



**Verified Carbon
Standard**

ABC NORTE REDD PROJECT



Ecológica

An **Algar** Company

Document Prepared by Ecológica Assessoria Ltda.

Project Title	ABC Norte REDD Project
Version	01
Date of Issue	12-July-2021
Prepared By	Ecológica Assessoria Ltda.
Contact	Quadra 103 Norte, Av. LO-2, Lote 56, Sala 14, Edifício Olympia, Plano Diretor Norte, Palmas – TO, Brazil Postal Code: 77.001-022 T: +55 (63) 3219-7100 www.ecologica.org.br

CONTENTS

1.1	Summary Description of the Project	4
1.2	Sectoral Scope and Project Type	5
1.3	Project Eligibility	5
1.4	Project Design	6
1.5	Project Proponent	6
1.6	Other Entities Involved in the Project	7
1.7	Ownership.....	8
1.8	Project Start Date	8
1.9	Project Crediting Period	9
1.10	Project Scale and Estimated GHG Emission Reductions or Removals	9
1.11	Description of the Project Activity	10
1.12	Project Location	18
1.13	Conditions Prior to Project Initiation	23
1.14	Compliance with Laws, Statutes and Other Regulatory Frameworks	36
1.15	Participation under Other GHG Programs	40
1.16	Other Forms of Credit.....	40
1.17	Additional Information Relevant to the Project	40
2.1	No Net Harm	40
2.2	Local Stakeholder Consultation	40
2.3	Environmental Impact	40
2.4	Public Comments	40
2.5	AFOLU-Specific Safeguards	40
3.1	Title and Reference of Methodology	40
3.2	Applicability of Methodology	40
3.3	Project Boundary	41
3.4	Baseline Scenario	44
3.5	Additionality	64
3.6	Methodology Deviations	69
4.1	Baseline Emissions	69
4.2	Project Emissions	69
4.3	Leakage.....	69

4.4	Net GHG Emission Reductions and Removals	69
5.1	Data and Parameters Available at Validation	69
5.2	Data and Parameters Monitored.....	69
5.3	Monitoring Plan.....	69

1 PROJECT DETAILS

1.1 Summary Description of the Project

In Brazil, 58.39% of its entire 851,029,591.4 ha territory (IBGE, 20191) is covered by forests, representing almost 497 million hectares of forest area (FAO, 20202) and putting it in second place for nations with most forest area worldwide. Brazil has also been at times the country with the highest levels of deforestation in the world, having lost almost 15 million hectares of its forest area from 2010 to 2020 (FAO, 20203). The expansion of the agriculture frontier due to cattle ranching, soy farming, timber collection, infrastructure and colonization by subsistence agriculturalists has contributed to this historically high deforestation rate, which is concentrated in the northern portion of the country, where the Amazon Rainforest lies.

The primary objective of the ABC Norte REDD Project is to avoid the unplanned deforestation (AUD) of the 140,432.27 ha project area, consisting of 100% Amazon rainforest. The project area is located within a private property named “Fazenda Pacajá”, which is located between the municipalities of Portel and Bagre, in the State of Pará, Northeast Amazon.

The project proponent, ABC Agropecuária Brasil Norte SA Produção e Exportação, leased the area to a forestry company that carried out the sustainable forest management activities during almost 20 years. On 14-September-2017, despite a recurrent negative balance over the last years and an increasing deforestation pressure from external agents, the project proponent decided to maintain the Sustainable Forest Management Plan (SFMP) in Fazenda Pacajá through ceasing the contract with the former forestry company, and the investment in a certified reduced impact logging SFMP with other company combined with the expansion of social activities to local communities and enhanced surveillance in the project area. Carbon credits revenues are an important income source for making such activities feasible.

Thus, 14-September-2017 was defined as the project start date of the present project activity.

ABC Norte is the forestry company of Algar, a Brazilian family group with over 90 years of experience, and operations in the telecommunications, tourism and agribusiness sectors.

Environmental education and other social activities that benefit the local community will be supported, as well as improving the control of deforestation. The SOCIALCARBON® Standard is being applied to assess and monitor the project's contribution to sustainability using six key indicators: Biodiversity; Nature; Financial; Human; Social and Carbon Resources, thus improving the social and environmental conditions in the project region.

The present REDD project is estimated to avoid a predicted 9,245 ha of deforestation, equating to 3,955,602 tCO₂e in emission reductions over the 10 year of project lifetime (14-September-2017 to 13-September-2027), with an annual average of 395,560 tCO₂e.

The project is located in the State of Pará, in priority areas within the agricultural expansion frontier region, according to the Ministry of Environment. The main deforestation and degradation agents acting within the reference region during the historical period were: cattle ranching, mainly producing beef cattle; and timber harvesters, acting both legally and illegally. Deforestation in the region involves spatially overlapping activities: firstly, extraction of commercially valuable tree species for sale to timber companies. The final step is the slash-and-burn deforestation of the area above for pasturelands and cattle ranching.

The increased complexity and costs associated with the sustainable operation of the forest as well as other factors such as bureaucratic constraints and price fluctuations of certified timber prices make sustainable forest management less competitive than illegal logging. Thus, revenue from the sales of the Verified Carbon Units (VCUs) is essential for the project activity to compete with profitable alternative land use scenarios.

In addition to contributing to the long-term conservation of the region, the ABC Norte REDD Project also establishes a barrier against the advancement of deforestation, making it an important contribution to the conservation of Northeast Amazon biodiversity and also to climate regulation in Brazil and South America.

1.2 Sectoral Scope and Project Type

14. Agriculture, Forestry, Land Use (AFOLU)

Reducing Emissions from Deforestation and Degradation (REDD) through Avoided Unplanned Deforestation.

This is not a grouped project.

1.3 Project Eligibility

The project is eligible under the scopes of the VCS Program Version 4.0:

- The project meets all applicable rules and requirements set out under the VCS Program;
- The project applies a methodology eligible under the VCS Program;
- The implementation of this project activity does not lead to the violation of any applicable law;
- This is an eligible AFOLU project category under the VCS Program: reduced emissions from deforestation and degradation (REDD);
- This project is not located within a jurisdiction covered by a jurisdictional REDD+ program;
- Implementation partners are identified in the project activity;
- This project does not convert native ecosystems to generate GHG. The project area only contains native forested land for a minimum of 10 years before the project start date;
- This project does not occur on wetlands and does not drain native ecosystems or degrade hydrological functions;

- Non-permanence risk will be analyzed in accordance with the VCS Program document AFOLU Non-Permanence Risk Tool.

1.4 Project Design

1.5 Project Proponent

Organization name	ABC Agropecuária Brasil Norte S.A. - Produção e Exportação
Contact person	Luciana Di Paula Assunção Pereira
Title	Executive Forestry Manager
Address	Travessa Manoel Evaristo, 449, sala 005-06, Ed. Centro de Negócios Umarizal Office, Umariza Postal Code: 66.050-290 Belém - PA, Brazil
Telephone	+ 55 34 99992-4484
Email	luciana.pereira@algarfarming.com.br

Organization name	Ecológica Assessoria Ltda.
Role in the project	Project developer. As the authorized project contract, Ecológica was given the responsibility of developing the present Project Document.
Contact person	Marcelo Hector Sabbagh Haddad
Title	Technical Coordinator
Address	Quadra 103 Norte, Av. LO-2, Lote 56, Sala 14, Edifício Olympia, Plano Diretor Norte Postal Code: 77.001-022 Palmas - TO, Brazil

Telephone	+55 (63) 3219-7100
Email	marcelo@ecologica.org.br

1.6 Other Entities Involved in the Project

Organization name	Sustainable Carbon Projetos Ambientais LTDA.
Role in the project	Carbon credits trader and Registry Manager
Contact person	Stefano Merlin Cintia Donato Carolina Pendl Abinajm Heloisa Dorneles Moitinho Lyara Carolina Montone do Amaral Yara Fernandes da Silva
Title	Stefano Merlin – CEO Cintia Donato – Legal Coordinator Carolina Pendl Abinajm - Technical Analyst Heloisa Dorneles Moitinho - Technical Analyst Lyara Carolina Montone do Amaral - Technical Analyst Yara Fernandes da Silva - Technical Analyst
Address	Rua Dr. Bacelar, 368, Cj. 23 – Vila Clementino, São Paulo – SP Postal Code: 04056-001 Brazil www.sustainablecarbon.com
Telephone	+55 11 2649-0036
Email	smerlin@sustainablecarbon.com

Organization name	Uezu Planejamento Ambiental S/S LTDA
Role in the project	Geographic Information System – GIS
Contact person	Alexandre Uezu
Title	CEO
Address	Rodovia Dom Pedro I – KM 47, SN, Nazaré Paulista – SP
Telephone	-
Email	aleuezu@ipe.org.br

1.7 Ownership

The project area of the ABC Norte REDD Project is owned by ABC Agropecuária Brasil Norte S.A. - Produção e Exportação. The legal documents proving the land title and ownership of the property will be made available to the auditors during the validation process.

1.8 Project Start Date

The Project Start Date is 14-September-2017. Despite a recurrent negative balance over the last years and an increasing deforestation pressure by external agents, ABC Norte (i.e., the project proponent) decided on this date to maintain the Sustainable Forest Management Plan (SFMP) in Fazenda Pacajá through ceasing the contract with Cikel (i.e., the former forestry company). Furthermore, as from this first action, the project proponent also decided to invest in a certified reduced impact logging SFMP combined with the expansion of social activities to local communities and enhanced surveillance in the project area. As part of this new strategy, a contract between Madeireira J&Y and ABC Norte to lease of its farm for the purposes of carrying out the SFMP in a more sustainable manner.

The mentioned contract with J&Y was signed for a specified period of 05 years and its exclusive object was the harvesting of forest products (wood, residual woody material from exploitation and non-wood products), in Fazenda Pacajá.

Since the project start date, the project implemented socio-environmental responsibility and environmental education programs. Furthermore, the project started the forest management certification in 2017 and received the CERFLOR certification in 2020. The Sustainable Forest Management Plan was renewed in 2019, being valid until 2025, and, in addition, the Rural Activity License (RAL) was obtained, valid until 2025 as well.

Therefore, on 14-September-2017 was conducted the main action of the company in terms of reducing GHG emissions and initiating the present REDD project, and is thus the designated project start date.

Furthermore, project activity also increased the surveillance since the project start date, which helps to avoid unplanned deforestation or illegal logging within the project area by external agents.

1.9 Project Crediting Period

The project has a crediting period of 30 years, from 14-September-2017 until 13-September-2047.

1st baseline period : 14/09/2017 to 13/09/2027

2nd baseline period: 14/09/2027 to 13/09/2037

3rd baseline period: 14/09/2037 to 13/09/2047

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	x

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
2017	37,877
2018	86,870
2019	256,841
2020	256,028
2021	254,876
2022	322,006
2023	414,640

2024	454,156
2025	537,585
2026	622,774
2027	711,948
Total estimated ERs	3,955,602
Total number of crediting years	10
Average annual ERs	395,560

1.11 Description of the Project Activity

The main objective of the present REDD project is the conservation of 145,680.7882 ha of Amazon rainforest area within a private land named “Fazenda Pacajá”, which is described in section 1.9 of the present VCS PD. This will be achieved through avoidance of unplanned deforestation.

This project is located within the Para State jurisdiction which is not covered by a jurisdictional REDD+ program. The “Fazenda Pacajá” was acquired in 1979, starting the process of opening and occupation. From 1982 to 1999 the Sustainable Forest Management Plan (SFMP) took place, being leased to Cikel from 1999 to 2017. In 2014, Algar incorporated ABC Norte, and in 2017, Cikel ceased to be responsible for the Management Plan.

On September/2017, the Madeireira J&Y signed with the project proponent, ABC Agropecuária Brasil Norte SA Produção e Exportação, the lease of its farm called Fazenda Pacajá with the purpose of carrying out its Management Sustainable Forestry (not including carbon credits). The contract was signed for a specified period of 5 years and has the exclusive purpose of exploiting forest products (wood, residual woody material from exploitation and non-wood products).

Under the management of ABC Norte, and since the project start date, social activities began through environmental education and socio-environmental responsibility programs. Some communities are located inside the farm, with 13 communities nearby. Currently, the project serves 5 of them. Furthermore, the certification of the SFMP by CERFLOR also started after the project start date, and it was obtained in 2020.

In recent years, the project region has been deforested for the expansion of agricultural and livestock activities, mainly due to the advancement of the so-called arc of deforestation from the south of the

Amazon biome. This pressure is expected to continue, given the globalization of markets in the Amazon region and international development policies planned for the region¹.

The main deforestation and degradation agents within the ABC Norte REDD project region are: cattle ranching, mainly producing beef, timber harvesters, acting both illegally, and infrastructure, such as the proximity to existing highways and the expected expansion and/or retrofit of such roads in the near future.

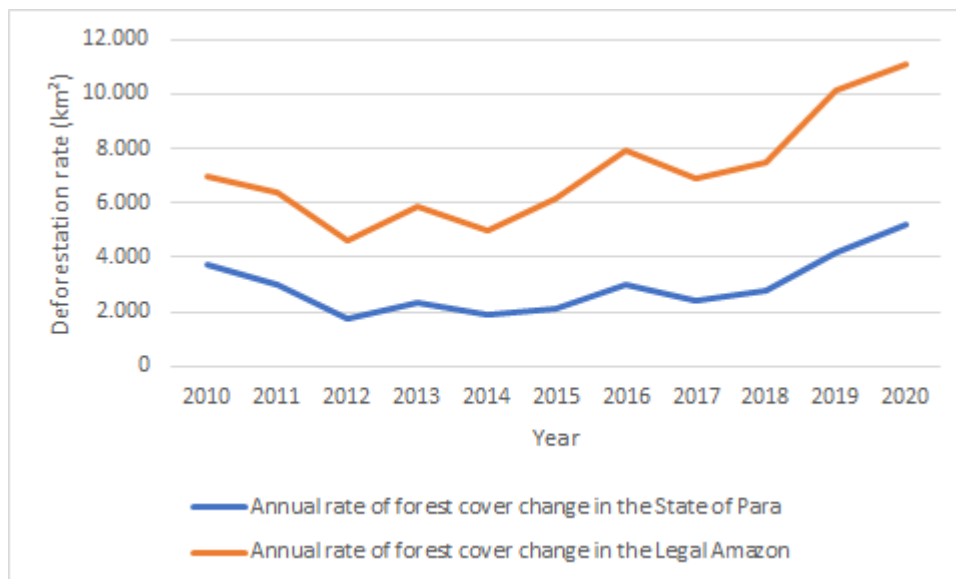
Furthermore, according to PRODES², the municipalities of Altamira and São Félix do Xingu are located next to Portel and Bagre (which contain the project area in its entirety) and were the municipalities that burned the most in recent years in the Amazon biome, a result of the disorganized occupation and the lack of economic alternatives for local communities and landowners. Moreover, the project area is located close to the Brazilian arc of deforestation, which is a region with high deforestation pressure and illegal logging.

According to PRODES, the rate of deforestation has been increasing since 2017, growing almost 3 times until 2020, that is, during the same period that the ABC Norte project started. In 2017 deforestation in the state of Pará was 2,433 km², increasing to 5,192 km² in 2020. The figure below displays a comparison between the 2010 to 2020 annual deforestation rate in the State of Para and in the Legal Amazon region.

¹ Nepstad, D. C.; C. M. Stickler e O. T. Almeida. 2006. Globalization of the Amazon Soy and Beef Industries: Opportunities for Conservation. *Conservation Biology* 20(6):1595-1603.

² PRODES Project - Brazilian Amazon Forest Monitoring through Satellite, Instituto Nacional de Pesquisas Espaciais (INPE). Available at: <http://terrabrasilis.dpi.inpe.br/app/dashboard/deforestation/biomes/legal_amazon/rates>. Last visited on 20-January-2021.

Figure 1. Comparison between the annual rate of forest cover change in the State of Para and in the Legal Amazon, for the 2010 - 2020 period



Through the present project activity, ABC Agropecuária Brasil Norte SA Produção e Exportação, committed to conserve the forest area, despite having more profitable land use alternatives. Therefore, the revenue from this REDD project is essential for the continued conservation of this native rainforest area. Conservation activities include increased monitoring to prevent invasion of illegal deforestation by outside agents and banning of unplanned logging and other unpermitted degradation within the project area.

Forest supervision is carried out by Aflora Engenharia, which monthly monitors aspects of Fazenda Pacajá, such as satellite images and cartographic data from official bodies as IBGE, IBAMA, INPE and SEMAS, themes related to vegetation cover, deforestation of the forest management production of the Fazenda Pacajá. This surveillance allows the management of the environmental situation of the property during the development of the forest exploration work, in addition to ensuring compliance with the requirements set out in the current legislation.

The objective of the temporal analysis is to verify possible changes in the vegetation cover of Fazenda Pacajá, through the identification of deforestation, hot spots, fires and anthropism, using geoprocessing and image processing techniques of satellite images, in order to promote the monthly update of the technical report of the area.

The ex ante estimate for the predicted avoided deforestation within the project area over the 10 years of project lifetime is 9,245.97 ha. The avoided emissions due to the ABC Norte REDD AUD Project are expected to be 3,955,602 tCO₂e across the first ten years of the project crediting period (14-September-2017 to 13-September-2027), including buffer (RF), leakage (DLF) and project efficiency (EI) reductions.

Besides forest conservation, the present project aims to improve and quantify its social and environmental benefits through the application of the SOCIALCARBON® Methodology. This methodology

is an innovative concept developed by the Ecológica Institute to measure the contribution of carbon projects to sustainability. The SOCIALCARBON® Methodology is based on six main indicators: Biodiversity; Natural; Financial; Human; Social and Carbon Resources and aims to deliver high-integrity benefits in each.

Background on Sustainable Forest Management Plan within the ABC Norte REDD Project Area

The Sustainable Forest Management Plan (PMFS) is a set of plans and techniques for forest extraction, adapted to the conditions of the forest. This concept will guide the exploitation of forest resources (wood, residual woody material from exploration and non-wood products), guaranteeing the supply of wood processing and processing units.

The management of the forest must occur in a sustainable manner, which ensures the use of available resources based on techniques such as the Reduced Impact Exploration (EIR) system, the conservation of the forest, preventing soil wear and erosion, in addition to protecting watersheds, reduce the risk of fire and allow the maintenance of natural regeneration and protection of biological diversity.

Therefore, there is a guarantee that the wood product comes from sustainable management, which makes its commercialization feasible. And the main products are roundwood and sawn wood, to serve the foreign and domestic markets. The companies involved in the ABC Norte project are committed to the norms and principles of sustainability of the forestry activity.

The Sustainable Forest Management Plan (PMFS) aims to produce forest resources in a sustainable manner in order to provide continuous supply to the company's industrial processing and value-added units. Its main products are wood, residual woody material from exploration and non-wood products, and seeks to add value to the products, in addition to enabling the supply of raw materials of safe and continuous origin to the consumer market.

Furthermore, the company Madeireira J & Y has currently started the CERFLOR certification process and has acquired the recommendation for the acquisition of the “green seal”. With this, it is guaranteed that this project has to offer countless benefits for the sustainable development of the region, contributing to the conservation of local biodiversity, generation of knowledge and income for the local community.

In 2019, a sample forest inventory was developed within the SFMP area, based on the points of paths to be covered by opening between points, considering species with DBH greater than 30 cm, in a 50 m wide band, being 25 m to the right and 25 m to the left. This was necessary to assess the area's forestry potential, plan the location of roads and access paths, and determine the actual area for sustainable forest management in order to design the SFMP. This area was divided into 35 large Annual Production Units (APUs), which constitute the forest areas to be managed for the next 35 years (operation cut cycles).

Although the total property area has 145,680.7882 ha. The area for forest harvest management is 116,285,078 ha. In this area were excluded the permanent preservation areas and the absolute reserve area. According to the Brazilian Forest Code, permanent preservation areas (PPA) at the borders of waterways shall be comprehensively preserved. The Permanent Preservation Area of the property is 6,016.40 ha.

Therefore, 79.83% of total property area is subject to SFMP. The adopted rotation cycle is 35 years, thus each annual productive unit (APU) has around 3,521 hectares. Figures 2 and 3 below show the location of each APU and protection areas within the ABC Norte area.

Figure 2. APU Location

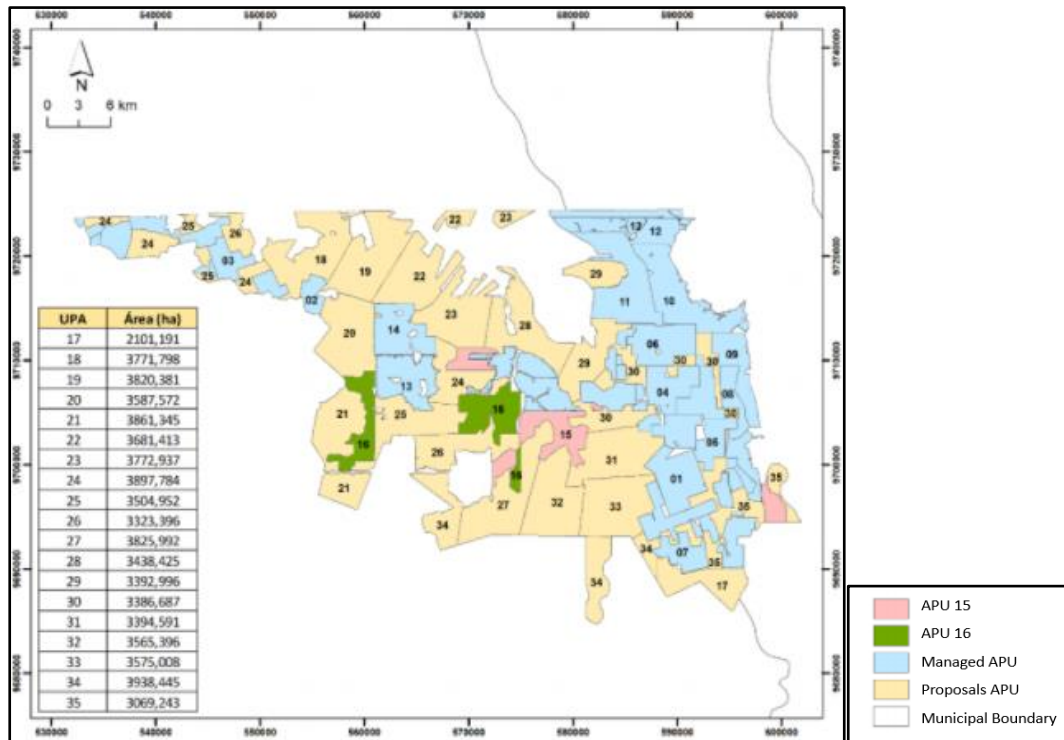
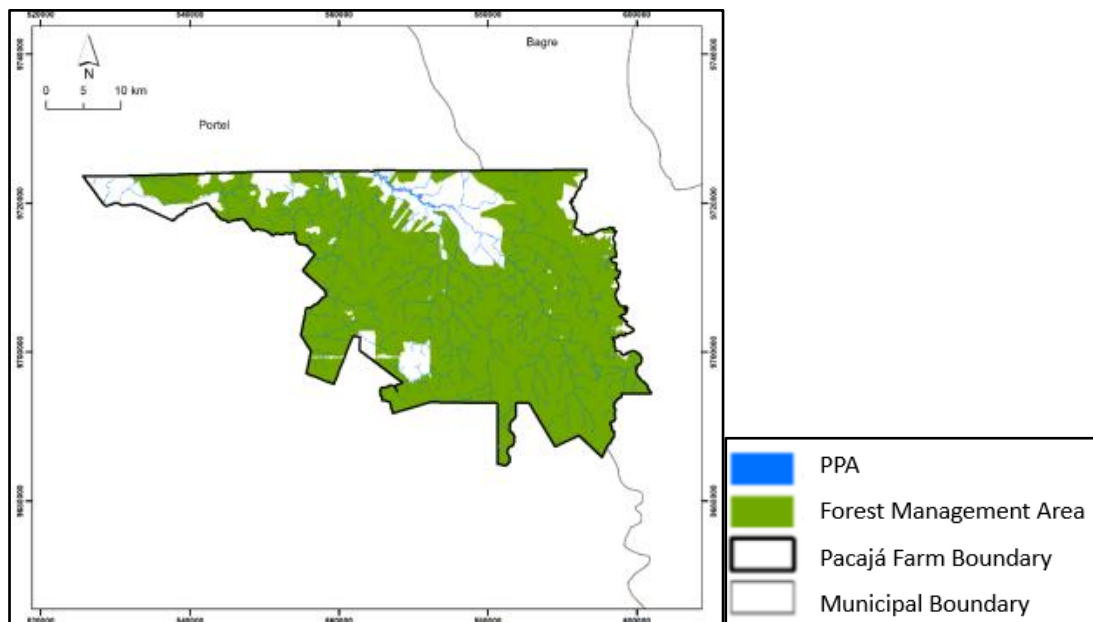


Figure 3. Management Area, Absolute Reserve and Permanent Preservation Area



To develop the assessment to the area's potential, data was sought through the Inventory Systematic Sampling, a methodology aimed at collecting information on species of interest, as well as biogeographic characteristics of interest in the field, where the execution had as reference base the waypoints to travel through the opening between points, considering species with DBH greater than 30 cm, in a 50 m wide strip, being 25 m to the right and 25 m to the left. After processing the collected data, the true potential of commercial species and volumetry of the asset was fetched using the most reliable estimate available.

The cutting cycle in this plan is 35 years. This cycle is based on an attempt to introduce new paradigms for forest management, in order to reduce the period for recovery of forest stocks. This innovation is based on the premise that with the use of a low harvesting intensity (up to 30m³ ha), combined with silvicultural interventions to be carried out in the residual forest (see item Silvicultural System) will allow the return to the area in a shorter time period, aiming at a new cutting cycle. However, forest monitoring will provide the growth data from the permanent plots installed in the Forest Management Unit, aiming to adjust the period initially foreseen. For this plan, it is proposed to harvest according to the concession contract 29.86 m³ per hectare, despite the legislation authorizing a maximum of 30 m³/ha.

The silvicultural system to be adopted is the polycyclic one, widely recommended for yields upland forests in the Brazilian Amazon. EMBRAPA named the referred system of the Brazilian System of Selective Management. In each cycle, mature trees are harvested in intermediate cuts. In the case of this management plan, a cycle will be initially adopted of 35 years.

The application of this system is due to the results of research carried out, which indicate this system as the most appropriate for the management of tropical forests. The sequence of operations of the system to be developed in the PMFS of Fazenda Pacajá is presented below.

Table 1. Main forestry measures and operations to be conducted by ABC Norte in the SFMP

Year	Operations
Y-1	• Demarcation of UPAs, UTs and trails or guidance trails; • 100% inventory (forest census) and cutting of vines on trees to be harvested; • Preparation of exploration maps; • Establishment and measurement of permanent plots; • Fauna inventory; • Harvest; • Planning and construction of permanent infrastructure (roads and storage yards);

Y	• Exploration of trees, observing the established guidelines for exploration with reduced impact; • Exploitation of residues for charcoaling;
Y+1	• Remeasurement of permanent parcels; • Post exploratory fauna inventory; • Maintenance of permanent infrastructure; • Survey of damage caused by exploration and waste; • Data collection for volume equation; • Silvicultural treatments;
Y+3	• Remeasurement of permanent parcels; • Fauna inventory (post exploratory);
Y+4	• Inventory of forest residues;
Y+5	• Remeasurement of permanent parcels; • Fauna inventory (post exploratory); • Data collection for the volume equation; • Adjustment of the volume equation;
Y+10	• Remeasurement of permanent parcels;
Y+20	• Remeasurement of permanent parcels;
Y+35	• Beginning of the new cycle.

The Sustainable Forest Management Plan (PMFS) aims to produce forest resources in a sustainable way in order to provide continuous supply of industrial units processing and adding value to the company. Its

main products are wood, residual woody material from exploration and non-timber products, and seeks to add value products, in addition to enabling the offer of safe and continuous raw material for the consumer market.

Furthermore, the applied forestry management system has the following objectives:

- Employ Reduced Impact Exploration (EIR) techniques, in order to mitigate damage to remaining forest, regulating production in order to ensure a minimum cutting cycle of 35 years old;
- Implement a monitoring and control program for forest management activities, aiming to optimize productivity, reduce impacts and costs of operations, in order to guide the possible changes that may be necessary to the original management plan;
- Develop partnerships with research institutions for the development of studies that enhance the improvement of forest management techniques;
- Support forest certification in the management area, through compliance with the principles and criteria of onshore forest management;
- Value local products, whether timber or non-timber;
- Maximize the resources of the management area through the multiple use of the forest;
- Develop markets and secure existing markets with wood and non-wood products (resins, oils, seeds, etc.) of sustainable origin.

All actions that cause direct and indirect impacts on the environment must be monitored and the appropriate mitigating measures implemented. Likewise, it should be noted that both management and field teams must be properly trained to employ natural resource management methodologies in order to minimize impacts and costs, in addition to the use of reduced impact exploration techniques to minimize the damage caused to remaining species, to the soil, hydrography, air and fauna. In this aspect, the activities with the greatest impact will be identified and monitored, offering conditions for assessment and measurement directly in the field by the company's team.

With the management and exploration system employed, the environmental impacts are reduced. The selection method provides a stable habitat for plants and animals. Managed stands support more weeds, secondary vegetation and natural regeneration than unmanaged primitive stands. It increases the diversity and frequency of birds and nests with rapid recovery after exploration and has a reduced impact on the mammal community because of the maintenance of natural conditions important to their development.

The chain of custody is extremely important, as it ensures the tracking of the raw material, from production to the consumer. Tree identification starts at the forest inventory, through the plates that are placed on the tree stump after the cut. The log must also carry identification (UPA number, UT number, tree, section number, species code and log length) after unloading. Marking must be done on each section of the logs when tracing is needed.

For the tracking of wood in the various stages of management, some activities will be developed to ensure control of the entire wood chain, from the tree that will be harvested to the exit from the industrial processing unit.

The Company seeks to maintain the traditional local culture and insert communities into its production chain, generating jobs and regional development. The ABC Norte project also provides training for workers in reduced impact extraction, occupational safety, occupational health and safety, first aid and fire fighting. Activities related to the Sustainable Forest Management Plan do not affect the food production of the communities. Social and environmental actions are carried out to introduce new forms of income and food for the community, such as raising chicken and fish.

Despite the importance of sustainable forest management for climate change adaptation and mitigation, its implementation is not considered common practice, primarily due to the shortage of human resources and funding required to implement the necessary measures.

Implementation of REDD and SOCIALCARBON mechanisms together with SFMP promotes sustainable forest use because it initiates forest conservation and storage of carbon stocks in forests while reducing pressure for timber from other conserved areas. In this way, biodiversity conservation and development of the local economy can be achieved simultaneously. Furthermore, REDD+ mechanisms in sustainably managed forests can provide a guarantee to purchasers of wood products that the product was produced in an environmentally responsible way, thus catering to the growing market demand.

1.12 Project Location

The ABC Norte REDD project is located in a private property named “Fazenda Pacajá” covered almost in its totality by native vegetation, totaling 145,680.7882 ha., which is situated between the municipality of Portel and Bagre, in the State of Pará, Northeast Amazon.

According to the logistical arrangement, Fazenda Pacajá can be accessed via a route, by river, leaving the city of Belém by the river Pará until the city of Portel at a distance of 304 kilometers. It follows the route, still by river via Pacajá River, from the city of Portel to Fazenda Pacajá, covering 180 kilometers. In total, it travels 484 km from the state capital to the farm.

Project Area

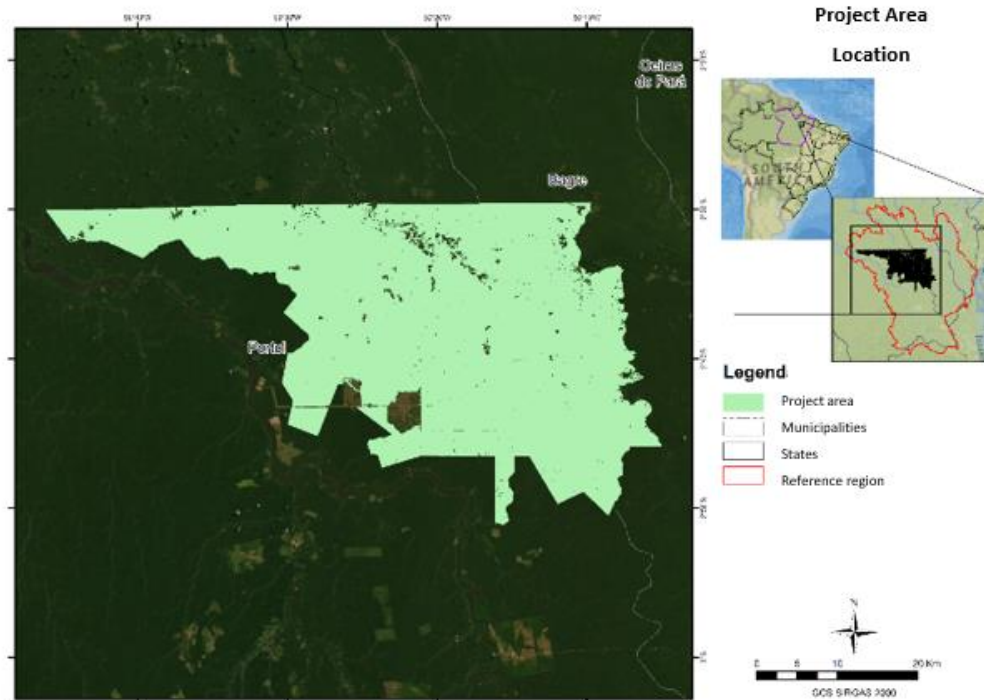
In accordance with VCS requirements, stipulated in Approved VCS Methodology VM0015, version 1.1, the project area may only include areas composed of “forest”³ for a minimum of ten years prior to the project start date. Satellite images from 2007 to 2017 were analyzed and classified.

Thus, for the definition of the project area, the deforested areas until 2017, the vegetation areas classified as formation of rural areas and the water bodies (MapBiomass mapping) were subtracted from

³ Brazilian Forestry Service. Brazil adopts FAO forest definition: “Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 hectares (ha).” Available at: <http://www.florestal.gov.br/snif/recursos-florestais/index.php?option=com_k2&view=item&layout=item&catid=14&id=158>. Last visited on: 22 June 2021.

the total property area, which has 145,680.78 ha. Therefore, the area of the project has an extension of 140,432.27 ha (Figure 04).

Figure 4. Management Area, Absolute Reserve and Permanent Preservation Area



- Definition of the property boundaries

The borders of the project area used in the ABC Norte REDD Project were extracted from technical reports registered at a notary and at INCRA. Vectorization – which is the process of converting the technical reports into digital shapefiles and polygons, formats compatible with GIS software – was conducted using ArcGIS and ArcCatalog software.

The reports were double checked against the descriptive memorandum of the property, which shows the property limits through geographic coordinates. In addition, the hydrographic limits were also utilized because the rivers delineate the property in some locations.

- Historical reference period

The historical reference period is the period in which analysis of LU/LC-change within the reference region and project area is carried out. In accordance with the methodology, this period must not exceed 10 – 15 years in span and end as close as possible to the REDD project start date (≤ 2 years). The project start date is 14-September-2017 and the historical reference period comprised analysis of images from 2007 to 2017. Sufficient satellite images covering the reference region referring to this period were available, with low presence of cloud cover.

- Image classification

To map the dynamics of land use in the reference region, mapping from 2007 to 2017 produced by MapBiomass (collection 5.0) was used, available in raster format on the program's website (<http://mapbiomas.org/>).

To compose the entire reference region, three Landsat scenes per year (orbit/point: 225/62, 225/61 and 224/62) of the reference period were necessary. The final resolution of the mapping was 30 m pixel.

MapBiomass is a multi-institutional initiative of the Greenhouse Gas Emission Estimation System (SEEG - <http://seeg.eco.br/en/>) promoted by the Climate Observatory. The co-creation of MapBiomass involves NGOs, universities and technology companies. In MapBiomass, the image classification methodology uses, for each year, all Landsat images available in each period (Landsat 5 [L5], Landsat [L7] and Landsat [L8]) with a cloud cover less than or equal to 50%.

Thus, a representative mosaic of each year is generated by selecting cloudless pixels from the available images. For each pixel, metrics are extracted that describe its behavior during the year, which can contain up to 105 layers of information.

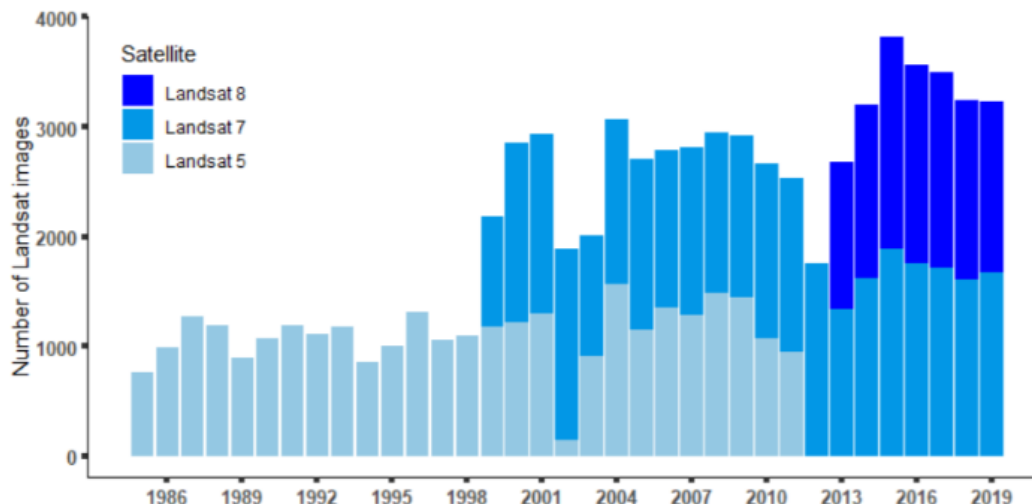
The mapping is performed with an artificial intelligence classifier, Random Forest.

The acquisition of Landsat images is done via Google Earth Engine, with sources from NASA (American Space Agency) and the USGS (U.S. Geological Survey). The algorithm uses samples obtained from reference maps, generation of stable collections from previous MapBiomass series, and direct collection by visual interpretation of Landsat images to classify as a single map per class. Then, this classification goes through the steps of the spatial filter, applying neighborhood rules and temporal filters, especially the impossible or not allowed changes in coverage and use, to reduce spatial and temporal inconsistencies.

Table 2. Data used for historical reference period

Vector	Sensor	Resolution		Coverage	Acquisition date	Scene	
		Spatial (m)	Spectral (µm)	km²	2007 -2017	Path/ Latitude	Row/ Longitude
Satellite	TM	30	0,45-2,35 µm	34.225	2009 - 2019	225	62
Satellite	TM	30	0,45-2,35 µm	34.225	2009 - 2019	225	61
Satellite	TM	30	0,45-2,35 µm	34.225	2009 - 2019	224	62

Figure 5. Number of Landsat images for mapping the Amazon. Source: MapBiomass



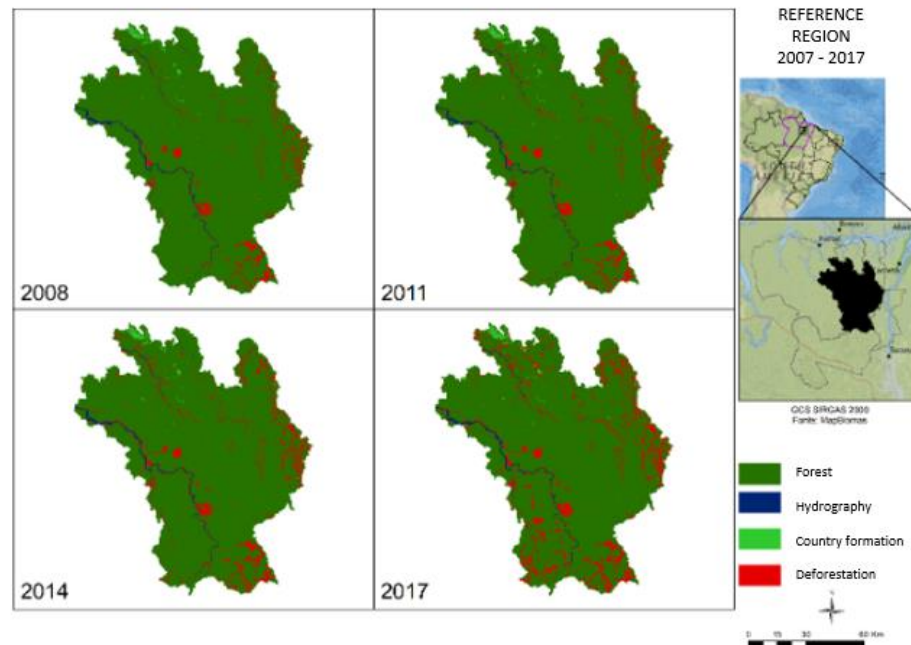
For the dynamics of the reference region, only the transition from the forest cover area to an area with anthropogenic vegetation was considered.

The year 2007 was then utilized to exclude forests that are less than 10 years old at the project start date from the project area. Finally, the “hydrography” class was defined as constants throughout the historical reference period, and the same class was applied for each mapped year, as those values did not significantly vary across the analyzed period.

For the present project, the process of accumulating “Non Forest” areas was adopted, in such a way that areas classified as “Non Forest” in one year were necessarily included in the same category in the following year.

The project area contains only areas which were defined as “forest” in 2007 (more than 10 years prior to the project start date), as depicted in the forest cover benchmark maps in Figure below.

Figure 6. Forest cover benchmark maps, comparison between 2008, 2011, 2014 and 2017



Classification was first conducted for the whole Reference Region and subsequently cropped to the Leakage Belt and Project Area. The classification of the images was carried out in accordance with the VM0015 methodology. The classified images of the reference region, project area and leakage belt by year follow in Section 2.4 – Baseline Scenario below.

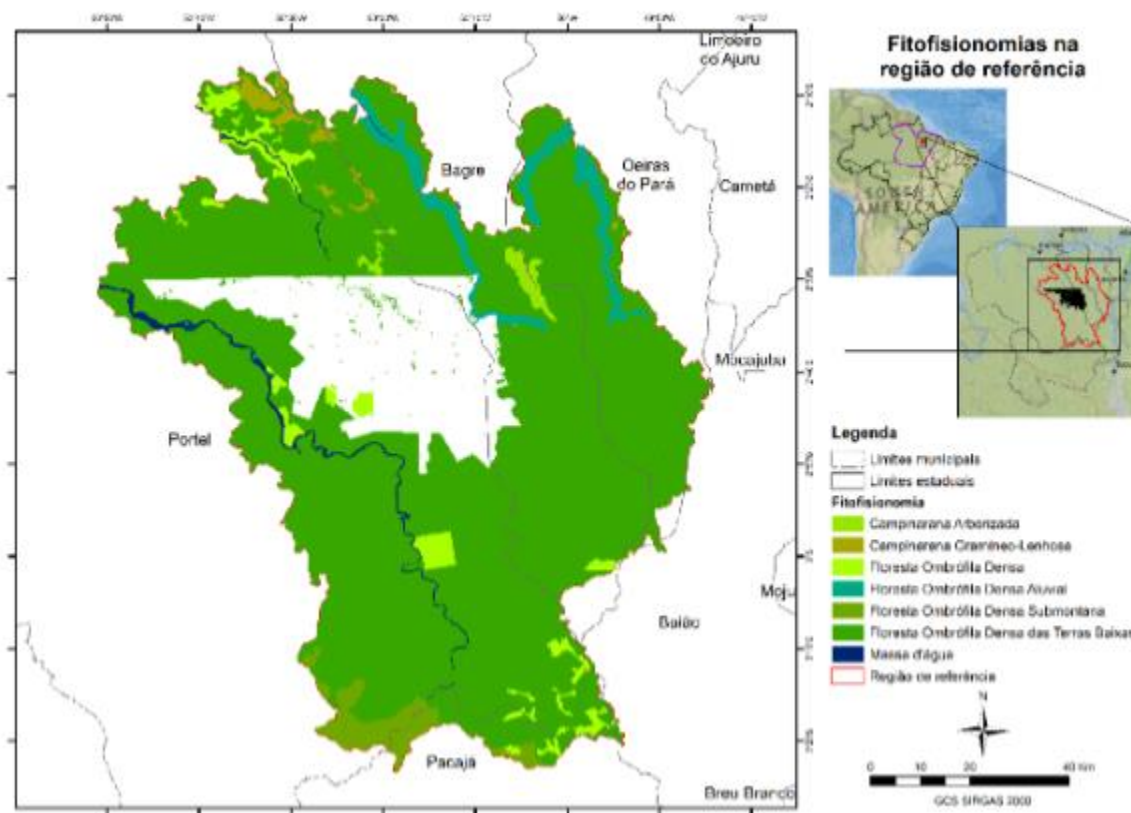
Reference Region

To define the project area, hydrographic basins were used within an area of 22,231,948.95 hectares around the project area, from the drainage network produced by the digital elevation model of the SRTM. For each of these basins, the average elevation, slope and precipitation values and the percentages of different types of vegetation were determined. Based on these values, the basins that presented values close to the values of the project area were selected. We then sought to select basins until reaching an extension of approximately seven times the size of the project area.

From the definition of this area, which was 976,850,1 ha (6.94 times the project area), the criteria related to the type of vegetation, elevation, slope and precipitation were tested to verify the similarity in relation to the project area and the rest of the reference region.

Only for elevation, the project area values are outside the criteria adopted by the standard. However, for the other three variables the values meet the criteria, indicating the adequacy of the reference region.

Figure 7. Vegetation cover in the Reference Region



1.13 Conditions Prior to Project Initiation

The ABC Norte REDD Project makes an important contribution to the conservation of Northeast Amazonia's biodiversity as well as to climate regulation in Brazil and South America.

In addition to contributing to the long-term conservation of the region, this project also functions to establish a barrier against the advancement of the Brazilian Arc of Deforestation, creating a Northeast Amazon biodiversity corridor in a vulnerable region.

The present project activity has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction. On the other hand, the project aims to combine REDD and SFMP activities, which will promote forest conservation combined with alternative income generation from sustainable practices, associated with a greater surveillance against deforestation agents. Furthermore, the SFMP has a minimal 30-years cutting cycle, ensuring the presence in the area, the natural regeneration of the forest, and the permanence of GHG emission reductions.

The general characteristics of the project area and reference region are described below.

Climate

According to the Köppen classification, the project region has a dominant hot and humid climate, characteristic of Tropical Forests. Furthermore, the region maintains heavy rainfall rates (around 2,400 mm of rain), high average air temperature (26°C) and relative humidity above 85%. The average annual temperature varies from 26° to 27°C, highs between 31°C and 33°C and lows between 21°C and 24°C.

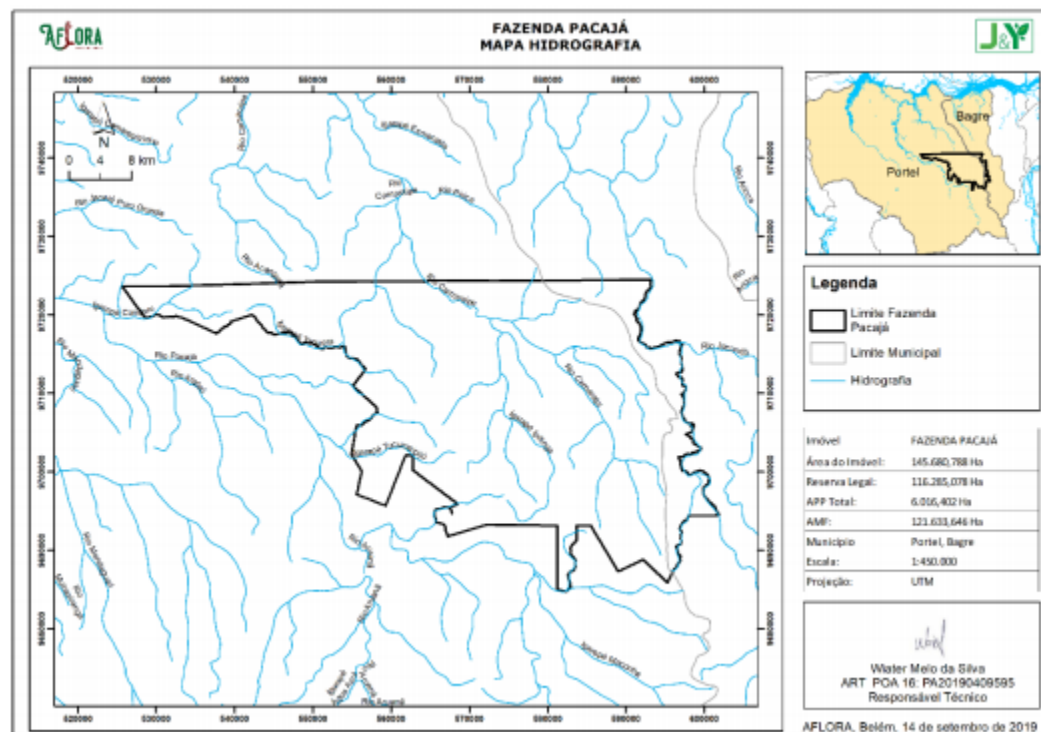
Regarding the pluviometric regime, the region has total annuals generally between 1800 mm and 2800 mm, but it is subject to important fluctuations during the time. The rains are not distributed equally during the year, being characterized by a sharp division in a period with heavy rains from January to July, and another with low rainfall from August to December.

Hydrography

The municipality of Portel has a hydrography rich in rivers, however, with regard to the use of regional hydrography, the most prominent river is the Pacajá River.

According to the description of the RADAM-BRASIL project (1974), the management area is located in the region of the Lower Plateau of the Amazon (Baixo Amazonas), in the Portel hydrographic region - Marajó.

Figure 8. Hydrography of Fazenda Pacajá



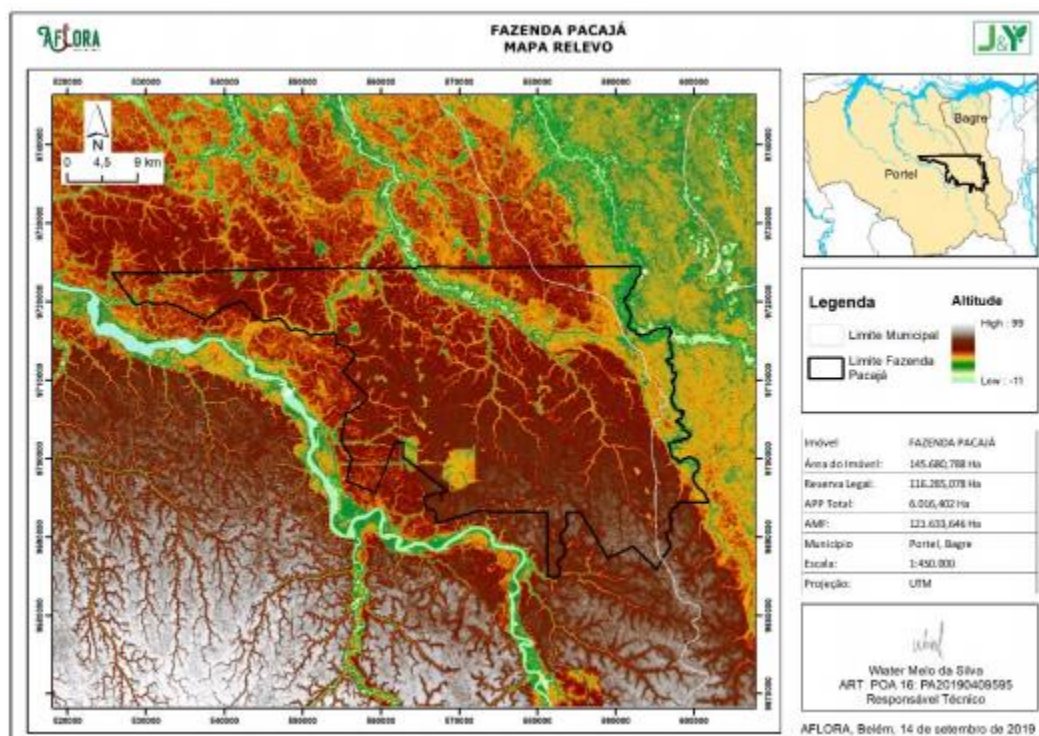
Within the managed forest area, there are the following main rivers: Pacajá Candirú, Raquerá, Camaraipi, Jacundá, Repartimento, Arraia and Castanha, in addition to many other small streams such as the Conderu Taquera and Ipitinga streams, and caves that will be demarcated in the surveys of field and

submitted to a protection regime as Permanent Preservation Areas (APP) as established by the forest code.

Geology, Topography and Soils

The lowered plateau of the Amazon is the extensive surface of the Pleistocene Pediplano that borders the river banks with the Amazonian plain; to the south with the peripheral depression of southern Pará and to the north with the plateau of the sedimentary basin of Amazonas. In the region in question, the pediplane is preserved despite the dense forest cover, however Cametá has on the left bank Tocantins River where isolated, depressed areas appear with sandy deposits, subject to floods covered by undergrowth (RADAM, 1974).

Figure 9. Relief of Fazenda Pacajá



According to SUDAM (1974), the region to the north originates from the Quaternary period, with sand and clay sediments formed by rivers, or sometimes by the sea. To the south is Tertiary, with sediments mainly of clay, with sand and layers of sand stones.

According to IBGE (1990) the rocks of the mesozoic sedimentary cover constitute the Alter do Chão formation of Cretaceous age and which represents the most widely distributed mapping unit in the plateau area of the Amazonian sedimentary basin. This formation supports the reliefs of the lowered plateau of the Amazon in which the area of the plan is inserted.

According to the Brazilian Soil Classification System (EMBRAPA, 2006), the municipality's soils are composed of the following types:

- Dystrophic Yellow Latosol;
- Dystrophic Yellow Latosol Concretionary;
- Dystrophic Yellow Argisol;
- Hydromorphic Carbic Spodosol;
- Ferrocyclic Spodosol;
- Quartzarenic Neosol.

In the area of Fazenda Pacajá there is a predominance of soil classified as Yellow Latosol.

Socio-Economic Conditions

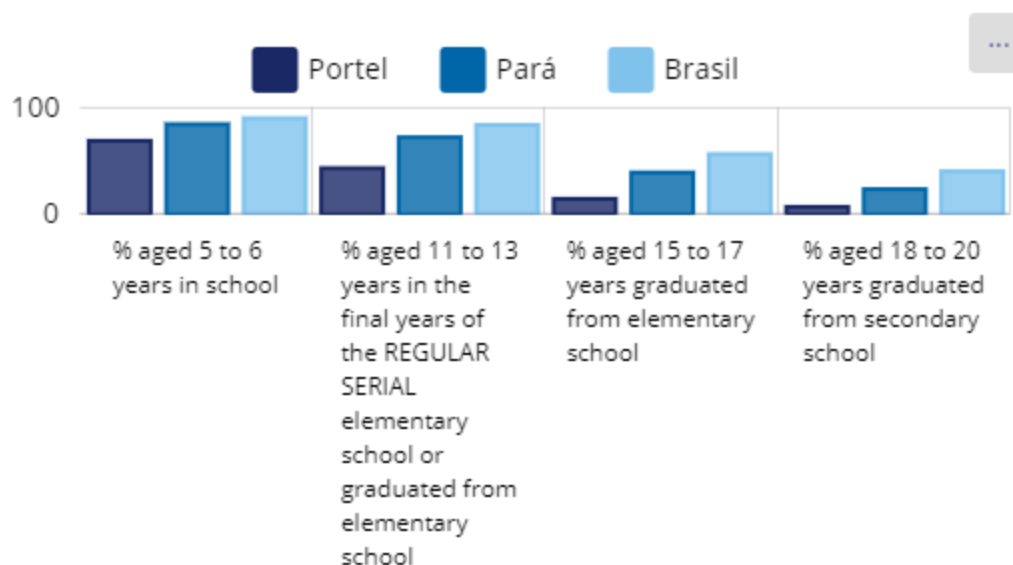
The municipality of Portel is located at 01°56'08" south latitude and 50°49'16" west longitude, in the western region of Pará, in the Mesoregion of Marajó, in the micro-region of Portel and is located on the banks of the Pacajá River. It has an area of 25,384.779 km² and a distance of approximately 266 kilometers, in a straight line, from the state capital.

Portel has 62,043 inhabitants, according to estimates of the IBGE Census (2019) and is located in the state of Pará. Data from the Demographic Census shows that Portel's MHD was 0.359, in 2000 and 0.483, in 2010. Meanwhile, in the state of Pará, the MHD went from 0.359 to 0.483. In relative terms, the evolution of the index was 34.54% in the city.

According to estimates from 2017, the population of Portel was of 60,322 people, composed, on its majority, by men and black people. Between 2013 and 2017, the city registered an increase of 7.54%. In the same period, Pará registered an increase of 4.98%.

In the city, the share of children aged 5 to 6 years in school was 69.79%, in 2010. In the same year, the share of children aged 11 to 13 years attending the final years of elementary education was 43.95%. The share of young people aged 15 to 17 years graduated from elementary education was 14.97%; and the share of young people aged 18 to 20 years graduated from secondary education was 7.37%.

Figure 10. Education per age group in the city of Portel and the State of Pará - 2010



Analyzing the indicator years of study expectancy, in 2000 the expectancy was 3.86 years and 6.19 years in 2010, while the state reported 6.80 and 8.49 years, respectively.

In addition, according to the Atlas of Human Development, people are considered extremely poor, poor and vulnerable to poverty when their household per capita monthly income is below R\$70.00, R\$140.00 and R\$255.00 (values from August 2010), respectively. Thus, in 2000, 42.43% of the city population were extremely poor, 69.01% were poor and 87.21% were vulnerable to poverty; in 2010, these shares were, respectively, of 39.40%, 60.55% and 80.46%.

According to CadÚnico, data and information collection center that aims to identify all low-income families in the country for inclusion in social assistance and income redistribution programs, from Federal Government, the share of extremely poor registered after receiving the Bolsa Família social benefit went from 75.90%, in 2014, to 61.65%, in 2017. On the other hand, the share of poor people registered in the system after receiving the Bolsa Família benefit was of 88.91%, in 2014, and 92.98% in 2017. Finally, the share of people vulnerable to poverty was of 89.70%, in 2014, and 97.61%, in 2017.

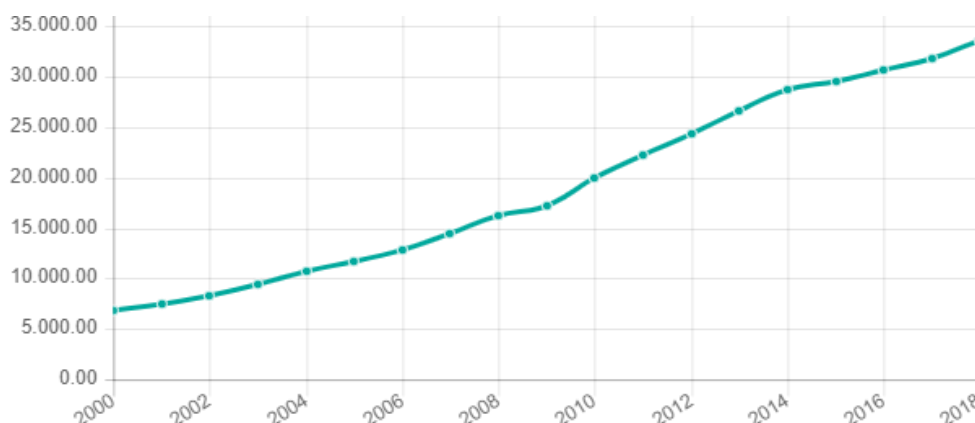
The Gini index in Portel reduced from 0.66, in 2000, to 0.64, in 2010, indicating, therefore, a reduction in income inequality.

Historically, the region's main economic activity is the extraction of forest products, mainly from lowland forests. In addition, it is also characterized by the development of agriculture, timber industries and trade.

In 2010, of the employed people aged 18 or over in the municipality, 43.47% worked in the agricultural sector, 0.00% in the extractive industry, 8.36% in the processing industry, 3.67% in the construction, 0.66% in the public utility sectors, 9.51% in commerce and 26.71% in the services sector.

By the end of 2017, the municipality of Portel had 416 active companies, with its GDP as shown in Figure 11 below.

Figure 11. Portel's GDP evolution



Biodiversity

Brazil harbors the greatest concentration of biodiversity on the planet. It has a great abundance of life forms – which translates to over 20% of the total species on Earth – and raises Brazil to the main nation among the 17 countries with the highest biodiversity levels globally, containing over 70% of the planet's biodiversity⁴.

Brazil has the greatest flora species richness in the world, with 46,392 species described. Furthermore, it contains over 8,700 known species of vertebrates consisting of 720 mammals, 986 amphibians, 759 reptiles, 1,924 birds and 4,388 fish species. It is estimated that around 93 thousand invertebrate species are known⁵.

The number of known species in Brazil is estimated to range from 170 to 210 thousand, while the total number of species that the country harbors is approximately 1.8 million, putting the known proportion of biodiversity at a mere 11%. New species are described every day in Brazil⁶. It is also estimated then that approximately 10% of the entire planet's biodiversity is found in the project region, including many threatened species and those which exist only in Amazonia, or endemic species⁷.

The ecosystem of Pará presents the biodiversity characteristic of the Amazon region, where more than two thousand species of fish have been catalogued, about 950 species of birds, 300 species of mammals and about 10% of all plant species on Earth.

⁴ Brazilian Government Ministry for the Environment (Ministério do Meio Ambiente – MMA). The Brazilian Biodiversity. Available at: <http://www.mma.gov.br/biodiversidade/biodiversidade-brasileira>. Last visit on: March 18th, 2021.

⁵ Information System about the Brazilian Biodiversity (SiBBr). Available at: <http://www.sibbr.gov.br/areas/?area=biodiversidade>. Last visit on: March 18th, 2021.

⁶ Information System about the Brazilian Biodiversity (SiBBr). Available at: <http://www.sibbr.gov.br/areas/?area=biodiversidade>. Last visit on: March 18th, 2021.

⁷ Protected Areas Program of the Amazon - ARPA (Brasil) (Org.). Arpa Biodiversidade. Amazonas: WWF - Brasil, 2010. 34 p.

In the territory of Pará, this variety of animal and plant species is immense, mainly due to climatic conditions (location in the equatorial zone) and the size of the area covered by forests. Among the trees considered to be noble wood, which is why they are often cut down indiscriminately, are Angelim, Cedro and Mahogany. In the extractive sector, the most sought after species are rubber and Castanheira-do-Pará.

The flora also features exotic species, such as the water lily and dozens of species of bromeliads. In the last decades, the concern with the future of the Amazonian ecosystem has been manifested inside and outside Brazil, by governmental and non-governmental institutions.

Several factors contribute to the destruction of flora and the accelerated process of extinction of animals in Pará territory. Among these factors, we highlight the selective exploitation of wood (which ends with natural reserves of hardwoods), extensive agriculture (responsible for cutting down the forest for transformation into pasture), the construction of hydroelectric plants (which alters the ecosystem of rivers and nearby areas), indiscriminate hunting aiming at the removal of leather for commercialization, overfishing and extraction of plants destined for the pharmaceutical industry.

In some areas, animals, such as the white-lipped peccary, the manatee, the pirarucu, the turtles and the curassows have already been greatly reduced.

The Project area presents a very rich biodiversity. Fauna surveys conducted on the Project area indicated the presence of 15 species of medium and large mammals. Of the 15 species, the tamarin (*S. sciureus*) is endemic to the Amazon Forest. None of the species are on official lists of extinction threats, but the fox (*Cerdocyon thous*) and the scent tamarin (*Saimiri sciureus*) are present in Appendix II of CITES (Convention on International Trade in Species of Wild Flora and Fauna in Endangered).

Also, 48 species were sampled, including amphibians, lizards and snakes. None of the registered species are on official lists of extinction threats. Some species such as *Rhinella marina* and *Rhinella major* can adapt more easily to modified environments, are more tolerant to environmental changes and are commonly found in modified environments, such as urbanized areas.

On the other hand, species that use litter like *Adenomera andreae*, *Rhinella margaritifera*, *Rhinella proboscídea*, *Ranitomeya ventrimaculata* and *Allobates femoralis* were recorded during the sampling, corroborating the significant non-alteration of the environment, especially *R. ventrimaculata* and *A. femoralis* which are individuals who need microhabitats with specific characteristics of environmental quality to survive. The presence of *Anolis fuscoauratus* and *Plica umbra* demonstrates that the area provides the necessary support for species maintenance, since they are arboreal lizards and do not support drastic changes in the environment.

Seasonality proved to be very significant in the composition of herpetofaunistic communities, mainly due to the formation of new niches, and conditions that allow the occupation and reproduction of some species, such as the case of *Pithecopus hypochondrialis* and *Callimedusa tomopterna*. However, the methodology restrictions on time-limited demand (PLT) justify the collection efficiency values below the expected for the area, thus not meeting its maximum potential.

Figure 12. Animals registered at the Project Area

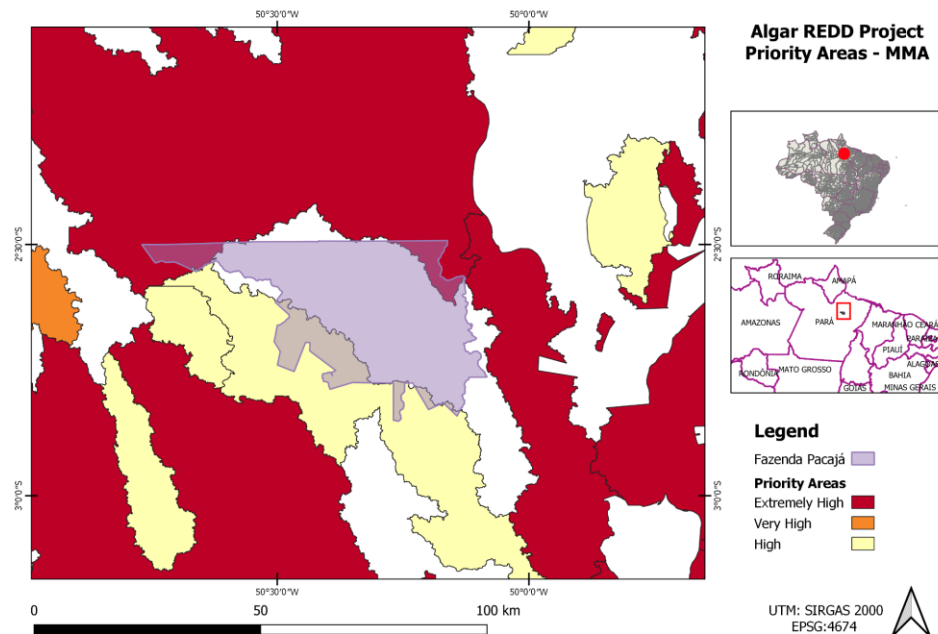


Figure 13. Animals registered at the Project Area



The Brazilian Government Ministry for the Environment did not include the ABC Norte REDD project region in its 2006 survey of Brazil's priority areas for conservation⁸. However, the surroundings of the project area are mainly classified within the “very high” priority category, as detailed in figure below. This shows the importance of the present REDD project for the conservation of Brazilian biodiversity, creating an ecological corridor for preservation of the fauna and flora species. Thus, the conservation of these private lands contributes to the Brazilian Government's conservation proposal.

Figure 14. Brazil's priority areas for conservation and the Project area



In terms of flora biodiversity, the vegetation within the project area itself was assessed by the Madeireira J&Y in a forest inventory. To develop the evaluation of the potential of the area, data was sought through the Systematic Sample Inventory, a methodology that aims to collect information on species of interest, as well as biogeographic characteristics of interest in the field, where the execution was based on the points of paths to be traversed by opening between points, considering species with DBH greater than 30 cm, in a range of 50 m wide, being 25 m to the right and 25 m to the left.

⁸ Brazilian Government Ministry for the Environment (Ministério do Meio Ambiente – MMA). Brazilian priority areas for biodiversity conservation and sustainable use. Available at: <http://www.mma.gov.br/biodiversidade/biodiversidade-brasileira/areas-prioritarias/item/489>. Last visit on: March 31st, 2021.

Therefore, the Northeast Amazon region has a great biological diversity and several environment types, in addition to the presence of endemic species of extreme importance to the conservation of Amazon biodiversity.⁹

The ABC Norte REDD project therefore creates an important Northeast Amazon biodiversity corridor in a threatened and still unknown region. Preserving continuous forest environments is one way of ensuring continued gene flow of regional species and limiting the entrance of invasive species from other habitats.

Vegetation Cover

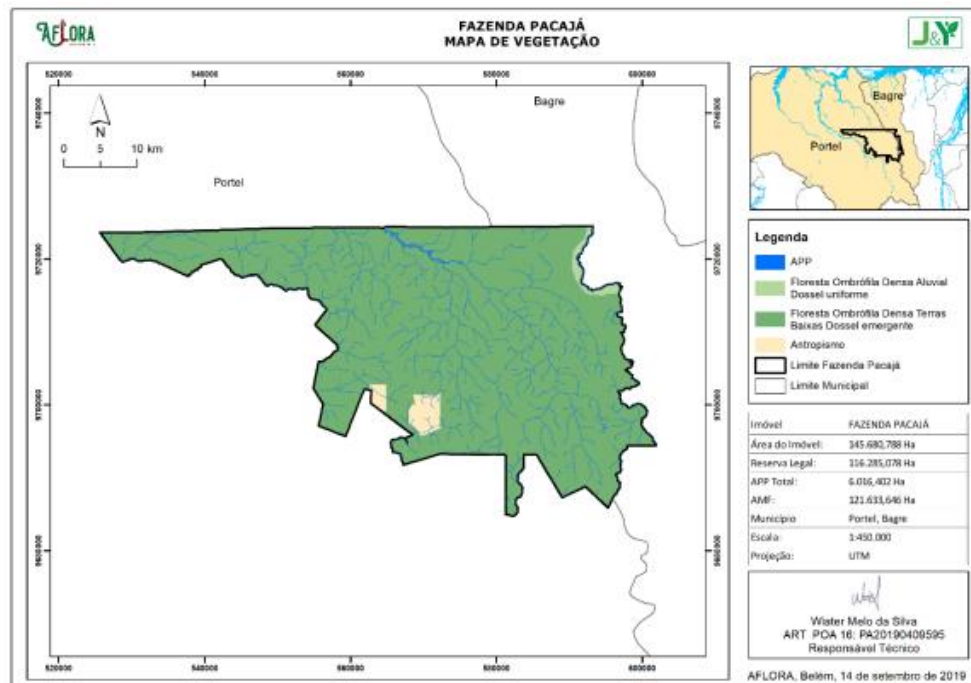
The project area is covered by native Amazonian vegetation. The Region has several types of vegetation groups, which vary depending on the types of soils and water drainage.

The areas related to native vegetation are the most representative element in the region under study. They occur preferentially along the main hydrographic basins that cross the region. Thus, the regions of Portel and Bagre, comprise two large groups of forest cover, which are:

- Group 1 - Dense Ombrophilous Lowland Forest emergent canopy: Formation typical of the Amazon region is also known as rainy tropical forest. It is characterized by its large trees, usually with one or two species that protrude from the uniform tree layer, between 30 to 50 m height. It occurs in almost every area of Fazenda Pacajá.
- Group 2 - Alluvial Dense Ombrophilous Forest uniform canopy: The high floodplains have a greater diversity of species than the low floodplain and igapó. It has a low density of large trees. Most species have rapid growth. It has a good occurrence in the area covered by the Project, bordering rivers and streams.

⁹ Nelson, B.W. e A. A. Oliveira. 1999. Avaliação e Ações prioritárias para a Conservação do bioma Floresta Amazônia: Ações Prioritárias para a Conservação da Biodiversidade da Amazônia. Programa Nacional da Diversidade Biológica- PROBIO, MMA.

Figure 15. Vegetation Cover of the Project Area



In general, the forest areas are of relevant interest to the economy of the municipalities, notably those related to the Dense Forest of Terra Firme, due to the presence of wood of high commercial value, such as tauari (*courati spp*), jarana (*Leeythis lucida*) and itaúba (*Mezilaurus itauba*), etc.

The Table below presents the list of the 20 main forest species found in the forest inventory, containing the common, scientific and family name.

However, the final analysis of the commercial class and which species will actually be harvested will be done in detail in each UPA and explained in the respective POAs, as the current list does not include future market variations or the company's work in the commercial development of lesser-known species.

In addition, as the forest inventory is sampling, during the census, some rare species may lose this status. On the other hand, some more abundant species may be rare in a given UPA.

Therefore, the current species list should be considered as a reference and not as a final list of the number of species and their commercial class, as this process is dynamic.

Table 3. Main forest species identified in the forest inventory

Nome Vulgar	Nome Científico	Família
Acapú	<i>Vouacapoua americana</i> Aubl.	Fabaceae
Andiroba	<i>Carapa guianensis</i> Aubl.	Meliaceae
Angelim-Amargoso	<i>Vatairea fusca</i> (Ducke) Ducke.	Fabaceae
Angelim-Pedra	<i>Hymenolobium petraeum</i> Ducke.	Leguminosae
Angelim-Vermelho	<i>Dinizia excelsa</i> Ducke.	Leguminosae
Breu-Sucuruba	<i>Trattinickia burserifolia</i> (Mart.) Willd.	Burseraceae
Copaíba	<i>Copaifera langsdorfii</i>	Fabaceae
Cumarú	<i>Dipteryx odorata</i>	Fabaceae
Cupiúba	<i>Goupia glabra</i> Aubl.	Goupiaceae
Fava-bolota	<i>Parkia pendula</i> Benth. ex Walp	Leguminosae
Faveira	<i>Parkia decussata</i> Ducke.	Fabaceae
Guajará-bolacha	<i>Yzygiopsis oppositifolia</i> Ducke.	Sapotaceae
Jatobá	<i>Hymenaea courbaril</i> L.	Fabaceae
Jutaí	<i>Hymenaea courbaril</i> L. (Hayne) Lee	Caesalpinaceae
Louro-Vermelho	<i>Nectandra rubra</i> (Mez) C. K. Allen	Lauraceae
Maçaranduba	<i>Manilkara huberi</i> (Ducke) Chevalier.	Sapotaceae
Mandioqueira-preta	<i>Ruizterania albiflora</i> , Marciano Bert.	Vochysiaceae
Maparajuba	<i>Manilkara bidentata</i>	Sapotaceae
Marupá	<i>Simarouba amara</i> Aubl.	Simaroubaceae
Matamatá-branco	<i>Eschweillera coriacea</i> (DC.) S.A.Mori	Lecythidaceae
Melancieira	<i>Alexa grandiflora</i> Ducke	Leguminosae
Muiracatiara	<i>Astronium gracilis</i> Engl.	Anacardiaceae
Orelha de Macaco	<i>Enterolobium schomburgkii</i> (Benth.) Benth	Leguminosae
Pequiá	<i>Caryocar villosum</i> (Aubl.) Pers.	Caryocaraceae
Pequiarana	<i>Caryocar glabrum</i> (Aubl.) Pers.	Caryocaraceae
Sapucaia	<i>Lecythis usitata</i> Miers.	Lecythidaceae
Sucupira	<i>Lecythis pisonis</i> Cambess.	Fabaceae
Tauari	<i>Couratari oblongifolia</i> Ducke & R. Knuth.	Lecythidaceae
Taxi-Branco	<i>Sclerolobium paniculatum</i>	Leguminosae
Timborana	<i>Piptadenia suaveolens</i> (Mcq)	Mimosaceae

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

In the Amazon, regions known as the agricultural expansion frontier (usually located in remote areas where access is difficult and there is little action/control by government bodies), land occupation takes place in a disorderly manner and without regard for legislation¹⁰.

The conditions of low governance, poorly defined land tenure and land occupation pressure through unofficial roads propagate an ideal scenario for the advancement of deforestation in Pará State. This is a problem made possible by the local geo-political situation, which the municipalities do not have the capacity to deal with alone.

Deforestation in the Brazilian Amazon has been taking place at an average rate of 0.4% or 13,600 km² per year since 1996¹¹, showing a significant reduction from 2004 to 2012, but presenting a upwards trend from 2013 to 2016. Around 44% of the reduction observed has been attributed to negative trends in the livestock industry, 37% due to creation of new protected areas, and approximately 18% to causes potentially attributable to command and control campaigns by the federal government¹². The deforested annual area in the 2010 to 2013 period reduced by 70% compared to the 1996 to 2005 period. However, data from recent years shows a new increase in deforestation and the need to improve efforts to preserve forest resources. Therefore, it is difficult to guarantee with certainty that deforestation is under control, mainly because it is ever more interlinked with commodities, mainly beef and soy, traded in global markets¹³.

Command and control activities are more concentrated in the States of Pará, Mato Grosso and Rondônia, while in Southern Amazon they are rare. Given the advancement of the deforestation frontier associated with improvement of infrastructure, deforestation has tended to continue at the same pace, taking into account the dynamic of the agents involved as presented above and the great expanse of forested land still available¹⁴.

However, despite the clear drop in deforestation in the Amazon between 2010 and 2012, data from PRODES shows deforestation observed in the biome increased for the following four years (2013 to 2016). Deforestation in 2016 has reached 7,989 km², which represents an increase of more than 35%

¹⁰ INSTITUTO DE CONSERVAÇÃO E DESENVOLVIMENTO SUSTENTÁVEL DO AMAZONAS (IDESAM). Reduções de Emissões do Desmatamento e Degradação Florestal (REDD+): Estudo de Oportunidades para a Região Sul do Amazonas. Manaus: Idesam, 2011. 45 p. (Relatórios Técnicos nº1).

¹¹ PRODES Project - Brazilian Amazon Forest Monitoring through Satellite. Instituto Nacional de Pesquisas Espaciais (INPE). Available at: <<http://www.obt.inpe.br/prodes/index.php>>. Last visited on April 06th, 2017.

¹² SOARES-FILHO, B. *et al.* **Role of Brazilian Amazon protected areas in climate change mitigation**. Nova York: Columbia University. 2010.

¹³ NEPSTAD, Daniel C.; STICKLER, Claudia M.; ALMEIDA, Oriana T.. Globalization of the Amazon Soy and Beef Industries: Opportunities for Conservation. **Conservation Biology**, Belém, v. 20, n. 6, p.1595-1603, 30 mar. 2006.

¹⁴ INSTITUTO DE CONSERVAÇÃO E DESENVOLVIMENTO SUSTENTÁVEL DO AMAZONAS (IDESAM). Reduções de Emissões do Desmatamento e Degradação Florestal (REDD+): Estudo de Oportunidades para a Região Sul do Amazonas. Manaus: Idesam, 2011. 45 p. (Relatórios Técnicos nº1).

compared to 2012 and the highest value since 2009. This fact demonstrates that deforestation in the Amazon biome is still not under control.

An excellent study by Antonio Nobre in 2014¹⁵, which collected information from over 200 scientific studies and articles from the Amazon biome, reports that deforestation and degradation of the rainforest had reached 2,018,079 km², signifying that up to 47.34% of the entire forest had already undergone some kind of human impact. According to the report, deforestation may put at risk the forest's capacity to "export" moisture to other regions via the so-called "flying rivers" which regulate the climate, causing droughts and other negative effects. The Amazon rainforest survived over thousands of years of volcanic, meteoric, seismic, and glacial impacts, but in less than 50 years of human activity, it has been pushed to a significant level of threat.

Furthermore, the State of Pará, especially the city of Portel, where the project area is located, has shown the highest deforestation rates from 2000 to 2016, according to PRODES¹⁶. The low presence of government in the region, combined with few awareness raising and anti-deforestation initiatives, will leave it poorly prepared to prevent deforestation in the coming years.

Therefore, as observed by Idesam (2011)¹⁷, Carrero (2009)¹⁸ and Nepstad *et al.* (2006)^{19,20}, these data confirm the acceleration of the deforestation dynamic in the Amazon Rainforest, related to historical patterns, indicating a frontier of agricultural expansion.

According to the Brazilian Forest Code (Law N° 12.651, 25/05/2012²¹), all rural estates located in forest zones shall have:

I - Permanent preservation area: protected areas covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, biodiversity, gene flow of plants and animals, protecting the soil and ensuring the well-being of human populations

¹⁵ NOBRE, Antonio Donato. **O Futuro Climático da Amazônia**. São José dos Campos: Articulação Regional Amazônica (ARA), 2014. 42 p.

¹⁶ PRODES Project - Brazilian Amazon Forest Monitoring through Satellite. Instituto Nacional de Pesquisas Espaciais (INPE). Available at: <<http://www.obt.inpe.br/prodes/index.php>>. Last visited on April 06th, 2017.

¹⁷ INSTITUTO DE CONSERVAÇÃO E DESENVOLVIMENTO SUSTENTÁVEL DO AMAZONAS (IDESAM). Reduções de Emissões do Desmatamento e Degradação Florestal (REDD+): Estudo de Oportunidades para a Região Sul do Amazonas. Manaus: Idesam, 2011. 45 p. (Relatórios Técnicos nº1).

¹⁸ CARRERO, G.C. Dinâmica do Desmatamento e Consolidação de Propriedades Rurais na Fronteira de Expansão Agropecuária no Sudeste do Amazonas. Master thesis, Instituto Nacional de Pesquisas da Amazônia. 68p. 2009.

¹⁹ Nepstad, D. C.; C. M. Stickler e O. T. Almeida. 2006. Globalization of the Amazon Soy and Beef Industries: Opportunities for Conservation. **Conservation Biology** 20(6):1595-1603.

²⁰ Carrero, G. C., and P. M. Fearnside. Forest clearing dynamics and the expansion of landholdings in Apuí, a deforestation hotspot on Brazil's Transamazon Highway. **Ecology and Society** 16(2): 26. 2011.

²¹ BRASIL. Law nº. 12.651, of 25 May 2012. Forest Code. Diário Oficial [da] República Federativa do Brasil, Brasília, DF, 25 May 2012.

II - Legal Reserve: an area located within a rural property or possession which is required to be segregated, as well as the permanent preservation area, for the sustainable use of natural resources, conservation and rehabilitation of ecological processes, biodiversity conservation and shelter, and protection of native flora and fauna. In the Brazilian Legal Amazon²², eighty percent (80%) of a rural property should be preserved ..

However, there is a clear disregard for legal conservation requirements in the region. Much of the deforestation occurs in areas that should be preserved.

One of the main ways to combat deforestation in Brazil is command and control mechanisms, such as effective monitoring, requiring compliance with environmental legislation along with a greater State presence. However, this does not seem to be implemented in most regions of the country, because of the government's tendency to disregard these responsibilities in comparison with other social goals and economic interests, which has put Brazil among the world's largest deforesters²³. Given the approval of the new Forest Code (2012) and its general pardoning of those who deforested, a significant increase in annual deforestation rates has been observed²⁴.

In spite of the legal provisions intended to preserve at least 80% of the Amazon Forest coverage, lack of law enforcement by local authorities along with public policies seeking to increase commodity production and encourage land use for agricultural, bio energy and cattle breeding purposes have created a scenario of complete disregard for the mandatory provisions of the Forest Code. In addition, covering vast areas with low demographic density makes tracking of illegal activities and land surveillance very difficult for the authorities^{25,26}.

Moreover, according to PRODES, around 788,893 km² have been deforested until 2016, which is equivalent to 18.9% of the total Amazon biome area. Given the increasing deforestation trend observed in recent years, this data shows the non-compliance with the Legal Reserve requirement established by the Brazilian Forest Code.

²² The concept of Legal Amazonia was originated in 1953 and its boundaries arise from the necessity of planning the economic development of the region. For this reason, Legal Amazonia's boundaries do not correspond to those of the Amazon biome. The former has an area of approximately 5 million km², distributed through the entirety or a proportion of 9 Brazilian states.

²³ FAO. **Global Forest Resource Assessment 2015**: Desk reference. Rome, 2015. 253 p.

²⁴ NOBRE, Antonio Donato. **O Futuro Climático da Amazônia**. São José dos Campos: Articulação Regional Amazônica (ARA), 2014. 42 p.

²⁵ MOUTINHO, P. *et al.* REDD no Brasil: um enfoque amazônico: fundamentos, critérios e estruturas institucionais para um regime nacional de Redução de Emissões por Desmatamento e Degradação Florestal – REDD. Brasília, DF: Instituto de Pesquisa Ambiental da Amazônia, 2011.

²⁶ INSTITUTO DE CONSERVAÇÃO E DESENVOLVIMENTO SUSTENTÁVEL DO AMAZONAS (IDESAM). Reduções de Emissões do Desmatamento e Degradação Florestal (REDD+): Estudo de Oportunidades para a Região Sul do Amazonas. Manaus: Idesam, 2011. 45 p. (Relatórios Técnicos nº1).

Therefore, all calculations were made assuming that the reference region has a general non-compliance with the Brazilian Forest Code. Thus, the baseline scenario considers the potential of unplanned deforestation in the project area to surpass the limits stipulated by the Law.

In this sense the preparation for REDD+ activities, programs and projects become essential for the Project Region, not only as a means to promote forest conservation, but also as a way to implement a new productive forest-based economy. This scenario needs to be reinforced because the areas in question hold incomparable biological and cultural diversity, with their traditional inhabitants marginalized from the process of economic development through capitalized livestock production.

Regarding other regulatory frameworks that exist in Brazil, on November 26th, 2015 occurred the approval of the Federal Decree 8,576 / 2015, which establishes the National Commission for Reducing Emissions of Greenhouse Gases from Deforestation and Forest Degradation, Conservation of Forest Carbon Stocks, Sustainable Management of Forests and Increase of Forest Carbon Stocks - REDD +²⁷.

The development of this Project is not in conflict with such Decree. It is important to clarify the difference between Law and Decree in Brazil. The Brazilian Federal Constitution establishes the principle of legality for all the national territory, according to the text of article 5, item II "no one shall be obliged to do or not to do anything other than by virtue of law."

Law is an infra-constitutional (sub-constitutional) norm, it is a mandatory rule by the coercive force of the legislative power or of legitimate authority, which constitutes the rights and duties in a society. Law is different from Decree.

Decrees, on the other hand, are administrative acts, issued by the Chief Executive (president, governor or mayor), with the main objective of regulating and detailing a law, in order to grant it the necessary means for its faithful execution, without, however, being able to contradict any of its provisions or to innovate the Law.

Thus, in terms of the object, jurisdictionally and scope of the Decree 8,576 / 2015, it is understood that its application is merely administrative, that is, it merely organizes the functioning of the Federal Government about the REDD+ agenda. Its application is restricted to the federal entities of the Public Administration, and, because it is a decree, a normative type that only grants regulation to the matter of law, does not establish duties or obligations to the society.

Thus, Article 6 of Decree 8,576 / 2015 only limits the Federal Government's understanding of what shall be accounted for in order to comply with mitigation commitments of other countries to the United Nations Framework Convention on Climate Change. It does not impose a barrier or obstacles to the implementation of REDD projects and the commercialization of carbon assets generated from these projects. This consideration in the Decree does not affect or interfere with the voluntary or regulated carbon market, domestic or international.

²⁷ The Decree is available in Portuguese at: <http://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2015/Decreto/D8576.htm> . Last visited on February 26th, 2018.

There is no law in Brazil that does not allow or restrict the execution of REDD projects or that does not allow or restrict any commercial transaction of assets resulting from REDD projects. On the contrary, such transactions are valid and legally permitted. Thus, there is no contradiction or irregularity between the ABC Norte project and such Decree.

1.15 Participation under Other GHG Programs

1.16 Other Forms of Credit

1.17 Additional Information Relevant to the Project

2 SAFEGUARDS

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

This project utilizes the approved VCS Methodology VM0015: Methodology for Avoided Unplanned Deforestation, version 1.1, published on 03-December-2012.

Furthermore, the following tools were used:

- VT0001 - Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0, published on 01-February-2012;
- AFOLU Non-Permanence Risk Tool v4.0, published on 19-September-2019.

3.2 Applicability of Methodology

Table 7. Applicability conditions of the chosen methodology

Applicability Conditions	Justification of Applicability
a) Baseline activities may include planned or unplanned logging for timber, fuelwood collection, charcoal production, agricultural and grazing activities as long as the category is unplanned deforestation according to the most recent VCS AFOLU requirements.	None of the baseline land use conversion activities are legally designated or sanctioned for forestry or deforestation, and hence the project activity qualifies as avoided unplanned deforestation. This is in accordance with the definition of unplanned deforestation under the VCS Standard v4.0. The primary land uses in the baseline scenario are: agriculture, livestock and sustainable forest management, therefore the present criteria are fulfilled.

b) Project activities may include one or a combination of the eligible categories defined in the description of the scope of the methodology (table 1 and figure 2).	Within the categories of Table 1 and Figure 2 of the methodology, the present project activity falls within category B, “Avoided Deforestation with Logging in the Project Case”. The reason is that the project area contains 100% native vegetation, and a sustainable forest management plan is implemented in the project area. In addition, it is important to note that degradation is not included in either the baseline or project scenario.
c) The project area can include different types of forest, such as, but not limited to, old growth forest, degraded forest, secondary forests, planted forests and agro-forestry systems meeting the definition of “forest”.	The REDD project area is 100% made up of Wooded Capinarama, Lowland Dense Ombrophilous Forest and Alluvial Dense Ombrophilous Forest. No deforested, degraded or areas otherwise modified by humans were included in the project area at Project Start Date.
d) At project commencement, the project area shall include only land qualifying as “forest” for a minimum of 10 years prior to the project start date.	The project area consisted of 100% tropical rainforest in 2007 – 10 years prior to the project start date – all of which conformed to the Brazilian definition of forest³³. This was ascertained using satellite images, as described in the section Project Location of the present VCS PD.
e) The project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the project area includes forested wetlands growing on peat (e.g. peat swamp forests), this methodology is not applicable.	The project area region is formed by soil types yellow latosol and haploid gleysol. Therefore, none of the project region grows on peat, satisfying this applicability criterion.

3.3 Project Boundary

The project area is formed by a single property (Fazenda Pacajá) which has a total area of approximately 145,680 ha, covered almost in its totality by native vegetation. However, in order to satisfy the definitions of the methodology, which establish that the area must be forest for at least 10 years before the Project

³³ Brazil adopts the FAO forest definition: “Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 hectares (ha). The trees should be able to reach a minimum height of 5 meters (m) at maturity in situ.” Available at: <<http://www.fao.org/docrep/006/ad665e/ad665e06.htm>>.

Start Date, some adjustments and discounts were made. The property comprising the project area – defined in accordance with the methodology’s rules governing the latter – as well as the size of the leakage belt, are displayed in Table 7 below.

Table 8. Project Area and Leakage Belt area

Name	Area (ha)
Project Area	140,432.27 ha
Leakage Belt	

The applied Methodology considers the six carbon pools listed in the Table below. Their inclusion or exclusion within the boundary of the proposed AUD project activity, as well as the respective justification/explanation, are described in the Table below.

Table 9. Carbon pools included or excluded within the boundary of the proposed AUD project activity

Carbon pools	Included/excluded	Justification
Above-ground	Included	Carbon stock change in this pool is always significant
	Non-Tree: Excluded	No existence of perennial crops as final class
Below-ground	Included	Stock change in this pool is significant
Dead wood	Excluded	Excluded for simplification. This exclusion is conservative
Harvested wood products	Excluded	Not significant
Litter	Excluded	Not to be measured according to VCS Methodology Requirements, 4.0.

In accordance with the Methodology, approximately 1/10 of the carbon stock in the below-ground pool of the initial “forest” class will be released in a ten-year interval. This is further discussed in the section Baseline Emissions.

In addition, the Methodology considers the two sources of GHG emissions listed in the Table below. Their inclusion or exclusion within the boundary of the proposed AUD project activity, as well as the respective justification/explanation, are described in the Table below.

Table 10. Sources and GHG included or excluded within the boundary of the proposed AUD project activity

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass Burning	CO ₂	Excluded	Excluded as recommended by the applied methodology. Counted as carbon stock change.
		CH ₄	Included	Included as non-CO ₂ emissions from biomass burning in the baseline scenario, according to the methodology.
		N ₂ O	Included	Included as non-CO ₂ emissions from biomass burning in the baseline scenario, according to the methodology.
		Other	Excluded	No other GHG gases were considered in this project activity.
	Livestock emissions	CO ₂	Excluded	Not a significant source
		CH ₄	Excluded	Excluded for simplification. This is conservative.
		N ₂ O	Excluded	Excluded for simplification. This is conservative.
		Other	Excluded	No other GHG gases were considered in this project activity.
Project	biomass burning	CO ₂	Excluded	Excluded as recommended by the applied methodology. Counted as carbon stock change.
		CH ₄	Included	Included as non-CO ₂ emissions from biomass burning in the project scenario, according to the methodology.
		N ₂ O	Included	Included as non-CO ₂ emissions from biomass burning in the project scenario, according to the methodology.
		Other	Excluded	No other GHG gases were considered in this project activity.
	Livestock emissions	CO ₂	Excluded	Not a significant source
		CH ₄	Excluded	No livestock agriculture increase is predicted to occur in the project scenario compared to the baseline case. Therefore, considered insignificant.
		N ₂ O	Excluded	As above.

		Other	Excluded	No other GHG gases were considered in this project activity.
--	--	-------	----------	--

3.4 Baseline Scenario

In the baseline scenario, forest is expected to be converted to non-forest by the agents of deforestation acting in the reference region, project area and leakage belt, as described below. Therefore, the project falls into the AFOLU-REDD category, specifically: Avoided unplanned deforestation (AUD). The revenue from the present REDD project is essential to maintain this area as standing forest, as described under additionality of the project (section 3.5), as well as to carry out the present project's leakage management activities.

Degradation was not considered in the present REDD project, in accordance with methodology requirements, which define "forest" and "non-forest" as the minimum land-use and land-cover classes.

Analysis of historical land-use and land-cover change

- Collection of appropriate data sources

GIS MAPPING, REMOTE SENSING TECHNIQUES

To carry out the assessment of land use and land cover (LU/LC) for the baseline period (2007-2017), remote sensing satellite analysis was carried out, which is described below.

The historical reference period is the period in which analysis of LU/LC-change within the reference region and project area is carried out. The historical reference period for the present project during the assessment of the baseline period comprised analysis of images from 2007 - 2017. In accordance with the methodology, the analysis shall be made using the data obtained from monitoring LU/LC changes in the reference region during the historical reference period.

To map the dynamics of land use in the reference region, images from 2007 to 2017 produced by MapBiomias (collection 5.0) were used, made available in raster format on the program's website (<http://mapbioma.org/>).

In order to compose the entire reference region, two Landsat scenes per year (orbit/point: 225/62 and 224/62) from the reference period were required (Table 9). The final mapping resolution was 30 m pixel.

MapBiomias is a multi-institutional initiative of the Greenhouse Gases Emissions Estimation System³⁴ promoted by the Climate Observatory. The MapBiomias creation involves NGOs, universities, and technology companies. In MapBiomias, the image classification methodology utilizes for each year, all Landsat images available in each period (Landsat 5 [L5], Landsat [L7] and Landsat [L8]) with a cloud cover less than or equal 50%. Thus, a representative mosaic of each year is generated by selecting cloudless pixels from the available images. For each pixel, metrics that describe its behaviour during the

³⁴ SEEG website. Available at: <http://seeg.eco.br/en/> Last visited on 19/04/2021

year are extracted and can contain up to 105 layers of information with an artificial intelligence classifier, Random Forest. The acquisition of Landsat images is done via Google Earth Engine, with sources from NASA (American Space Agency) and USGS (US Geological Survey).

The algorithm uses samples obtained by reference maps, generation of stable collections from previous MapBiomass series and direct collection by visual interpretation of Landsat images to classify as a single map per class. This classification then goes through the stages of the spatial filter, applying neighbourhood rules and temporal filters, in particular changes in coverage and use that are impossible or not allowed, to reduce spatial and temporal inconsistencies.

Table 11. Data used for historical LU/LC change analysis

Vector	Sensor	Resolution		Coverage (km ²)	Acquisition date DD/MM/YYYYe ar	Scene	
		Spatial (m)	Spectral (µm)			Path	Row
Satellite	Landsat TM	30	0.45-2.35	34,225	2007 - 2017	225	62
Satellite	Landsat TM	30	0.45-2.35	34,225	2007 - 2017	225	61
Satellite	Landsat TM	30	0.45-2.35	34,225	2007-2017	224	62

- **Definition of classes of land-use and land-cover (LU/LC)**

The classes of LU/LC were defined as “forest” and “non-forest” in accordance with the procedures described above. These classes are the minimum classes to be considered in the present REDD project as stipulated by the Methodology. As such, degradation was not a factor.

Stratification was not carried out in either class, and therefore the categories “forest” and “non-forest” have homogenous carbon stocks. Satellite images were used to generate the land-use and land-cover map in 2017 shown in the figure below.

Figure 19. Land use and land cover map comparing 2007 and 2017.

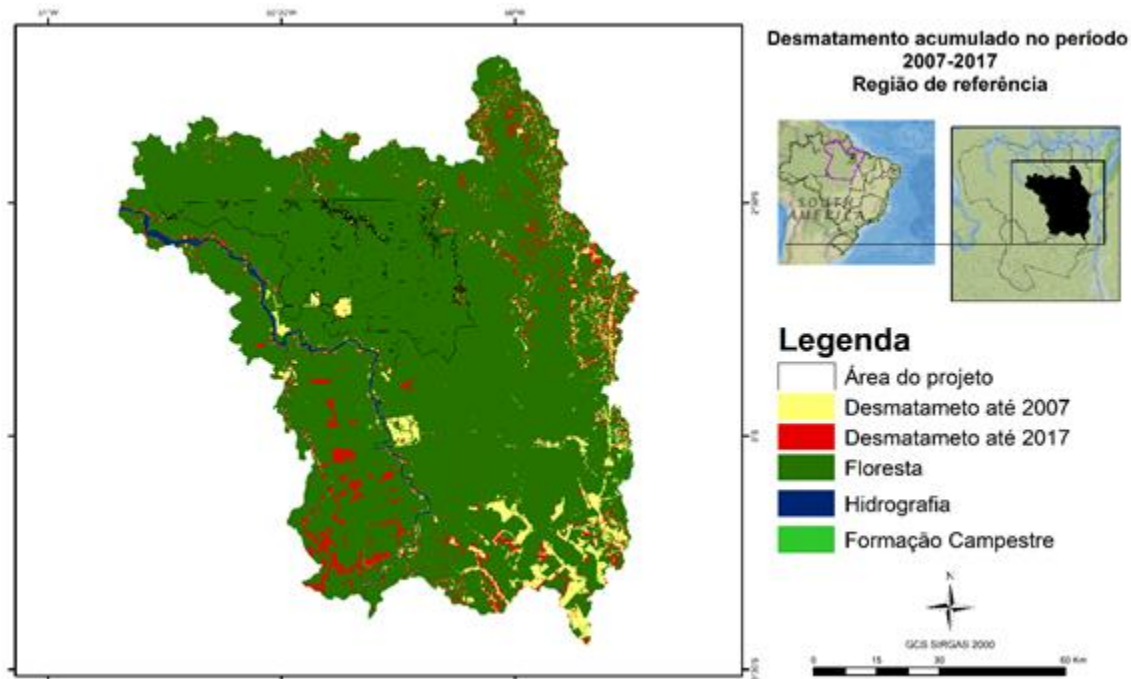


Figure 20. List of land use and land cover change categories

Class identifier		Trend in carbon stock	Presence in ³⁵	Baseline activity ³⁶			Description (including criteria for unambiguous boundary definition)
IDc	Name			LG	FW	CP	
1	Wooded Campinarana (Campinarana Arborizada)	decreasing	RR, PA	no	no	no	According to official classification of the types of vegetation of Brazil (SIVAM). Predominantly Wooded Campinarana.
2	Dense Alluvial Tropical Rainforest (Floresta)	decreasing	RR	yes			According to official classification of the types of vegetation of Brazil (SIVAM).

³⁵ RR = Reference region, LK = Leakage belt, LM = Leakage management Areas, PA = Project area

³⁶ LG = Logging, FW = Fuel-wood collection; CP = Charcoal Production

	Ombrófila Densa Aluvial)						Dense Alluvial Tropical Rainforest.
3	Dense Lowland Tropical Rainforest (Floresta Ombrófila Densa das Terras Baixas)	decreasing	PA	yes			According to official classification of the types of vegetation of Brazil (SIVAM). Dense Lowland Tropical Rainforest.
4	Grassy-woody Campinarana	decreasing	RR	yes			According to official classification of the types of vegetation of Brazil (SIVAM). Grassy-woody Campinarana.
5	Dense Submontane Tropical Rainforest	decreasing	RR	yes			According to official classification of the types of vegetation of Brazil (SIVAM).Dense Submontane Tropical Rainforest.
6	No forest	decreasing	RR, PA, LK	no	no	no	Mosaic of anthropic areas: pasture, annual, perennial crops and roads according to the satellite image classification
7	Hydrography	decreasing	RR, PA	no	no	no	Presence of rivers and water bodies in the satellite image classification and information from the National Water Agency - ANA

- **Definition of categories of land-use and land-cover change (LU/LC-change)**

The LU/LC-change categories that could occur within the project area and leakage belt during the first baseline period, in both the baseline and project case, are identified in the potential LU/LC-change matrix and the list of LU/LC-change categories during the project crediting period are shown in the Tables below.

Table 11 shows that deforestation could occur in the baseline and project scenarios within both the PA and LK areas and shows the quantities of deforestation observed within the historical reference period associated with each identifier. The deforestation present within the PA and LK are shown in the LU/LC-change map. This Table displays deforestation across the whole reference period.

As shown in tables below, degradation was not considered in any of the LU/LC classes

Table 12. Land use change matrix in the reference region between 2007 and 2017

			Initial LU/LC class						
			Wooded Campinarana	Dense Rainforest	Dense Alluvial Tropical Rainforest	Dense Lowland Tropical Rainforest	Grassy-woody Campinarana	Dense Submontane Tropical Rainforest	No forest
			I1	I2	I3	I4	I5	I6	I7
Final Class	F1	Wooded Campinarana	I1/F1	0	0	0	0	0	0
	F2	Dense Rainforest	0	I2/F2	0	0	0	0	0
	F3	Dense Alluvial Tropical Rainforest	0	0	I3/F3	0	0	0	0
	F4	Dense Lowland Tropical Rainforest	0	0	0	I4/F4	0	0	0
	F5	Grassy-woody Campinarana	0	0	0	0	I5/F5	0	0
	F6	Dense Submontane Tropical Rainforest	0	0	0	0	0	I6/F6	0
	F17	No forest	I1/F7	I2/F7	I3/F7	I4/F7	I5/F7	I6/F7	I7/F7

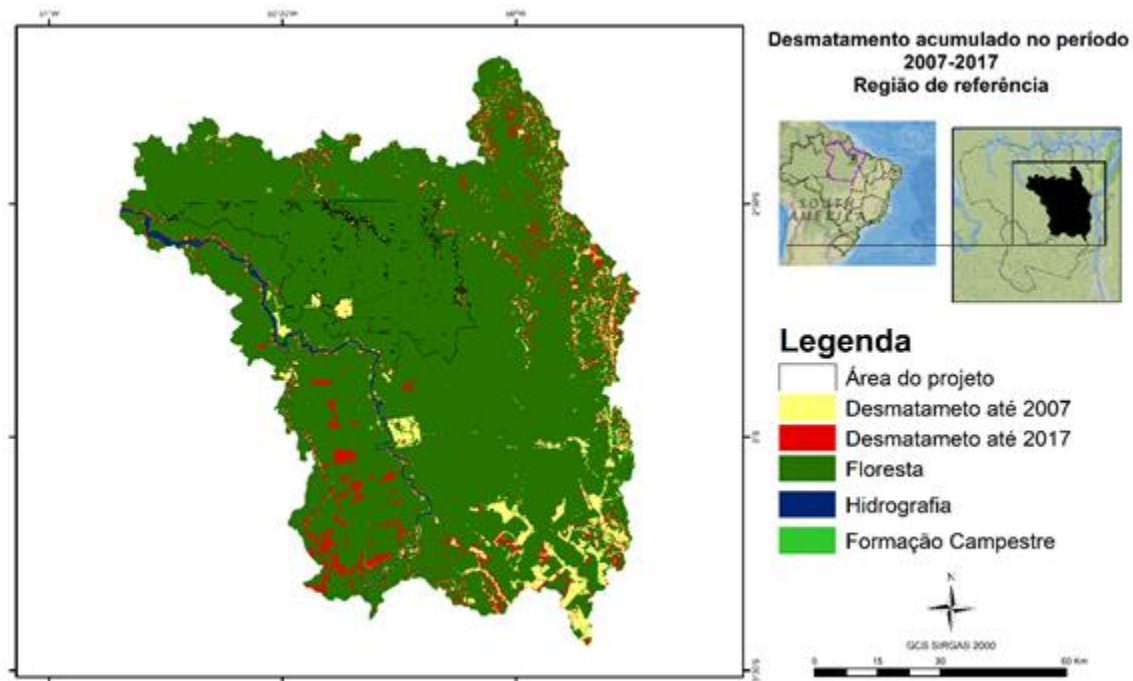
			BASELINE SCENARIO				
			Initial LU/LC class				
			I1	I2	I3	I4	Total (ha)
IDcl			Forest	Hydrography	Grassland formations	Deforestation	
Final Class	F1	Forest	862,379.83	0	0	0	862,379.83
	F2	Hydrography	0	9,935.28	0	0	9,935.28
	F3	Grassland formations	0	0	2,311.57	0	2,311.57
	F4	Deforestation	51,915.89	0	0	49,966.94	101,882.83
	Total (ha)		914,295.72	9,935.28	2,311.57	49,966.94	976,509.51

Table 13. List of land use and land cover change categories

IDct	Name - Initial	Trend in carbon stock	Presence in	Activity in the baseline case			Name - Final	Trend in carbon stock	Presence in	Activity in the project case		
				LG	FW	CP				LG	FW	CP
I1/F1	Wooded Campinarana	decreasing	RR, PA	yes	no	no	Wooded Campinarana	constant	RR, PA	yes	no	no
I1/F7	Wooded Campinarana	decreasing	RR, PA	no	no	no	Non Forest	constant	RR, PA	no	no	no
I2/F2	Dense Rainforest	decreasing	RR, PA		no	no	Dense Rainforest	constant	RR, PA		no	no
I2/F7	Dense Rainforest	decreasing	RR, PA		no	no	Non Forest	constant	RR, PA		no	no

I3/F3	Dense Alluvial Tropical Rainforest	decreasing	RR		no	no	Dense Alluvial Tropical Rainforest	constant	RR		no	no
I3/F7	Dense Alluvial Tropical Rainforest	decreasing	RR		no	no	Non Forest	constant	RR		no	no
I4/F4	Dense Lowland Tropical Rainforest	decreasing	PA		no	no	Dense Lowland Tropical Rainforest	constant	PA		no	no
I4/F7	Dense Lowland Tropical Rainforest	decreasing	PA		no	no	Non Forest	constant	PA		no	no
I5/F5	Grassy-woody Campinarana	decreasing	RR	no	no	no	Grassy-woody Campinarana	constant	RR		no	no
I5/F7	Grassy-woody Campinarana	decreasing	RR	no	no	no	Non Forest	constant	RR		no	no
I6/F6	Dense Submontane Tropical Rainforest	decreasing	RR	no	no	no	Dense Submontane Tropical Rainforest	constant	RR		no	no
I6/F7	Dense Submontane Tropical Rainforest	decreasing	RR	no	no	no	Non Forest	constant	RR		no	no
I7/F7	Non Forest	increasing	RR, PA	no	no	no	Non Forest	constant	RR, PA		no	no

Figure 21. Cumulative deforestation between 2007-2017 in reference region



- Analysis of historical land-use and land-cover change**

According to the GIS analysis, between 2007 and 2017, there was a deforestation of 55,117.62 ha within the reference region, with an average oscillation of approximately 5,511.76 ha/year. There was a significant increase in deforestation rate during that period ($R^2=0.21$, $p=0.10$), still, this increase was not statistically significant. However, when this model was adjusted using a piecewise linear regression, it was found that the coefficient of determination rises to 0.62 and the comparison becomes significant ($p=0.027$), indicating that this model has a good relationship. The main reason is that as from 2014 (breakpoint) there is an increase in the deforestation rate in the reference region. This information is presented in figures and tables below:

Figure 22. Deforestation dynamics, between the years 2007 and 2017, in the reference region and project area. Source: MapBiomas and IPE data

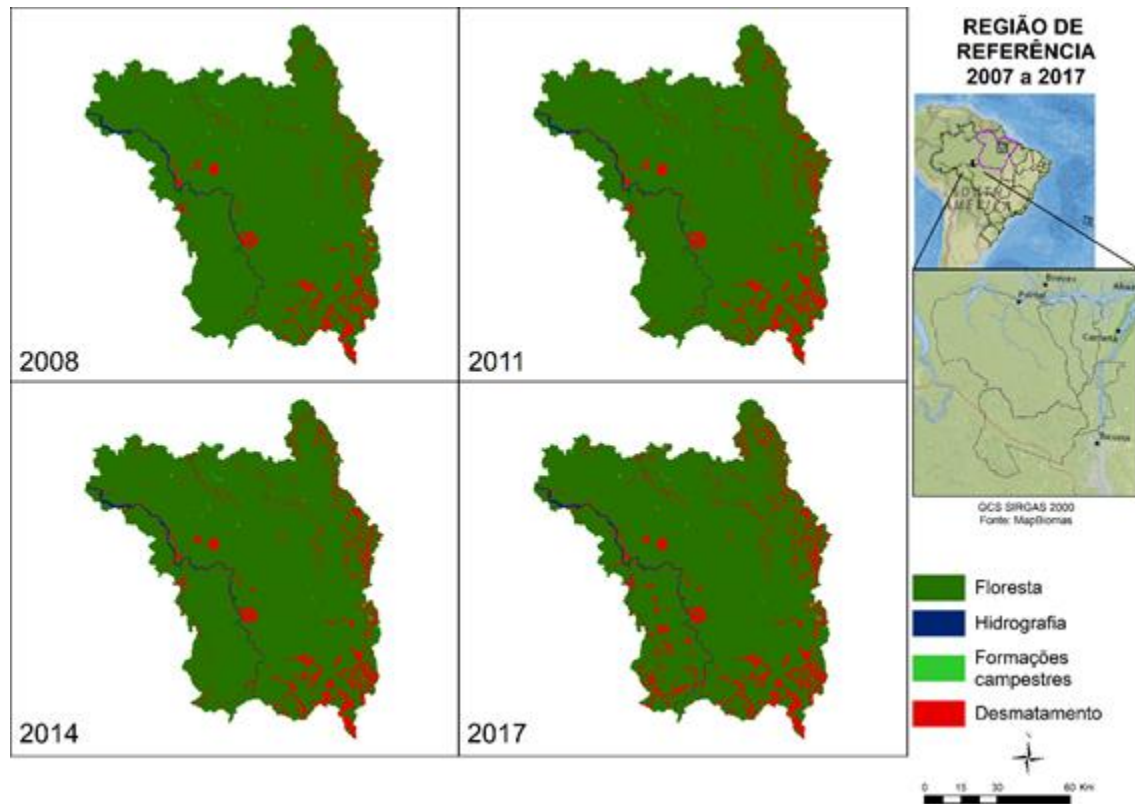
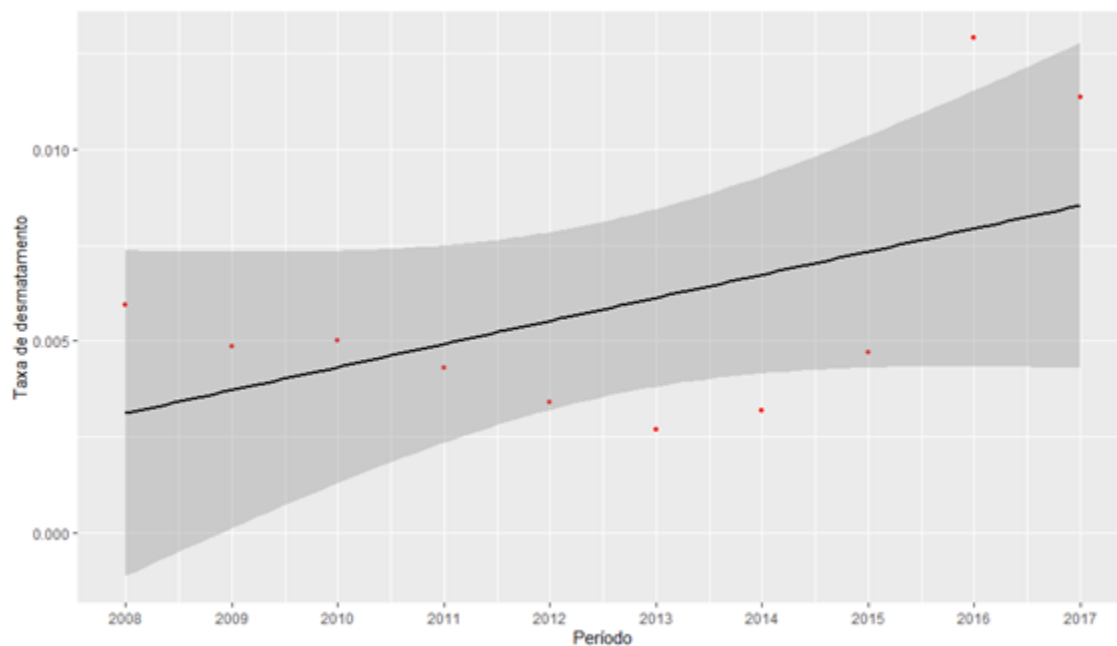


Figure 23. Variation in the deforestation rate in the reference region between the years 2007 and 2017. Source: MapBiomas



The annual deforestation values in the Project Area during the historical reference period can be seen in the table below.

Table 14. Annual deforestation in the Reference Region between 2007-2017 (September-2007 to September - 2017)

Year	Accumulated deforestation (ha)	Deforestation per year (ha)
2008	38,706.75	5,126.13
2009	42,927.30	4,220.55
2010	47,697.93	4,770.63
2011	51,611.76	3,913.83
2012	54,702.36	3,090.60
2013	56,956.05	2,253.69
2014	59,755.32	2,799.27
2015	64,048.41	4,293.09
2016	78,415.74	14,367.33
2017	88,698.24	10,282.50

- **Map accuracy assessment**

The results of MapBiomass undergo an accuracy assessment, which for the entire Amazon Biome is on average 95%. However, to meet the particularities of the region, an independent evaluation was carried out for the reference region from the years 2007 to 2017.

To assess the accuracy of the maps produced by the MapBiomass methodology, a confusion matrix was generated by calculating the user's and producer's percentage of correct answers, errors of omission and commission. For that, 200 sample points were randomly drawn on the reference region, 50 in each class (forest, hydrography and deforestation), and the degree of correctness classification was verified. As a reference, high resolution Landsat images were used, where it was possible to visually determine the land use of the sample points drawn. The table below shows the accuracy analysis carried out for each year and each land use class.

Table 15. Summary of confusion matrices from the evaluation of MapBiomass from 2007 to 2017

Producer accuracy					User accuracy			
Year	Forest	Hydrography	Pioneer vegetation	Deforestation	Forest	Hydrography	Pioneer vegetation	Deforestation
2007	91.30%	97.96%	84.00%	87.27%	84.00%	96.00%	95.45%	85.71%
2008	95.65%	98.04%	95.35%	80.00%	88.00%	100.00%	82.00%	96.00%
2009	100.00%	100.00%	89.13%	76.27%	92.00%	98.00%	82.00%	90.00%
2010	97.67%	98.00%	84.62%	80.00%	84.00%	98.00%	88.00%	88.00%
2011	95.83%	96.15%	83.67%	82.35%	92.00%	100.00%	82.00%	84.00%
2012	88.68%	94.00%	91.49%	86.00%	94.00%	94.00%	86.00%	86.00%
2013	97.92%	92.16%	87.76%	86.54%	94.00%	94.00%	86.00%	90.00%
2014	97.83%	98.00%	83.33%	86.00%	90.00%	98.00%	90.00%	86.00%
2015	95.74%	100.00%	82.46%	87.23%	90.00%	98.00%	94.00%	82.00%
2016	100.00%	100.00%	85.45%	86.00%	92.00%	98.00%	94.00%	86.00%
2017	93.75%	100.00%	81.48%	85.71%	90.00%	98.00%	88.00%	84.00%

Analysis of agents, drivers, and underlying causes of deforestation

As specified in the methodology, it is necessary to understand “who” the deforesting agent is and what drives land-use decisions (“drivers” and “underlying causes”). This analysis is important for two main

reasons: (i) Estimating the quantity and location of future deforestation; and (ii) Designing effective measures to address deforestation, including leakage prevention measures³⁷.

- **Identification of agents of deforestation**

In the past few years, the project region has been the subject of news and studies, mainly due to the advancement of the arc of deforestation in the Amazon biome. This pressure is expected to continue, given the globalization of markets in the amazon region and international development policies planned for the region³⁸.

Of the ten cities that most deforested in 2016, five are located in Pará. The city of Portel remains in the ranking of the ten municipalities that have lead deforestation in the Brazilian Amazon at least for five years^{39, 40}.

The main deforestation agents identified in the region are timber harvesting, acting both legally and illegally;

- a) Timber harvesting**

As aforementioned in section 1 above, timber logging (both legal and illegal) is an important economic activity within the reference region. The large-scale commercial logging for timber which occurs on Marajó Island is sold on local, national and international markets⁴¹. Logging in the Portel region peaked in the 1970s and 2000s and was marked by a strong connection between communities and companies⁴²

Economic data sources between 2007 and 2017 show that timber is the largest contributor to the value of annual production when compared to all extractivism products in the project area and reference region municipalities.

³⁷ VM0015: STEP 3: Analysis Of Agents, Drivers And Underlying Causes Of Deforestation And Their Likely Future Development, page 37. Available at: <<https://verra.org/wp-content/uploads/2018/03/VM0015-Methodology-for-Avoided-Unplanned-Deforestation-v1.1.pdf>>.

³⁸ Nepstad, D. C.; C. M. Stickler e O. T. Almeida. 2006. Globalization of the Amazon Soy and Beef Industries: Opportunities for Conservation. *Conservation Biology* 20(6):1595-1603

³⁹ Available in: <<https://agenciabrasil.ebc.com.br/geral/noticia/2017-01/amazonia-perde-7989-km2-de-floresta-maior-desmatamento-desde-2008>>. Last visited on 14/05/2021.

⁴⁰ IPAM. Overview Of Amazon Deforestation 2016. Available at: <http://aliancaamazonia.org.br/wp-content/uploads/2017/05/Overview-of-Amazon-deforestation-2016_IPAM.pdf> . Last visited: 14/05/2021.

⁴¹ Fundação de Amparo e Desenvolvimento da Pesquisa (FADESP) (2002), 'Comunidades Agroextrativistas do Rio Mapuá – Breves/PA, Diagnóstico SócioEconômico'.

⁴² D'Arace, L. M. B. et al. Wood production in log and firewood in northern Brazil and the state of Pará. *Brazilian Journal. of Development, Curitiba*, v. 5, n. 9, p. 16885-16896, september 2019.

Figure 24. Extraction Production Value (R\$) – Portel/PA

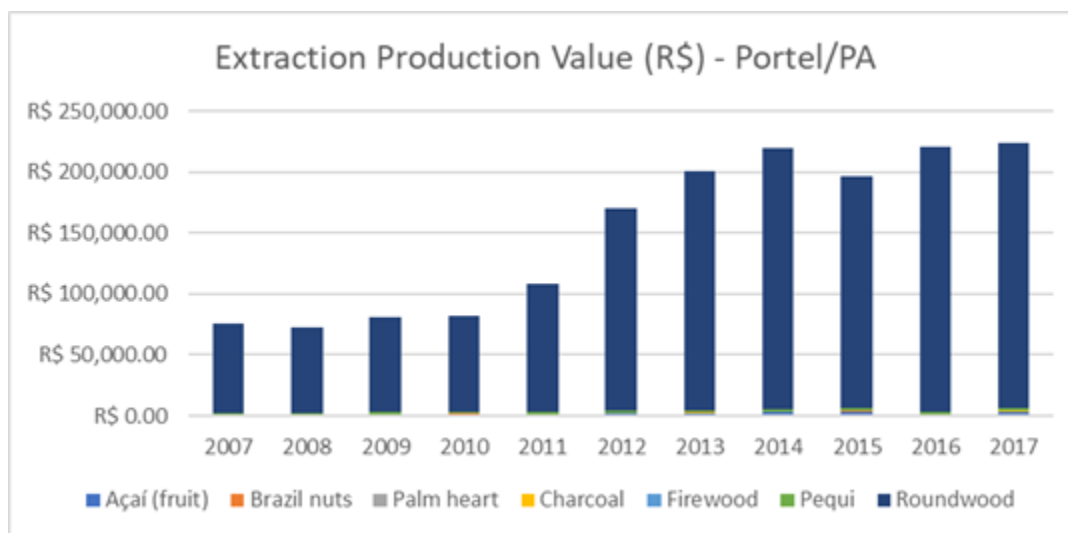
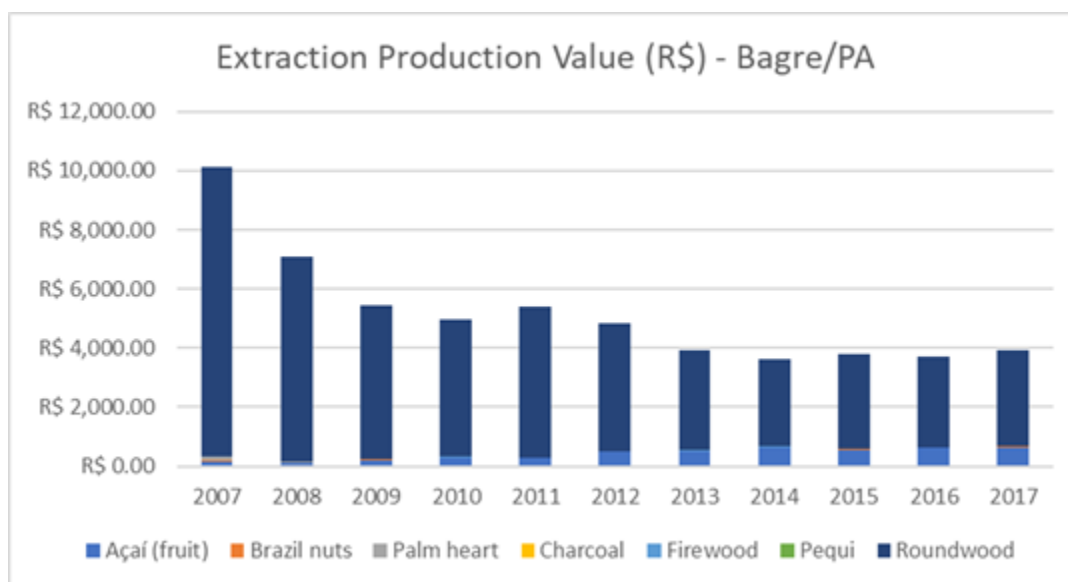


Figure 25. Extraction Production Value (R\$) – Bagre/PA



Portel had the highest production values for roundwood. However, beyond the high production level shown in official data, the production of timber continues to be conducted illegally: studies estimate that 36% of Brazil's timber production is legal⁴³. By comparing official data from the Portel microregion (which includes the municipalities of Bagre, Gurupá, Melgaço and Portel) it is possible to note the proportion of

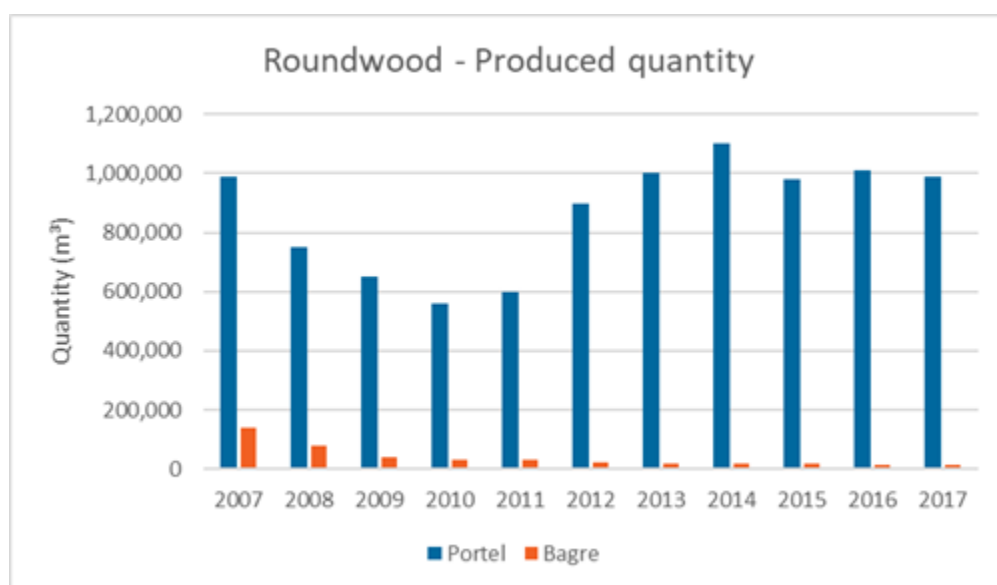
⁴³ Serviço Florestal Brasileiro (SFB), Instituto de Pesquisa Ambiental da Amazônia (2011), "Florestas Nativas de Produção Brasileiras".

logs illegally extracted and traded through the incompatible data between the sources⁴⁴. Illegal wood harvesting is known to take place within the reference region and project area, being transported to the sawmills by riverboat.

Usually, timber logging is the first deforestation agent that reaches previously inaccessible forest lands, using existing roads or creating illegal ones, followed by land speculators or farmers in search of cheap land.

The Figures below show the annual quantity of timber logging produced, separated in firewood and roundwood, in the municipalities of the project area. The municipality of Portel was the main responsible for the expansion of this activity.

Figure 26. Roundwood - Produced quantity ^{45, 46}



⁴⁴ SANTANA, A. C. SANTOS, M. A. S. OLIVEIRA, C. M. Preço Da Madeira Em Pé, Valor Econômico E Mercado De Madeira Nos Contratos De Transição Do Estado Do Pará. Research Report from the Federal Rural University of the Amazon. Belém, Pará, 2010.

⁴⁵ IBGE Cidades – Extração vegetal e silvicultura – Portel. Available at: <https://cidades.ibge.gov.br/brasil/pa/portel/pesquisa/16/12705>. Last visited on July 05th, 2021.

⁴⁶ IBGE Cidades – Extração vegetal e silvicultura - Bagre. Available at: <https://cidades.ibge.gov.br/brasil/pa/bagre/pesquisa/16/12705>. Last visited on July 05th, 2021

Figure 27. Firewood - Produced quantity



It can be concluded that timber, whether firewood or roundwood, represents a product of much more attractive value compared to other types, being even more advantageous when combined with animal production afterwards, where there is no need for forest management.

a) Driver variables explaining the quantity (hectares) of deforestation:

The main drivers of deforestation in the project region are the increase in population and prices of timber logs.

Several studies for the Amazon biome⁴⁷⁴⁸⁴⁹ mention that deforestation rates may increase because of population growth and the need for more land for food, fuelwood, timber, or other forest products. The number of people and their socio-economic conditions both have a significant impact on deforestation. As agriculturally based population density increases in and near forested areas, the strongest relationship between population growth and deforestation occurs, as local people and young migrant families arrive at the forest frontier and clear land to provide more area for subsistence farming. Therefore, besides addressing the population numbers, policies that impact the socio-economic conditions of the people are needed if deforestation is to be delayed or forests are to be sustained.

⁴⁷ ANGELSEN; KAIMOWITZ. Rethinking the Causes of Deforestation: Lessons from Economic Models. The World Bank Research Observer, vol. 14, no. 1 (February 1999), pp. 73–98.

⁴⁸ ASHOK K.; JAGDISH C.; DAVID K. Understanding the Role of Population in Deforestation. Journal of Sustainable Forestry Vol. 7, Iss. 1-2, 1997

⁴⁹ MEYERSON, F. A. B. Population Growth and Deforestation: A Critical and Complex Relationship. Population Bulletin 58, no. 3. 2003

As detailed in previous sections and in the description of deforestation agents above, timber prices have much higher value than other products exploited in the region. Roundwood production in the region represented a higher value when compared to other PFNM produced in the municipalities. Prices vary between 560,000 and 1,100,000 reais. In 2016, non-timber forest products were responsible for moving around 2.8 billion reais, while the forestry industry generated more than 13.7 billion reais⁵⁰.

Furthermore, forested property values are almost 4 times cheaper than established pasturelands⁵¹. Thus, this disparity promotes the purchase of new forested areas, deforestation, and further creation of new pasturelands.

b) Driver variables explaining the location of deforestation:

The main drivers of deforestation related to the location of impact in the project region are:

Distance from deforested areas

The presence of “non-forest” is a driver variable predicting quantity and location of future deforestation.

The reference region is located in one of Brazil’s richest areas in terms of waterways, which historically determined the locations of settlements in relation to extraction of non-timber forest products (NTFPs) and timber. Waterways remain the overwhelmingly predominant means of transport and access to forest products. Furthermore, the small sawmills to which timber is taken for processing are located on riverbanks. For these reasons, the great majority of the regional population is located in small settlements on the banks of the rivers⁵².

Roads, highways, access roads and navigable rivers

Access roads are means of communication, which influence the spatial distribution of land-uses. Access roads have an influence on fragmentation, population densities, agriculture and pastureland. The

⁵⁰ SNIF. Boletim 2017 sobre Recursos Florestais no Brasil. Available at: <https://www.florestal.gov.br/documentos/publicacoes/3230-boletim-snif-2017-ed1-final/file>. Last visited on July 7th, 2021.

⁵¹ REYDON, Bastiaan Philip. O desmatamento da floresta amazônica: causas e soluções. Economia Verde:

Desafios e Oportunidades, Campinas, v. 8, p.143-155, jun. 2011. Available at:

https://web.archive.org/web/20171031104223/http://www.gestaodaterra.com.br/arquivos/O_desmatamento_da_floresta_a_mazonia_causas_e_solucoes.pdf. Last visited on: July 7th, 2021.

⁵² Grupo Executivo do Estado do Pará para o Plano Marajó (GEPLAM) (2007), “Plano De Desenvolvimento Territorial Sustentável Do Arquipélago Do Marajó”.

possible creation of new access roads, added to the already plentiful rivers in the region, increases anthropogenic pressure and, consequently, the intensity of deforestation⁵³⁵⁴⁵⁵.

The proximity to waterways historically determined the locations of settlements in relation to extraction of non-timber forest products (NTFPs) and timber. Waterways remain the overwhelmingly predominant means of transport and access to forest products.

Extreme poverty

Poverty and government abandonment, which does not develop welfare public policies aimed at the sustainable development of the region, encourages illegal activities associated with the lack of economic options and the need to generate income. Logging in the Portel region is marked by a strong connection between communities and companies. This connection was mainly based on the need to generate income for these families, who sell wood logs from their land at extremely low prices, clandestinely, without any planning of use or notion of the value of the forest⁵⁶.

The cities of Portel and Bagre have one of the worst averages of the Human Development Index (HDI) in Brazil, reaching only 0.483⁵⁷ and 0.471⁵⁸, respectively.

⁵³ BROADBENT et al. Forest fragmentation and edge effects from deforestation and selective logging in the Brazilian Amazon. *Biological Conservation*. Volume 141, Issue 7, July 2008, Pages 1745–1757.

⁵⁴ GENELETTI, D. Biodiversity Impact Assessment of roads: an approach based on ecosystem rarity. *Environmental Impact Assessment Review*, v.23, n.3, p.343-365, 2003

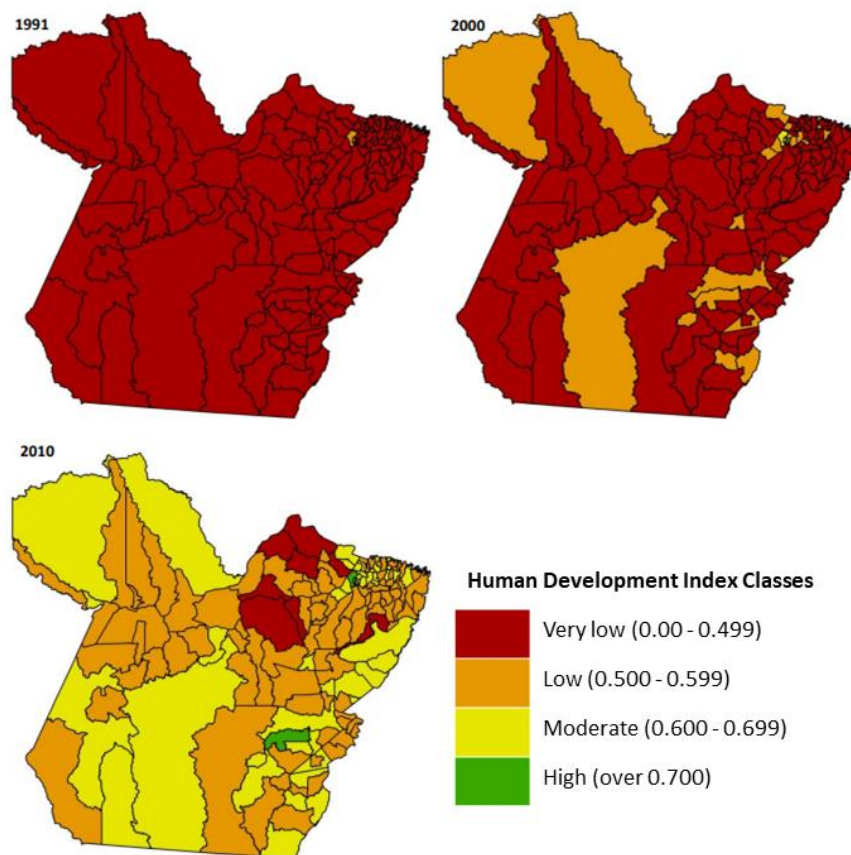
⁵⁵ Fearnside, P.M. e P.M.L.A. Graça. 2006. BR-319: Brazil's Manaus-Porto Velho Highway and the Potential Impact of Linking the Arc of Deforestation to Central Amazonia. *Environmental Management* 38:705-716

⁵⁶ D'Arace, L. M. B. et al. Wood production in log and firewood in northern Brazil and the state of Pará. *Brazilian Journal. of Development*, Curitiba, v. 5, n. 9, p. 16885-16896, september 2019.

⁵⁷ Available at: <https://www.ibge.gov.br/cidades-e-estados/pa/portel.html>. Last visited on July 8th, 2021.

⁵⁸ Available at: <https://www.ibge.gov.br/cidades-e-estados/pa/bagre.html>. Last visited on July 8th, 2021

Figure 28. Historical analysis of the HDI in the state of Pará⁵⁹



Despite the evolution in the HDI of almost all municipalities in the State of Pará between 1991 and 2010, The figure above allows to observe that the cities of Portel and Bagre continue in the range of worst socioeconomic situations, being in 5,553rd and 5,558th places in the Brazil ranking (which has 5,568 municipalities as a whole). Beyond that, the average monthly income of the inhabitants of these cities is around 2.3 basic wage (around 2,155 reais in 2017), however, only 7.2% of the population has formal jobs, making the population socio-economically vulnerable.

Identification of underlying causes of deforestation

In addition, there are underlying causes that also promote deforestation in the region. Due to being located at the frontiers of the arc of deforestation and displaying a large amount of unoccupied lands, the reference region has considerable social conflict issues, primarily land conflict. Land is occasionally

⁵⁹ IDESP. Síntese do Índice De Desenvolvimento Humano Municipal – IDHM Para o Estado do Pará. Available at: <http://www.fapespa.pa.gov.br/upload/Arquivo/anexo/234.pdf?id=1479216410>. Last visited on July 7th, 2021.

illegally occupied by squatters and illegal loggers⁶⁰. Thus, the main underlying causes of deforestation within the reference region are associated with land conflicts (tenure issues), and the lack of public policies promoting sustainable alternatives to combat deforestation and degradation activities.

Analysis of chain of events leading to deforestation

Therefore, the analysis of chain events leading to deforestation within the reference region was based on the facts presented above, analyzing the relations between main deforestation agents, drivers, and underlying causes that caused and most likely will lead to deforestation.

Conclusion

The conduction of the Step 3 and available evidence allows to analyze that the most likely future deforestation trend within the reference region and project area is conclusive.

The hypothesized relationships between agent groups, driver variables, underlying causes and historical levels of deforestation can be verified at hand of statistical tests, literature studies, or other verifiable sources of information, such as documented information provided by local experts, communities, deforestation agents and other groups with good knowledge about the project area and the reference region.

The increasing deforestation rate, added to the region's cattle ranching advancement, population increase, lack of effective governmental control and environmental planning, and the recently opened illegal road crossing the reference region and project area are clear evidence that the overall trend in future baseline deforestation rates will be increasing, and this demonstrates the need for conservation measures that encourage a change in the business and production model in the region.

Projection of Future Deforestation

As the Methodology stipulates, the aim of this step is to locate in space and time the baseline deforestation in the project area, reference region and leakage belt.

Selection of Baseline Approach

As described in sections above, the deforestation rates measured in different historical sub-periods in the reference region reveal a clear trend, and this trend is an increase of the deforestation rate. The

⁶⁰ HAWBAKER, T.J.; RADELOFF, V.C.; HAMMER, R.B.; CLAYTON, M.K. Road density and landscape pattern in relation to housing density, land ownership, land cover, and soils. *Landscape Ecology*, v.20, p.609-625, 2004.

analysis of presented evidence related to deforestation agents and drivers, in addition to underlying causes, allows to conclude that the deforestation rate is increasing, and it is likely that this trend will continue in the future.

Thus, the selected baseline approach is the Time function approach. With this approach, the rate of baseline deforestation is estimated by extrapolating the historical trend observed within the reference region (or its strata) as a function of time using either linear regression, logistic regression or any other statistically sound regression technique. It requires multiple deforestation measurements during the past 10-15 years.

Quantitative projection of future deforestation

Projection of the annual areas of baseline deforestation in the reference region, leakage belt and project area:

Projection of the location of future deforestation

The projection of the future deforestation within the reference region followed four steps:

- (i) Definition of the model assumptions, which consists of defining the modelled deforestation;
- (ii) Organization of the spatial and non-spatial database that represents the selection and standardization of the variables used;
- (iii) Calibration and validation of the model, which consist of the combination of variables and evaluation of the adjustments of the models; and
- (iv) Development of scenarios, which is the creation of future scenarios using historical trends (2008 to 2017) through the Business-as-usual scenario.

Assigning weightings to change agents

Selection of most accurate deforestation risk map

Mapping of locations of future deforestation

Definition of the Land-Use and Land-Cover Change Component of the Baseline

Calculation of baseline activity data per forest class

The following is in accordance with step 5.1 Calculation of baseline activity data per forest class”, in which is stipulated that the previously created maps of annual baseline deforestation and LU/LC map can be combined, producing a map showing deforestation per class in the baseline case.

The LU/LC-change within the project crediting period, caused by baseline deforestation consisted of initial forest classes being converted to the final LU/LC class of ‘non-forest’.

3.5 Additionality

For the purpose of the present analysis, the VCS Tool for the Demonstration and Assessment of Additionality in VCS Agricultural, Forestry and Other Land Use (AFOLU) Project Activities - VT0001 version 3.0⁶¹ was applied.

This tool is applicable to this project activity because the following conditions have been met:

- a) AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced;
- b) The applied baseline methodology provides a stepwise approach to justify determination of the most plausible baseline scenario, in accordance to VCS AFOLU Requirements.

STEP 1. Identification of alternative land use scenarios to the AFOLU project activity.

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

Credible alternative land use scenarios to the present AFOLU project activity are:

- I. The continuation of the current (pre-project) land use scenario:** in this scenario, no REDD project is undertaken. The deforestation pattern identified in section 3.4 above, which describes the relationship among the agents, drivers and underlying causes present in the region during the historical period, will most likely continue to cause deforestation in the future.

This scenario involves the implementation of a sustainable forest management plan within the project boundaries of the proposed VCS REDD project, however without carrying out additional social and environmental activities, as well as activities to reduce unplanned deforestation. This scenario also complies with item iii of the methodological tool (activities similar to the proposed project activity on at least part of the land within the project boundary of the proposed VCS AFOLU project at a rate resulting from legal requirements).

Although this is a similar activity proposed by the present project, i.e. avoiding deforestation through conducting sustainable forest management activities, no other complementary activities to improve monitoring of deforestation would be carried out, such as: increased surveillance, monitoring and control by satellite images, REDD+ technical studies, social and environmental activities promoted by the SOCIALCARBON Standard, among others.

⁶¹ Available in <<https://verra.org/wp-content/uploads/2017/11/VT0001v3.0.pdf>>

Many scientific articles conclude that sustainable forest management plans (SFMP), namely those certified, can be considered a tool for forest conservation, maintenance of forest carbon stocks, and decrease of deforestation rates in the region where they are implemented. This mainly occurs due to the use of reduced impact logging techniques, reduced social and environmental operational impacts, greater surveillance in the area, and generation of economic value for forests. On the other hand, there is a belief that forest is a non-productive natural resource and needs replacing with productive activities, such as livestock farming and agriculture, primarily in areas that require social and economic development^{62, 63, 64, 65, 66}.

However, the complexity and costs of a sustainable timber operation, added to factors such as bureaucratic constraints and fluctuation of certified timber prices, make SFMP less competitive than illegal logging. Thus, investment in additional practices to what is required by law is risky and may affect the survival of the operation. This includes activities that are complementary to the operation, specifically avoidance or reduction of unplanned deforestation/degradation and increase of monitoring of forest management areas.

Therefore, despite the contribution to forest preservation and carbon stock maintenance, SFMP areas are subject to unplanned deforestation and loss of carbon stock due to external agents, however expected to be in a lower intensity than in other areas without forest management. In addition, the local population is motivated to perform this unplanned activity, followed by the expansion of low productivity agricultural activities, resulting in an ongoing necessity of cutting down the forest to maintain production.

There are many challenges to guarantee the consolidation of these areas and their effective social and environmental protection. Many conservation areas located in the Amazon still don't have an approved management plan, and a large amount does not have a management team. Furthermore, the number of Government agents assigned to these areas is greatly lacking and insufficient to carry out effective surveillance. The

⁶² BRASIL. Ministério do Meio Ambiente (MMA). Plano de ação para prevenção e controle do desmatamento na Amazônia. Brasília, 2012.

⁶³ SCHULZE, M., GROGAN, J., & VIDAL, E. 2008. O manejo florestal como estratégia de conservação e desenvolvimento socioeconômico na Amazônia: quanto separa os sistemas de exploração madeireira atuais do conceito de manejo florestal sustentável? In N. Bensusan & G. Armstrong (Eds.), *O Manejo da Paisagem e a Paisagem do Manejo* (1ª ed., pp. 161-213). Brasil: IEB

⁶⁴ VIEIRA, I. C. G.; SILVA, J. M. C.; TOLEDO, P. M. Estratégias para evitar a perda de biodiversidade na Amazônia. *Estud. av.*, São Paulo, v. 19, n. 54, Aug. 2005.

⁶⁵ HOLMES, T.P. et al. Custos e benefícios financeiros da exploração de impacto reduzido em comparação à exploração florestal convencional na Amazônia Oriental. Belém: Fundação Floresta Tropical, 2002, 66p, 2nd edition.

⁶⁶ VERWEIJ, P. et al. *Keeping the Amazon Forests standing: a matter of values*. Zeist: WWF, 2009. 72p.

result is intense deforestation and pressure on protected areas in the legal Amazon, primarily because of wood harvesting activities, agriculture, road construction and mining^{67,68}.

- II. Implementation of a sustainable forest management plan, combined with the implementation of additional activities:** In this scenario, the Project activity would be carried out on the land within the project boundary, nevertheless performed without being registered as the VCS REDD project. This scenario would include avoiding deforestation through conducting sustainable forest management activities, with the addition of certifications such as SYSFLOR or FSC.

Additionally, complementary activities to improve the monitoring of deforestation caused by the agents (identified in section 3.4 above) would have to be carried out, such as: increased surveillance, monitoring and control by satellite images, REDD+ technical studies, social and environmental activities promoted by the SOCIALCARBON Standard, among others. These investments are usually not made by the Brazilian Government, nor are part of sustainable forest management plans, as they are financially unattractive and not necessary to legally perform the timber harvest. Therefore, the economic feasibility of this scenario would be reduced without additional revenues from the sale of VCU.

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

Scenario I - The application of a sustainable forest management plan is regulated in Brazil by the laws N° 12,651⁶⁹, decree N° 5,975⁷⁰, in addition to Pará legislation, with law N°6,462⁷¹ and normative instructions IN 05⁷² and N° 001/2014⁷³. Despite the requirement to mitigate social impacts, social and environmental activities for the communities surrounding the management

⁶⁷ VERÍSSIMO, A. *et al* (Org.). **Áreas Protegidas na Amazônia brasileira: avanços e desafios**. Belém : Imazon ; São Paulo : Instituto Socioambiental, 2011. 90 p.

⁶⁸ PORTAL AMAZONIA.COM. Unidades de Conservação do Amazonas ainda sofrem com crimes ambientais. 2013. Available at: <<http://www.portalamazonia.com.br/editoria/meio-ambiente/unidades-de-conservacao-do-amazonas-ainda-sofrem-com-crimes-ambientais/>>. Last visit on: March 12th, 2015

⁶⁹ Available at <https://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12651.htm> Last visit: 02/07/2021

⁷⁰ Available at <http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2006/decreto/d5975.htm> Last visit: 02/07/2021

⁷¹ Available at <<https://www.semas.pa.gov.br/legislacao/files/pdf/506.pdf>> Last visit: 02/07/2021

⁷² Available at <<https://www.semas.pa.gov.br/2015/09/11/in-05-de-10092015-publicada-no-doe-32969-de-11092015-paginas-de-37-57/>> Last visit: 02/07/2021

⁷³ Available at <<https://www.semas.pa.gov.br/2014/01/14/in-0012014-de-10-de-janeiro-de-2014-publicada-no-doepa-no32563-de-14012014-caderno-5-paginas-6-7-8/>> Last visit 02/07/2021

plan area are not required by law. According to Ribeiro⁷⁴, the main obstacles related to the approval of the sustainable forest management plan in the Amazon are: a) low investment capacity, financial and fiscal incentives, b) bureaucracy and lack of control in the PMFS approval procedure and c) lack of participation of traditional communities in the process of elaboration of the PMFS, when they are involved. Thus, it is common to see the exclusion of the surrounding community from management activities in private areas.

As it does not contain social and environmental activities to control deforestation coming from communities surrounding the property, scenario I may contain activities that are illegal or of uncertain legal status, not being enforced namely due to the lack of control⁷⁵ and government capacity. This type of illegal deforestation, apart from planned deforestation, occurs mainly due to social pressure and low HDI in the Amazon regions. Although not being in compliance with applicable mandatory laws and regulations, this scenario results from systematic lack of enforcement of applicable laws and regulations. One of the goals of the present REDD project is to contribute to a solution to this problem by promoting the sustainable management of forest resources through increased monitoring and surveillance to avoid unplanned, illegal deforestation.

Government conservation units such as parks and sustainable use areas (APAs) are also affected by advancing deforestation and increased accessibility of the region to economic activities due to creation or improvement of infrastructure. Between 2000 and 2008, 2.25 million hectares were deforested in protected areas in Legal Amazon, and illegal exploitation of wood (degradation) has occurred in many of them.

One way to avoid increased accessibility and illegal exploitation of protected areas would be to increase the effectiveness of sanctions in cases of environmental malpractice.

The creation of protected areas is proven to be one of the most effective tools in forest conservation and the fight against deforestation. However, without management and investment, these important reserves do not attain their sustainable development goals, leaving them vulnerable to criminal activity such as land squatting, illegal wood harvesting and deforestation. This underlines the importance of REDD+ projects for forest conservation, despite being located in protected areas, because they are capable of contributing to the improvement of deforestation monitoring and control, promoting social, economic and environmental benefits in the region.

⁷⁴ RIBEIRO, A.C.F. et al. O PLANO DE MANEJO FLORESTAL COMO INSTRUMENTO DE DESENVOLVIMENTO SUSTENTÁVEL NA AMAZÔNIA. Direito & Desenvolvimento, ISSN 2236-0859, 2020. Available at <<https://periodicos.unipe.br/index.php/direitoedesenvolvimento/article/download/875/715/#:~:text=O%20Plano%20de%20Manejo%20Florestal%20Sustent%C3%A1vel%20D%20PMFS%20est%C3%A1%20intimamente%20relacionado,forma%20alc%C3%A7amos%20um%20desenvolvimento%20ambiental>>.

⁷⁵ MOUTINHO, P. et al. **REDD no Brasil: um enfoque amazônico: fundamentos, critérios e estruturas institucionais para um regime nacional de Redução de Emissões por Desmatamento e Degradação Florestal – REDD**. Brasília, DF: Instituto de Pesquisa Ambiental da Amazônia, 2011.

As Scenario II is the implementation of the SFMP with the addition of social environmental activities, as presented above, it is also in compliance with all applicable legal and regulatory requirements. Thus, there are no restrictions for SFMP within the areas where the ABC Norte REDD project's property is located.

Sub-step 1c. Selection of the baseline scenario

The most plausible baseline scenario was identified in section 3.4 above according to procedures provided on the applied methodology. The main land uses that promoted or stimulated deforestation within the reference region during the historical reference period were:

- Agricultural and livestock production;
- Timber harvesting;
- Roads, highways, access roads and other infrastructure projects.

Those agents and drivers, combined with underlying causes present in the region, will most likely continue to cause deforestation in the future, and therefore the continuation of the current (pre-project) land use scenario was defined as the most plausible baseline scenario. The future trend for baseline scenario is that the deforestation rate in the reference region will probably increase, as verified during the historical reference period.

In addition to this context, it is important to consider the scenario of the ABC Norte operations in the period. The damage caused by the poor administration and execution of the current management plan was a crucial point to consider its closure, which would make the project area even more vulnerable to invasions and illegal and unplanned actions.

STEP 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The ABC Norte REDD Project generates financial benefits other than the revenue from the sale of VCUs, primarily through the commercialization of timber, as a result of the sustainable forest management plan. Thus, an investment analysis comparison (Option II) will be carried out in order to determine the project's additionality, i.e, whether the proposed project activity, without the revenue from the sale of GHG credits, is economically or financially less attractive than the other land use scenarios.

Sub-step 2b. - Option II. Apply investment comparison analysis

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

Sub-step 2d. - Sensitivity analysis

STEP 4. Common practice analysis

The previous steps shall be complemented with an analysis of the extent to which similar activities have already diffused in the geographical area of the ABC Norte REDD project activity. Similar activities to the proposed REDD project, i.e., that are of similar scale, take place in a comparable environment, inter alia, with respect to the regulatory framework and are undertaken in the relevant geographical area, shall be analyzed. Other registered VCS AFOLU Project activities shall not be included in this analysis.

3.6 Methodology Deviations

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5 MONITORING

6 APPENDIX