measurement
Value to be applied:	-
Equipment:	Diameter tape and metric tapes

Quality control applicable procedures:	Annex 46
Method of calculation:	On-site measurement in PSPs
Comments:	Application of the parameter in equations 3-10; 3-11; 3-12 in VCS 2011

Parameter	$DBH_{tree\_nd,n,i,snd,j,t}$
Unit	Cm
Description	Diameter at breast height for the individual tree n of species i in the portion of the sample in the naturally disturbed area and of stratum j in year t
Source of data:	Field measurement of permanent plots
Method of measurement and procedures to be applied:	Measurement procedures in the field as described in Annex 46.
Frequency:	At no greater intervals after the first field measurement
Value to be applied:	-
Equipment:	Diameter tape and metric tapes
Quality control applicable procedures:	Annex 46
Method of calculation:	On-site measurement in PSPs
Comments:	Application of the parameter in equations 3-10; 3-11; 3-12 in VCS 2011

Parameter	$H_{n,i,s,j,t}$
Unit	m

Description	Height for the individual tree n, of species i, in plot portion s, of stratum j, in year t
Source of data:	Field measurement of permanent plots
Method of measurement and procedures to be applied:	Measurement procedures in the field as described in Annex 46.
Frequency:	At no greater intervals after the first field measurement
Value to be applied:	-
Equipment:	Diameter tape and tape measure
Quality control applicable procedures:	
Method of calculation:	Annex 46
Comments:	On-site measurement in PSPs

Parameter	$H_{tree\_nd,n,i,snd,j,t}$
Unit	m
Description	Height for the individual tree n of species i in the portion of the sample in the naturally disturbed area and of stratum i in year t
Source of data:	Field measurement of permanent plots
Method of measurement and procedures to be applied:	Measurement procedures in the field as described in Annex 46.
Frequency:	At no greater intervals after the first field measurement
Value to be applied:	-
Equipment:	Diameter tape and tape measure

Quality control applicable procedures:	Annex 46
Method of calculation:	On-site measurement in PSPs
Comments:	Application of the parameter in equations 3-10; 3-11; 3-12 in VCS 2011

Parameter	$KM_{plan\_flight,y,t}$
Unit	Km
Description	Distance traveled per trip for a total of Y trips in year t
Source of data:	Travel log sheets provided by the proposer
Method of measurement and procedures to be applied:	Flight Travel Log
Frequency:	Yearly
Value to be applied:	-
Equipment:	Computer and electronic publishing software Sofwtares
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$N_{plan\_flight,y,t}$
Unit	Number of passangers
Description	Number of passengers per trip in year t
Source of data:	Travel log sheets provided by the proposer

Method of measurement and procedures to be applied:	Flight Travel Log
Frequency:	Yearly
Value to be applied:	-
Equipment:	Computer and spreadsheet editing software
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$KM_{plan\_ground,y,t}$
Unit	Km
Description	Distance traveled per trip for a total of Y trips in year t
Source of data:	Travel log sheets provided by the proposer
Method of measurement and procedures to be applied:	Spreadsheet analysis
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$V_{fuel\_plan\_ground,y,t}$

Unit	kL
Description	Annual volume of fuel consumed per trip in year t
Source of data:	Vehicle Travel Registration
Method of measurement and procedures to be applied:	Analysis of fuel consumption control spreadsheets provided by the tenderer
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$KM_{design\_flight,y,t}$
Unit	km
Description	Distance traveled per trip for a total of Y trips in year t
Source of data:	Flight Travel Log
Method of measurement and procedures to be applied:	Analysis of travel control spreadsheets provided by the proposer
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers

Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$N_{design\_flight,y,t}$
Unit	Number of passengers
Description	Number of passengers per trip in year t
Source of data:	Flight Travel Log
Method of measurement and procedures to be applied:	Analysis of travel control spreadsheets provided by the proposer
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$KM_{design\_ground,y,t}$
Unit	km
Description	Distance traveled per trip for a total of Y trips in year t
Source of data:	Vehicle Travel Registration
Method of measurement and procedures to be applied:	Analysis of travel control spreadsheets provided by the proposer

Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$KM_{design\_ground,y,t}$
Unit	Km
Description	Distance traveled per trip for a total of Y trips in year t
Source of data:	Vehicle Travel Registration
Method of measurement and procedures to be applied:	Analysis of travel control spreadsheets provided by the proposer
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$KM_{monitoring\_flight,y,t}$
Unit	km

Description	Distance traveled per trip for a total of Y trips in year t
Source of data:	Flight Travel Log
Method of measurement and procedures to be applied:	Analysis of travel control spreadsheets provided by the proposer
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$N_{monitoring\_flight\ y,t}$
Unit	Number of passengers
Description	Number of passengers per trip in year t
Source of data:	Flight Travel Log
Method of measurement and procedures to be applied:	Analysis of travel control spreadsheets provided by the proposer
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-

Method of calculation:	-
Comments:	-

Parameter	$KM_{monitoring\_ground,y,t}$
Unit	Km
Description	Distance traveled per trip for a total of Y trips in year t
Source of data:	Vehicle Travel Registration
Method of measurement and procedures to be applied:	Analysis of travel control spreadsheets provided by the proposer
Frequency:	Yearly
Value to be applied:	-
Equipment:	Electronic spreadsheet editing software and computers
Quality control applicable procedures:	-
Method of calculation:	-
Comments:	-

Parameter	$A_{nd,j,t}$
Unit	ha
Description	Area of natural disturbance nd, in stratum j in year t
Source of data:	Satellite imagery and field measurement
Method of measurement and procedures to be applied:	Through SR / GIS monitoring and field evaluations and validations
Frequency:	Yearly

Value to be applied:	Only after remote sensing and field evaluation in case of any disturbance
Equipment:	Computational resources, satellite images and specific software.
Quality control applicable procedures:	Verification of the field evaluation and subsequent measurement in a GIS environment with the aid of low / medium resolution satellite images.
Method of calculation:	GIS environment
Comments:	Application of the parameter in equations 4-15; 4-17a in VCS (2011)

Parameter	$f_{natdisturb,j,t}$
Unit	Dimensionless
Description	Fraction of forest naturally damaged in stratum j, year t
Source of data:	Field research
Method of measurement and procedures to be applied:	Through SR / GIS Monitoring and field assessments
Frequency:	Yearly
Value to be applied:	Only after field and remote evaluation
Equipment:	Computer resources and specific software
Quality control applicable procedures:	Measurement in GIS environment with the aid of low / medium resolution satellite images.
Method of calculation:	GIS environment

Comments:	Application of the parameter in equations 4-16 in VCS (2011)

Parameter	$V_{illegal\_harvest,t}$
Unit	M³
Description	Illegal logging as detected in field survey in year t
Source of data:	EBFC
Method of measurement and procedures to be applied:	Field survey and secondary information
Frequency:	Yearly
Value to be applied:	-
Equipment:	Satellite imagery, computational resources and specific software and field and secondary observation
Quality control applicable procedures:	A responsible team will be formed and trained for both RPDS surveillance activities as well as remote monitoring with expertise in geoprocessing technologies
Method of calculation:	Through field verification and preliminary information collection for further measurement in a GIS environment
Comments:	Application of the parameter in equations 4-21 in VCS (2011)

Parameter	$A_{illegal\_harvest,j,t}$
Unit	Há
Description	Illegal harvesting area in stratum j, year t

Source of data:	Satellite Data
Method of measurement and procedures to be applied:	Use of high / medium resolution satellite images in a GIS environment
Frequency:	Yearly
Value to be applied:	Only where relevant
Equipment:	Satellite imagery, computational resources and specific software
Quality control applicable procedures:	Visual interpretation of images and field verification
Method of calculation:	Through field verification and preliminary information collection for further measurement in a GIS environment
Comments:	Application of the parameter in equations 4-22 in VCS (2011)

Parameter	$V_{actual\_harvest,l,t}$
Unit	m³ / ano
Description	Actual annual harvest volume for land l which is owned and / or operated by the Project Proponent or the forest with comparable conditions and conditions at the local or regional or national level in year t
Source of data:	EBCF (2013). Evidence with pre-project documents
Method of measurement and procedures to be applied:	100% inventory and licensing. Ex-ante
Frequency:	Yearly

Value to be applied:	Varying annually according to POA
Equipment:	-
Quality control applicable procedures:	EBCF and responsible licensing body
Method of calculation:	Following state and federal legislation
Comments:	Application of the parameter in equations 5-4; 5-5; 5-6; 5-7 on VCS (2011)

MONITORED FLORA PARAMETERS

Parameter:	**Floristic and phytosociological structure of the tree community**
Data unit:	Non-dimensional
Description:	CFI PSPs will be checked for incidence of entry and mortality and also for what type(s) of vegetation stand(s) out, as well as the dynamics of growth and increase/decrease of biomass
Data source:	Primary data obtained by EBCF In the field with measurements by PSPs
Description of measurement methods and procedures to be applied:	Activities complementary to the re-measurement of the CFI, in order to know more about the dynamics, density, dominance and basal area of the species found. Temporal comparisons with previous phytosociological parameters, especially for species of highest and lowest values of Importance Value Index (IVI) and Coverage Value Index (IVC). Moreover, the red list of endangered and vulnerable species (SEMA, CITES, IUCN and MMA). Detailed description in Annex 46.
Monitoring Frequency and data collection:	At intervals not exceeding 5 years from the first measurement

Monitoring Equipment:	Tape-measure, GPS, field spread sheet, vehicle, computer, first aid kit

Parameter:	**Extraction of timber forest products**
Data unit:	Approximate cubic meters of timber and quantity of species used (common name)
Description:	The filling out of forms during community monitor interviews with families in the Project containing the descriptions of the varieties of trees extracted, wood volume, wood quality and the reason for its use (family benefit and/or sale).
Data source:	Primary data collected by the community monitors through the spread sheet given by EBCF
Description of measurement methods and procedures to be applied:	It is recommended that 2 monitors be trained in each community for the interviews with the families who fish for survival and/or commercial purposes within the project areas. The primary data collected must be made available to the EBCF team, which will tabulate the data, making qualitative and quantitative analyses.
Monitoring Frequency and data collection:	Community monitors should have the full information registered twice a year, the first survey during the summer period (between the months of May to October) and the second, in the winter period (November-April).
Monitoring Equipment:	Forms EBCF, clipboard, paper and pen.

Parameter:	**Extraction of non-timber forest products**
Data unit:	Quantity of products differentiated by species and weight in units compatible with those used by communities

Description:	A form containing the descriptions of the variety and quality of non-timber forest products extracted, their volumes, weights and use (family benefit and/or sale) will be completed during community monitor interviews with the families that use the natural resources in the project areas.
Data source:	Primary data collected by the community monitors through the spread sheet given by EBCF
Description of measurement methods and procedures to be applied:	It is recommended that 2 monitors be trained in each community for the interviews with the families who fish for survival and/or commercial purposes within the project areas. The primary data collected must be made available to the EBCF team, which will tabulate the data, making qualitative and quantitative analyses.
Monitoring Frequency and data collection:	Community monitors should have the full information registered twice a year, the first survey during the summer period (between the months of May to October) and the second, in the winter period (November-April).
Monitoring Equipment:	Forms, clipboards, paper and pen

Parameter:	**Extraction of non-timber forest products for subsistence**
Data unit:	Unit /Family /Time
Description:	Quantification and qualification of demand for forest products such as timber, lumber, NTFPs, vines, palm trees and other benefits from the forest

Data source:	Primary data collected by the community monitors through the spread sheet given by EBCF
Description of measurement methods and procedures to be applied:	Informal conversations and semi-structured questionnaires with community members
Monitoring Frequency and data collection:	Annual
Monitoring Equipment:	Forms, clipboards, paper and pen

MONITORED PARAMETERS OF FAUNA

Parameter	**Medium and large mammals**
Unit	Number of species
Description	Diversity of medium and large mammal species
Source of the parameter:	Biological inventory in the field
Measurement methods and procedures to be applied:	Animal visualization via line transects and tracking traces in sampling points, complemented by indirect data from feces and hair, as well as interviews with locals about the species present in the area and on how they use the wildlife. The line transect method is standard for systematic inventories of diurnal mammals in the Amazon and other tropical forests. The procedure consists of carefully tracing a straight track - the transect - at an even pace, recording all encounters with the relevant species. At each meeting (sighting) with individuals or groups of target species the following should be recorded: time, location on the track, species, number of individuals and their sex-age classes, perpendicular distance animal-trail, observed behavior of the animal, height from the ground

	and other relevant information, such as the food item being consumed. In the case of a group, the data should refer to the first animal sighted. Before starting the course, the date, sample point, observers, weather and start time are recorded. The closing time should also be noted
Monitoring Frequency:	Biological inventories, including for mammals, should be repeated at an interval not exceeding 5 years from the first measurement.
Value Applied:	-
Equipment:	Measuring tape, binoculars, camera, plastic gloves, magnifying glasses and plastic bags to collect hair and stool and forms for the interviews.
Quality control procedures to be applied:	The inventory will be conducted by a specialized crew with vast knowledge in the rapid inventory of mammals.
Calculation method:	-
Comments:	Species whose adult weight is equal to or less than one kilogram will be considered medium and large mammals. The specialized staff to be hired should participate in joint expeditions with other teams of experts in order to identify other animal of interest.

Parameter	**Mammals: Chiroptera (bats)**
Unit	Number of species
Description	Diversity of bat species
Source of the parameter:	Biological inventory in the field
Measurement methods and procedures to be applied:	The main methodologies used for sampling bats will be based on (1) trapping of animals mid-flight with the aid of mist nets and (2) diurnal

	search and capture in quarries, using nets and hand nets. Samplings will be directed to several types and subtypes of associated vegetation, especially mosaics. Types and subtypes of vegetation should be diagnosed earlier by flora teams and landscape studies on the relevant region.
Monitoring Frequency:	Biological inventories, including for chiroptera, should be repeated at an interval not exceeding 5 years from the first measurement.
Value Applied:	-
Equipment:	Tape, mist nets, hand nets, camera, leather gloves, magnifying glass and plastic bags to collect fur and feces
Quality control procedures to be applied:	The inventory will be conducted by a specialized team with vast knowledge in the rapid inventory of bats.
Calculation method:	-
Comments:	Species whose adult weight is equal to or less than one kilogram will be considered medium and large mammals. The specialized staff to be hired should participate in joint expeditions with other teams of experts in order to identify other animal of interest.

Parameter	**Bird inventory**
Unit	Number of species
Description	Diversity of bird species
Source of the parameter:	Biological inventory in the field
Measurement methods and procedures to be applied:	Animal visualization and recordings via line transects, carefully tracing a straight track - the transect - at an even pace, recording all

	encounters with the relevant species. At each meeting (sighting) with individuals or groups of target species the following should be recorded: time, location on the track, species, number of individuals and their sex-age classes, perpendicular distance animal-trail, observed behavior of the animal, height from the ground and other relevant information, such as the food item being consumed. In the case of a group, the data should refer to the first animal sighted. Before starting the course, the date, sample point, observers, weather and start time are recorded. The closing time should also be noted The methods of visual and sound recording will be used together to survey the bird species of the localities. Where possible, bird vocalizations will be recorded with the aid of an ultra-directional analog or digital recorder. Prior to the field visit, literature searches should be done to help with identification of birds in the field, as well as to gather information on the geographical distribution of the species marked for the region.
Monitoring Frequency:	Bird inventories should occur every 5 years.
Value Applied:	-
Equipment:	Binoculars, audio recorder, camera, and record spread sheets.
Quality control procedures to be applied:	The inventory will be conducted by a specialized crew with vast knowledge in the rapid inventory of birds.
Calculation method:	-

Comments:	The specialized staff to be hired should participate in joint expeditions with other teams of experts in order to identify other animals of interest.

Parameter	**Fish Species**
Unit	Number of species
Description	Diversity of fish species and groupings in lakes, streams and rivers.
Source of the parameter:	Biological inventory in the field
Measurement methods and procedures to be applied:	Methodology based on the protocol for research on fish in RAPELD modules of the PPBio, in grids. RAPELD grids and transect system and permanent plots with standardized distances. For the biological fish inventory, aquatic plot types are used. Each plot corresponds to a 50m long stretch along the streambed, *igarapé*, river and the measurement is done by the margin, in the mouth-to-head direction.
Monitoring Frequency:	Preferably performed in the same seasonal period.
Value Applied:	-
Equipment:	Tape measure (50m); ½ inch PVC pipes (100 cm long, 8 to 10 units); colored plastic ribbons (colors that are easily seen in the vegetation); fine mesh hand nets (1 mm); small dragnet; formaldehyde 37%; 96% ABV alcohol; 90g tracing paper labels; indelible pen or ink; resistant plastic bags; rubber bands
Quality control procedures to be applied:	The inventory will be conducted by a specialized crew with vast knowledge in the rapid inventory of ichthyofauna.
Calculation method:	-

Comments:	For further details, see: http://ppbio.inpa.gov.br/sites/default/files/Peixes.pdf

Parameter	**Reptiles**
Unit	Number of amphibian and reptile species.
Description	Sampling plots and identification of species diversity in the project area.
Source of the parameter:	Biological inventory in the field
Measurement methods and procedures to be applied:	Two methods will be employed: i) Pitfall traps with drift-fence and ii) Visual Encounter Surveys, CRUMP; SCOTT, 1994). Method I) Standardized sampling, suitable for the collection of frogs, reptiles, mammals and many invertebrates in litterfall. Provides quantitative data that can be compared across different areas, given that the size of buckets, the distance between them and the design of the traps are the same. At each sampling point, four 60 liter buckets are used, arranged in a Y shape with the central bucket 10 meters away from each of the three peripheral buckets. Each peripheral bucket is connected with the central bucket with a plastic tarp, 50 cm in height, with its lower end buried in the ground. The three tarps form a 120°angle with each other (JONES, 1981; GIBBONS; SEMLITSCH, 1981; CORN, 1994; RIBEIRO-JUNIOR et al., 2008). During the sampling period, the buckets should be inspected daily in order to collect the captured animals. Between the sampling periods, the buckets should be closed or twigs should be placed in the buckets in order to allow a way out for animals that fall in. The second option is usually more efficient, depending on how hard it is to close the buckets.

	Method II) The method consists of slowly walking along the grid of trails. On each side of the trail, an area of 5 meters is sampled to a depth of 3 to 4 meters. The litterfall, decaying trunks, trunk cavities, vegetation in holes in the ground, and other places that can provide shelter for reptiles are surveyed. Time and place are registered for the animals that are sighted or heard, but not collected, if the identification is secure. This method requires at least 100 hours of research time.
Monitoring Frequency:	Preferably performed in the same seasonal period.
Value Applied:	-
Equipment:	Pitfall traps, binoculars, microphone for recording vocalizations, 40 and 100 liter plastic buckets.
Quality control procedures to be applied:	The inventory will be conducted by a specialized crew with vast knowledge in the rapid inventory of reptiles.
Calculation method:	-
Comments:	For further details, see: http://ppbio.museu-goeldi.br/?q=pt-br/protocolo-10-herpetofauna

Parameter	Anurans (amphibians)
Unit	Number of species (richness)
Description	Diversity of anuran species
Source of the parameter:	Biological inventory in the field
Measurement methods and procedures to be applied:	In order to identify anura, the RAPELD methodology should be used, with grids in transect systems and permanent and standardized plots. It is advisable to perform at least two surveys, one at the peak of the rainy season and another at the end of the rainy

	season. This allows species with short and restricted breeding seasons to be detected during one of these periods. Before initiating field activities, it is important to collect as much information as possible on the species occurring in the study area, using photos and sound files available on the Internet or in specialized literature for mounting boards and collections of reference sounds. The material obtained should be used to start a collection of references, associating photos of individuals of each species with their vocalizations. Photos and sonograms (visual representations of vocalizations) can be arranged on boards of images that observers can take into the field to assist in the identification of species.
Monitoring Frequency:	Biological inventories, including for Anurans, should be repeated at an interval not exceeding 5 years from the first measurement.
Value Applied:	-
Equipment:	Camera; digital recorder; transparent (5 L) plastic bags used to transport animals collected in the field; appropriate thermometer for measuring air temperature; wristwatch; permanent markers; pencil and eraser; clipboards for annotations; head-mounted flashlight; and GPS.
Quality control procedures to be applied:	The inventory will be conducted by a specialized crew with vast knowledge in the rapid inventory of anuran species.
Calculation method:	-
Comments:	If the precise identification of the species via sonogram is not possible, naming morphotypes is sufficient. The genus or family name of each

	species can be used, followed by the epithet "sp." More accurate identifications can be made later by specialists in the group. The specialized staff hired should participate in joint expeditions with other teams of experts in order to identify other animals of interest.

Parameter:	Subsistence and/or commercial fishing
Data unit:	Number of species caught (common name) and weight of fish (in kilograms)
Description:	In interviews with community monitors and families that use the natural resources in the project areas, forms will be filled out containing the descriptions of the species and weights of fish caught in lakes, *igarapé*s and rivers of the project areas and the surrounding region (buffer zone)
Data source:	Primary data collected by the community monitors through the spread sheet given by EBCF
Description of measurement methods and procedures to be applied:	It is recommended that 2 monitors be trained in each community for the interviews with the families who fish for survival and/or commercial purposes within the project areas. The primary data collected must be made available to the EBCF team, which will tabulate the data, making qualitative and quantitative analyses.
Monitoring Frequency and data collection:	Community monitors should have the full information registered twice a year, the first survey during the summer period (between the months of May to October) and the second, in the winter period (November-April).

Monitoring Equipment:	Tape measure, GPS, field spread sheet, computer, first aid kit and camera.

Parameter:	**Subsistence and/or commercial hunting**
Data unit:	Number of hunted species (common name), number of individuals hunted by species and animal weight (in kilograms)
Description:	In interviews with community monitors and families that use the natural resources in the project areas, forms will be filled out containing the descriptions of the animals and their respective weights, indicating which locations were hunted and the average frequency of hunting.
Data source:	Primary data collected by the community monitors through the spread sheet given by EBCF
Description of measurement methods and procedures to be applied:	It is recommended that 2 monitors be trained in each community for the interviews with the families who hunt for survival and/or for commercial means within the project areas. The primary data collected must be made available to the EBCF team, which will tabulate such data, making qualitative and quantitative analyses.
Monitoring Frequency and data collection:	Community monitors should have the full information registered twice a year, the first survey during the summer period (between the months of May to October) and the second, in the winter period (November-April).
Monitoring Equipment:	Tape measure, GPS, field spread sheet, computer, first aid kit and camera

Parameter:	**Synergistic animals, flagged, under threat or conflict**
Data unit:	Number of species (common name) visualized and recorded in audio and/or video.
Description:	Community monitors will be trained to promote the monitoring of animal species of ecological interest (endangered, of interest for tourism, under pressure from resident use - hunting and fishing). Specific trails will be defined in various locations that provide access the PA lands. Each trail will be reviewed periodically. It is suggested at least twice a year, once in the dry season and once in the flooded season.
Data source:	Primary data collected by the community monitors through the spread sheet given by EBCF
Description of measurement methods and procedures to be applied:	The main settlements and access trails to the project areas of interest for monitoring should be identified. Trained community monitors should traverse the trails with defined frequencies to observe and record animals, to be defined by EBCF.
Monitoring Frequency and data collection:	To be defined in training workshops held by the EBCF and community monitors, according to the species to be monitored.
Monitoring Equipment:	Binoculars, GPS, field spread sheet, computer, first aid kit and camera and recorder

MONITORED SOCIAL PARAMETERS

Parameter:	**Land-use**
Data unit:	Number of production and managed units

Description:	Production and extractivist areas will be quantified and measured in the project area.
Data source:	Participatory mapping of the Management Plan and primary data to be obtained in the field by EBCF throughout the project
Description of measurement methods and procedures to be applied:	Improvement of participatory maps from the interpretation of high-resolution satellite images and field visits to production and managed units in each community.
Monitoring Frequency and data collection:	Every three years
Monitoring Equipment:	GPS, measuring tape, satellite images

Parameter:	**Agricultural, forest and fishery production**
Data unit:	Bags, kilos, tons, liters, hectoliters produced
Description:	Quantification of the production of annual and biannual crops, (such as corn, beans and mandioc) of fish and non-timber products (such as Brazil nuts, andiroba, copaiba and others).
Data source:	Primary data to be obtained through the application of questionnaires and field visits by the AAVs and the EBCF team.
Description of measurement methods and procedures to be applied:	Application of EBCF questionnaires with AAVs and in-field sampling.
Monitoring Frequency and data collection:	Twice a year, once in the dry season and once in the flooded season.
Monitoring Equipment:	Forms, clipboards, paper and pens

Parameter:	**Technological Level**
Data unit:	Description

Description:	Technological level, management plans approved and in execution. Rules for fishing instituted and put into practice
Data source:	Primary data to be obtained in the field by EBCF.
Description of measurement methods and procedures to be applied:	Field visits to production and managed units to analyze some indicators such as number of cultivated and/or managed species, cultivation techniques employed and/or management, such as intercropping systems and crop rotation, use of ecological and organic fertilizers and use of mulch, etc.
Monitoring Frequency and data collection:	Every three years
Monitoring Equipment:	Field notebooks

Parameter:	**Social Organization**
Data unit:	Number of events, associations and community groups. Number and quality of documentation produced, decision-making and lessons learned. Number of partnerships and cooperative systems established with other groups and institutions.
Description:	Quantitative and qualitative characterization of the level of organization of Communities, including the ability to establish partnerships as well as dealing with conflicts
Data source:	Analysis of documents and interviews with the leadership.
Description of measurement methods and procedures to be applied:	Quantification and functional description of each event and/or institution. Participation by gender and age. Examining the capacity of institutions and groups to develop plans, business plans,

	reports etc. Existence of approved and ongoing projects and funding.
Monitoring Frequency and data collection:	Biannual
Monitoring Equipment:	Field notebooks and recorders, when allowed

Parameter:	**Demography**
Data unit:	Number of people
Description:	Number of people in the Communities, age range, birth and mortality rates.
Data source:	Primary data to be obtained in the field by the EBCF and secondary data to be obtained from census and health agencies
Description of measurement methods and procedures to be applied:	Updating demographic data of the Management Plan through home visits
Monitoring Frequency and data collection:	Biannual
Monitoring Equipment:	Field notebooks, clipboards and recorders, when allowed

Parameter:	**Income Generation**
Data unit:	Quantity, volume and diversity of commercialized products
Description:	All commercialized products will be quantified. Techniques to add value to products, storage system, marketing strategies, transportation used, and the markets involved will also be identified.
Data source:	Existing documents and primary data to be obtained by EBCF.
Description of measurement methods and procedures to be applied:	Interviews with leaders and visits to storage areas and selling locations.

Monitoring Frequency and data collection:	Biannual
Monitoring Equipment:	Scales and other appropriate equipment

Parameter:	**Installed infrastructure and equipment**
Data unit:	Amount, type and state of the installed infrastructure and equipment
Description:	Identifying the description of the state and maintenance of the installed infrastructure and equipment such as boats, ambulance boats, schools, libraries, warehouses, sheds, community centers, community kitchens, wells, satellite dishes, computers, ham radio, telephones, internet, electrical network, etc.
Data source:	Primary data to be obtained by EBCF.
Description of measurement methods and procedures to be applied:	Field visits to Communities
Monitoring Frequency and data collection:	Biannual
Monitoring Equipment:	Cameras and field books

Parameter:	**Health and sanitation**
Data unit:	Identification of the most frequent diseases; description of the state of health of the local population, infrastructure and community health equipment; water supply, sewage and garbage systems
Description:	Survey on the incidence of disease and malnutrition; existence of programs and preventive health initiatives, sanitation and retrieval of traditional herbal medicines; existence and training of health workers
Data source:	Primary data to be obtained by EBCF.

Description of measurement methods and procedures to be applied:	Interviews and questionnaires
Monitoring Frequency and data collection:	Biannual
Monitoring Equipment:	Forms and field books

Parameter:	**Education**
Data unit:	Amount of infrastructure and equipment; number of teachers and qualification of the educational system
Description:	Collecting information on levels of educational of the population by age and gender and qualitative description of the education system in Communities, including teaching and informative materials and equipment; school transportation and teacher training
Data source:	Analysis of existing documents and primary data collection by EBCF
Description of measurement methods and procedures to be applied:	Updating information of the Management Plan; interviews with teachers, leaders and students.
Monitoring Frequency and data collection:	Biannual
Monitoring Equipment:	Forms and field books

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