

RIBEIRINHO REDD+ PROJECT

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1 SUMMARY OF PROJECT BENEFITS

REDD Projects since the original VM0015 methodology was released relied more on investos to fund them than credits, the price of credits was too low. Now that credits are increased in value, the funds coming from the sale must result in Transformational Regional Results. The saying goes: "With Great Power, comes Great Responsibility" and this is what the Ribeirinho REDD+ Project intends to do, take 100% of the funds, and use some funds to return the seed money investment with no interest and the remaining funds are going toward Transforming Portel, Para into a backwater mafia lead city into a structured city with low crime and zero deforestation. The Ribeirinho REDD+ project nearly touches every small river that the illegal loggers like to Operate in and thus nearly all of Portel is affected by this project and nearly all of Portel will benefit from this project.

The project a woman lead REDD project. The Ribeirinho REDD+ Project in Portel, Para is protecting 199,962 hectares in an overly critical region of the Brazilian Amazon. The region ranks #1 or #2 for deforestation each year for the last 5 years. INPA, the Brazilian space agency, has rated Portel, Para and the two neighboring municipalities with the highest rate of deforestation in the Brazilian Amazon. This was due to government policy starting in 2010, were it wanted to define settlement areas in this region – to uproot the large landowners and turn the region into small plot farms for the agrarian reform. The landowners stopped this process and have focused on preservation however the wheels were already set in motion for massive invasion to take place.

The project donors have invested millions of reais paying for the landowners (project proponents) to gain their land tenure certificates. This was critical for the success of the project.

The project is one of three currently REDD projects to reach all 17 Sustainable Development Goals, making it a very unique and worthwhile project.

The project has various major benefits, the first being stability for both the local population and for the municipality as a whole. The project has been able to achieve this stability by paying for the project proponents to gain their land rights. Prior to the project, the illegal logging syndicate was preventing the families that own this carbon credit project from gaining their rights. The project itself had to pay for the owners to gain their land documents, so that the project could be completed. Despite this, the riverine are harassed by the illegal loggers, and told that they have no right, and that they don't own the land – despite having a government certificate acknowledging that. As this project is being drafted the same illegal loggers and local NGO's that are funded by illegal loggers, that have worked for years to stop the ribeirinhos from gaining their land rights, now are trying to trick them into doing a illegal loggers funded REDD project in the region, in order to deprive the ribeirinho traditional people, of the money they so desperately need.

Unlike other REDD projects in the Portel, Para region, they are on the private property of numerous large landowners. This project is 100% on individual riverine areas and the areas in between these areas. 100% of the proceeds from the project goes into a 501c3 Charity and is distributed between security and social projects. There are no large landowners to pay rent to. As a result, funds from this project are extremely beneficial for the social development of the region as 100% of the funds go to the local development.

The project works with the Local City Council Men, the Secretary of Education as well as the Union (Syndicate) of Rural Producers to help coordinate social activities and counter those of the illegal loggers that have been greatly interrupted by this project and other REDD projects in the region. It is difficult to

gain support for a legitimate REDD project in Portel when 90% of the population work directly or indirectly for the illegal logging mafia including most of the local politicians.

The project directly affects approximately 2,500 individuals who are project proponents and indirectly affects, in the social outreach region, a total of 8,000 individuals. There are slightly more female community members than male community members.

The project greatly improves the visual presence in the region to stop the illegal loggers and land grabbers. The project does this by working with two neighboring projects to construct 30 new large schools of 12,000 square feet, per school, and 10 smaller schools: totaling over 300,000 square feet of high-end classrooms and health clinics. Each school also includes a health clinic and security office to be used by both project and security, as partnerships with other security groups. By developing essential infrastructure, the schools will bring numerous benefits to the region.

The security in the region will greatly improve with the project. During the first 5 years of years of the project, security patrols were conducted with their own teams and off-time police. However, starting in 2019, the project has made closer partnerships with government agencies for security proposes in the region.

In the long term, the project will greatly improve the biodiversity of the flora and fauna of the region. The project has created a preliminary partnership with UFRA, the Federal Rural University of the Amazon, so that the University can utilize the 30 schools being built for research and collaboration. The project experts believe that bringing in more researchers to the region will make it harder for the illicit activities to escape the eyes of authorities and the public.

1.1 Unique Project Benefits

Table 1: Outcome or Impact Estimated by the End of Project Lifetime

Outcome or Impact Estimated by the End of Project Lifetime	Section Reference
1) The project will provide protection and conservation to 199,962 hectares of private property land in the municipality of Portel, Para. This results in the protection of flora and fauna across a large area.	2.1.1
2) The project has paid for every family that is in the Project Area to gain their land tenure – Cadastrol Ambiental Rural. This prevents displacement and will result in prevention of land grabbers entering the area.	2.1.1
3) The project will help every family in the region to have better education at least between 2017 and 2046.	2.1.1
4) The project has distributed around 500 eco-stoves to the communities in the periphery of the project area. The project has trained around 60 people in monitoring the fauna that would enter the area in the vicinity of their homes. They will be trained to use their cell phone cameras to take pictures and record the animals that they see.	2.1.1

5) Build up the local economy by focusing on a large Acia operation in partnership with a local Acia distributor who will buy all the Acia berries from the Project Proponents.	2.1.5
6) Developing the region by helping all inhabitants gain property titles as well as developing the local economy should make it possible so that by the 31 st of December, 2046, the forest will no longer be under threat.	2.1.1

1.2 Standardized Benefit Metrics

Table 2: Standardized Benefit Metrics

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
GHG emission reductions or removals	Net estimated emission removals in the project area, measured against the without-project scenario	N/A	
	Net estimated emission reductions in the project area, measured against the without-project scenario	33,927,167	2.1.17
Forest ¹ cover	For REDD ² projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario	199,962 hectares	2.1.5
	For ARR ³ projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario	N/A	-
Improved land management	Number of hectares of existing production forest land in which IFM ⁴ practices are expected to occurred as a result of project activities, measured against the without-project scenario	N/A	-
	Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario	10,000 hectares	4.4.1
Training	Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities	500 families	4.4.1
	Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities	500	4.4.1

¹ Land with woody vegetation that meets an internationally accepted definition (e.g., UNFCCC, FAO or IPCC) of what constitutes a forest, which includes threshold parameters, such as minimum forest area, tree height and level of crown cover, and may include mature, secondary, degraded and wetland forests (*VCS Program Definitions*)

² Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)

³ Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)

⁴ Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
Employment	Total number of people expected to be employed in project activities, ⁵ expressed as number of full-time employees ⁶	63	2.3.15
	Number of women expected to be employed as a result of project activities, expressed as number of full-time employees	7	2.3.15
Livelihoods	Total number of people expected to have improved livelihoods ⁷ or income generated as a result of project activities	2,500	2.1.6
	Number of women expected to have improved livelihoods or income generated as a result of project activities	1,300	2.1.6
Health	Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	8,000	2.1.19
	Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario	4,400	2.1.19
Education	Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	8,000	4.2.1
	Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario	4,500	4
Water	Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	8,000	4

⁵ Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.

⁶ Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102]; [17.28])

⁷ Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

Category	Metric	Estimated by the End of Project Lifetime	Section Reference
	Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	4,500	4
Well-being	Total number of community members whose well-being ⁸ is expected to improve as a result of project activities	5,000	4.2.1
	Number of women whose well-being is expected to improve as a result of project activities	2,500	4.2.1
Biodiversity conservation	Expected change in the number of hectares managed significantly better by the project for biodiversity conservation, ⁹ measured against the without-project scenario	10,000	5
	Expected number of globally Critically Endangered or Endangered species ¹⁰ benefiting from reduced threats as a result of project activities, ¹¹ measured against the without-project scenario	5	5

⁸ Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.

⁹ Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species

¹⁰ Per IUCN's Red List of Threatened Species

¹¹ In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

2 GENERAL

2.1 Project Goals, Design and Long-Term Viability

2.1.1 Summary Description of the Project (G1.2)

Ribeirinho REDD+ project seeks to combine elements of conventional integrated conservation and development projects (ICDP) with a “payments for ecosystem services” (PES) approach when designing and implementing the project. REDD has at times been conceived narrowly as simply a system of conditional performance-based payments (PES), (Sills et al. (2009), The evolving landscape of REDD projects). The project has gone further to create benefit permanence by helping the traditional people in the project area gain a permanent title so that they can have the same benefit that many of the large landowners, who already have carbon credit projects, have gained. Through the reaction of the illegal loggers, and filmed interviews for everyone that have gained a land tenure certificate, everyone agrees that the certificate will both bring stability and more security to the region – while allowing for the riverine traditional people who are project proponents to gain carbon benefits.

The baseline scenario of the project area is unplanned timber logging and grazing activities.

The project’s main focus is on conserving the native forest through protection and to avoid further actors of deforestation who are seeking to degrade it. The native forest conservation will be able to support and protect more flora and fauna.

The project goal is to demonstrate the economic feasibility of preserving the forest in regions that are highly hostile to preservation efforts, where the illegal wood trade is extreme and well organized with their own NGO’s mandated to counter preservation projects, and where it is still considered socially acceptable to convert forest to agriculture. The illegal loggers operated via a local NGO that has completed campaigns for the riverine community groups (project proponents) not to participate in a legally mandatory government program, called SEMA’s Cadastrol Ambiental Rural, which gives the riverine their right to their land. Without this certificate, the NGO could evict at will any riverine community member or person that did not co-operate with the illegal loggers.

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

Climate Description Summary

The Climate objective of the Project is to avoid and prevent unplanned deforestation in native forests thus avoiding the net emission of 33,927,167 tCO₂e through a period of 30 years of the Project’s crediting period.

Such objectives are achieved by helping the riverine achieve sustainable development goals by helping them increase their personal economy by completing projects that produce higher streams of income on less area of land, such as Acai. The other objective is to guide them so that they can keep the illegal loggers out of their land as well as preventing the land grabbers from moving into their area. The current sustenance plots become Acai plots, which take up less area, and the riverine no longer need to open up the forest for further un-economical Cassava expansion. The land tenure certificate, backed by a robust security force paid for by the project, keeps out the land invaders.

This operation has strengthened as the current Brazilian government has backed programs that are foundational for REDD projects. The riverine people community and traditional rural villagers adapt to government related policy changes as well as more sophisticated strategies adopted by illegal agents of deforestation. In order to maintain such a large area of property, the operation includes rigorous enforcement, anthropologist professionals, social workers, survey technicians, attorneys, satellite monitoring, and government database monitoring.

The short-term hope is to change the mentality from this region from a lawless conflict region to a stable region where everyone has title, without overlapping claims, and no one fears land grabbers or having to spend excessively on legal fees to remove landowners.

The medium-term goal is to allow forest regeneration by reducing the area of cassava, by focusing on smaller footprint crops and alternatives that result in higher profits. Thus, increasing the amount of carbon sequestered in the forest.

Community Description summary

The community is a “traditional people’s” community known as Ribeirinhos, or in English Riverine people. This means River people and traditional rural villagers. They are actually all related to each other, as the original families came in the 1950's to the area and have intermarried with each other.

There are multiple villages in the project area:

- Vila Do Boga
- Monte Horebe
- Laguinho Vila
- Vila Aru
- Jerusalem
- Nossa Senhora do Perpetuo Socorro
- Meniono Deus
- Sao Joao Batista
- Rio Pacaja
- Ponte da Boia
- Sao Jose
- Vale da Bencao
- Paraiso
- Nossa Senhora de Nazare
- Deus Provera
- Parada
- Bevenatu
- Santo Antonio

The rural riverine people are not indigenous, they are referred to as traditional people, however they are traditional in the sense that they prefer to live along the river in rural regions and be left alone. The main distinction between the riverine and a non-riverine is the non-riverine rural families typically want to develop agriculture holdings and the riverine want to focus on sustenance plots.

In order to complete this project, the riverine gained the support of project consultant to pay for them to gain land tenure certificates. With these certificates known as the Cadastrol Ambiental Rural (CAR) the riverine gained a document that showed where their plot of land was, and it had their name. Prior to this they had no document and without a document the illegal loggers and local NGO's would report them as land invaders if they did not co-operate with the wood extraction trade, thus most riverine reluctantly went along with the illegal loggers and those that refused to co-operate were evicted by the illegal loggers. This oppression or suppression of the population greatly decreased the quality of life and caused there to be misery amongst the population and the municipality. This misery resulted in a co-dependance since the beginning of the wood extraction industry.

The project had lent and deposited USD 4 million dollars from charities donors, to be paid back without interest upon the completion and sale of credits.

The education system that the riverine population had was devastatingly poor due to the illegal loggers. The current Mayor of Portel, Paulo Ferreira is a local business man, not involved in the wood trade, which brings a new vision to this region (i.e. carbon credits), however the previous mayors for the last 100 years were all involved in the wood trade. As a result, previous mayors were accomplices to the illegal loggers and possessed a similar mentality: take everything, especially from the rural dwellers of Portel. Despite an acceptable education budget, the local government of Portel never invested into new schools and focused all money only on teachers, anything remaining was not spent on schools, causing most schools in the region to be in the worst conditions possible. From an infrastructure standpoint, worse than 1870 schools for black freed slaves in Mississippi.

The biggest threat to the land in the project area comes from the land grabbers who enter the region with a plan to destroy the forest lands. The land grabbers try to state that the land is a conflict region in order to execute their plan. The common thought of the general population is that each riverine should have just a few hectares, which leaves them as 2nd class citizens, while illegal land grabbers can claim huge areas through illegal means. Some can claim tens of thousands of hectares in a scheme where they pay to borrow someone's ID document, while illegal persons enter the area and grab the land for timber. (Source: ITERPA)

A recent decertification that was sourced from the Ministerio Publico Federal stated that the new scheme in the region of Portel for the last several years consists of illegal loggers paying off "syndicates" that are supposed to be representative of the riverine population and forcing them to sign up for a community title. Then, the illegal loggers appoint a president for the community title and start cutting at will. When the riverine population try to escape this situation, they are held captive in their home by the illegal loggers. (Source: Ministerio Publico Federal). The project was informed by DEMA, the Integrated Environmental Police, that the illegal loggers are wanting to start REDD carbon credit projects now in order to prevent legitimate REDD projects from being held in those locations.

Geo-referenced information has been gathered by the technicians in order to set up a new governance structure for a new association that the project has set up to coordinate activities; which helps enhance the community's organizational capabilities for a better management of the social projects that have been conducted already and the ones that are planned.

The project participant is the Syndicate of Rural Producers, which is the legal representative and the syndicate that has worked for the last several years in Portel with the REDD projects including 977, 981 and 2252, as well as this project, to grow the rural production of Acai and honey. The goal of both the project and the syndicate is to have 1,000 total plots of new Acai projects. The courses started in 2019 for this project and the goal by the end of 2021 is to have 1,000 total families trained in the project. The project conducts the training sessions on the project's boat.

The community meetings took place with each family signing a form to gain the Cadastrol Ambiental Rural. Each project proponent had to provide a photocopy of their ID to help them gain their CAR document.

With the syndicate as project proponent, this has greatly countered the anti-carbon credit message that the illegal loggers have tried to spread in the region. The messages were to try to hurt the project and discredit it so that the riverine would not want to participate.

Biodiversity Benefits:

The project helps connect other private reserves that are in carbon credit projects. This larger animal corridor helps protect numerous endangered species in the region. This protection helps preserve the forest and biodiversity.

The laboratories for biodiversity research in each of the 30 schools will help monitor the fauna and flora better, bring more researchers to the region, and greatly show more presence so that illegal loggers and land invaders do not enter the region.

2.1.2 Project Scale

Project Scale	
Project	
Large project	X

2.1.3 Project Proponent (G1.1)

Organization name	Friends of the Riverine 503c non-profit charity
Contact person	Carlos Soares
Title	Social Services Operator for the Project.
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Organization name	Sindicato do Prodotores Rurais Ltda. (Union of Rural Producers)
Contact person	Pastor – Carlos Soares
Title	President
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Individual Riverine Project Proponents to be contacted via the Syndicate of Rural Producers, 1,252 families:

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Abidias Guedes da Silva Junior	Jucineia da CRUZ Silva
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Adail da Silva Costa	Judemilson Barbosa de Novais
Adailson de Melo da Silva	Jugereson Barbosa Batista
Adailson Souza Brabo	Julia Alves Mendes
Adailton Alves dos Santos	Julia Braga e Braga
Adailton Brito da Costa	Juliane de Almeida dos santos
Adailton da Silva Costa	Juraci Lafithe Barbosa

Adailton Primavera Diniz	Juracy Braga Marinho
Adalton Fereira Machado	Juracy Maria Marinho Pantoja
Adamor Alves dos Santos	Jurandir Moreira da Silva
Adelaide Bezerra Rocha	Jurandir Primavera Moura
Adelso Alves de Vilhena	Jurandir Vaz Valente
Adelson Martins Ramos	Juscelino da Rocha Maia
Adelson Pinto da Costa	Juseli Gomes e Silva
Ademar Moraes Palheta	Justino alves Machado
Ademilton Valente Monteiro	Juvenildo Noronho jardim
Ademir Cordovil da Silva	Kariane da Silva Jardim
Adenildo da Silva Silveira	Kátia Leide Moraes Valente
Adenilson Santana Novais	Katia Silene Moura Ladislau
Adici de Michelly Santos dos Santos	Katiane Gomes Vasconcelos
Adicilene Cordeiro dos Santos	Keila Noronho valente
Adilson de Michel Santos dos Santos	Keila Rocha da Gama
Adilson Ferreira Brabo	Keila Silveira Pereira
Adilson Rodrigues Pimentel	Keiza Silveira pereira
Adonaldo Barbosa de Almeida	Ketelen Prata Lima
Adriana da Silva Costa	Keury Lafithe Neres
Adriano Moraes da Silva	Laudelino Cruz Rodrigues
Adriano Palheta Moura	Lauriete Borges das Flores
Adriano Silva da Costa	Laurilucy Evangelista da Cruz
Adriano Vilhena Camara	Laurinete Cardoso dos Santos
Adrielem valente cardoso	Laurinha Ferreira de Souza
Adrielmar Braga Freitas	Laurive Rodrigues de Souza
Adriely Araujo Lopes	Lavico Rodrigues dos Santos
Aeliton da Silva Jardim	Leandro da Silva da Costa
Agripino de Oliveira Fonseca	Leandro da Silva da Costa
Aguinaldo Vaz de Souza	Lecilda de azevedo dos Santos
Ailton da Silva Guedes	Leidelaura Barbosa da Silva
Ailton Diniz Serrão Filho	Leliane dos Santos Almeida
Ailton Melo Barbosa	Leliany Machado Pacheco
Ailton Rodrigues de Freitas e Daria Ribeiro da Costa	Leniete Rodrigues Braga
Alacide da Silva Araújo	Leocy dos santos da Silva
Alan Braga Freitas	Leonardo Dutra de Souza
Albelenice dos Anjos da Silva	Leondro Santana Baia
Alcicleia Moura Braga Barbosa	Leonete dos Santos Moraes
Alcidio Pinheiro Pimenta	Levi da Silva Gomes
Alcinei Valente Monteiro	Lia Carvalho Ferreira
Alcirene Moraes Macedo	Lidiel Silva Souza
Alda Neide Brabo do Nascimento	Lindalva Castelo de Carvalho
Aldamir de Freitas Braga	Lindomar Moraes Almeida
Aldenir Macedo da Silva	Lino de Freitas Silva
Aldenora da Costa do Carmo	Lisolete Rodrigues da Silva
Alessandra da Silva Jardim	Locicleide De miranda Pereira

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Alessandro Baliero Valente	Lorencio Rodrigues da Silva
Alessandro Chaves Pinheiro	Lourdes Ribeiro dos Santos
Alessandro Moura pacheco	Luana Pereira Cunha
Alessandro Vilhena Camara	Lucas Freitas da Silva
Alex dos Santos Pereira	Lucas Freitas da Silva Filho
Alex Mavigno da Cruz	Lucas Gomes dos Santos
Alex Rodrigues Gomes	Lucas Pereira Cunha
Alexandre de Aquino Martins	Lucas Pinheiro Guerreiro
Alexandre do Carmo Freitas	Lucicleia de Moraes Franca
Alexmax Melo da Silva	Lucidalva Barbosa Rodrigues de Almeida
Alicia Maria Goncalves	Lucielison Sales da Silva
Alilson da Silva Santana	Luciene Sales da Silva
Alindomar Cartilho dos Santos	Lucileia de Azevedo dos Santos
Almir Pureza Alves	Lucilene Freitas Pereira
Aluizo Santos da Silva	Lucilene Miranda Silveira
Alzenir de Lima dos Passos	Lucilete Silva Pereira
Alzenir Valente Monteiro	Lucimar Acássio dos Santos
Alzira da Silva Valente	Lucinda Figueiredo Lobato
Amadeu Ferreira Guedes	Lucineide Silveira Pereira
Amadeu Guedes Carvalho	Luciney Barros de Aquino
Amanda Fareira Silva	Lucio Jarson Gama da Silva
Amauri Primavera dos Santos	Lucio Rodrigues Lopes
Amauri Silva Moreira	Lucivaldo Azevedo Pinto
Amelia Rodrigues Felix	Lucivaldo pereira Coelho
Amiraldo de zevedo dos santos	Lucivania Guilherme Palheta
Ana Claudia da Silva Santos	Luiz Carlos Marinho Pantoja
Ana Claudia Goncalves de Almeida	Luiz Costa Silva
Ana de Luiz Santiago de Lima	Luiz da Silva Negrao
Ana Luzia Leao Barbosa	Luiz Santana dos Santos
Ana Maria de Souza Machado	Luzia Barbosa de Almeida
Ana Maria Jardim Pereira	Luzia Barbosa de Carvalho
Ana Paula Bispo Costa	Luzia Gomes de Aquino
Ana Roselina Gomes de aquino	Luzia Osmarina Primavera Braga
Ana Ruth Primavera Braga	Luzia Santana Pacheco
Anderson Caldas de Almeida	Luziane Pacheco Barboza
Anderson Valente da Silva	Luzirene Cardoso Neres
Anderson Valente de Lima	Macia de Andrade Vieira
Andre Lobato da Silva	Macia Ferreira Pacheco
Andreia de Souza Santos	Macicleia Santos da Silva
Andrelino Melo da Silva	Macimiano Moraes de Brito
Angelica Jardim Oliveira	Madeu Santana Pacheco
Angelica Silva Alves	Madeu Vanderlei Machado Pacheco
Anizia Cordeiro E Silva	Magaethe Barros Nascimento
Antenor de Freitas Correa	Maiza Calixto Gloria
Antonio Alves Braga	Mak Sandro Santiago de Lima

Antonio Amiraldo Alves Bandeira	Manoel Araujo da Silva
Antonio Carlos de Oliveira Jardim	Manoel Benedito Alves Santana
Antonio Carlos de Souza Gama	Manoel Costa da Silva
Antonio Carlos Lobato	Manoel de Almeida Gibison
Antonio Costa Araujo	Manoel de Jesus da Luz Araujo Pantoja
Antonio da Conceição	Manoel de Jesus de Souza Baia
Antonio de Souza Ladislau	Manoel de Jesus Ferreira Pacheco
Antonio dos Santos Almeida	Manoel de Oliveira Fonseca
Antonio dos Santos Pereira	Manoel de Souza Barbosa
Antonio Edir da Silva Valadares	Manoel do Socorro dos Santos Correa
Antonio Lobato da Silva	Manoel Francisco Pimentel Raposo
Antonio Marcos Santana	Manoel Goes Pantoja
Antonio Marinho Pantoja	Manoel Gomes
Antonio Marques Ribeiro	Manoel Guimaraes Goncalves
Antonio Portilho Gomes	Manoel Joao Maciel Dias
Antonio Portilho Lobato	Manoel Jorge Santana Pinheiro
Antonio Ribeiro Assis	Manoel Marinho Pantoja
Antonio Rodrigues	Manoel Mesquita Lobato
Antonio Ronaldo Barbosa Gibson	Manoel Moreira da Costa
Antonio Santana Castor	Manoel Pantoja
Antonio Santana da Silva	Manoel Raimundo Barbosa Gibson
Antonio Santos da Silva	Manoel Raimundo Barbosa Souza
Aracelia Lobato Portilho	Manoel Raimundo de Freitas da Penha
Arielson Braga Serrao	Manoel Raimundo Matos dos Santos
Arilson Alves dos Santos	Manoel Raimundo Rodrigues de Almeida
Arinelson Rodrigues dos Santos	Manoel Ramos da Silva
Arisandra de Almeida Baia	Manoel Riamundo Mendes da Silva
Arison de Aquino Castor	Manoel Rodrigues da Costa
Arliane Neves de Souza	Manuel Adeodato Cardoso
Arlinda Santos dos Anjos	Manuel de Matos Baia
Arly Aires Moura Filho	Maquidove Cordeiro da Cruz
Arnaldo dos Santos Viana	Marcelino Jardim
Artemis Alves de Vilhena	Marcelino Marinho Pantoja
Arthur Pereira Machado	Marcelino Serrao dos Santos
Assuero da Silva Ferreira	Marcilene Portilho Barbosa
Ataide Moraes Sobrinho	Marcilene Rodrigues Moreira Alves
Ataide Pereira dos Santos	Marcio dos Santos Alves
Augusto Pena dos Santos	Marcio Martins da Costa
Beatriz Braga da Silva	Marclane Gomes Goncalves
Benaia Correa dos Santos	Marcos Albuquerque de Sousa
Benedita Chaves Pinheiro	Marcos Rodrigues da Silva
Benedita Costa da Silva	Marcos Rodrigues de Araujo
Benedita Guilherme de Melo	Margarete Noronha Jardim
Benedita Pinheiro da Silva	Maria Alves de Freitas
Benedito Almeida Moraes	Maria Amelia Almeida da Silva
Benedito Almeida Pereira	Maria Amelia Barbosa Lopes

Benedito Arione Lopes dos Santos	Maria Amelia da Silva Moura
Benedito Baia Valente	Maria Amelia da Silva Moura
Benedito Braga Barbosa	Maria Anete Miranda dos Santos
Benedito Brazão de Freitas	Maria Antonia Neres Pantoja
Benedito Costa Lobato	Maria Arleth Alves Villhena
Benedito de Moraes Sales	Maria Aurilene leão da Costa
Benedito de Oliveira Lobato	Maria Balieiro da Silva
Benedito Gama Pantoja	Maria Balieiro Valente
Benedito Goes pantoja	Maria Benedita do Amaral do Oliveira
Benedito Goncalves Farias	Maria Benedita dos Santos Lima
Benedito Marinho dos Santos	Maria Benedita Rodrigues Correa
Benedito Mendes da Silva	Maria Brasao de Freitas
Benedito Monteiro de Albuquerque	Maria Célia Ramos da Gama
Benedito Monteiro Santana_Sítio Boa Esperança	Maria Clara Pantoja Valente
Benedito Moraes dos Santos	Maria Cleidiane Pantoja de Aquino
Benedito Pereira de Araujo_Sítio São Benedito	Maria Cleude Palheta Novaes
Benedito Pereira Tavares	Maria Costa da Silva
Benedito Reginaldo Rodrigues de Almeida	Maria Cristina Alves Braga
Benedito Santiago de Lima	Maria da Conceição Souza Alves
Benedito Souza da Silva	Maria da Luz Barbosa Neres
Benedito trindade Machado de Aquino	Maria da Luz Guimaraes Rodrigues
Benevaldo de Jesus Valadares da Silva	Maria da Luz Leao Santana
Benvenida de Souza Taveira	Maria da Luz Valente Vilhena
Bernardo Pereira da Costa	Maria Dalva Almeida da Silva
Bianca da Cruz Gomes	Maria das Gracas Carvalho Rocha
Bibiana dos Santos Moraes Guilherme	Maria das Graças da Silva Valadares
Bibiano Marcolinoda Silva	Maria das Graças Monteiro Ramos
Brazão de Freitas - comunidade	Maria de Fatima Barbosa de Assis
Bruno Herico Barbosa Alves	Maria de Fatima Carvalho Portilho de Lima
Caleb dos Santos Viana	Maria de Fatima dos Santos Araujo
Carlito da Costa do Carmo - Sítio Pimentao II	Maria de Fatima dos Santos Pereira
Carlos Andre Magno Negrao	Maria de Fatima Guimaraes Damasceno
Carlos Costa Araujo	Maria de Fatima Lima Baia
Carlos Fonseca Jardim	Maria de Freitas Silva
Carlos Primavera Braga	Maria de Jesus Alves Pinheiro
Carlos Santiago de Lima	Maria de Jesus da Silva Pinheiro
Carmelita Paiva Darao Machado	Maria de Lourdes Nonata Mendes
Carmino Tupinamba Mendes	Maria de Melo da Silva
Cecília Alves Palheta	Maria de nasare nascimento de Araujo
Cecilio Carvalho Pinheiro	Maria de Nazare da Silva Lobato
Celio Balieiro Valente	Maria de Nazare do Nascimento Moraes
Celita Peres Fernandes	Maria de Nazaré Lopes
Charles Coelho Costa	Maria de Nazare Mesquita Farias
Charles Pinheiro da Silva	Maria de nazaré Silva Pires
Cintia Souza da Silva	Maria de Nazera Alves Braga

Cirilo Alves Valadares	Maria Dileia Maia Gomes
Claudaide Barros dos Santos	Maria do Carmo Cardoso de Almeida
Claudenilson Pinto dos Santos	Maria do Carmo Conceicao Pantoja
Claudinete Borges de Souza	Maria do Nascimento Moraes
Claudio Ney Mendes dos Santos	Maria do Socorro Araujo Gomes
Claudionor Freire Rodrigues	Maria do Socorro da Costa Lima Barbosa
Clebson Valente Ramos	Maria do Socorro Rodrigues dos Santos
Cledenaldo Pantoja de Aquino	Maria Eliedna Gama da Silva
Cleibiane Barbosa Valadares	Maria Elza
Cleiciane Nascimento dos Santos	Maria Elza Rodrigues da Costa
Cleidenor Gonçalves Ramos	Maria Ferreira Farias
Cleidiane Correa Novais	Maria Ferreira Leão Gomes da Cruz
Cleidiane Felix Araujo	Maria Francisca Marques da Costa
Cleidiane Machado Pacheco	Maria Gabriela Castor Soares
Clemente Valdares de Almeida	Maria Gonçalves
Clemilson Caldas de Almeida	Maria Graciete Pereira Martins
Clenilson de Aquino Valadares	Maria Izabel Palheta Franca
Cleudecy Baia Cardoso	Maria Jacira Ferreira de Melo
Cleumide Aquino de Almeida	Maria Joana de Carvalho Silva
Cleuse Mavignonda Cruz	Maria Jose Almeida da Silva
Clevenaldo Mavigno Rodrigues	Maria Jose da Silva Duarte
Clodorice Braga da Cruz	Maria Jose da Silva Guedes
Crehma da Conceição Loureiro	Maria Jose de Lima Barbosa
Creuza Almeida da Cruz	Maria José Santana
Creuza dos Santos Lopes	Maria Jose Serrao de Lima
Cristiane da Costa de Lima	Maria Jose Silva de Oliveira
Cristiane de Almeida Braga	Maria Justina Adeodato Cardoso
Cristiano Ferreira Lopes	Maria Katilene Santos Cardoso
Cristiano Sanches de Aquino	Maria Leia Cruz Mendes
Cristina Ramos da Silva	Maria Leila Lopes Barboza
Dadinho Nunes Fonseca	Maria Lobo Batsta
Daiana Pantoja Moraes	Maria Lucas Marques da Silva
Dailane de Aquino Vilena	Maria Lucia Cordeiro dos Santos
Dailson de Souza Alves	Maria Lucilene Araujo Gomes
Dalva Cascalheira Fonseca	Maria Lucilene Cruz Mendes
Damaura Pereira da Cunha	Maria Luzia da Costa
Damilton Brito da Costa	Maria malete Barbosa de Almeida
Daniel de Aquino Marques	Maria Miguelina da Silva Duarte
Daniel de Aquino Moraes Junior	Maria Moreira da Silva
Daniel dos Santos Barrozo	Maria nelma Barroso Salazar da Gama
Daniel Goes Pantoja	Maria Nogueira Morais
Daniel Luiz de Souza	Maria Odete da Conceicao
Daniel Silva Pires	Maria Raimunda Barbosa de Novais
Daniel Silveira Pereira	Maria Raimunda da Silva Ferreira
Daniela Pimentel Prata	Maria Raimunda Nunes Gil
Daniele Freitas da Cruz	Maria Raimunda Pimentel Prata

Daniely Santana Baia	Maria Raimunda Ribeiro de Jesus
Danilo Ribeiro dos Santos	Maria Raimunda Rodrigues Pimental
Daria Ribeiro da Costa	Maria Regina Freitas da Silva
Darliene Nascimento dos Santos	Maria Regina Silva Portilho
Davi Farias Ponte	Maria Rodrigues Duarte
Davi Moraes da Silva	Maria Rosa de Llma Alves
Davi Valadares da Silva	Maria Rosilda Barbosa da Silva
Davy Pimental Farias	Maria Sanches Gomes
Debora Barbosa da Silva	Maria Sebastiana Portilho dos Santos
Debora Pinheiro da Silva	Maria Sorlene Portilho Barbosa
Deiziane Cardoso Araujo	Maria Trindade da Cunha Lobato
Deiziane Pinheiro Fonseca	Maria Trindade Moraes Araujo
Delmiro Palheta dos Santos	Maria Valadares da Silva
Demison Pereira da Costa	Maria Vandeleia Pereira dos Santos
Demison Prata Ladislau	Mariade nazaré Barbosa de Almeida
Denildo Barbosa Soares	Marilda Batista Pereira
Denilson Salazar Alves	Marilda da Silva Brabo
Denis de Freitas Palheta	Marilda dos Santos Correa
Denise Barbosa Gibson	Marilene Aires da Costa
Derlei de Almeida da Silva	Marilene da Silva Guedes
Deusiane Barbosa Gibison	Marilene dos Santos Souza
Deuza Maria da Silva Lobo	Marilene Silva Pires
Deuza Rodrigues Pereira Moura	Marilenem Fonseca do Nascimento
Deuzarina Noronha Gomes	Marinaldo Evangelista da Cruz
Deuzerene Vaz Souza Rodrigues	Marinalva Leao Maia
Diego da Cruz Gomes	Marineia de Aquino Vilena
Dielciane Pinto da Costa	Marineide Valente Pimental
Diemilly Brabo Mendes	Mario Barbosa de Assis Filho
Dileia Barbosa de Novais	Mário de Nasare Goes puresa
Dilma de Almeida da Silva	Marivani Pinheiro Martins
Dimilson Primavera Almeida	Marlene da Costa Almeida Moraes
Dinair Gonçalves Santana	Marlene de Aquino Vilhena
Dinalva Lobato Alves	Marlene Duarte Pantoja
Dinalva Mendes da Silva	Marlene Mavilha dos Santos
Dinelson Baliero Valente	Marlene Santana
Dione Mendes Santana	Marli Pimentei dos Santos
Dionizia Santana Alves	Marliete Carvalho Rocha
Djalma de Freitas Braga	Marlison Jardim de aquino
Doberto Rodrigues Saraiva	Marta Barbosa Pantoja
Dolores de Sousa Correa	Matheus da Silva Nascimento
Domingas de Freitas Mavigno Rodrigues	Mauricio de Almeida Braga
Domingas Santos da Silva	Mauriete do Nascimento Serrao
Domingos dos Santos Ramos	Mauro Lopes Ferreira
Domingos Gomes dos Santos	Mauro Santos Silva
Domingos Pereira	Maycon Damasceno Resendo
Domingos Pinheiro Gama	Maycon Valente Moraes

Domingos Rodrigues da Costa	Melquizedeque de Moraes Lobo
Doralice Jardim Correa	Miguel Almeida de Lima
Doriedina Melo Palheta	Miguel Brabo da Silva
Douglas Valente Lopes	Miguel de Oliveira Fonseca
Dulcileia Pimental Barros	Miguel Grana da Silva
Dulcirene Silva Pires	Miguel Machado da Silva
Edanilo Souza da Silva	Miguel Santana Barbosa
Edemilson Vilarino dos Santos	Milena Santana Lobato
Edemir Crisostomo de Olveira Santos	Miquel da Silva valadares
Edenilson de Freitas Braga	Miquel Valadares da Silva
Eder Almeida de Freitas	Miracy Curgino Bezerra Nery
Edicarlos Miranda Silveira	Miraldo Ferreira Moura
Ediel Jardim Gomes	Mirle Vilena dos Santos
Edielsa Barbosa Rodrigues	Moacyr Santos dos Santos
Edielson Barboza Valadares	Moises Alves do Nascimento
Edila Pinheiro Guerreiro	Moises de Aquino Marques
Edilamar Tavares de Aquino	Moises Ferreira Neres
Edilene Gomes Cardoso	Monica Barbosa Pimenta
Edilene Goncalves Alves	Mozaniel dos Santos Correa
Edileuza Braga Texeira	Nair Almeida Aquino
Edilson da Luz Almeida	Nairacy Moreira dos Santos
Edimar Palheta de Oliveira	Naldo Barbosa Rodrigues
Edimilson Machado Dultra	Naliel da Silva Souza
Edimilson Pacheco de Souza	Nataliene Dos Santos
Edina da Conceição Valadares da Silva	Natalina Pinheiro da Silva
Edina Maria Vaz Santana	Nayara Pimentel da Silva
Edina Oliveira da Silva	Nazael Noronha Valente
Edinalda Rodrigues de Almeida	Nazaré Brazão de Freitas
Edinaldo Barboza Rodrigues Junior	Nazareno do Nascimento
Edinaldo da Silva Pacheco	Nazir Sanches Mendes
Edinaldo da Silva Soares	Nelita de Jesus da Costa Almeida Moraes
Edinalva Alves Gomes	Nelsinho Pena Barbosa
Edinelson Cunha da Silva	Nelson Alves de Oliveira
Edinete Baia Machado	Nelson Gama Pantoja
Edineuza Castor Lopes	Neosiane Brazão de Freitas
Edinho da Silva Marques	Nerias Barroso da Cruz
Edinho Moraes da Silva	Neuracir Pinheiro da Silva
Edinho Moreira Mendes	Neuziane Noronha Valente
Ednilson Pacheco de Souza	Neuziane Valente Ramos
Ednilson Tavares Miranda	Nici Laura Barbosa de Almeida
Edion Carlos Mendes da Silva	Nicileia Valente de Paiva
Edison Ancantara da Silva	Nicolau Carvalho Barbosa
Edison de Aquino Guimarães	Nila Magno Oliveira
Edison Miranda da Silveira	Nilcivani da Silva Santos
Edison Noronha dos Anjos	Nildo Lope da Costa
Edivaldo de Oliveira Boga	Nildon de Souza Pires

Edivaldo Fonseca do Nascimento - Sitio Acaizal	Nilicleia Alves da Silva
Edivaldo Santana Alves	Nilson Marques Tupinamba
Edmilson Braga da Costa	Nilson Primavera Almeida
Edmilson da Silva Santos	Niralci Pinheiro da Silva
Edmilson Miranda Silveira	Nivaldo Marinho Gomes
Edna Cardoso da Silva	Nivaldo Santana Castor
Ednaldo Gloria do Carmo	Nizomar Gomes Santana
Ednaldo Martins	Nizomara dos Santos
Edson de Jesus Cardoso de Oliveira	Noel Gulmaraes Goncalves
Eduardo Evangelista da Cruz	Norberto Braga dos Santos
Elana de Paiva Monteiro	Ocilene Chagas Damasceno Resendo
Elcicleia Caldas de Almeida Souza	Octavio Alves Valdares Filho
elciline Cadas Almeida	Odaisa da Silva Rodrigues
Elealdo da Silva dos Santos	Odam Correia da Silva
Elen de Jesus Gomes	Odeliane da Silva Pereira Vanzeler
Eleonora dos Anjos da Silva	Oderleu Curcino Nery
Elessandra dos Santos	Odete Santos da Silva
Eliany Noronha Valente Novais	Odimar da Silva e Silva
Elias Barbosa Marinho	Odinela Valente Pimental
Elias machado Carvalho	Odma Gomes Caldas
Elicilda dos Santos Pinheiro	Odocio Gomes Chaves
Eiel Alves Baia	Odonaio Pereira da Costa
Eiel Jardim Correa	Olavo Silva dos Santos
Eielson Pinto da Silva	Oliveira Santos dos Anjos
Eielson Ribeiro Miranda	Orceleia Correa da Silva
Eielton Silva da Silva	Ordenizio Barbosa Souza
Eielza da Silva Ramos	Orisvaldo dos Santos Souza
Elieny Araujo Gomes	Orisvaldo Marcal dos Santos
Elieuzo Baia da Cunha	Orlando Barbosa
Eliezer Machado Silveira	Orlando Barbosa Junior
Elinaldo Araujo Gomes	Orlando Rodrigues da Cunha
Elinalva Rodrigues de Oliveira	Ortencia Alves de Freitas
Elinete Moraes da Silva	Osana Gonçalves Barbosa Pinto
Elisabete da Silva Santana	Oscar da Luz da Silva
Elisete da Silva Valadares dos Santos	Oseas Silva da Silva
Eliseu Barbosa Marinho	Oseias Balieiro Cardoso
Elisiane Cardoso de Oliveira	Oseias da Silva Novaes
Elivaldo Baia da Cunha	Oseias de Aquino Guimarães
Elivaldo Evangelista da Cruz	Oseias dos Santos Caldas
Elivane da Silva Silveira	Oseias Ferreira Guimarães
Elivane Franca Novas	Osmarina Ferreira Lopes
Elizabete Guedes Serrao	Osvaldo Alves Valente
Elizana Gomes Medeiro Marques	Osvanildo Veiga Martins
Elizangela Brabo Farias	Othon dos Santos Pereira
Elizangela da Luz Freitas	Ozana da Silva de Souza
Elizangela Pinheiro Pimenta da Silva	Ozana dos Santos Laranjeira

Elizangela Sousa de Almeida	Ozenias Primavera dos Santos
Elizeu de Freitas Correa	Oziamar Gomes Caldas
Eliziete da Silva Pinheiro	Ozimar da Silva e Silva
Ellem de Almeida Rodrigues	Ozinethe Baia Machado
Eloy de Freitas Monteiro	Ozivaldo Gomes Novais dos Santos
Elrilene Caldas de Almeida	Paloma Aquino Guimarães
Elsino Castelo Pereira	Patricia da Silva Ramos
Elva da Silva Silveira	Patricia de Souza Vilhena
Elva da Silva Silveira	Patriciia Almeida Lobo
Elza Silva Melo	Paula de Jesus Ferreira Silva
Elzilene Caldas De Almeida	Paulo Cesar Fontes Reis
Elzinita Barbosa de Carvalho	Paulo Dias dos Santos
Elzo Machado Serrao	Paulo Marques da Trindade
Emilly Mariane Ladislau da Silva	Paulo Ronaldo dos Santos Fonseca
Enisia Ribeiro dos Santos	Pedro Almeida da Silva Filho
Eralda da Silva Costa	Pedro Barbosa Barros
Eraldo Santos dos Anjos	Pedro de Oliveira e Oliveira
Erenildo Palheta de Melo	Pedro Farias Ponte
Erica da Silva Vieira	Pedro Jardim
Erica Pinto da Silva	Pedro Maia de Carvalho
Erika Pinheiro de Souza	Pedro Pereira Pinto Neto
Eristiana dos Santos Caldas Novais	Pedro Pereira Tavares
Eriton Adeudato Cardoso	Pedro Rodrigues de Oliveira
Errilaudo Moraes de Brito	Petrolina Alves de Freitas
Ertorgio Rodrigues da Cunha	Rael Lopes dos Santos
Esladeck da Costa Carvalho	Rafael Goes Pantoja
Esmeralda Valente da Silva	Rafaela Moura dos Santos Souza
Esperidião Martins da Silva	Railane Lopes de Lima
Estelita Camara da Cunha	Raimunda Alves de Oliveira
Etevaldo Pereira da Silva	Raimunda da Trindade Moraes Sales
Eulaziany Ferreira de Souza	Raimunda dos Santos Farias
Eullem de Melo Brabo	Raimunda Elivane Pinheiro Carvalho
Evandro Araujo gomes	Raimunda Rodrigues de Lima
Evandro Gonçalves de Abreu	Raimunda Valente
Evanilson da Silva Santos	Raimundo Almeida dos Santos
Fabiana Pereira dos Santos	Raimundo Angelo Alves da Silva
Fabio do Nascimento Palheta	Raimundo Baia de Oliveira
Fabio Junior Barbosa Pinto	Raimundo Correa Baia Junior
Faustina Oliveira dos Santos	Raimundo da Silva Goncalves
Felicia de Moraes Lobo Otone	Raimundo da Silva Pereira
Feliciano Correa Palheta	Raimundo Do Socorro Adeodato Cardoso
Fernando de Souza Valente	Raimundo do Socorro Ferreira da Costa
Filomena Vilhena Santana	Raimundo do Socorro Galena dos Santos
Floriano dos Santos Marques	Raimundo Farias Pantoja
França Gomes da Silva	Raimundo Goes Pantoja
Franciclei Duarte da Silva	Raimundo Jorge Monteiro de Albuquerque

Francidalva Barrozo Salazar	Raimundo Lobato da Silva
Francidalva Machado Rodrigues	Raimundo Magno Negrao
Franciete Santos dos Santos	Raimundo Mago Moraes Brabo
Francigel Duarte da Silva	Raimundo Marçal dos Santos
Francinildo Barbosa Dias	Raimundo Matos Rodrigues
Francisca Alves Jardim	Raimundo Mendes Pereira
Francisca Alves Pimentel	Raimundo Nonato
Francisca de Oliveira Lobato	Raimundo Nonato da Silva
Francisco Costa da Silva	Raimundo Nonato Marques Tupinamba
Francisco da Cruz Barros	Raimundo Oliveira Fonseca
Francisco de Almeida Rodrigues	Raimundo Pacheco de Azevedo
Francisco de Freitas Cunha	Raimundo Pantoja Baia
Francisco do Nascimento Moraes	Raimundo Pereira de Melo
Francisco dos Santos Marques	Raimundo Pereira Valente
Francisco Jardim Pereira	Raimundo Pinheiro Ladislau
Francisco Mauro de Almeida	Raimundo Rodrigues
Francisco Pereira Viana	Raimundo Rodrigues dos Santos
Francisco Rodrigues Lopes	Raimundo Trindade do Nascimento Moraes
Francisco Wilagaissom Lemos Rabelo	Raquel da Silva Ferreira Costa
Franklin Silva de Souza	Raquel de Melo Farias
Frederico da Silva Fereira	Raquel Pacheco de Lima
Gelson Braga Alves	Rasangela Maia Reis Macedo
Genilson Souza Brabo	Raysa da Costa Castor
Geovane Barbosa de Novais	Rebeca Aline Ferreira Rebelo
Geovane Brazão de Freitas	Reginaldo Carvalho Neves
Geovane da Gama Lopes	Reinaldo Evangelista da Cruz
Gercika Rocha da Gama	Renato Rodrigues Saraiva
Gerciolina Santana da Cruz	Renato Sanches Gomes
Gerison Duarte Nascimento	Ricardo Rodrigues da Cunha
Gesival Fernandes Reis	Rildo da Silva e Silva
Gideao Santana Barbosa	Risoneia da Cruz Valadares
Gilberto da Silva Valente	Rita alves do Nascimento
Gilmar da Silva Valente	Rizonete Costa Pinheiro
Gilvandro Jose Rodrigues	Robert dos Santos de Souza
Giovan Maia Serrao	Roberto Bento Monteiro de Albuquerque
Gisele Brabo Farias	Roberto da Silva Carvalho
Gracilene Primavera Almeida	Robson de Souza Rodrigues
Gracimar Fonseca Mavigno da Cruz	Rodrigo Aquino Guimarães
Guilherme Dias Dos Santos	Rodrigo Palheta Moura
Guilherme Fonseca Ferreira	Rodrigo Valente da Silva
Hailton Diniz Serrão	Rogerio Prata de Lima
Hamilton de Freitas Braga	Romario da Silva Castor
Hamilton Ferreira Moura	Romario Nobre Lobato
Hamilton Lima Malaquias	Romario Rodrigues da Silva
Harleson Valente de Aquino	Rômulo de Aquino Martins

Helca Monteiro Cunha	Ronaldo Barbosa Rodrigues
Heleilson Machado de Aquino	Roney Jardim Moraes
Heleno Valente Rodrigues	Ronis Tupinamba Barros
Helio Jardim Martins	Ronivaldo de Araujo dos Santos
Henrique Alves Martins	Rosa Benicia da Costa
Henriqueta Jardim Martins	Rosa da Silva Cunha
Herbson Ribeiro da Silva	Rosa Lobato
	Rosa Maria Cordovil de Melo_Sítio Limoeiro
Hermitonn Palheta de Oliveira	Rosalino Ferreira dos Santos
Honorato Santos da Silva	Rosana Gomes Costa
Humberto dos Santos Duarte	Rosana Gomes Farias
Ilson Primavera Almeida	Rosana Machado Maia
Ipiranga Juniel Noronha Gomes	Rosangela Fereira Lopes
Iraci Brabo Fernandes	Roseane de Almeida Sousa
Iracilda Dias Dos Santos	Roseane Marcolino Moraes
Iracilda Ferreira Machado	Roseane Valentim da Silva
Iracilda Pacheco	Roseli de Freitas Palheta
Iraelson da Silva Soares	Roselin de Azevedo dos Santos
Iranildo da Silva Santos	Roselma da Costa do Carmo
Iranildo Merces da Silva	Rosenice Rodrgiues de Araujo
Irenildo Gomes Pimental	Rosenilda Sanches Baia
Iriane da Silva Soares	Rosenildes Lobato Correa da Silva
Irineu Mesquita Lobato	Rosenildo da Luz Almeida
Isis de Fatima Araujo dos Santos	Rosiane Ramos Gomes
Ismael da Silva Rodrigues	Rosiangela Conceição Santos
Ivanete de Almeida da Silva	Rosilene Dias dos Santos
Ivanete de Freitas da Silva	Rosinaldo Barbosa Rodrigues
Ivanildo da Silva Rodrigues	Rosineia Rodrigues Toscano
Ivanilson Machado Silveira	Rosilene Machado Silveira
Ivanilza do Nascimento Mathias	Rosineide Nunes Ferreira
Izabel Costa Pinheiro	Rosinete Barbosa De Carvalho
Izaias Primavera dos Santos	Rosinete Gouveia Farias
Izanildo da Costa Pinheiro	Rosinete Leite Bandeira
Izaurenis Goncalves Carvalho	Rosires Monteiro Loureiro
Izomar Barbosa de Almeida	Rosivaldo Araujo do Carmo
Izonete Gomes de Souza	Rosivaldo Barbosa Barros
Jacileia da Costa Carvalho	Rosivaldo Martins
Jacileia do Nascimento Serrao	Roziane Rodrigues Moura
Jaciropo Lobato da Silva	Rozilda Oliveira Moura
Jacqueline Barbosa Souza	Rozinaldo Araujo dos Santos
Jacquiele Barbosa Souza	Rubemax Brabo Resendo
Jaidemilson Gomes de Souza	
Jailene Souza da Silva	
Jainha de Souza Baia	
Jair Barbosa Maia	
Jair Miranda da Silva	

Jairo Barboza Alves	Rubiane Gomes da Cruz
Jairo da Costa Brito	Rui Santana
Jairo da Cruz Valadares	Ruthi da Silva Marcolino
Jairo Gomes de Souza	Sabina Pacheco da Silva
Jairo Serrao Rodrigues	Sabino Barbosa Rodrigues
Jairzinho Duarte dos Santos	Sabrina Rocha Monteiro
Janari dos Santos Prata	Salomao Ferreira Mathias
Jaqueline Lorena Cunha Pontes	Samara Raposo de Oliveira
Jaqueline Miranda Alves	Samara Silva e Silva
Jardeane Tenorio Barbosa	Samarina Pontes Maia
Jardel Braga Barbosa	Samuel dos Santos Filho
Jardel Brazao de Freitas	Samuel Pontes Maia
Jardel de Aquino Martins	Sandra do Socorro Silva Gama
Jardel Fonseca Jardim	Sandra Helena Maciel Freitas
Jaurimar Alves de Vilena	Sandra Maria de Matos da Costa
Jean Carlos Souza Alves	Sandra Muniz Valente
Jeferson Almeida da Cruz	Sandro Rodrigues Gomes
Jeferson Souza Alves	Sansão Primavera dos Santos
Jeila Souza Alves	Sebastiana Almeida Palheta
Jeny Lobo Moraes	Sebastiana Barbosa de Souza
Jeosirene Pacheco da Silva Santos	Sebastiana dos Santos Souza
Jeremias de Moraes Lobo	Sebastiao Lopes de Oliveira Filho
Jerfeson Rodrigues Gomes	Sebastiao Magno Marques
Jessica Azevedo Galvão	Sebastiao Nascimento da Silva
Jesus Araujo Gomes	Sesbastião Martins Alves
Jhemission Santos Monteiro	Sidelma Ferreira Pacheco
Jhon Carlos de Jesus Almeida	Sidnei Primavera Braga
Jhone Aquino Guimarães	Siely Almeida Ramos
Joa Henrique Goncalves Lobato	Silelda Santiago de Lima
Joabe da Silva Conceicao	Silene Mendes da Silva
Joana Alves de Souza	Silvana da Silva Pontes
Joana de Aquino	Silvana de Aquino Guimarães
Joao Almeida Palheta	Silvany de Souza Rodrigues
João Alves Bandeira	Simar Monteiro
João Bastista Araujo Melo	Simone Barbosa de Souza
Joao Castelo de Carvalho	Simone da Silva da Costa
João de Aquino Neto	Simone dos Santos Moraes
João de Nazaré Serrão Fonseca	Simone Fernandes Guimaraes
Joao do Nascimento Moraes	Simone Jardim de Oliveira
João do Socorro Alves de Souza	Simone Machado Soares
João Ferreira de Sousa Sobrinho	Simone Serrao Guedes
João Ferreira dos Santos	Sinair Vilarinho da Cruz
João Gomes	Sinei Viana
Joao Mendes da Silva	Socorro Guilherme Palheta
João Santiago de Lima	Solange Moura Ribeiro
Joao Soares da Costa	Solomao de Sousa Silva

Joaquim Moreira da Silva	Sonia Correa da Silva
Joaquim Moreira da Silva Filho	Sonia Maria Balieiro Valente
Joaquim Vasconcelos Ferreira	Sonia Pimental Raposo
Joel Ferreira Pacheco	Sorajane Souza Alves
Joelson Ferreira Pacheco	Suelem de Oliveira Duarte
Joelson Vilhena do Nascimento	Taianny Gonçalves Santana
Jonas Mendes da Silva	Taina Gonçalves Santana
Jonas Mendes Santana	Tais Pereira Coelho
Jonas Santana Barbosa	Tatiane Monteiro Batista
Jonatas Farias Pontes	Tatianny Gonçalves Santana
Jones Miranda da Silva	Tatima Dias Vito
Jorge dos Santos Vilena	Teresa Araujo dos Santos
Jorge Matos Alves	Tereza Barbosa dos Santos
Jorge Santana Castor	Tereza de Alcantara Valente
Jose Adriano Salazar da Gama	Terezinha Barbosa Pimental
Jose Alaerco da Silva Guedes	Terezinha Guedes da Silva
Jose Albedi	Thiago de Aquino Guimarães
Jose Assuncao Araujo	Tiago Barbosa Pinto
José Benedito Noronha Gomes	Tiago Bispo Costa
Jose de Jesus Portilho dos Santos	Tiago Lima de Almeida
Jose de Moraes Sales	Tito Cordeiro da Silva
Jose de Souza Moraes	Valda de Souza Pimenta
Jose Ederaldo Costa Barbosa	Valdeci de Almeida da Silva
Jose Elizonilson Machado	Valdecir Gama de Aquino
Jose Jeovane de Almeida Barbosa	Valdeir Felix Araujo
Jose Junior de Freitas Monteiro	Valdelir Cordeiro da Costa
Jose Maria Alves de Oliveira	Valdemir Cordeiro da Costa
José Maria Barbosa Gibson	Valdemir Gibson Coelho
Jose Maria Bezerra Duarte	Valdemir Jardim Moraes
Jose Maria Candido de Oliveira	Valdenir da Costa e Silva
Jose Maria Cardoso Novais	Valdenir Valente de Paiva
José Maria Ferreira de Aquino	Valdete Gomes Carvalho
José Maria Lopes Freitas	Valdileia de Souza Gama Farias
Jose Maria Pereira Moraes	Valdineia Pureza Valente Pimentel
Jose Miguel Barbosa da Silva	Valdir Barbosa da Silva
Jose Miguel dos Santos Araujo	Valdir Cordeiro da Costa
Jose Milton Serrao Guedes	Valmir Marinho Valadares
Jose Moraes Araujo	Vanael Araújo dos Santos
Jose Moraes Serrao	Vander Correa Santiago
Jose Moreira da Costa	Vanderlei Moura dos Santos
José Orlando Mavigno de Souza	Vaneide Pereira Farias
Jose Raimundo de Souza Baia	Vaneize Noronha Gomes
Jose Raimundo dos Santos Araujo	Vanilda da Silva Silveira
Jose Raimundo Ferreira Batista	Vanilson Primavera Almeida
Jose Ribeiro da Costa	Verdilho Valadares da Silva
Jose Roberto Lopes Freitas	Victor Miranda dos Santos

Jose Santana Castor	Vilma Maria Moura dos Santos
Jose Wilke Coelho Costa	Vital Cordeiro e Silva
Joseane Rodrigues Costa	Vitória Machado de Aquino
Joselino Alves Braga	Volnaldo Barros Nascimento
Josely Machado de Aquino	Waldelei Santa Baia
Josenilton Silva Moreira	Waldelina Ferreira
Josias Alves do Nascimento	Waldir Baia Barbosa
Josias Costa Araujo	Waldir Gibson Coelho
Josias Ferreira da Silva Oliveira	Waldir Lucas Cardoso
Josiel da Carvalho Rocha	Walter Barros Nascimento
Josimar da Silva Moreiras	Walter Ferreira Alves
Josimar Duarte Fonseca	Walter Nunes de Oliveira
Josimar Pacheco Baia	Walter Willer Santos Nascimento
Josinaldo Barbosa Rodrigues	Wandeleia Santana Castor
Josinaldo Pacheco Baia	Wellington Luiz de Oliveira Chaves
Josinaldo Santos da Silva	Willibran Raatz Barcellos
Josuel de Carvalho Rocha	Zacarias Alves dos santos
Jozete Alves da Costa	Zamor Moreira dos Santos
Jucelino de Freitas Silva	Zaniela Sardes Correa
Jucelino Junior Souza Alves	Zeni Marinho da Silva
Jucelino Ramos da Silva Filho	Zenilda Barbosa Farias
Juci Almeida Lobo	Zuleide Barbosa Souza

2.1.4 Other Entities Involved in the Project

Title	City Council Members and the Secretary of Education
Address	Avenida Duque de Caxias number 813, Bairro: Centro, CEP: 66480-000

2.1.5 Physical Parameters (G1. 3)

1. Location of the Project

General Location

The Project is located in the northwest of Brazil, in the State of Pará, micro region of Portel, municipality of Portel. Main transportation means to arrive in Portel is by boat. The trip takes approximately, 12 hours from Belém. About 50% of Portel's population is rural. Main source of income in the municipality is wood extraction and subsistence agriculture, specifically, cassava agriculture. Figure 1 shows the location of the Project in Brazil and in Pará.

2°10'22.91"S 51° 5'57.19"W

2° 6'26.15"S 50°56'34.83"W

2°31'0.88" S 50°55'9.88"W

2°36'18.21"S 51°22'52.65"W

2°34'11.01"S 51° 5'6.33"W

Figure 1: Project location in Brazil



Figure 2: Project Location in relation to General deforestation in the Amazon

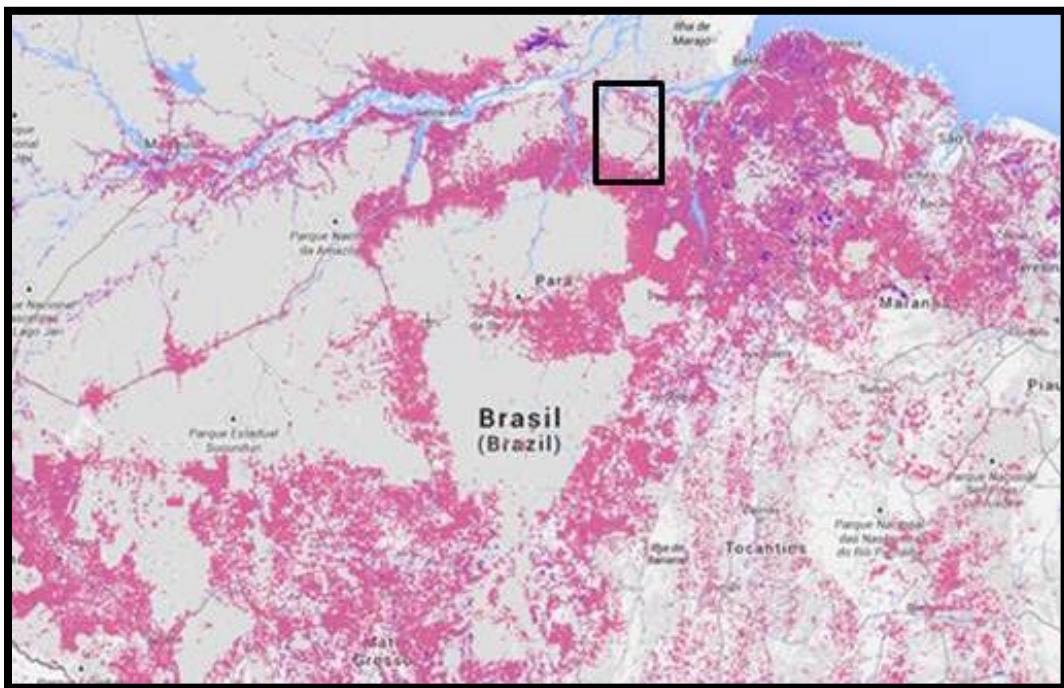


Figure 3: The Municipality of the Project Location in the Amazon

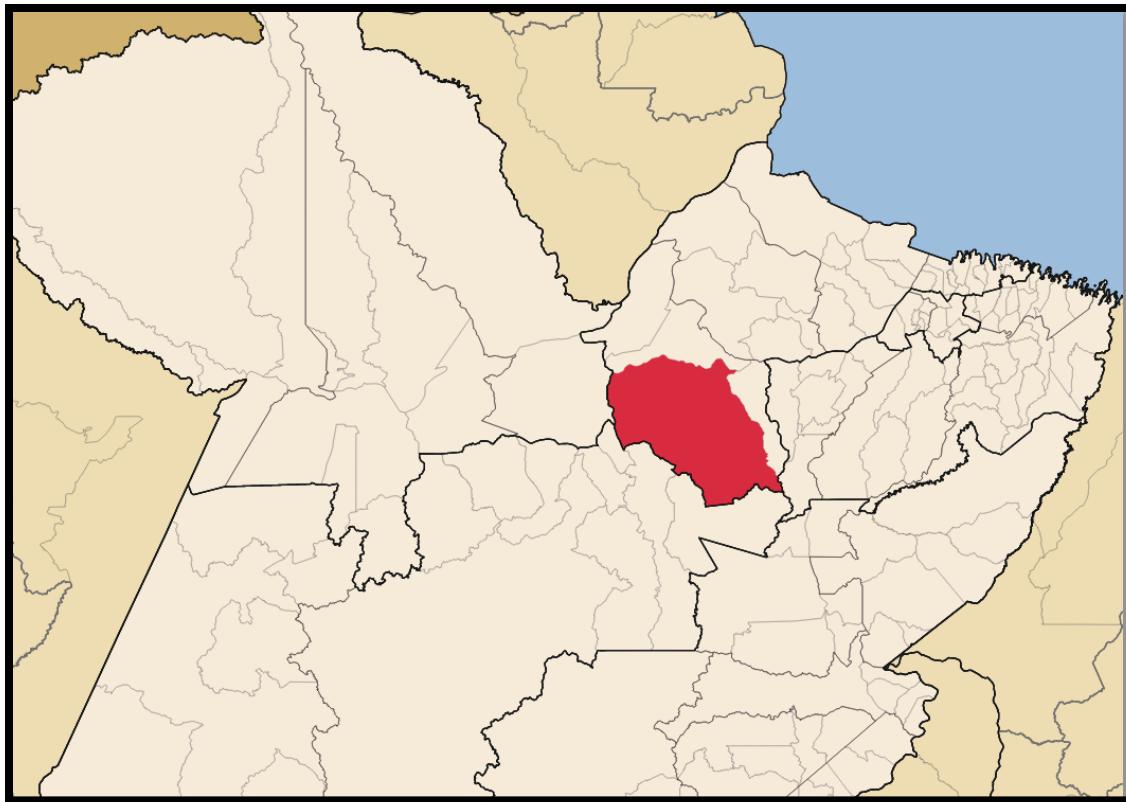
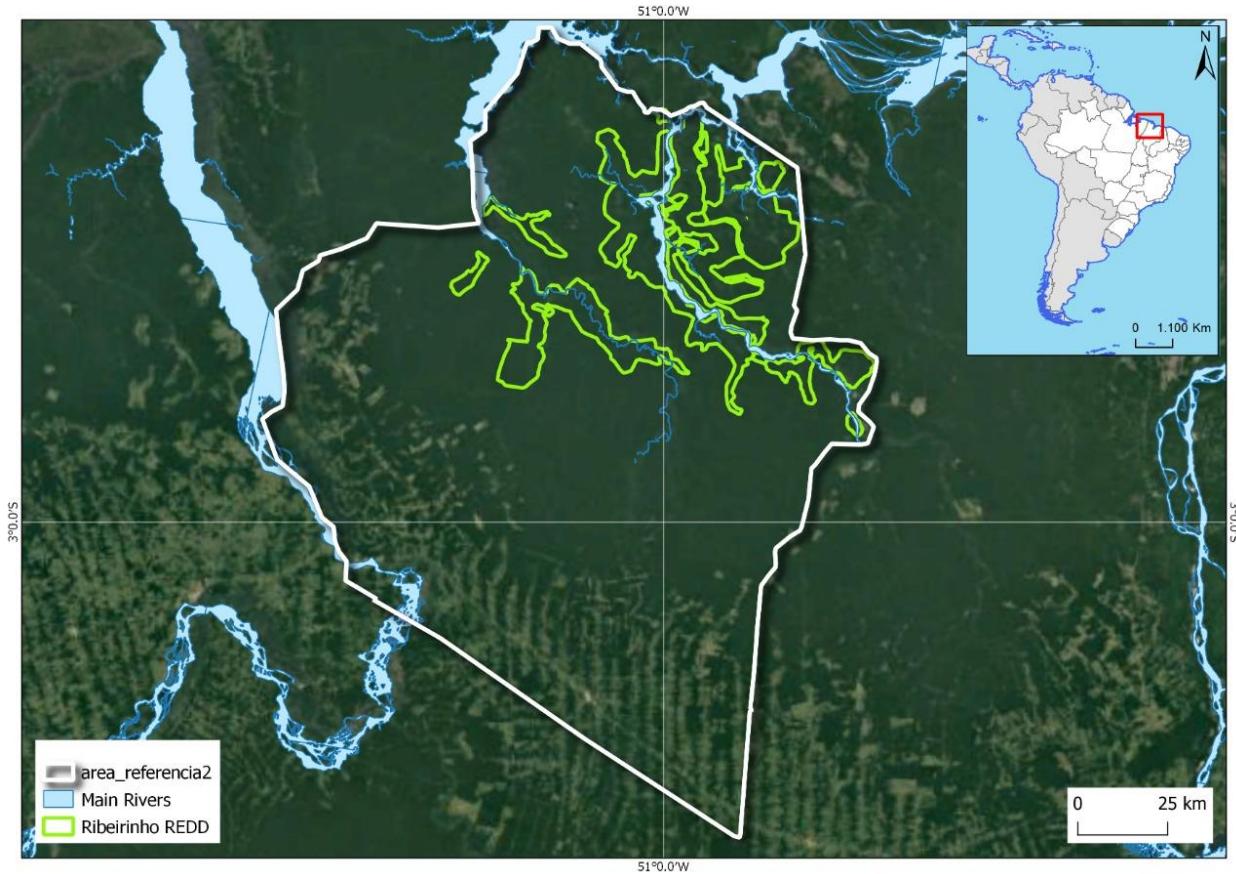


Figure 4: Project Area Map 199,962 hectares



Project Boundary

205,820 hectares, including the project Area and the Leakage Management Area.

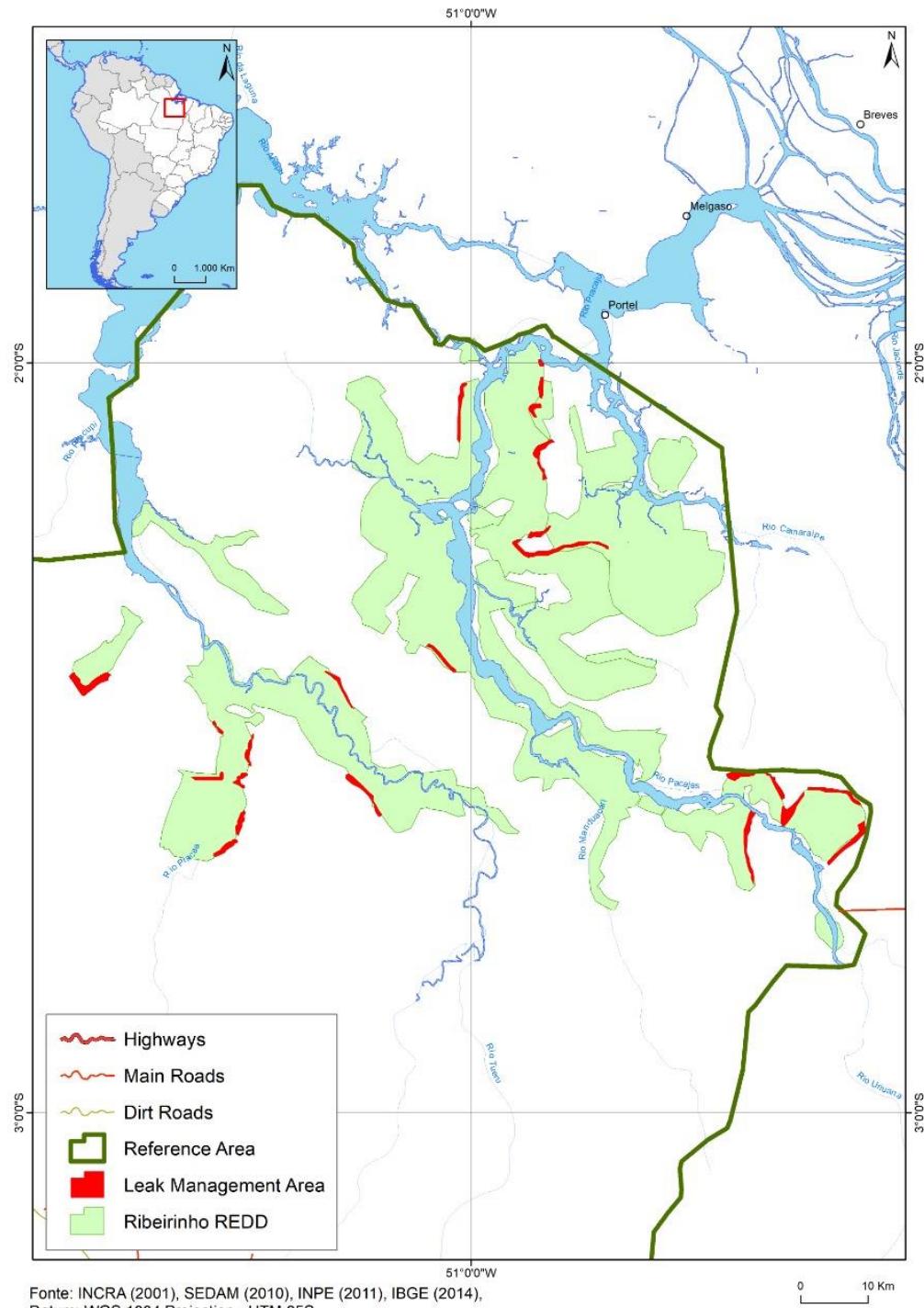
Project Area

The Project Area has an area of 199,962 ha and it is constituted by over 875 Cadastrol Ambirental Rural properties that contain forest and non-forest land. The forested land, within the Project's Boundary, constitutes the Project Area. With the Leakage Management Area (LMA) neighboring, this results in 16,503 ha. The Project Boundary (Figure 4), leakage belt (Figure 5) and Reference Region for Deforestation (RRD) are shown in Figure 6.

Leakage Management Area – 16,503 hectares in yellow, along the border of the project area.

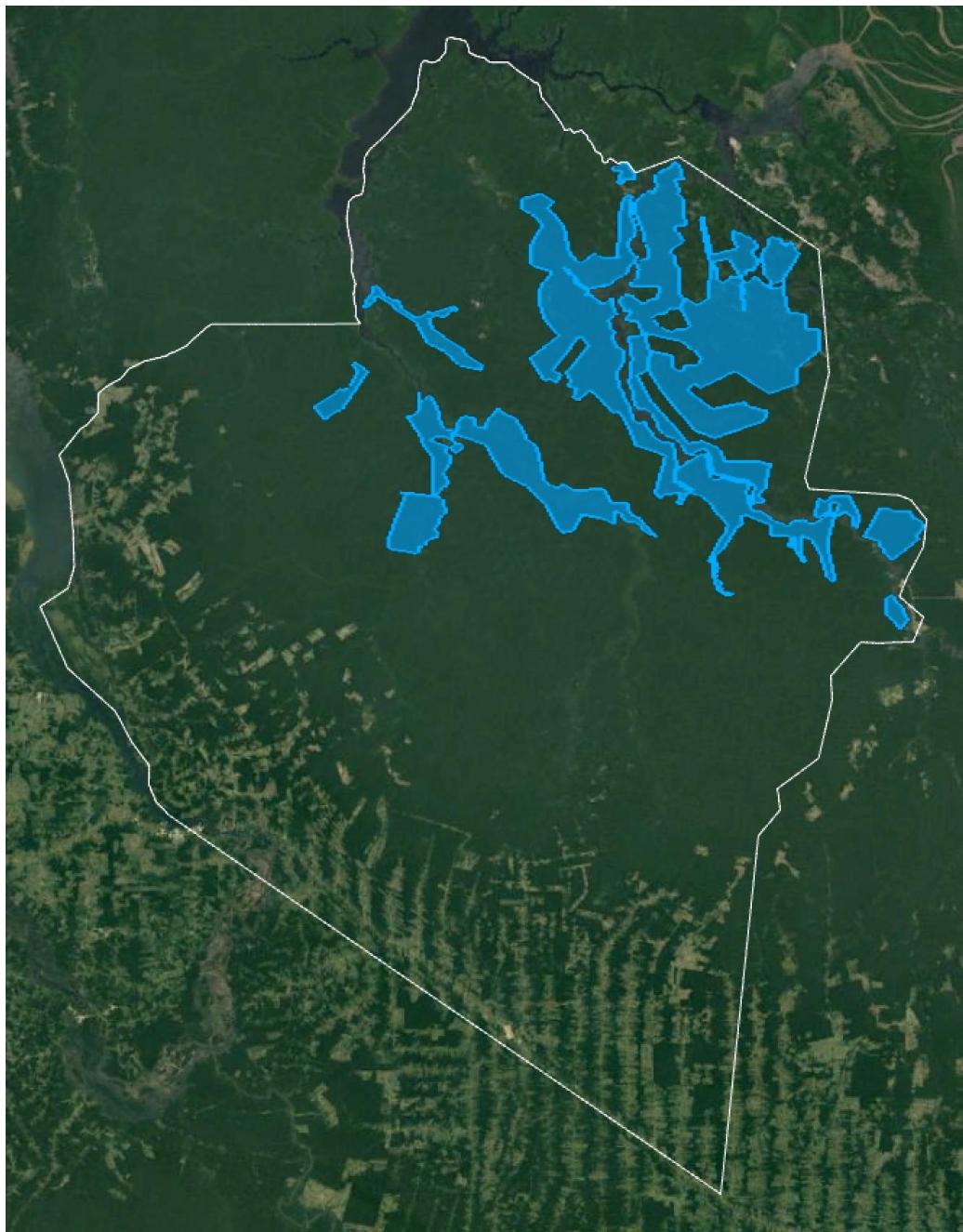
The project's leakage management areas are based neighboring areas to the project that in most cases are not owned by the riverine.

Figure 5: Project physical Boundary and Project Leakage Management Area (16,503 hectares as shown in red)



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
 Datum: WGS 1984 Projection - UTM 25S

Figure 6: Reference Region 1,991,227 ha (Project area 199,962 hectares)



2. Basic Physical Parameters

Climate

Climate in the Marajó region, as it is in the great Amazon region, is tropical humid. The average annual temperature is never above 27 degrees Celsius and rainfall ranges between 2,800 and 3,400 mm with relative humidity 85%. Rain is concentrated during six months between January and June. The summer is dry with sparse rain from August to December. It is a humid tropical climate with 350mm of precipitation in April and 60mm in October. The雨iest season is between February and April, while the driest months are August, September and October (annual precipitation 2,200mm).

Figure 7: Annual Precipitation

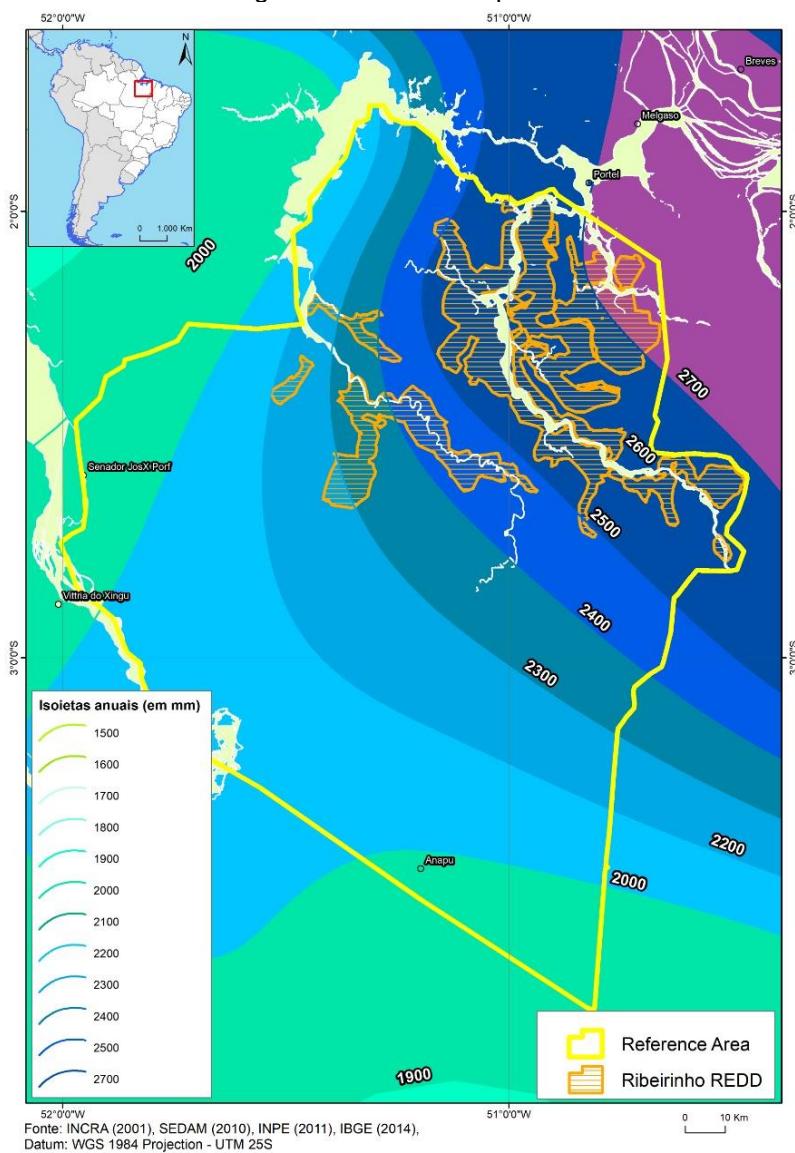
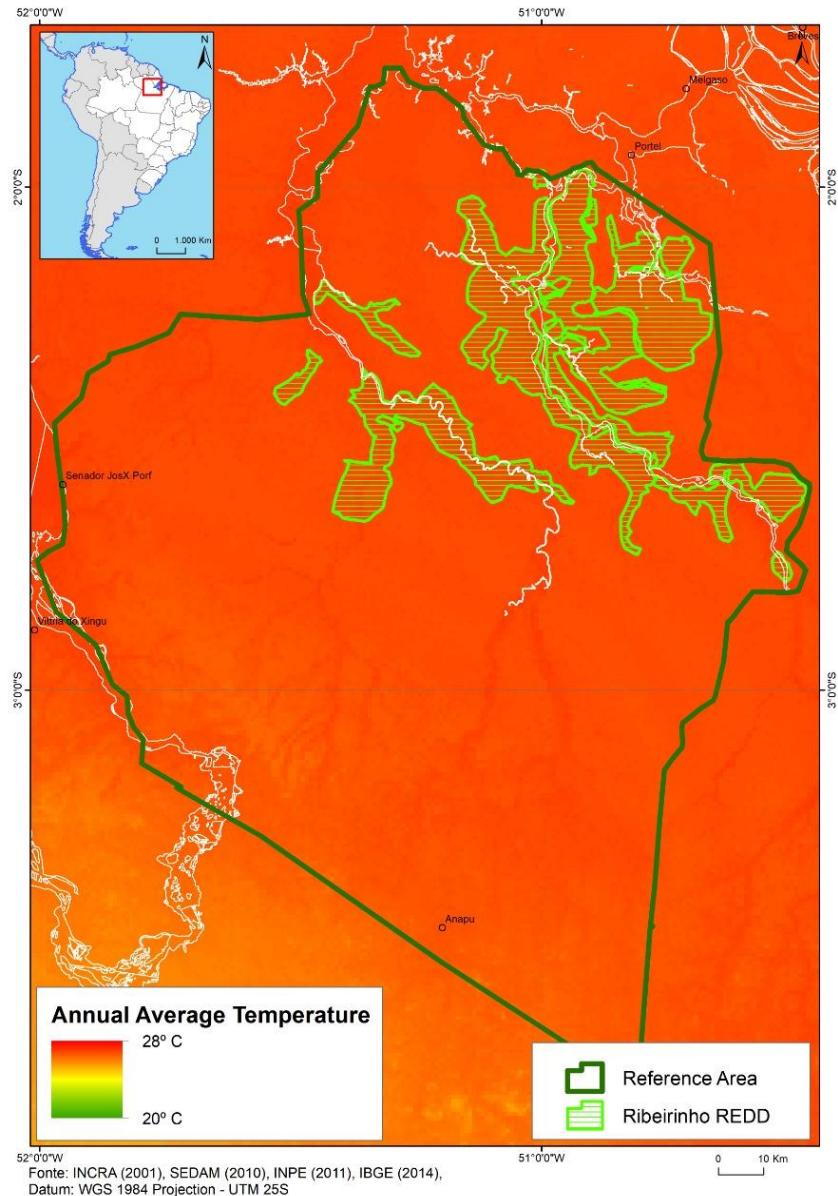


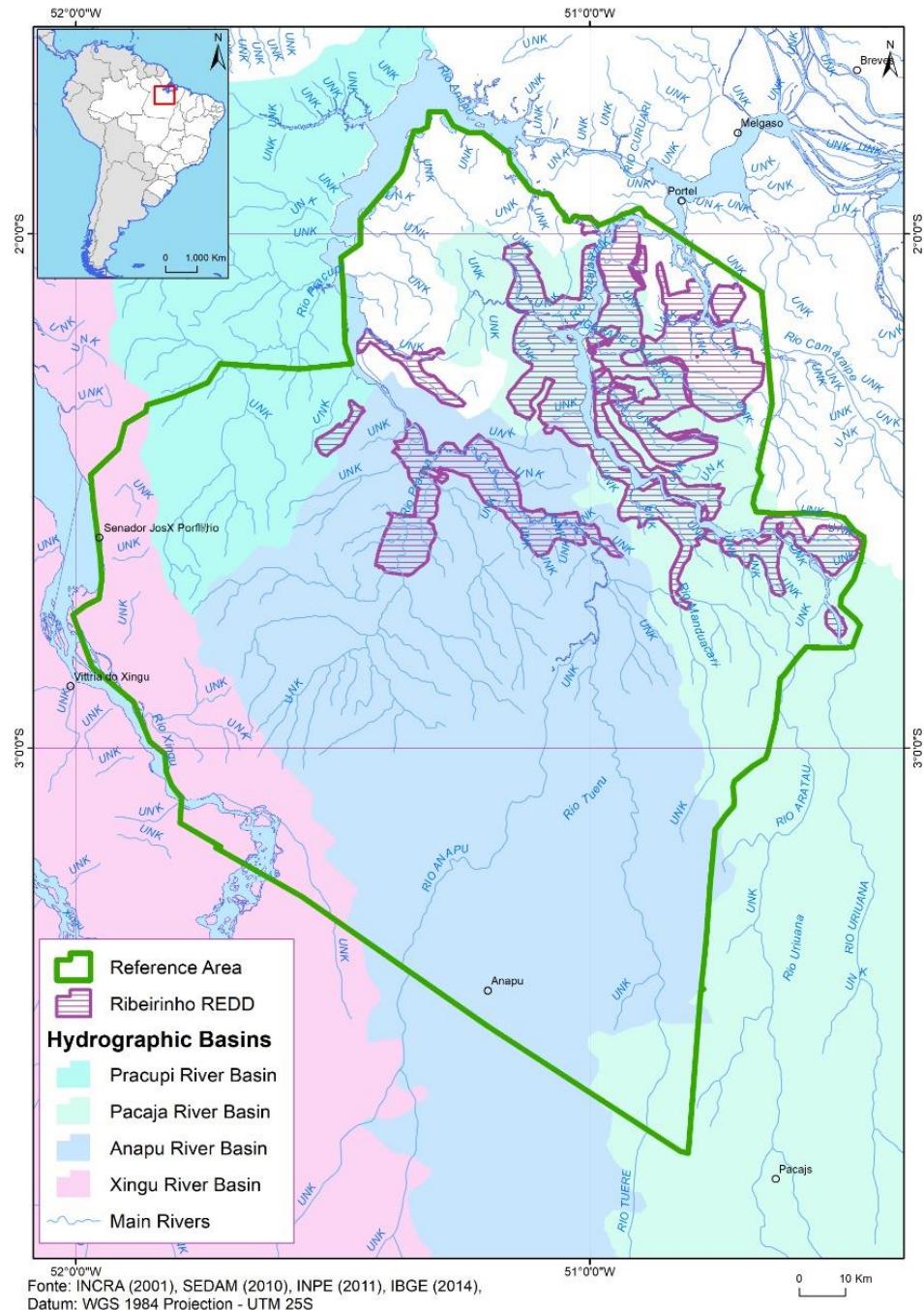
Figure 8: Annual Temperature



Hydrography

This municipality has 3 big rivers that drain the entire region: Anapu River, Pacajá River, and Camairapiri River. They flow from south to north. The Anapu river flows to the Pracui bay and Caxiúana bay and the major tributaries are: from the right – Marinahu river, Tueré, Mapareua, Mandaquari, Jacaru Puru river and the igarapés: Itatira, Muirapiranga, Janal, Umarizal, Marapua, Atua and Majua. From the left – Pracuruzinho river, Curio river and Pracuri river, and the igarapés: Carunbé, Itatinguinho, Tatingao, Cocoajá e Tapacú.

Figure 9: Hydrography



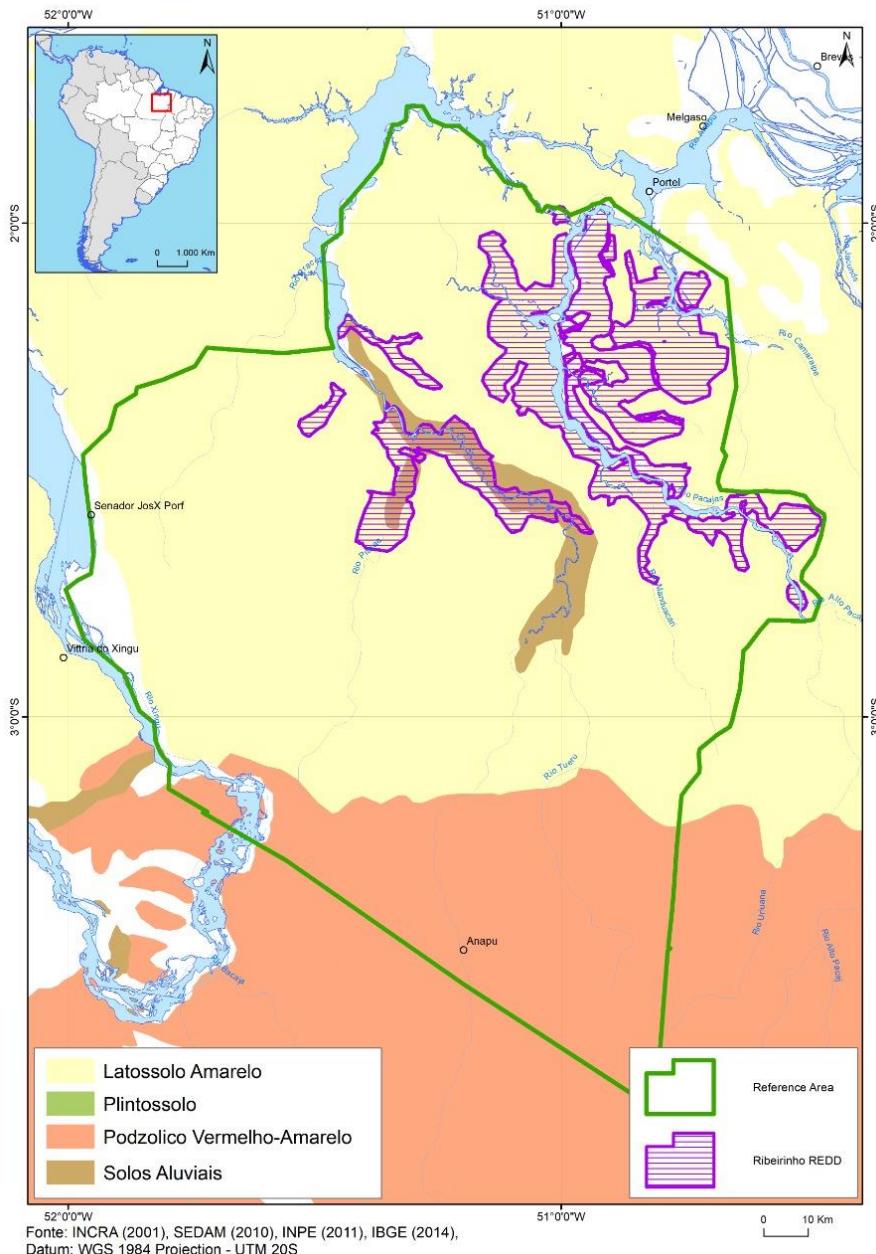
Soils

Soils in the Project Area appear to be mostly Latosol Amarelo, with some Agrisol Amarelo and some minor areas of Neosol Fluvico, according to the Brazilian System of Soil Classification (EMBRAPA 1998). Soils in the Project Area and its surroundings are shown in the map below.

Latossolo Amarelos contain a range from 15% to over 60% B-horizon clay. It is possible to define a sort of intermediate texture of the soil (15% to 35% of clay), clay (35% to 60% of clay) and other clay (more than 60% of clay). With reference to land use possibilities, Rodrigues et al. (2003) mentions that Oxisols, due to

their chemical characteristics unfavorable for agricultural activities, requires correction, especially in relation to high acidity and high aluminum content. The application of lime and chemical and organic fertilizers, easily correct these limiting characteristics in order to increase concentration and retention capacity of soil nutrients. Soils in the Project Area are showed below in Figure 10.

Figure 10: Soils in the Project area

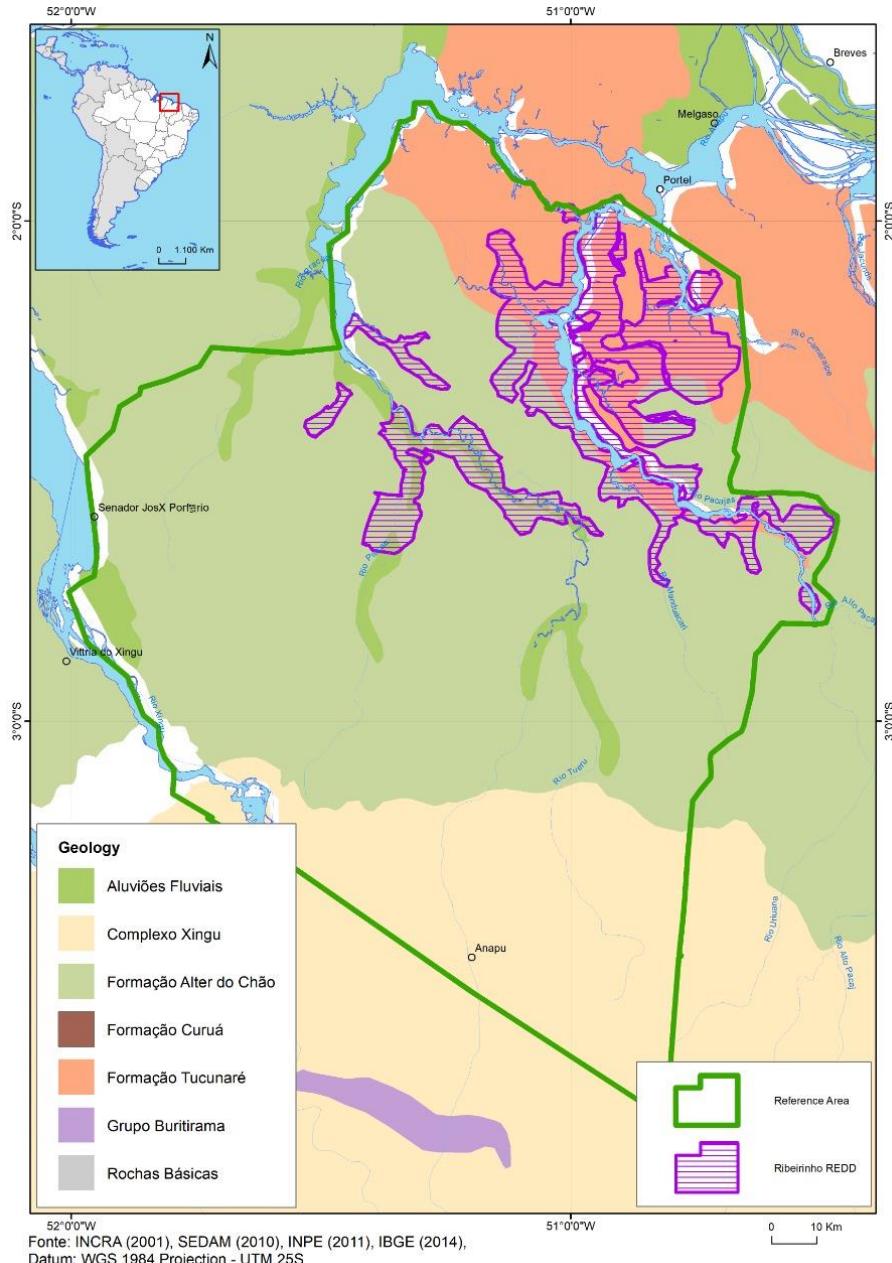


These source rocks of the sandy-argillic and argillic-sandy soils are with concretions over which Yellow Latossolos, Argissolos amarelos, and Plintossolos Petricos are developed. On these rocks predominate reliefs of ramps and hills. As well as fluvial deposits, fluvio-lacustrine and estuarine: these Quaternary deposits are associated with the basin of the Tocantins River, whose deposition formed large alluvial subject to tidal action. These unconsolidated deposits consist of fine sand, silt, clay and gravel, which develop sandy-argillic soils.

Geology

Geologic formations for the project area belong almost entirely to one single class Formacao Alter do Chao with some areas with Tucunare formations and a little of Fluvial alluvium. Geologic formations in the project area are shown below in Figure 11.

Figure 11: Geology in the Project area



Land Use

Most of the project boundary is constituted by primary and secondary Omboprofile dense forest with very small patches of human activity. These small patches constitute small-scale cassava agriculture (conducted

by riverine people and traditional rural villagers using slash and burn technique). From a social assessment conducted by the project there is now a conversion taking place with the current presidential administration to expand sustenance farming to higher use farming. The riverine are constitutionally protected and can slash and burn all the forest they want; thus, the project's importance in preventing the riverine from partaking in further expansion.

Figure 12: Forest Cover Type in the Project Area

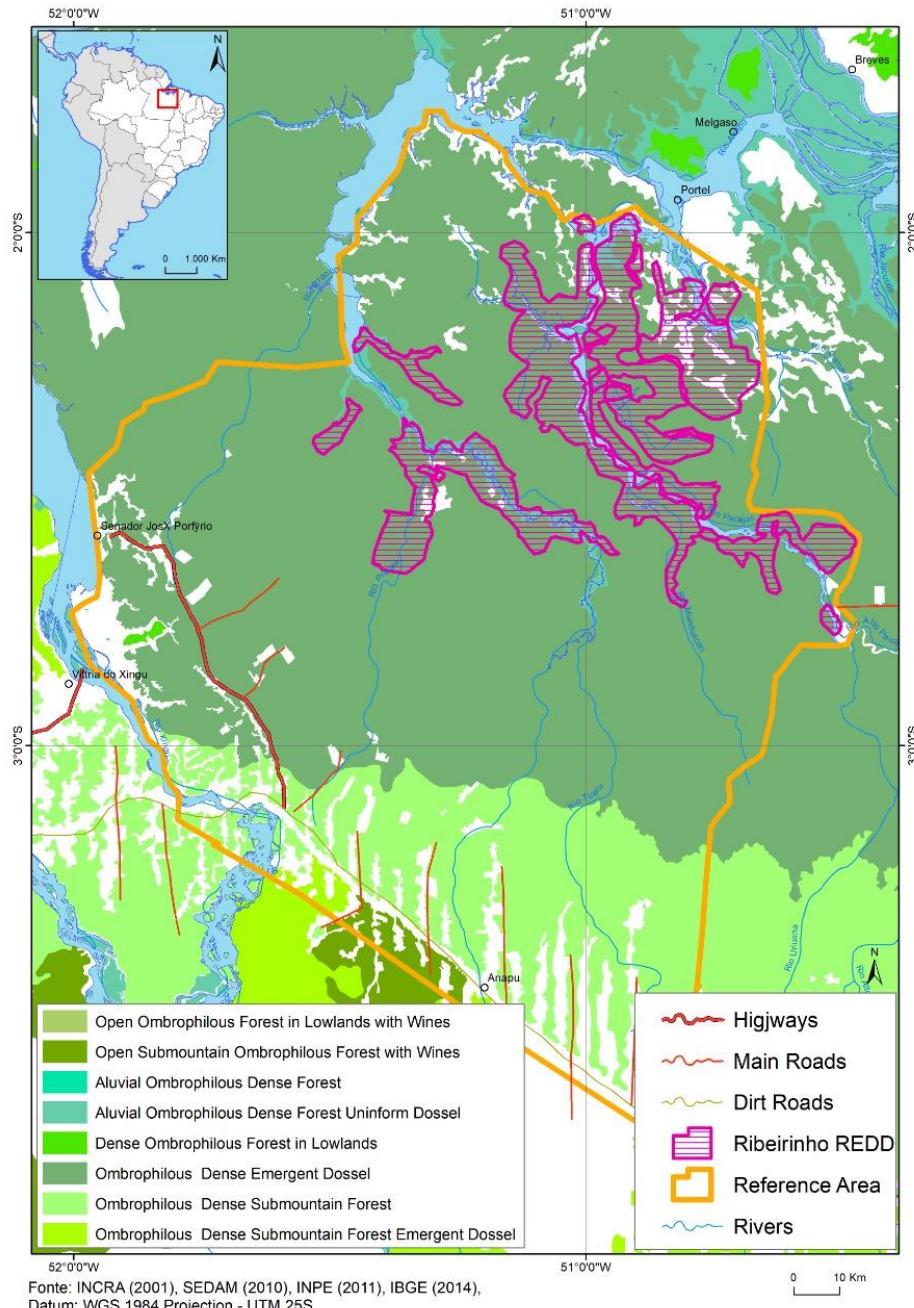
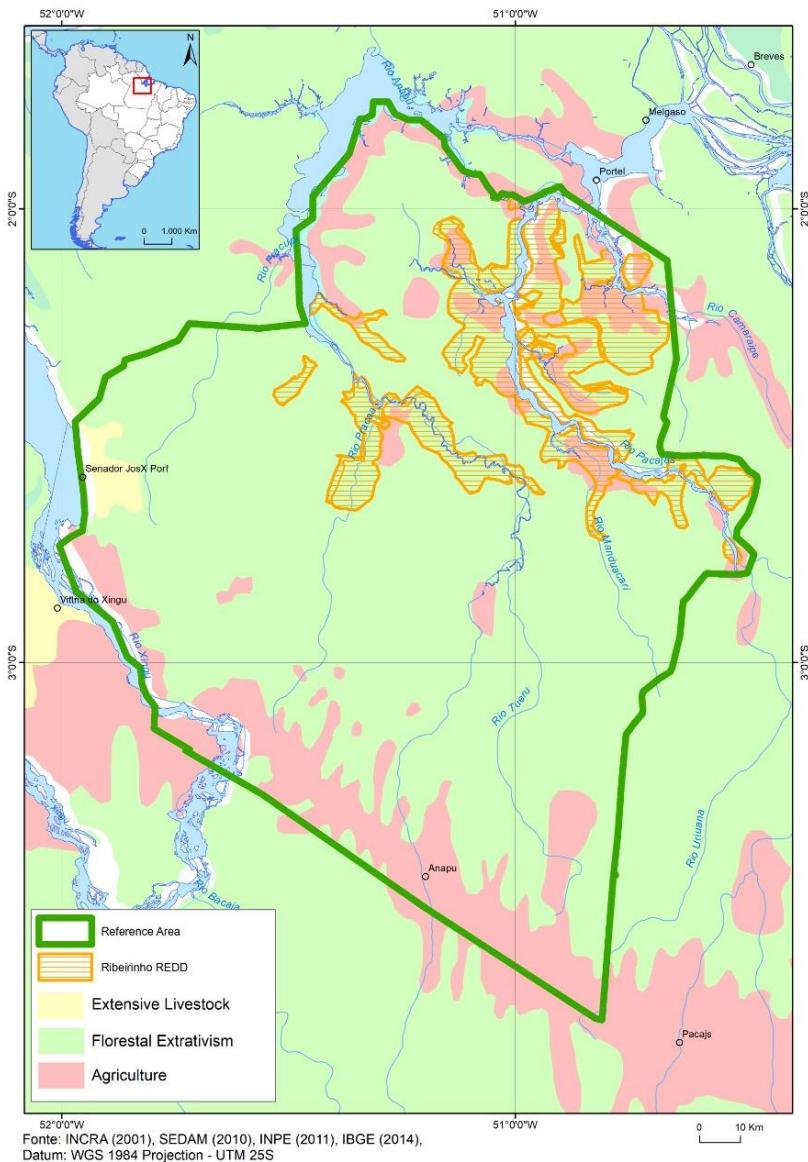


Figure 13: Land Use in the Project area



2.1.6 Social Parameters (G1.3)

From April 1st, 2017 the primary activity implemented by the Project has been monitoring, enforcing, and focusing on helping the rural riverine population gain the Cadastrol Ambiental Rural.

Due to the fact that in the case of this project, the project proponents are the riverine population, and the Syndicate of Rural Producers, the project did conduct a Free, Prior and Informed Consent (FPIC) when the riverine gained their land certificate. The agreement asked if the riverine wanted to gain their certificate for their land, and if they wanted to partake in a carbon credit project. The Participatory Rural Appraisal (PRA) takes place when the Project contemplates the opportunity to implement activities with local households, to improve local livelihoods, and to scale-up forest surveillance. For the benefit of any doubt, all forms were scanned, and all interviews have pictures of the person holding the form. In many cases the pictures have GPS imprint from the GPS cameras the team used.

The project's goal is to help everyone in the region, not only the riverine, in the Project Area to become stable. Prior to October, 2019, Participatory Rural Appraisals (PRAs) were conducted in the area constituted by the Project's Boundary and a 15 km buffer in the populated area to gather socio-economic information. All the information presented in this section is derived from such study. It should be remarked that the Project couldn't find available official demographic and socio-economic information at the household level for the sampled area, so it was necessary to conduct an exploratory fieldwork to gather as much information as possible from primary sources. It is worth mentioning that the Project's limited economic resources and time availability neither allowed to identify nor to perform a census of all the households within the sampled area. As a result, surveyed householders resulted in 1,645 households for the municipality of Portel. With an additional 875 households that are directly involved in this REDD project as proponents.

The Project conducted a thorough census in the Project's Boundary and Leakage Belt to identify all affected households and to geo-reference active and resting agricultural plots. This census already took place by July 2018.

Census Protocol

Intervention area:

The total area of the project has an extension of 199,962 ha located between the Anapú and Pacajá rivers in the municipality of Portel, State of Pará in Brazil.

The intervention area has settlements called "riverine households" and traditional rural villagers which are made up of 3 to 13 homes. Such population share common settlement characteristics, economic activities and livelihoods, fairly adapted to the existent conditions. The social baseline study has not identified indigenous peoples dwelling in the project area. FUNAI, the federal indigenous agency, has clarified there are no indigenous people in the area and no reserves in the area.

20 years ago, the local Riverine people and traditional rural villagers have confirmed that "homeless" indigenous peoples have arrived in the region looking for a new home after their previous home was destroyed, but FUNAI removed the indigenous and placed them on a reserve.

General Achieved Objective

The project completed a census in the intervention area. The project obtained definite and total information about the reality of the territory and the populations settled in the LMA in order to implement the strategies and indicators to be followed in the monitoring plan; upon approval by the populations through a process of Free, Prior, and Informed Consent (FPIC).

Specific Objectives

1. Share with local riverine and traditional rural villagers the results of the PRA developed by the project and the proposed Project's activities. Such information has been assessed and potential impacts and benefits to local livelihoods have been identified in a participatory approach with local households. These participatory evaluations have constituted the base information for a Free, Prior, and Informed Consent assessment of the Project by local riverine and traditional rural villagers living in the Leakage Management Area.
2. Participatory construction of social and environmental indicators for a Social Monitoring System of the impacts of the project in the quality of life of the population.
3. The project has obtained, updated and systematized socio-economic and organizational information of all the riverine and traditional rural villagers' population in the project area.
4. The project has obtained spatial information and has mapped the natural resources extraction areas, crops and the settler's territories.

Methodological proposal

Selection of the technical and professional staff for the development of the activities

Ribeirinho REDD+ Project has directed the execution of all the activities through its local specialists who are in charge of designing a definite methodological proposal for this work, selecting the technical staff, work functions distribution, and the initial follow-up of the field work.

The project has a team of local professional technicians trained as survey engineers with experience in conducting rural workshops, land survey and communitarian management. The PP, through its social teams, have completed social related field activities, established contact and negotiation with local leaders, carried out interviews with key informal actors from the community and completed community meetings in each household.

The social teams included field technicians, who were professionally trained for the collection of relevant information through surveys, obtaining geographical information and assisting the personnel in the workshops and assemblies with the population.

The local team has become highly efficient over the years, well trained, and well paid. Previous issues of high turnover with college educated managers who did not want to live in Portel for extended periods of time, has been resolved with the partnership with the local syndicates and government, who have helped source local experts, who are not with college education, but are still well experienced in leading projects, following directions and completing tasks in an honest way.

Logistics and work distribution

Prior to 2018 the project contracted out the work to 3rd party environmental consulting agencies to perform activities, as time went by, the project managers determined that more can be done for the same money by doing this work in house. Then in 2018 and 2019 the project went through a period of friction, hiring and training and then hiring again managers and staff, most qualified managers did not want to relocate to the Portel region, resulting in a difficult situation. The project has 3 technicians working 3 support staff, and 1 cook, 1 manager and 1 boat captain. On occasion semi-professional photographers are hired in order to complete documentation. The office has the General Manager, two support staff. There is 1 local police office that helps with patrols in his days off. In Belem there are 3 support staff and one manager for the technical aspects, and in Belem is a rover manager that deals with denunciations, governmental affairs, and other aspects of the project. A project archivist who works for the local news blog of Portel is working part time for the project to help track data. The project has recently hired 40 construction staff members to build the schools and make the bricks for the schools. There is a large legal team whose job is to sue land invaders and protect the legal integrity of the project in Brazil.

UNICEF is participating in the project as they are fully supporting the project for construction and reformation of the education system in Portel, Para.

Future work will result in more concentrated patrols. With 30 different social worker boats tending to each river, also reporting all activity in those areas.

The social team works 20 to 21 days in the field and comes back for a 9-to-10-day break. The security patrol team goes out 1 day per month and typically follows up to what the social team monitors in the field, and goes to specific points that the virtual monitoring team find. The activities for each locality were distributed as follows (Table 3):

Table 3: Census activities

Day	Activity	Brief description
Day 0	Inform the communal authorities about the visit	<p>Two days before the visits to each locality, one team formed with each team leader has informed the communal authorities about the project activities and visits, ask for their consent to carry out the project and request the support to the planned activities from the dwellers in each locality.</p> <p>The Syndicate of Rural Producers is in charge of informing the community. They are responsible for all communication, all paper material, all PD and MR documents sit in their office. They have the large group WhatsApp.</p>
Day 1, day 2 and day 3	<p>Informative assembly to inform about the details of the project and PRA results.</p> <p>Participatory assessment of the project activities and the impacts in involved households.</p> <p>Request Free, Prior, and Informed Consent to implement the project.</p> <p>Workshop for the planning of activities and construction of social and environmental indicators</p>	<p>One assembly with the population was carried out in order to inform about the details of the project. A simplified and short version of the PD in Portuguese was distributed and explained for those who cannot read. Such version was being developed in a simplified language without leaving out any important details.</p> <p>Project activities were assessed jointly with the households and a participatory evaluation was carried out in order to know local perceptions. Comments were collected and used to improve/adapt the activities to local expectations</p> <p>The project has developed a Free, Prior, and Informed Consent – FPIC (see section G.5.3.) – protocol in order to promote awareness and participation in the decision-making processes and avoid future possible setbacks with the population.</p> <p>Once FPIC is obtained, one workshop was carried out to detail and plan several activities and also determine the participation of the population. The indicators to monitor the benefits of the projects were constructed in a participatory manner.</p>
Day 4, day 5 and day 6	Community census and mapping	The census and surveys, agricultural parcels mapping, natural resources extractive areas and community territory determination were carried out.

Specific Objective 1. Share with local Riverine and traditional rural villagers the results of the PRA developed by the PP and the proposed Project's activities. Such information has been assessed and

potential impacts and benefits to local livelihoods have been identified in a participatory approach with local households. Such participatory evaluation has constituted the base information for a Free, Prior, and Informed Consent assessment of the Project by local riverine living in the project area.

The communitarian representatives/leaders have been asked to support a communal assembly where the results of the Social Study and the Participatory Rural Diagnosis, carried out prior to October 2018, were presented. For this purpose, a simplified version of the PD has been distributed and explained for those who cannot read. This simplified version of the PD as well as the presentation has been done in Portuguese, in a friendly format and in an easy-to-understand language. Also, flipcharts with didactic images have been used, always looking to account for the particularities of the local reality of each household.

All documentation is held with the legal representative of the Riverine – the Sindicato of Rural Producers, so the riverine can gain all information directly from them.

Picture 1: Meeting



Picture 2: Meeting



Picture 3: One-on-One meeting with the President of the Syndicate and a local Riverine Person



Picture 4: Technicians and Lead Engineer with two local Riverines



Afterwards, the Project's activities have been presented and assessed in a participatory approach with each riverine and traditional rural villager persons, identifying the potential impacts and options to mitigate them. All the feedback from these participatory workshops has been recorded. There were no negative impacts discovered in the one-on-one meeting besides a concern by the households of actual follow-thru. As told by most households: NGO's show up and never come back again, thus making some community member skeptical of all outsiders. This concern was remedied by setting expectations low, thus any and all future benefits are better than the original expectation.

The project has asked for the population conformity on the planned activities and their free, prior, and informed consent to implement the project. All those that participated in the Project's activity signed a document that states that they received all appropriate information about the Project and that they have participated in a participatory rural appraisal to identify impacts and mitigation activities.

Later, the representatives were invited to the workshop or on one-on-one meeting designed to plan the project activities and construct the social-environmental indicators for the social monitoring portion of the project.

Picture 5: Riverine person with filled out form in agreement with the project



Specific Objective 2. - Participatory construction of social-environmental indicators for the social monitoring system of the impacts of the project over the quality of life of the population.

A workshop carried out to detail and plan the activities related to the participatory census and determine the participation modality of the settlers according to their level of specific knowledge in order to accompany the project technicians.

Afterwards, the Project team worked with the population on the construction of social-environmental indicators that are easy to understand and manage to them, allowing an assessment of the impacts of the project over the quality of life of the community and the establishment of a monitoring system to measure the benefits of the project. These indicators were included in the social monitoring plan.

Specific Objective 3. - Census, systematization and updating of the socioeconomic and organizational information.

Picture 6: The project's six Technicians and two social workers



The households participating in the activities in each location were identified based on if they had a house or physical shelter in the LMA area, and several visits were carried out in the totality of the households in which the surveys were taken place with the head of the family or and elder.

All the surveys applied were organized and completed by the end of the workday in each locality.

The information was uploaded in a database in SPSS by the end of the field work and was then systematized in a final report of the indicators that did allow measuring the impacts of the project in the population during its implementation.

Specific Objective 4 - To collect spatial information and map agricultural parcels, relevant areas intervened by the population, and the territories occupied by riverine and traditional rural villagers.

The areas utilized by the population were identified in a workshop, based on the maps elaborated by PRA and/or satellite images provided by the project. Geo-reference activities of the total amount of agricultural parcels were carried out in order to differentiate the areas being used, the ones being prepared and the lands that have been abandoned in the previous year. Likewise, the limits indicated in reference to the area utilized by each community and other relevant areas for the project and the population were identified.

The riverine and traditional rural villager people that accompanied the mapping activities carried out by the project specialists were selected in a workshop in accordance to their knowledge over the territory.

These people were trained in the use of GPS technology and registration templates filling in order to support the technicians in the activities of geo-referencing relevant land spots.

Agricultural parcels were identified for each dweller, geo-referenced to the center of each parcel; data was collected (according to local terminology and/or estimation in meters) for cultivated species, agricultural technologies and productive timeframes.

The natural resources areas exploited by the riverine were identified in the workshops and several spots in specific locations, or relevant to the project, were taken if possible.

Likewise, the communitarian territory, the area indicated to be occupied by the riverine and traditional rural villagers, was mapped.

All the information collected in regard to households, households and parcel locations were geo-referenced. Pioneer roads and pathways in the project zone were collected.

Isolated households

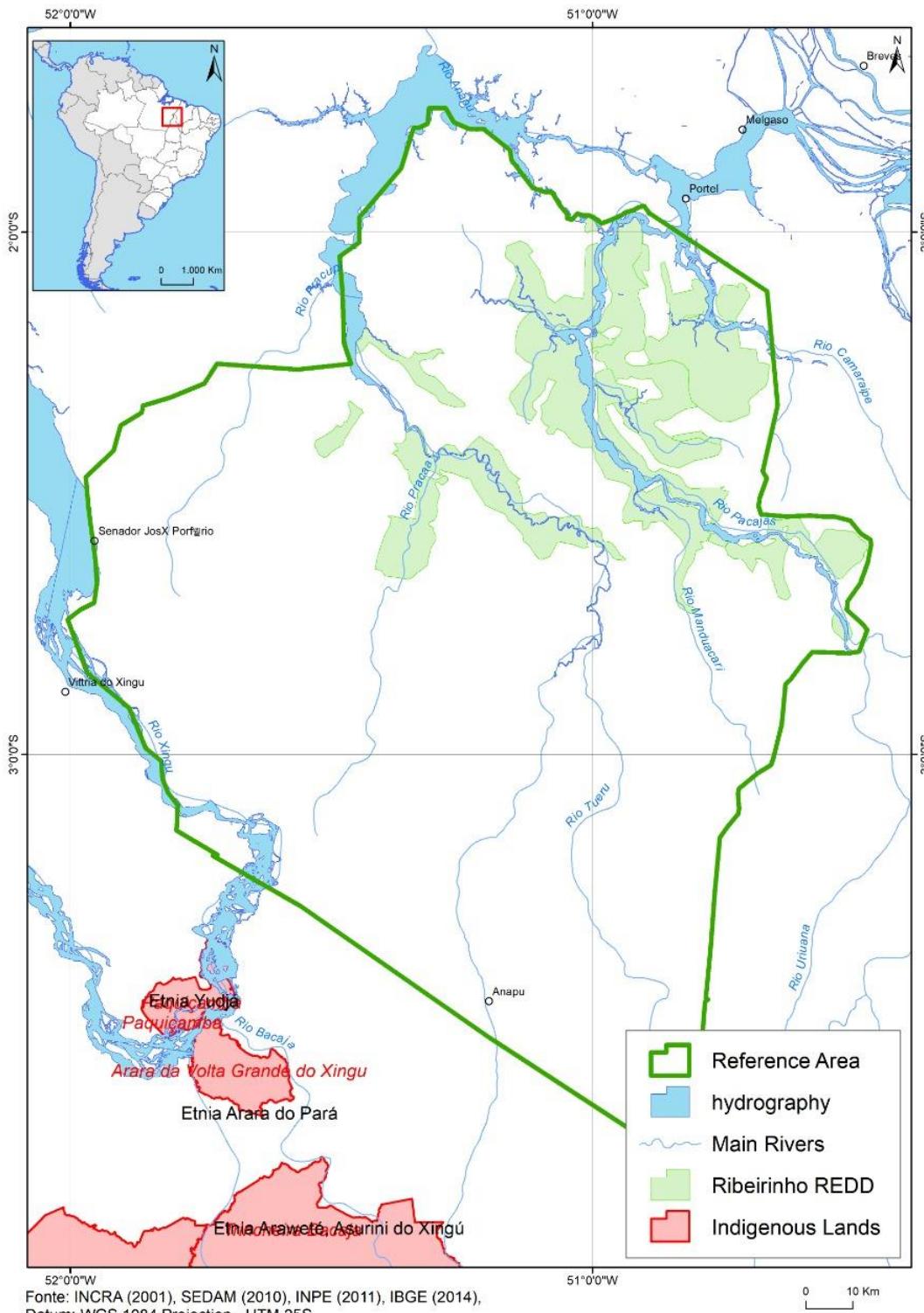
There were no isolated households as the project team went to each point, no matter how remote using a motorized canoe known as a *rabeta*. The project owns 4 rabetas that are pulled by the larger boat.

It is important to remark that the definite census protocol was defined after the validation of the project and included an extensive development of each one of the activities, protocols, annexes, formats and tools to be used as well as the designation of the direct responsible people for the activities and results.

Indigenous People in the Project Area or LMA

As for indigenous groups, according to official information from FUNAI (FUNAI 2012), indigenous lands recognized by FUNAI are not present in the Project's Boundary or Leakage Belt (see Figure 14). Therefore, the project did not involve or affect indigenous people.

Figure 14: Indigenous Lands near the Project's Area and RRD according to official FUNAI database



Based on official information from FUNAI available at <http://mapas.funai.gov.br/>

The smallest administrative unit at which population information can be found is at the sector scale, which is smaller than municipalities but still comprises broad divisions of the territory. Sectors are smaller administrative units known by ID codes designated by IBGE.

Population in the project zone is completely rural (the only urban center is in Portel city, capital of the micro region of Portel). Population in the micro region of Portel is classified as belonging to sectors. Sectors have been defined as registry units by the 2010 census (IBGE 2011).

Figure 15 showing: IBGE as 52,172 family members for the municipality.

População

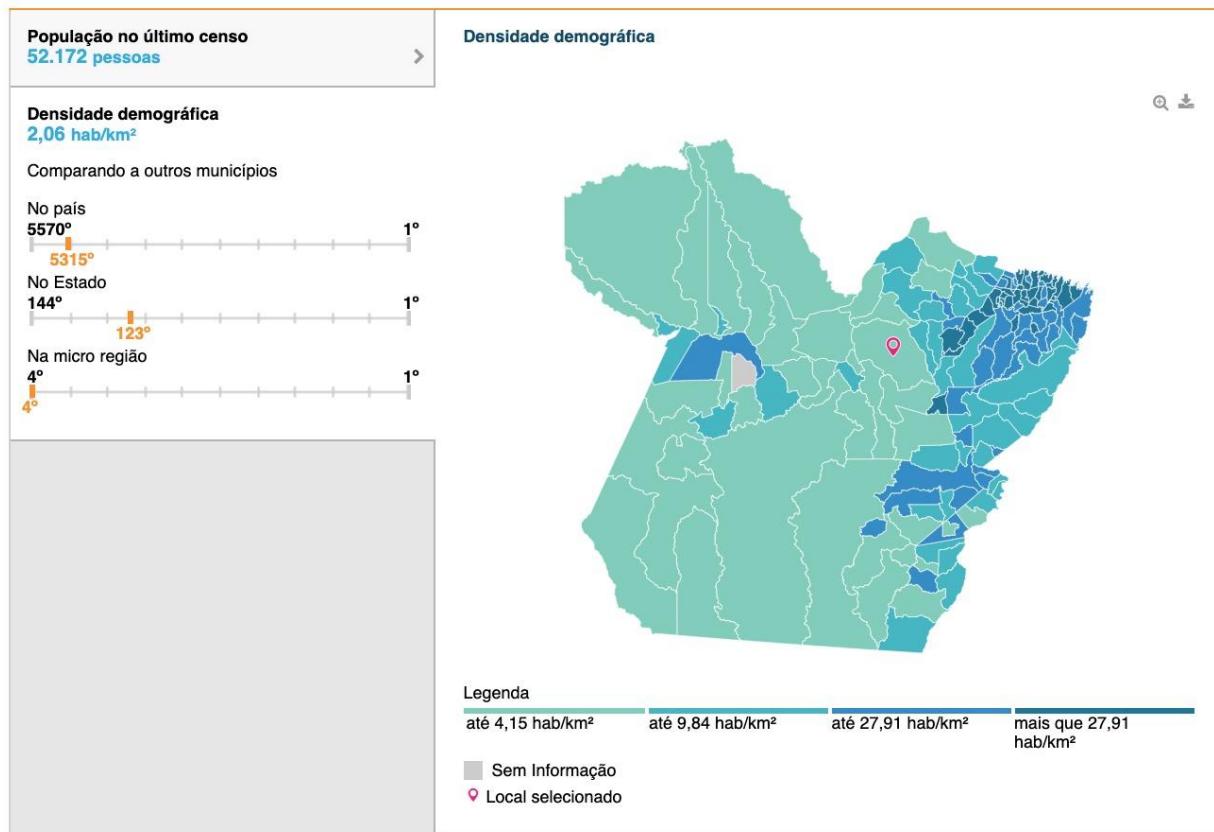
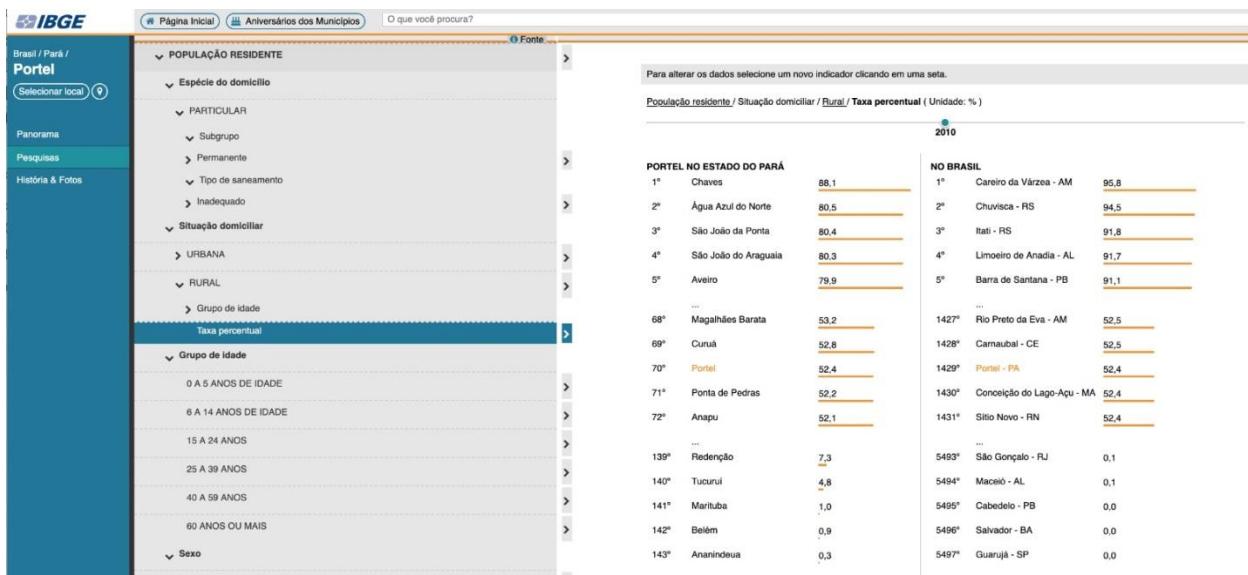


Figure 16: showing 52.5% of the population is rural population.



Population for the municipality is 27,320 for rural areas. The core area is closer to the city, so the population density is more than in some of the remote areas.

Impacted population is distributed along Anapu and part of Pacaja rivers.

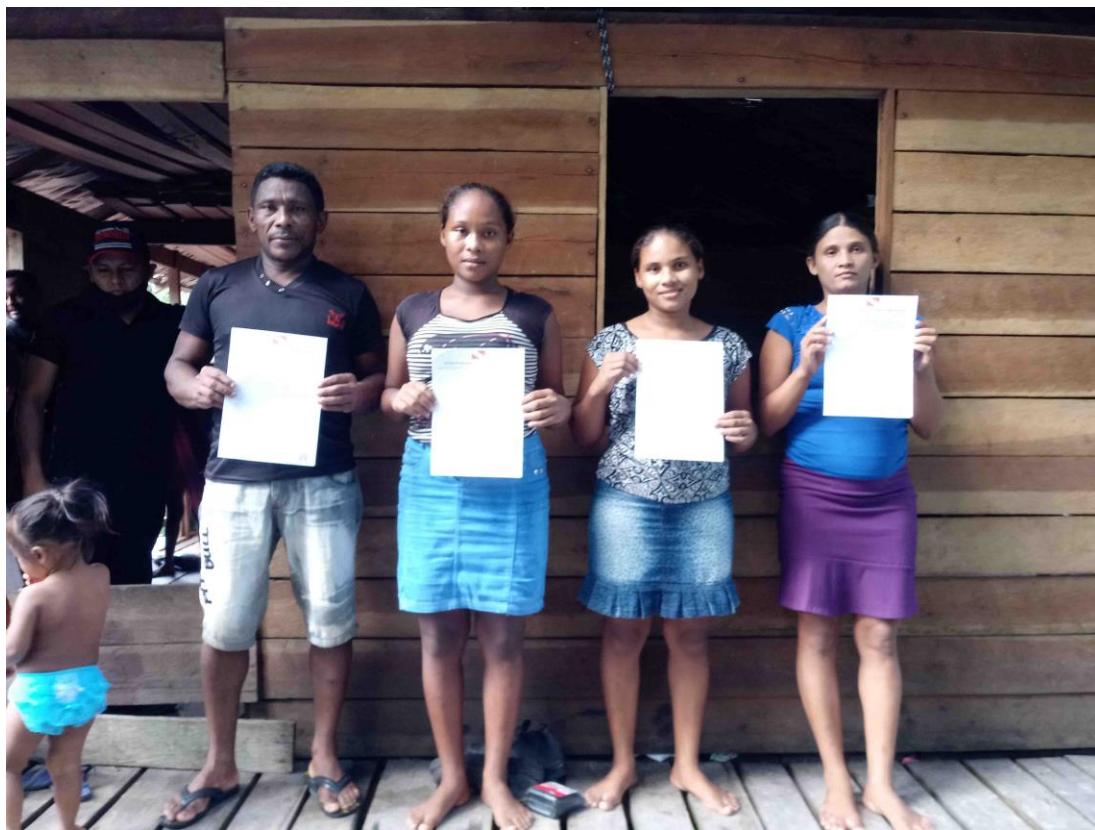
Picture 7: House Hold Structure of Riverine



Picture 8: Riverine House and family



Picture 9: Four different Riverine Families holding up the declaration agreeing to the project.



Picture 10: Riverine person in front of her house

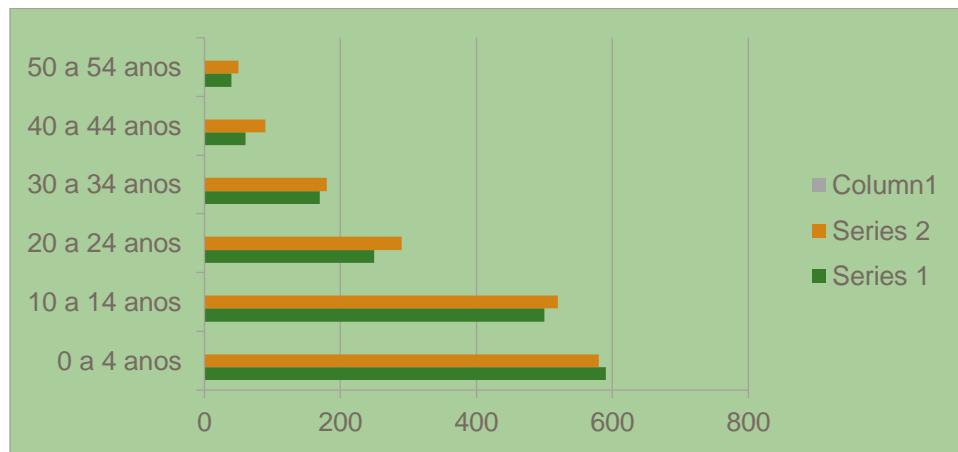


Stakeholders involved living in the Project Area, in an area that is between the river shore and the project area. Total population in this area is approximately 2500 people having a demographic density of 67 person/km² according to the latest demographic census at sectors level (IBGE 2011). Though most of the houses are directly along the river, leaving a large forested area for purposes of the project.

Population by gender and age group. The gender distribution by sectors in the project area is 52.7% male and 47.3% female.

The population pyramid has a wide base (especially women). This is explained by an absence of young people caused by a migration from rural areas to urban centers to assist to school (mainly to Portel city).

Figure 17: People by age groups

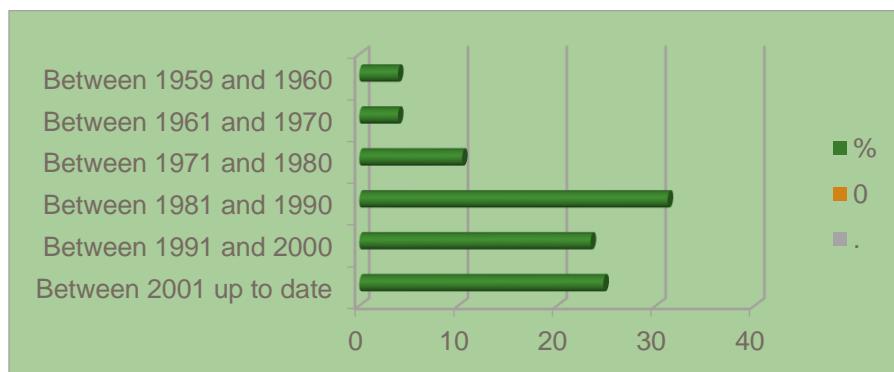


Generally speaking, households are composed by few households (between 1 to 13 agglomerate houses) with an average of 4 people each. With neighboring houses of the same family next door. Rarely is there a neighboring house of non-family relations.

From the total population, it was decided to treat each household individually, in order to force the project to have closer relations to the specific family and to allow the project to better understand the needs of specific households instead of generalized activities.

There is an increasing trend towards population growth because of immigration to the project area. Occupation of the project area by riverine date to 1950, showing an increment in population from 1971 to 1980 (10.4%), and then increments in each decade from 1980 to 2010 of 31.2%, 23.4%, and 24.7% respectively. When asked about emigrating, 81.2% will not do it and 18.8% will.

Figure 18: Year of migration to the area



Local Economy

In the project area, the main economic activity is cassava growing. Cassava is processed and commercialized as farinha in Portel, the price is 50% to 75% less expensive in Portel, than in Belem for the same product, thus commercialize this crop has not brought increases in living standards for the households.

Households perceive income from the following economic activities according to our PRA: 62.1% of households live mainly from agriculture, 18.2% has specialized in farinha production, 4.5% declares to receive money as retirement payments from the government and 6.1% receives income from sporadic timber extraction and sale, 9.1% of the population have no income. All females receive some form of welfare income of approximately USD 100 per month.

For context, farinha is produced through a set of steps. These steps are:

a. Cassava growing: Cassava is an annual crop, the first clear cut activities happen in October and planting happens in December, and in some cases where re-planting is necessary, it happens in July. A single plot can be productive for one year or maximum two years, and then is abandoned to let it rest for three to five years. All the members of a household participate in these activities.

Local stakeholders differentiate two main types of Cassava, the one commonly called Cassava (cultivated and processed to make farinha), and the other called Macaxeira, that is cultivated for direct self-consumption. All farmers surveyed indicate to grow these two species, which are complemented by corn, banana and cane.

Picture 11: Cassava plot processing



Cassava farming requires little investment, inputs and mechanization, which make this activity highly dependent of labor. Operations that require more labor are: planting, weed removal, and harvesting. Cassava is a wild and resistant crop that can grow in low fertility soils. In one single plots, it is common to find Cassava that presents different growing cycles (short, medium and long growing cycles). As Yam,

Cassava does not have a defined ripening period thus, after eight months; one can harvest it according to necessity.

Each farmer handles between 2 to 3 fields which are used according to the household labor capacity. Agricultural fields are measured in “brazas” (equivalent to the height of the farmer rising his arm holding a machete; a braza can measure between 2m and 2.5m) and areas are measured in “tarefas” (1 tarefa = 25 brazas x 25 brazas = 2500 to 3900 m²).

b. Farinha processing. Farinha processing starts right after harvesting (farinha quality is strongly correlated to this fact). Processing starts by soaking or washing the Cassava (which is done on the river shores), followed by peeling and shredding it to turn it into starch (which is done in a specific place within the house). The next step is to press the starch to dehydrate it. Then, the dry starch is cooked in an open oven where it's hand-tossed until it reaches the desired point. The final step is packing, for which an empty oilcan is used as a measurement unit it contains 30 kg of farinha (Picture 12).

As for the energy required to prepare farinha, for each work day, 6 feixes are used (feixe is the local name for a package of fuel wood and each feixe contains approx. 8 kg of fuel wood) which adds for a total of 48 kg of fuel wood for one farinhada (the process of making farinha). Each farmer makes two farinhadas per week gathering fuel wood.

Most of the farmers collect fuel wood from their own lands without travelling more than 1 Km (31.6%) while others travel up to 3 km to gather fuel wood (14%). Others (21%) just cover sort distances (150 meters on average). Fuel wood is collected mainly on forests perceived to be under control of the farmer.

Picture 12: Child processing of farinha in the project leakage management belt



Picture 13: Riverine person processing farinha



According to Ramos (2001), each 1 kg of farinha produces 0,2 kg of coroeira (farinha process wastes that are fed to chickens and ducks) and requires burning 2 kg of fuel wood. In general, a family (4 members) can produce 40 kg of farinha in one working day (8 hours).

c. Farinha commercialization: Some local people in the project leakage management area sell farinha to traders that travel along the river. Other people bring the farinha to Portel, for sale in the local market.

The project brought anthropologists to the project area. A common belief in scientific papers and publications is that the riverine barter one product for another product they do not produce. This was determined to be false in the region of Portel, Para. All riverine grow cassava and thus no one is going to barter cassava for cassava.

The PRA indicates that the monthly income from farinha sale is about 600 Reais that come from selling 20 fardos (packages) of farinha per month (on average 5 fardos per week). Households sell each fardo of 30 kg for 30 Reais. These amounts are variable and depend on market prices and family production/consumption of farinha.

The second economic activity in the project area is small scale extraction and sale of wood, where households can either work independently and sale wood to larger companies that visit the area or work directly for such companies. One survey carried out in the influence area reveals that 13% of the households incur in timber extraction as a second economic activity.

In the project area, timber extraction was an important activity that was undertaken in most of the households around 5 years ago. This is because of the presence of large timber extraction companies that would employ local households as workers to extract timber, given the lack of qualified work force in the area.

Past timber extraction can be verified in many households by the presence of unpaved roads (locally known as estradas).

Local households in the project area do not have local businesses such as restaurants, lodging facilities, drugstores, etc. The PRA shows that 70.0% of the households do not have a secondary business and that 27.7% of the households considers farinha sale as a lucrative business.

The PRA shows that average monthly income in the project area from agricultural activities is 269.7 Reais (ranging between 60 and 1000 Reais), the average revenue from farinha production is 434.3 Reais (ranging from 90 to 1,200 Reais), and the average revenue from timber extraction is 862.5 Reais ranging between 150 to 1,800 Reais).

The minimum legal salary in Brazil starting in 2020 is 1045 reais per month, thus local households are below the minimum salary line (except when wood sale happens).

Farming Activities

As mentioned before, households in the project area have agriculture as main economic activity and the main crop is Cassava.

Plots are traditionally prepared by slash and burn technique having as final product Capoeiras (cleared lands ready for sowing). This technique includes making fire barriers to prevent uncontrolled forest fires. In order to sow beans, slashes happen in May and to sow Cassava slashes happen in June or July. Slash and burn happens in August and planting starts again in September. In the case of corn, planting happens in November and December. Many households associate Cassava with Corn crops.

Picture 14: Slash and burn in two agricultural fields



About agricultural land ownership, only 45.6% of all surveyed farmers indicate that they somehow have rights of ownership on their lands. However, after further review the rights are pieces of paper that correspond to no government database that the project could find. All households requested "updated or correct" documents for their land. The project has since provided to all 875 families involved in this project the proper documents for their land.

Individual agricultural lands have an average extension of 2,923.1 m², with a medium of 1,000 m². Each land has large extensions of forested areas. In these forests, households do not conduct slash and burn. They would rather conduct slash and burn in order to open up small plots than sow perennial trees, as these lands are used and abandoned for a period of 4 to 5 years and then re-used.

On average each household has 3 plots, each one of approximately a quarter of a hectare. However, in recent years, the plots have been growing to be about 1 hectare. With the completion of helping each family gain their land, each family now has 70 hectares on average with a maximum of up to 400 hectares.

In all, 79.2% of the families grow Cassava, 1.3 % Corn and 19.5% do not grow anything. This last percentage is related to those who claim to not own land, with a difference of 3.9% corresponding to households that although claiming to own land, do not cultivate anything.

Products to be sold in Markets

Primarily Honey, Andiroba oil and Flour from Cassava. Rice is not currently grown in the region and is the main import crop.

Many of the households complement their diet by growing other products in small fenced in gardens. Such products include cabbage, black pepper, sesame seeds, pepper, chili, eggplant, tomatoes, chicory and basil.

It should be pointed out that not a single household in the project area undertakes cattle ranching activities as shown by the surveys and the PRA. The local rural workers syndicate has imposed a rule upon the local population to not have livestock of any type.

Forestry Activities

The PRA shows that most of the households (82.4%) do not claim to be owners of forested land. Although not owning such lands does not mean they do not extract timber from it. Most of those who claimed to be owners of forested land do not have titles or any proofs for that matter to support such ownership. However, the project has helped the families gain this forest area as part of their land tenure documents. The land is better held in the hands of the riverine than in the hands of a land grabber moving into the region. The project focused on making sure that all households gained a significant area of land, in line with what other Brazilians would do, the technicians were instructed to place the rear area of the riverine areas land right up against the next nearest private property that is registered with INCRA, the federal land agency.

Households in the project area extract timber mostly for self-consumption (raw materials for construction and one or two trees per household per year for sale). They extract timber in areas they claim are under their control or under communal control. The illegal loggers will pay R\$50 reais for trees that may fetch up to 10,000 reais in Belem the state capital, which although it is illegal for both parties to perform this extraction, it is not reasonable for the riverine, and the carbon credit project should help end this practice as the income from carbon credits will be much more lucrative than selling a 10,000 reais tree for 50 reais.

Even when local households do not extract timber at medium or large scales, they do have knowledge and experience on timber extraction, this is because of the extractive history that these communities have. For this matter, only 17.6% of the households state they extract timber, with the most extracted species being (in order of importance): Acapu, Macaranduba, Cupiuba, Itauba, Piquiá, Sucupira, Guariquara y Tarú (peca). Timber extraction by riverine and traditional rural villagers is not significant as it happens at a subsistence level.

Those who sell timber state they do so out of necessity and their main selling points are the same households (buyers are illegal loggers who buy for cheap and basically rip off the local riverine and traditional rural villagers).

On the other hand, although most of the households do not extract and profit from timber, they do extract and profit from other forest resources such as: Acai (66%) and Brazil nuts (57%) as main products, followed by Abacaba (7.3%), Copuacú, and Cipó (with 5.6% each), and other resources (12.1%) such as oxi, piquiá, bacuri, abacaxi, andiroba, buriti, jamoba, miriti, fruits and medicinal plants.

Most of the households collect Brazil nuts for self-consumption (starting in December and ending in March) and for some sporadic sales in Portel. Despite the fact that this product has a good selling price (1 can has a price between 10 to 12 Reais), it is not very common to sell this product due to the high transportation cost to Portel and the lower production costs of bigger producers.

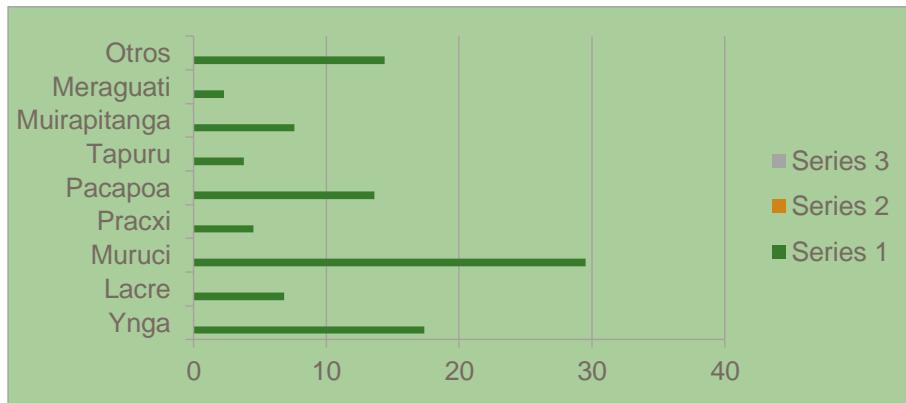
Hunting is an activity that happens intensively and frequently in the forest (on average, hunters cover up to 3km from their household). However, the PRA indicates that nowadays households hunt less because it's harder to find preys due to human intervention such as invasive and logging activities.

The PRA shows that 57% of the households have a high hunting frequency (every day 33.8%; each week 22.1%). Regarding hunting places, those who hunt state that 28.6% of the hunting takes place in the forest of their property, 5.2% hunt in common household areas and 14.3% hunt in other households. All of those who hunt state that they do so only for self-consumption.

Among the hunted species one can find (from most to least hunted): tatu (armadillo), the paca (majaz), the venado (deer), the cutia (rodent), the jabuti (turtle) and the porco, catitu, guariba, anta, macaco, námbu, among others. No other species have been identified by the hunters, which may reflect the low availability of fauna in the areas nearby the households.

Firewood comes mainly from the residues of the clearing cuts before applying fire to prepare agricultural plots. Firewood is used exclusively to produce farinha. According to the PRA firewood is collected by most householders in their agricultural plot (76.7%), in the standing forest in their agricultural land (5.8%) and in other people's forested agricultural land (5.6%). It's important to take into account that households would not collect firewood from a source farther than 3km from the river shore.

Figure 19: Wood species used for firewood



Social Organization and cultural identity

All households are agglomerations of small families and are organized according to religious beliefs. Some households can be catholic and others evangelic (in the project area there are 6 catholic and 3 evangelic households). According to the PRA, 80% of the people in the households are evangelical. An evangelical wave has spread over the region in the last 10 years, resulting in multiple evangelical churches/shacks being built in the project area, thus converting the local population since there is a church near their homes.

Churches are the meeting place for each household and it is there where interest topics for the community are discussed. In the case of each religion, the person that offers the mass acts as a local leader as well. In some cases, illegal loggers will bribe or even place the local church leader on a salary in order to coordinate their illegal extraction and convince the population.

The church is an important system of support for the towns. From Portel, there are coordinators for rural sectors that support the formation and registry of the communities' affiliates. First, the leaders go to the Church of Portel, from where they request support, and soon thereafter they go to the municipal prefecture. This is the reason why the settlers of the populated centers do not count on a variety of social organizations; to a certain extent because the system of communal organization based on religion is moderately effective and efficient. In the Project Area, there was only mention of the Retirees Union, the Fishing Associations and the Association of Riverine.

Infrastructure and Services

Households. In the Project Area, have the following characteristics: 100% of the residents own their own house. Houses are mostly wooden plank constructions processed by chainsaw (not sawn).

Appliance distribution in households is: 37.7% of residents owning a radio, 42.0% of the local population having TVs, 62.3% having a gas stove and 16.9% of residents owning a refrigerator.

Drinking water. Local population uses water from rivers and streams as well as groundwater. In the project area 47.8% of the families mentioned draw groundwater (through artesian wells) and 52.2% from streams and/or rivers. With regard to water quality, 73.9% of respondents mentioned that the water is clean, 15.9% said it is muddy, and 10.1% said it contains debris.

Drinking water is not treated, and in some towns several illnesses associated with consumption of contaminated water have been identified.

Urban wastewater is eliminated in the backyard and in the local creek or river. The sanitation system is negligible, only 10.1% of households have a silo at home and 89.9% make their hygienic needs in the field or forest.

Energy consumption. None of the families have public electricity service. Families get electricity by using a diesel-powered electric generator.

Food cooking. Most families use gas stoves. Very few households use firewood for cooking, wood is used principally and almost exclusively for the preparation of farinha.

Education. Proper educational services are highly demanded by local households. The city does provide a boat to pick up students and bring them to a nearby school, but the quality of teachers is low and commuting is a major issue. The quality of schools is a disgrace even by Brazilian standards, the school system is one of the worst in Brazil.

Health. Most households in the project area have no health centers; households have to be assisted in the health center of Villa Monte Horebe and Santo Amaro. The only public boat service to the city of Portel from the project region is from Santo Amaro and only on Sundays.

2.1.7 Project Zone Map (G1.4-7, G1.13, CM1.2, B1.2)

The Project is located in the northwest of Brazil, in the State of Para, micro region of Portel, municipality of Portel. Project area nestles between 2°13'47.53"S Latitude and 51° 4'7.06"W Longitude. The main transportation mean to arrive in Portel is by boat. The trip takes approximately 12 hours from Belem. It straddles the river basins of the Amazon River in the region.

Figure 20: Boundary of the Project Area in yellow.

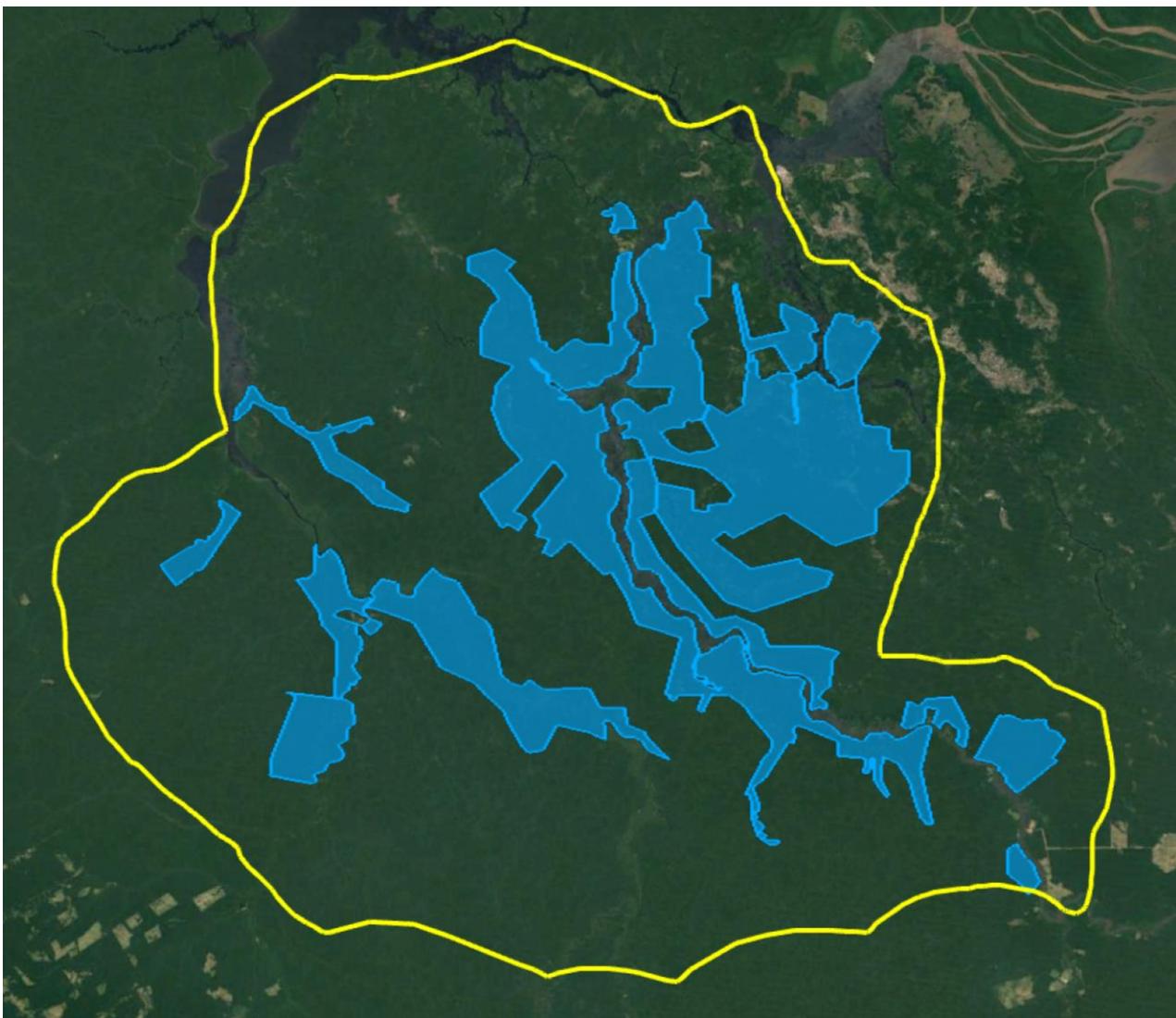


Figure 21: Location of the project area map

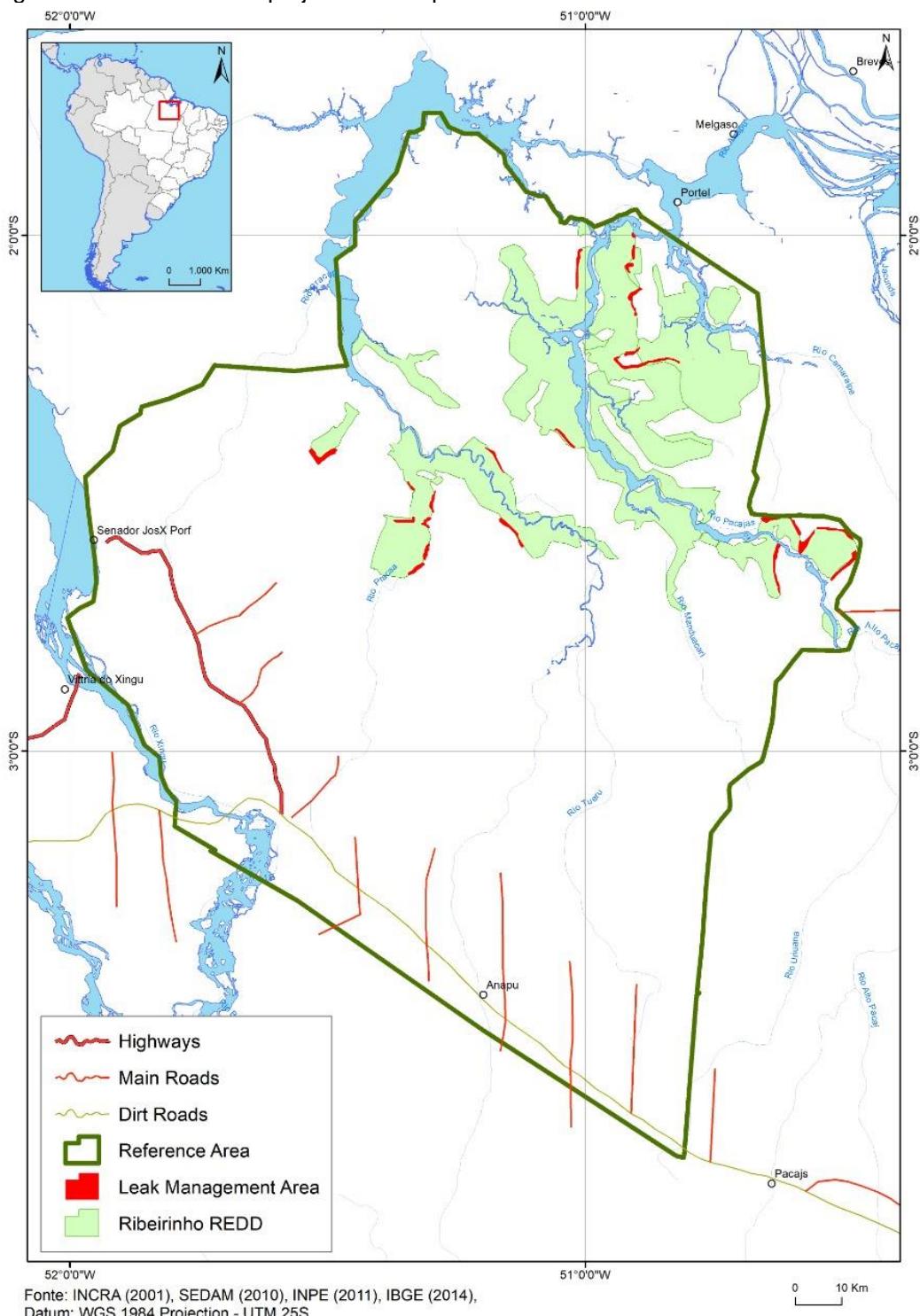


Figure 22: Map of Project Area showing project boundaries, location of communities (identified in Section 2.1.9), and High Conservation Value (HCV) Areas (identified in Sections 4.1.3 and 5.1.2).

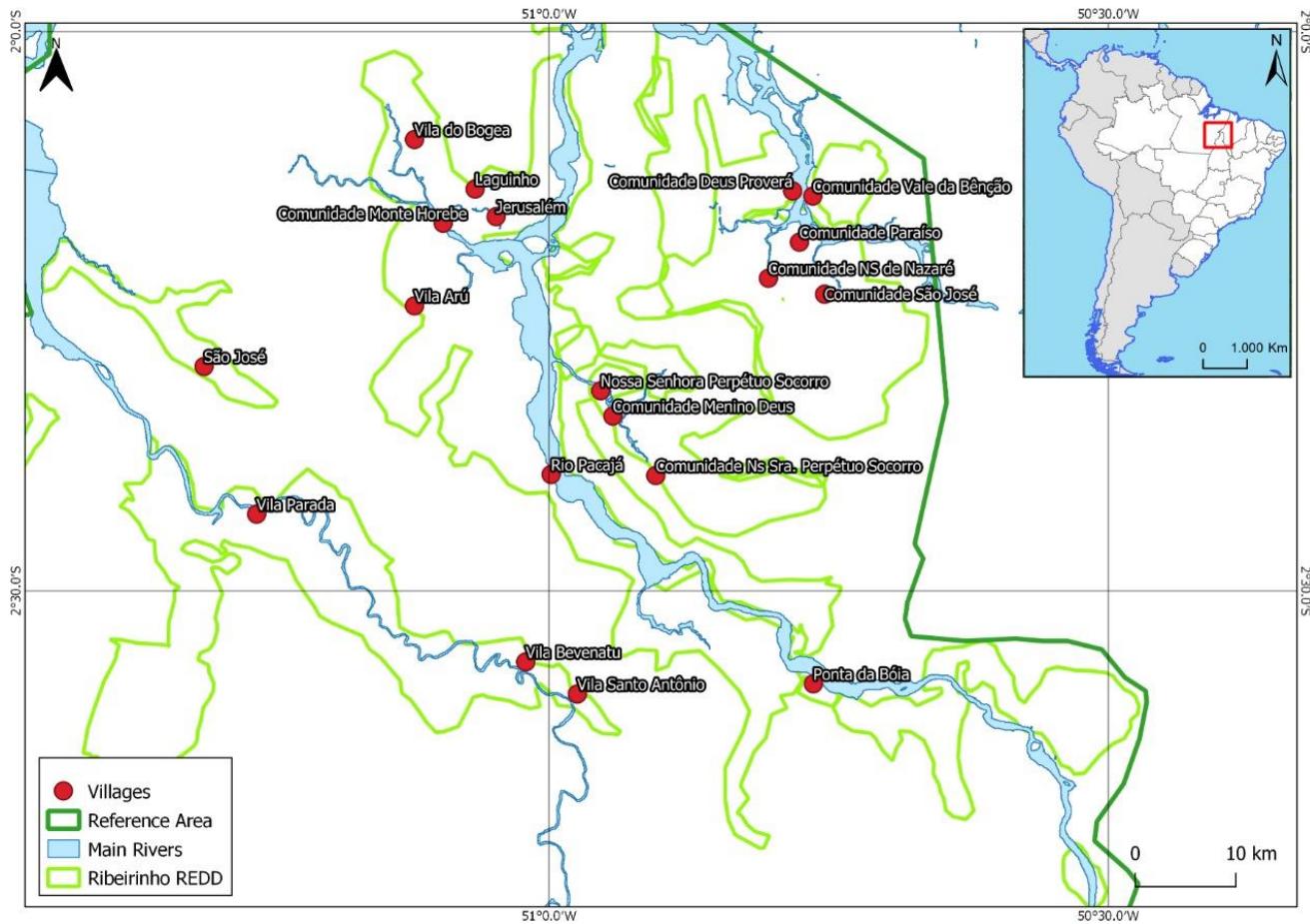
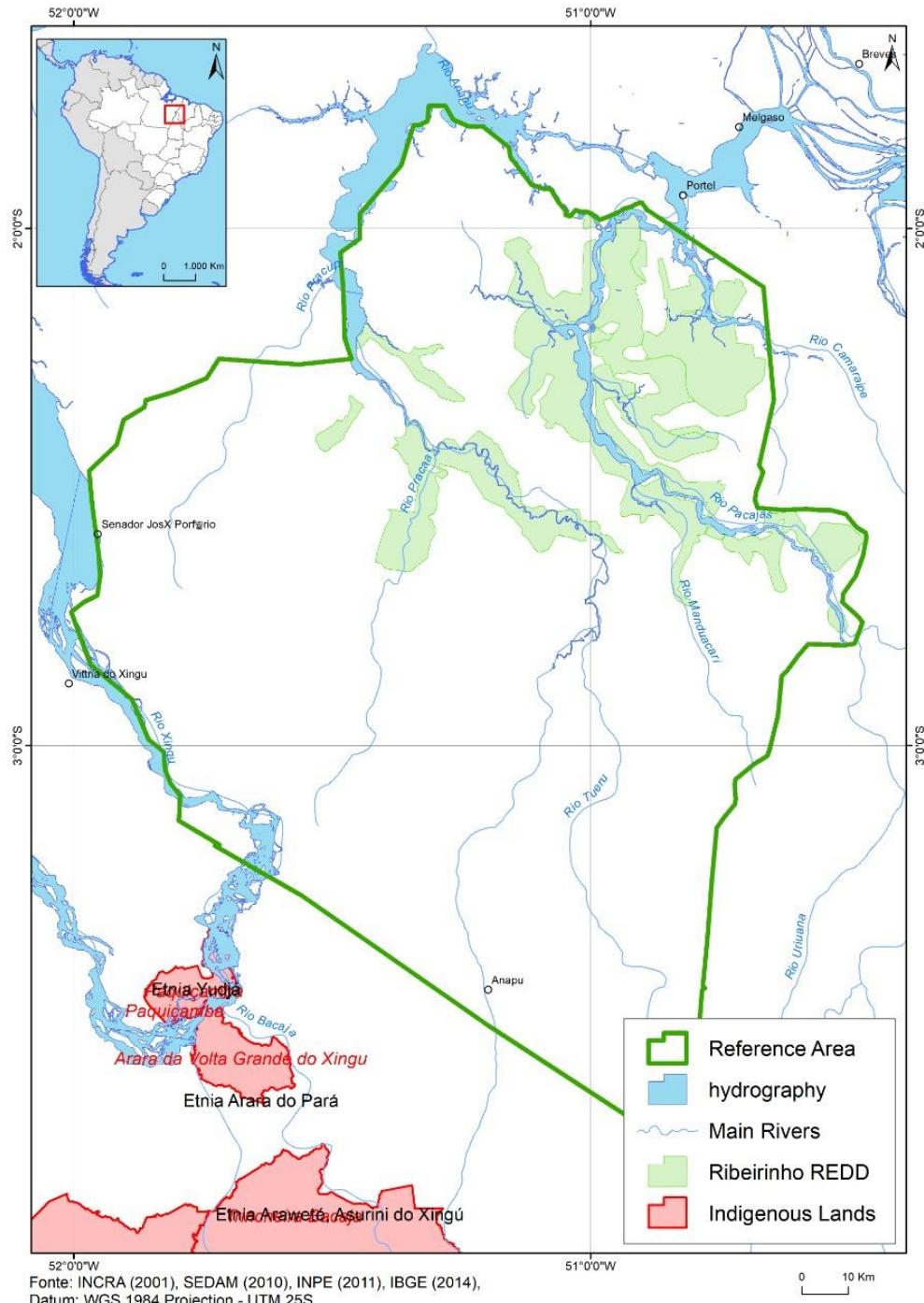


Figure 23: Displaying indigenous communities outside the Project Area



2.1.8 Stakeholder Identification (G1.5)

The process to identify the stakeholders was completed by identifying everyone who lived within the project area and leakage management area via census work. All people identified can be quantified as Riverine people and traditional rural villagers. The riverine people and traditional rural villagers are two groups, male and female, with varying degrees of needs and outcomes from the project.

The riverine people and traditional rural villagers are classified as a traditional people by the government. There are no other types of people within the project boundary, or leakage management area. The community group is all related to each other and people are 1st, 2nd, 3rd, or 4th cousins. They are, sisters, and brothers, and brother-in-law and sister-in-law. It is a giant interconnected family in the project area, all classified as one community by the government.

This committee is a proposal that emerged from the initial analysis of the involved stakeholders related to the project, the ones potentially interested and the actors that maintain a recognized influence in the zone. This committee was formed at the beginning of the FPIC process and would be in charge of the participatory and independent surveillance. Currently, the Syndicate of Rural Producers coordinates the committee's work for the project and decides the best use for the funds.

Its conformation was defined through a process to raise public awareness, dialogue and negotiation. This committee should also try to incorporate an even number of representatives from the civil society and governmental institutions. The committee must include representatives from:

- The National Environmental Authority, such as the Ministry of Environment and its entities involved in the Project
- Local and Provincial authorities: municipalities, council, government, police, church
- Population settled within the limits of the project – the Riverine people
- Civil society organizations
- Organizations invited to contribute in the process: public programs and institutions

Currently the committee is comprised by the local government, secretary of education, mayor, and respected and proven NGO's such as UNICEF.

The committee was a participative, inter-sectorial consultative body that watched over an appropriate implementation of the project and its members, and has the capacity to deliberate and decide over the affairs considered in their statutes and regulations.

The members of the committee did not receive any sort of economic retribution or recognition for their participation and assistance. The project did provide logistical support to these councils in order to complete their functions.

2.1.9 Stakeholder Descriptions (G1.6, G1.13)

Below are the listed stakeholders identified as anyone who lives within the project area or leakage management area of the project or have stake or direct & indirect impact on the project.

- 1) Riverine people: They are described as traditional people in Brazil and are all characterized as Riverine people. Their communities are located on the riverside and dry land areas in the region's forests. There are two community groups: female and male.

The females raise the children, cook and take care of the household, and are normally the leader of the family. While the men fish and tend to the Cassava patches of approximately 1 hectare per year. Two distinct community groups with mostly separate participatory roles in this group.

The riverine people are a suppressed community group that is under-educated and thus are open to abuse by both illegal loggers, land grabbers and even leaders of the community that are making agreements to allow illegal loggers to cut, in exchange for sub-par fees. The main abuse that this community group faces is the deprivation of property rights. The government has numerous major initiatives to provide property rights to all, however the representative bodies in the region have told

their riverine constituents that these programs are tricks to take their land, and that no one should trust these programs. This false narrative is also used against the private property owners, stating that they are not allowed to own land in the region of Portel.

- 2) Traditional rural villagers: These primary stakeholders would be considered the impoverished communities, living in rural villages, that are directly adjacent to the project area. These community group stakeholders listed in this section are directly targeted to be impacted by the project. Each forest block, of the project area, has focused on 2 or 3 villages directly adjacent or nearest to the project area.
 - The village is the group of population in a rural area.
 - Within the village is the community.
 - Within this community are different community groups: (1) male, (2) female, (3) children, (4) teenagers.
 - The male and female are direct beneficiaries and directly impacted by the project as they are the adults and interact directly with the project and benefit from this.
 - The children and teenagers have an indirect benefit and impact from the project as they are the children or teenagers of the direct beneficiary male and female community groups. These directly benefited groups, as stakeholders, are affected and impacted in different ways by the project:
 - Primary relationship between the female community group and the project stems from the project providing an eco-cook stove that was distributed and will improve their cooking conditions.
 - Primary relationship for the male community group within the village comes from the jobs working in the property, agroforestry training and adult education if requested as a benefit of working in the project area. The male and female community groups have a direct, and purposeful benefit from the project.

The following villages contain the community groups (male, female, children, and teenagers). These 15 villages have been targeted by the project, to bring direct and purposeful benefits, with the ultimate goal to help the community groups in the villages to move into the rural middle class, have better skill training and be able to provide better future for their children and teenagers:

Vila Do Boga
 Monte Horebe
 Laguinho Vila
 Vila Aru
 Jerusalem
 Nossa Senhora do Perpetuo Socorro
 Meniono Deus
 Sao Joao Batista
 Rio Pacaja
 Ponte da Boia
 Sao Jose
 Vale da Bencao
 Paraizo
 Nossa Senhora de Nazare
 Deus Provera
 Parada
 Bevenatu

Santo Antonio

The villages are typically broken into 3 and up to 13 houses grouped together next to rivers. In some cases, there are no schools, in other cases there is a government-run one-room school-house with no bathroom, no doors, and a roof that leaks. Each village has a village leader. The children are expected to go to the bathroom in the bushes behind the school.

In each village 1 person from each household was interviewed. In the interview the primary focus of the head of household was to have more money.

The villages are different from the ribeirinho (riverine community group) and traditional rural villagers. They are usually all related to the rural riverine group in one generation. In the case of traditional rural villages in the Amazon, they resemble several separate families more closely, although in some cases it may be a group of several families related by marriage to each other.

Within the villages are the children community group which has a direct impact. This children community group will also gain benefit when the new schools are complete. The schools provide a better education than that of the government run schools in the area and have proper facilities. Therefore, the children that attend the school are stakeholders.

- 3) Other workers and their families: other workers and families living within the project boundary and leakage management area are stakeholders. These people are not from local villages. They would be considered the working poor from a city that are trying to see if they can live the ribeirinho lifestyle – off the grid.

 - 4) Neighbors: the neighbors have been consulted and informed of the project. These include the neighboring farms and their workers and technicians. The neighbors would be considered an indirect beneficiary of the project. Upon completion of the current project, the validation for a grouped jurisdictional REDD project is to start involving these neighbors. Thus, the neighbors have an indirect benefit by the project's success. However, they are not the direct beneficiaries and not a community group but a stakeholder with a strong potential benefit from the project.
- **Direct stakeholders:** Project owners, investors that lent funds for the start of the project.
 - **Institutional Stakeholders:** Mayoral office of the Municipality of Portel, UNICEF
 - **Commercial Stakeholders:** Associations, businesses that will help supply materials for over 30 schools.

The project brought cook stoves, did training on other crops besides Casava and produced the land tenure certificates known as the Cadastro Ambiental Rural (environmental certificate) to demarcate their lands. The local population hopes to gain further benefits by joining this project and keeping out the illegal loggers. With the local riverine people and traditional amazon villagers having their land rights then they are less likely to be displaced by the drivers of deforestation and illegal logging.

Riverine community and traditional amazon villagers are all interconnected by each river affluent, thus cousins, uncles, aunts, and so on, have houses somewhere along the river. They have intermarried with each other. It was about 1 family per river branch that came to the region. They produced off-spring and

such off-spring married the offspring of other riverine families in the same region, thus all the current families can be traced back to 15 original families that arrived to the region in the 1950's as former rubber tappers.

The PRA was developed through a series of field visits, observations, surveys, workshops and interviews to local leaders and experts whom were informed about the project idea, its activities, the potential benefits to the communities and their participation in the project. To complement field information, the team used secondary information from IBGE's 2010 Census.

Picture 15: Surveys and one-on-one interviews on the boat



Picture 16: Surveys and interviews one-on-one applied to leaders of households



Picture 17: Survey Team with local riverine in one of their houses, going through the project in detail.



Carrying out meetings and one-one one discussions has been one element of great relevance for the design of the project in PRA. The households were informed about the project idea and the potential benefits for the communities and how their participation would be throughout the entire process. Likewise, ‘speaking maps’ were constructed in a participatory manner in each one of the workshops, which has allowed the households to face and describe their current life conditions identifying the main existing problems and the future conditions they would like to have in a situation where the project is being developed.

Picture 18: One of the teams in the field



The tool of elaborating a ‘current map’ and a ‘future desired map’ in each locality has allowed the population and Ribeirinho REDD+ Project to clarify the needs and expectations of the local community in comparative terms to how they are and how they picture their communities in the future.

The goal of the project consultant is to focus on trying to achieve 100 years of progress and sustainable development over the next 5 years, which can't be done without this and other carbon credit projects in the region.

Each head of household participated in Cook stove receipt, Land Tenure paperwork and survey process of the household property, as well as Agroforestry training.

Each household was surveyed one-on-one to determine the critical issues faced by that specific household.

In addition to this, each household signed off with the Free and Prior Consent to want the carbon credit project. 5 households deemed to be in ideal locations for Fauna Monitoring were trained to be able to monitor the fauna.

To complete the survey (and gain support to do the project), the team had to request the ID document of the riverine and traditional rural village person, as it was needed in order to enter the survey work into the government system for each person.

The information gathered in the field work through the tools mentioned before, especially the needs and problems pointed out by the leaders and local households, has been the basis upon which the proposal for

the activities of the project has been developed. The project staff believes that it was better to reach the households with a clear open mind in order to understand local needs and shape the activities based on the results of the PRA.

For this matter, project activities were conceived right after the social evaluation and not the other way around. Thus, local settlers not only have participated in the design of the project but have indeed provided inputs to Ribeirinho REDD+ Project staff for such design.

The following table shows the main problems, priorities and necessities identified by the *population in the workshops and interviews to the local leaders*.

Table 4: Main problems, priorities and necessities identified by the population

Main identified problems	Identified priorities
<ul style="list-style-type: none"> • Land Tenure issues, insecurity, and instability • Low family income • Limited work opportunities • Increased difficulty to get resources from hunting and fishing • Low training levels in relation to agricultural activities • Limited knowledge and training on productive activities alternative to farinha. • Low training levels in the organizations for communitarian management • Low levels of citizen participation in communitarian management • Unsafe water consumption • Limited access to health services • Limited access to education for children • Limited access to communication 	<ul style="list-style-type: none"> • Funding and coordination to gain Land Tenure certificate • Access to job opportunities • Agricultural production improvement • Access to communitarian transportation means in order to facilitate access to Portel • New productive alternatives (fisheries and minor animal breeding) • Access to drinking water • Access to electricity • Access to health services • Access to communication • Access to education

Stake Holder Locations in the Periphery of the Project

The individual lots below are in white polygons, this area is the project area. The green area around it is actually private property from some large landowners. The green area is the Rio Anapu-Pacaja REDD project managed by Brazil Agfor LLC. Below are 120 families of over 1000 people that are involved in the project.

Figure 24: Individual Plots surveyed and demarcated by the project in the Jacare Puru River community of the project. The green is the Rio Anapu-Pacaja REDD Project.



Picture 19: Cement property markers brought to the port



Picture 20: Cement property markers at the port being brought to Portel by boat



The proposal for the project activities has been designed based upon the problems and priorities identified and pointed out by the households.

The project knows that the activities do produce an improvement in the quality of life of the local households in terms of strengthening their capacities and provide opportunities for the economic development of the families. Likewise, being aware that it is not the role of the project to cover and comply with the functions and competencies of the State, the project considers that the proposed activities related to organizational and communitarian managerial capacity building did provide enough skills for the community to manage their public services requirements before the correspondent authorities.

Clearly, the project has realized that lack of funds, lack of education, lack of healthcare, lack of knowledge, and lack of training can be resolved by the project funding the construction of 30 schools that have health clinics in them and can become community centers for both children education and adult training.

Additionally, the project has determined the creation of an additional fund to the budget in order to develop and implement project activities. The amount consists of 5% of the funds, going as direct payments.

2.1.10 Sectoral Scope and Project Type

The project corresponds to the VCS Scope 14, VM0015 ver 1.1 – Methodology for Avoided Unplanned Deforestation. The project aims to protect rainforest, which are expected to be deforested in the absence of the Project.

- *Sectoral Scope: 14 Agriculture, Forestry and Other Uses of the Land (AFOLU);*
- *Project category: Reducing Emissions from Deforestation and Forest Degradation (REDD);*
- *Project Activity: Avoided Unplanned Deforestation (AUD);*
- *This project is not a grouped project*

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

The Project aims to promote joint actions aimed at reducing greenhouse gas emissions resulting from unplanned deforestation and forest degradation, acting through activities such as intensification of land security and patrimonial surveillance, remote monitoring of changes in land use and cover, multiple use forest management and monitoring of biodiversity in conjunction with social activities, and promoting the incentive for local socioeconomic development on a sustainable basis.

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

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

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program.

Table 10 provides a description of the activities and the principal outcomes and impacts which will contribute to achieving the anticipated benefits of the Project to the Climate, Community and Biodiversity. The activities are divided in themes for better understanding, these are: Initial Studies, Forest Monitoring Intelligence, Technical Assistance and project development from Friends of the Riverine, Social Organization, strengthening of the Association de Ribeirinhos e Moradores de Portel, Community Infrastructure (Energy and Communication), Efficient Management and Transparency and Environmental Monitoring and Scientific Research. A brief summary of development of these activities and themes are described below:

Initial Studies:

Activities related to the initial articulation of the Project extend from the signing agreements with each riverine person, which defined the initial terms of a long-term partnership aimed at environmental conservation and socio-economic development in the region, to meetings with technical partners to present results of the project initial studies. This process involved the elaboration of bids for hiring specialists and meetings between the proponents and the specialists involved to define the scope of the project.

It is understood that the activities related to the initial articulation process are a broad planning agenda for the elaboration of management strategies of this long-term project and, therefore, represent a causal relation of impacts for Climate, Communities and Biodiversity. Among the results identified after the initial articulation there are: the reduction of emissions generated by the beginning of the implementation of the project management plan initially designed, the delineation of actions aiming to better deliver the community

needs and improve the assistance carried out by Friends of the Riverine, and the viability of new environmental studies that provided a better understanding of environmental issues in the region and the generation of long term positive environmental impacts.

The initial studies consist of those related to the production of the technical subsidies necessary for the conception of the project management plan. Among the studies carried out are: the survey of the forest Carbon Stock Estimation and the elaboration of the deforestation Baseline (which result in direct climate impacts), Socioeconomic Diagnosis and Consultation with communities (which deepened studies already done in the area and resulted in direct Social impacts), and the Environmental Diagnoses that, as well as the Socioeconomic Diagnosis, supported the construction of actions to ensure the proper management of agricultural areas, forests and natural resources giving base to activities proposed in the item "Technical Assistance" (specifically activities aimed at strengthening Family Agriculture and Sustainable Extractivism), resulting in direct impacts on the Communities and Biodiversity.

Forest Monitoring Intelligence:

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

According to the description of the Project, the objective of the Project for the climate component is to avoid the emission of 33,927,167 tons of CO₂, corresponding to the deforestation of 199,962 hectares, which will be avoided through the following activities:

- a. Surveillance of the area
- b. Monitoring of deforestation and forest degradation by satellite images and
- c. Socioenvironmental Activities

Social Organization:

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

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

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

With the completion of the schools expected for 2023, there is a cafeteria in each school where a wall showing all the benefit programs and laws will be listed, as well as the carbon credit project documents showing how each person can benefit and be self empowered.

Technical Assistance:

In this aspect, increasing productivity, insertion of new techniques and production technologies, such as implementation of agroforestry systems, and the search for a greater efficiency of current productive systems is very important for a transition from a conventional productive system that is being applied, with cutting and burning, to a low carbon agriculture, with more efficient and profitable production systems and with lower GHG emissions rates.

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

The project intends to foster activities that allow the generation of additional income for the communities (community management), as well as improving the management of the territory and the protection of the forest in the long term. Among the proposed actions, the main axis of action is the encouragement of community forest management, which should include the exploitation of timber and non-timber products, depending on the interest and needs raised by the communities. These activities are aimed at the low impact exploitation of forest resources, associating with the maintenance of the ecological balance, socio-environmental responsibility and economic-financial efficiency.

Community Infrastructure (Energy and Communication):

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

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

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

Therefore, efforts will be made to resolve this issue with a view to improving production processes and increasing production capacity in a wide range of areas: improving food, storing food in a refrigerated environment, and facilitating access to information through the use of cellular devices and televisions; which may make it easier to access information and events in the world.

The school complexes will provide free internet which will allow access to communication and data.

Environmental Monitoring and Scientific Research:

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

In conjunction with multiple-use-forest-management practices, the Ribeirinho REDD+ Project aims to monitor and provide for the maintenance of forest cover in the Project Area, ensuring the conservation and protection of habitats and species present on the site and thus generating positive net benefits foreseen for biodiversity in the Project scenario.

The detailed diagnosis in section 5.1 – Without-Project Biodiversity Scenario, demonstrated that the Project Area covers a diverse and rich biodiversity, in addition to having species of flora and fauna present in national and international lists of threatened species, which demand great attention. In addition, the area plays an important role as an ecological corridor connecting several Conservation Units in the region.

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

Through education, workshops and trainings from the project will provide more benefits in the monitoring of the biodiversity. After the schools are complete, 1 person could conduct the training over a 15-day period, 4 times a year for all the project proponents that choose to participate in biodiversity monitoring.

Table 5: Summary of the expected changes for climate, communities and biodiversity with the scheduled project activities

Activity description	Expected climate, community, and/or biodiversity			Relevance to the project's objectives
	Outputs (Short term)	Outcomes (Medium term)	Impacts (Long term)	
Improved Education – via construction of over 30 schools.	Better education for children. Better training programs for adults with more constancy, organization and better instructors.	Better chance for children to have more success in life. For adults, improved economy via the agroforestry training. For biodiversity, improved biodiversity due to the training.	Adult children that grew up in a 1 st class education system are now entering the world better prepared. For adults, hopefully highly efficient plots that produce high economic yield. For the forest, the need for cutting logs will be reduced as the families have productivity from Acai and black pepper.	Brings stability and helps the project meet development goals.
Improved Medical care - Basic Health Clinics built at each school.	Access to healthcare and medical care in times of emergency.	Access to preventive healthcare which is rare even by Brazilian standards.	Longer lives for the project proponents.	A satisfied population that will be pleased with the project.
Improved drinking water – the project is installing a water well at each house of the 875 families as well as 425 families outside the project area.	Prevention of waterborne deceases.	Less lost work days, which will help overall economy. Less child mortality rates.	Longer life expectancy for the general population.	A healthier population.
Capacity building via the already completed program Plots for the Poor – helping the community gain their right to the land.	Secured land tenure. Better understanding of the importance of protecting the forest and how forest conservation benefits their livelihoods. Opportunity to develop local businesses through an external fund.	Invasive land illegal activity is minimized and protection is enhanced.	The forest is protected. Illegal activities are minimized.	Improved forest management practices with community participation.

Improve local livelihoods for households.	Diversification of food through agroforestry practices. Thus, an improvement in local nutrition. More efficient technologies to produce farinha. Therefore less time is consumed in this activity. Generation of income from monitoring activities.	Improvement in agricultural practices and promotion of income from other activities.	Food security is increased. Positive impact on average income.	Improvement of livelihoods by capacity building.
Reduced GHG Emission Reduction and Removal due to the project Activities.	Brazil in general, in the short term, is seeing a large uptick in both deforestation, fires and illegal logging, as the president of Brazil is focused on destruction and degradation due to possible economic benefits. The project is reducing the GHG emissions in the project boundary in the short term, while regional fires rage to the south.	The project under the next president should expect a general improvement in GHG emissions. The project will have a current immense stress taken off the shoulders of the project proponents as the threats are currently extremely high.	Long term, the project will greatly reduce GHG emissions. Once the project is completely done with the Plots for the Poor, which would be in 18 months from now, hopefully, 2000 families in the region will gain their land titles. It is believed that this will greatly reduce GHG emissions, as 2000 families will have access to better agroforestry techniques and will have their own land to invest into higher yield, lower negative impact crops, such as black pepper.	This will have a positive effect on reducing GHG emissions.
Participatory Rural Appraisal	Survey conducted in area constituted by the Project's Boundary and a 15km buffer to gather socio-economic information.	Identification of deforestation drivers and agents by means of survey.	Implementation of mitigation measures to reduce impact by drivers of deforestation.	Positive effect on maintenance of carbon stocks.
Improvement of health.	Distribution of improved cook stoves to households.	Better air quality is ensured in households.	Longer life expectancy.	Improvement of livelihoods.
Maintain forest cover and reduce habitat fragmentation.	Protect existing high-quality wildlife greenspace.	Improve the permeability of land use between sites.	Manage and improve degraded greenspace.	Conservation of forest cover.
Reduce human activities that do not comply with the conservation of biodiversity.	Identify locations of critical wildlife habitat for species at risk and the threats to these areas.	Monitoring of destruction, degradation and fragmentation of habitats.	Conducting trainings and workshops on Biodiversity Conservation.	Healthy ecosystems clean our water, purify our air, maintain our soil, regulate the climate, recycle nutrients and provide us with food.

2.1.12 Sustainable Development

Forests of the project area have become important areas for conservation. Although these are strategic ecosystems in the provision of environmental services, they are surrounded by a mosaic of pasturelands on the south, east and west and are at risk to become fragmented and are actively threatened with the expansion of the agricultural frontier. To continue supporting both production and conservation on these lands, adaptation strategies and alternatives to current regional production systems must be sought to both integrate the sustainable use of natural resources and allow for the connectivity of strategic ecosystems. Proper care is taken for man-made forest fires by deploying patrolling activities.

In keeping with the REDD+ approach of examining the direct relationship between human activities, deforestation, and forest degradation, a series of project activities has been proposed to reduce the aforementioned threats on the forests in the project zone and mitigate the associated GHG emissions.

The overarching aim of the project was to support the enactment of the project area Plots for the Poor program. The Project Proponent was focused on bringing stability. Plots for the Poor does three things: (i) promote sustainable economic activities that positively impact the local community while reducing the impact of production on the forests, (ii) integrate land management into the socioeconomic and political climate, and (iii) fortify management, governance, and technical capacities to ensure the efficient implementation of the REDD+ project.

With title deeds the local population is now able to invest back into their land. Currently the personal management plans of the local population are not focused on high yield crops due to risk of displacement once that investment is made.

The project is not located within a jurisdiction covered by a jurisdictional REDD+ program. If a jurisdictional REDD program was to be planned for the region, the project would Opt-Out of it due to its private property rights.

The development of the following series of project activities has been proposed after having carefully accounted for the ideas and the wealth of accumulated knowledge particular to the project zone. Among the considered information are a socioeconomic evaluation of the study area such as a scheme for black pepper or Acai to replace Cassava, as well as a plan to help the riverine and traditional rural villagers population gain bank loans for projects and wisely use that money on economic plans that have positive impact.

In addition, the Project Activity promotes proper handling of the land in the Amazon Biome, contributing to the mitigation of climate change by reducing GHG emissions, by generating sustainable development through activities such as capacity building and trainings, reforestation activities, and education for younger generation which will support and generate social, climatic and environmental co-benefits.

Currently the Presidential Directive for the Amazon is to focus on a rapid development with the hopes to improve the economy in the Amazon.

A total of 5 sustainable development goals will be addressed as per the project.

Social co-benefits:

Project activities have stimulated an increase in the local workforce employed in the Project Zone. The project is focusing on better types of agroforestry that can create the need for the riverine and traditional rural villagers to employ others.

Climate co-benefits:

The Project has a positive impact on the microclimate of the region, it contributes less soil reflectivity, and a reduction in temperatures. This could, as done on a large scale, have significant effects on the climate of the micro-region. The project aims to reduce nearly 33,927,167 tCO₂ of GHG emissions in the next 30 years of the crediting period. The start date being April 1st, 2017, and the end date being March 31st, 2047.

Environmental co-benefits:

Soil: The Project has a positive impact on the soil, which improves the characteristics, mainly organic matter increases following the planting and the subsequent cuts, due to the harvesting and the selection of timber involving abundant vegetable matter (branches and leaves) remaining in the location. This wood litter, with natural decomposition, integrates with the soil in the form of organic matter.

Biodiversity:

As for biodiversity in the specific case of the property, there will be an increase in different species including: black jaguar (onca preta), spotted cat, hawks, woodpeckers, snakes-hunter birds and various species of birds, anteaters, tapirs, deer, foxes, wild boars, ocelots and numerous species of rodents, which can be frequently found in the Project Zone.

The project aims to meet the nationally stated sustainable development priorities by helping all of the community members gain land title or land tenure certificates, if they request it. The project's goal is to provide these to everyone in the region.

Based on this support and in accordance with expected impacts, the project will contribute to the following UN sustainable development goals:

Sustainable Development Goals	Application in Project
1 NO POVERTY 	<p>The project plans to over 30 years change Portel from what is an incredibly poor and impoverished region of Brazil into a stable, well educated region.</p> <p>The region itself has what is known as the "Oil Curse" which is an abundance of natural resources, but all of that wealth held in the hands of the few.</p> <p>To reach this goal education, health and security are the three pillars of the project. It is believed that educating the children and adults in higher quality schools with working restrooms, running water and actual kitchens will help transform Portel over the next 15 years from a place that was incredibly impoverished into a flourishing, sustainable community. It will not be a fast process and there will be many hard detours along the way. However it is possible to complete.</p> <p>The environmental payment that will be paid monthly to all the project proponents will end a great deal of poverty in the project area.</p>
2 ZERO HUNGER 	<p>The project helps in the fight against hunger through the implementation of sustainable food production systems and resilient agricultural practices through strengthening low carbon family agriculture in the area, increasing productivity in family production units, recovering areas degraded previously by implantation of Agroforestry Systems, diversifying the agricultural production with the implantation of nurseries to supply seedlings of varied species, and generating guarantee of food security for the families.</p>

3 GOOD HEALTH AND WELL-BEING 	<p>The project has a nurse that works in the field and attends to the needs of the people. The project as listed will build 30 schools. In each school will be a 3-room health clinic for the local population. This health clinic is incredibly important as it will also provide virtual services. It will have medicine stocked and paid for by the project. It will be able to handle most common issues.</p>
4 QUALITY EDUCATION 	<p>Initially the project provides access and encourages education through technical and professional courses enabling better employment conditions and income, especially for women and youth. In addition, activities related to education and incentives to sustainable management practices of forest resources, reduce the spread of illegal activities, promote the appreciation of cultural diversity and contribute to the sustainable development culture. In order to achieve these objectives, the project is focused on intensifying technical assistance and rural extension services, as well as offering training aimed at production bias, social organization, corporativism, leadership and financial management, developing technical and professional skills. By mid-2023 the project will have rebuilt the entire educational system of Portel.</p> <p>In the region, including the Ribeirinho REDD Project and the Rio Anapu-Pacaja REDD Project there are 60 schools planned to be built in total.</p> <p>The schools serve a dual purpose as they are strategically located to cover all the regions of portel to have a total monitoring of the region for all activities that could lead to deforestation and degradation.</p> 

	 
5 GENDER EQUALITY 	<p>All project activities are open and stimulated for the participation of all the residents of the acting communities, especially women, youth and marginalized people.</p>
6 CLEAN WATER AND SANITATION 	<p>The project is focused on drilling 1,300 water wells. After working with neighboring REDD projects to deliver 625 water filters, it was determined that water wells are more expensive, however with the funding from increased credit pricing it made more sense for long term clean water improvements.</p>

7 AFFORDABLE AND CLEAN ENERGY 	<p>The project is conducting a pilot program to provide solar panel to 20 houses in the project area. The goal is to see the feasibility and to gain governmental support to fund this extremely expensive endeavor.</p> <p>The cost to provide full solar with batteries to all households in the project area is beyond the budget of the project even with increased credit prices.</p>
8 DECENT WORK AND ECONOMIC GROWTH 	<p>This REDD project is a major employer, for building the 30 schools/health clinics and security office, there are over 120 direct jobs for the region and another 200 indirect jobs that the project has created.</p> <p>For the direct employees in the social services team for the project the salaries are 30% to 50% of above the average pay for that profession in Brazil.</p> <p>For the local population the Acai program and the high price of the Acai Fruit is helping the local population improve and have their own personal economic growth.</p>
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE 	<p>The project has participated in setting up one of the only non-wood related industries in Portel, Para and that is building an Eco-logical brick factory. The goal is to produce bricks for building the schools, health clinics and security offices for the REDD projects in the region. However the brick factory is already running 3 shifts a day and around the clock, with a demand for bricks locally in the city.</p>
10 REDUCED INEQUALITIES 	<p>The primary goal is to reduce income inequality, which is incredibly hard to do in a place where the average salary is below minimum wage and that 20% of the population live on less than 3 dollars per month.</p> <p>To do this the goal is to promote at least minimum wage for everyone and this is for the project to employ and support local businesses. By employing more people more of the local population will be making more than minimum wage. By stopping the flagrant illegal logging, the project will ensure that these million reais salaries the illegal loggers make on the back of the local population will be greatly reduced.</p> <p>The project also has a pro-woman focus and focuses on equal opportunities. The Environmental Payment system will reduce numerous inequalities that exist and help put a floor under the population.</p>
11 SUSTAINABLE CITIES AND COMMUNITIES 	<p>The project focuses on a sustainable self-sufficient community. The project hopes to be an example for all of Portel.</p> <p>Currently Portel imports nearly everything it needs, it makes nearly nothing. This importation results in all usable money to be lost to businesses in other cities. It also result in increased carbon emissions as every product needs to be barged in from Belem.</p> <p>The project has a goal as it and the neighboring projects build these 60 schools, health clinics and security offices to build the materials locally, in a</p>

	<p>sustainable way, that can be an example to the city so they keep the wealth of Portel in Portel and this will make Portel as a whole more sustainable</p> <p>The school for example are using ecological bricks made in Portel, and due to this work, already a local entrepreneur saw this example of locally made sustainable bricks and is now working to open his own brick factory for Portel.</p>
12 RESPONSIBLE CONSUMPTION AND PRODUCTION 	Through actions that encourage the responsible exploitation of natural resources, low carbon agriculture and the recovery of degraded areas, the project promotes the conservation of natural resources coupled with socioeconomic development. Some of the main components of the Project are related to the promotion of scientific research focused on the efficient use of natural resources, seeking greater integration among the parties involved in the project and focusing on sustainable business chains, generating income and well-being for local communities and making the use of natural resources available more responsible and conscious.
13 CLIMATE ACTION 	All activities undertaken by the project aim to take action to combat climate change and its impacts through the reduction of deforestation in the project area and consequently reducing the emission of greenhouse gases, contributing directly to the Brazilian goal of reducing emissions, the project has the potential to reduce 33,927,167 tCO ₂ of GHG emissions in 30 years.
14 LIFE BELOW WATER 	The Amazon has a major issue below water, and that is that the rivers of the Amazon are being over fished. One species in particular that is nearly extinct in Portel is the Manatee. This animal has two small groups remaining and the riverine population has been hunting these endangered species for food. The project has hired a Veterinarian biologist who loves nature and has started a program to help get the word out for protecting the Manatee and not to hunt it. The goal is to bring back the Manatee to all parts of Portel and not only a few isolated locations.
15 LIFE ON LAND 	<p>The project works to use education to educate the over 6,000 people involved in this project to protect the land, protect the animals on the land and to not hunt species that are endangered or primates.</p> <p>The terrestrial life that will be the focus will be</p> <ol style="list-style-type: none"> 1. young anteater, 2. jaguar, 3. black jaguar, 4. red jaguar, 5. ocelot, 6. peccary, 7. tapir, 8. flag anteater, 9. capuchin monkey, 10. howler monkey and 11. paca

	<p>As the project gains credit sales an animal sanctuary will be set up in partnership with UFRA to help species protect, and study endangered species.</p>
<p>16 PEACE, JUSTICE AND STRONG INSTITUTIONS</p> 	<p>The riverine population have little peace or justice and the institutions in Portel are controlled by the illegal logging mafia.</p> <p>The project has already started a lawsuit on behalf of 70 riverine families that had their land invaded by a large industrial land grabber that wants to deforest 8,750 hectares. This only happened on July 2021.</p> <p>The families each had their plots in the government system of SEMA. This audacious "land grabber" found what is termed as a floating title and put it right on-top of their land to claim the area, claiming 17,500 hectares with the intent to deforest 8,750 hectares.</p> <p>The reason it is known of the intent to deforest is because the company doing the invading stated they are an Industrial Acai producer and because in the documents they claim the area is 50% already deforested – a trick land grabbers use in order to state: "it was already deforested" in the SEMA Governmental System. This helps them avoid fines and only gain a minor fine.</p> <p>The attorneys are working on both the lawsuit and working with the prosecutor's office in the capital to go after these local land grabbers – criminally as the local institutions are not advocates for the population.</p> <p>Any criminal act against the riverine population that would simply go unpunished will be targeted by the projects attorneys in Belem and Sao Paulo and the proper denunciations will be made to the authorities.</p>
<p>17 PARTNERSHIPS FOR THE GOALS</p> 	<p>The project has made two critical partnerships in Portel, that is with the Sindicate (Union) of Rural Producers who is the legal representative for the riverine population.</p> <p>The 2nd partnership is with 4 of the local city council members.</p> <p>Also with the Municipality Secretary of Education.</p> <p>The project is negotiating partnerships with the ITERPA, SEMA and other state and federal agencies.</p> <p>The goal over time to partner with the mayors office, however the current mayor's vice mayor is the wife of a major illegal logger in the region. Thus the project stands for principles that they are against. The project believes the next person to be mayor of Portel will be in favor of stopping illegal loggers.</p>

2.1.13 Implementation Schedule (G1.9)

Date	Milestone(s) in the project's development and implementation
2017	The community groups were contacted and one-on-one meetings took place to gain support for the project signature goal of inserting into the government database the necessary documentation to allow each family to gain land tenure documents.
January 15 th , 2017	Initial Participatory Rural Appraisal (PRA).
March 15 th , 2017	Stakeholder's meeting on carbon credits.
April 1 st , 2017	Start date of GHG accounting Period (First Verification).
January 1 st , 2018 to July 30 th 2018	Eco-Stoves were delivered for 20 families. Some land survey work was completed for each family.
September 2 nd , 2017	Implementation of biodiversity monitoring plan.
January 1 st , 2018 to July 30 th , 2018	Eco-Stoves were delivered to 20 families in the project area.
December 2018	500 land tenure certificates from the previous 18 months of field data collection were inserted into the government database of SEMA.
January 1 st , 2019 to May 30 th , 2019	Eco-Stoves were delivered to 400 families.
May 10 th , 2019	Resource Management Plan completed and signed.
January 1 st , 2020 to April 20 th , 2020	Additional land survey work for each family parcel is being completed so that the data can be submitted to the government for the final step in a long process to gain land title deeds for each Riverine and traditional rural villager's family.
20 th May 2021	Completion of PD and MR.
June 2021	Warehouse in Portel was purchased.
June 15 th , 2021	Tour the site locations with Carlos and the Secretary of Education of Porte, to perform site assessment prior to the beginning of the school construction.
July 2021	A brick machine to make ecological bricks arrived in Portel.
July 15 th , 2021	Beginning of the school construction in location.

Year 2020 to 2046	<ul style="list-style-type: none"> • Development and monitoring of environmental and social management activities • Monitoring of deforestation and emissions • Monitoring of biodiversity (Fauna and Flora) and High Conservation Value Areas • Development of scientific research • Verification of credits (Selection and contracting of verification body; Production of follow-up bulletins for Verification Project; Monitoring of field audit; Registration of credits) <p>Conducting of credit marketing processes</p>

2.1.14 Project Start Date

April 1st, 2017

2.1.15 Benefits Assessment and Crediting Period (G1.9)

April 1st, 2017 to March 31st, 2047. A total of 30 years.

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

No difference.

2.1.17 Estimated GHG Emission Reductions or Removals

Year	Estimated net GHG emission reduction or removals (tCO₂e)
1	831,853
2	1,124,361
3	1,311,585
4	1,288,455
5	1,220,730
6	1,081,276
7	1,122,741
8	1,035,209
9	987,912
10	943,898
11	914,085
12	919,824
13	904,327

14	858,804
15	917,015
16	942,731
17	943,964
18	959,413
19	972,324
20	997,225
21	1,049,657
22	1,052,282
23	1,206,829
24	1,274,861
25	1,284,499
26	1,368,080
27	1,396,817
28	1,474,576
29	1,685,747
30	1,856,085
Total number of credit years	30
Average annual ERs	1,130,906
Total estimated ERs	33,927,167

2.1.18 Risks to the Project (G1.10)

1. Communities' lack of effectiveness to control the Conservation Forest area

The Project did provide permanent land use rights against results for conservation to those families living within the Project Boundary. Families were trained to monitor the area and to protect the forest.

With the completed census, and knowing who individually owns what, if a family breaks the Conservation Forest Area plan, it is easy to identify who this is and future benefits from the project will be curtailed if the behavior continues. The project will have no way to revoke titles that have been provided to the riverine and traditional rural village people. The monthly payments per family is expected to be at R\$300 reais per month. To lose this value, because of breaking the conservation plan, would be a large impact to a family. In order to prevent groups from coming in and trying to buy out the riverine person's rights, only 1 family can gain a payment no matter how large their land is, even if they own multiple plots.

The project has done a financial feasibility assessment on how much it costs to visit a house, it is between 30 and 50 dollars (depending on the month's total productivity) between the team on the boat, staff salaries, and overhead just to visit the house. The project is adding technicians to the boat, so more families can be visited in less time, which the project hopes will reduce the high visitation expense.

The future process related to the land tenure is to request from the government to issue the final title deed. As much as the goal is to provide these titles in exchange for preservation, it is also a human rights factor where we cannot skip even one household no matter if the person is bad or has deforested, the stability brings preservation. The environmental certificate has helped monitor the persons' activities and, based on national statistics, has had significant impact in stopping deforestation.

2. Population growth forces agricultural expansion in project area.

Although population is growing in the area, it is clear from the PRA and the LULC change analysis that small-scale agriculture is not a significant driver of deforestation in the area. Nevertheless, the Project includes capacity building on agroforestry techniques to help riverine and traditional rural villagers develop more efficient crop systems that require less area and longer rotation times, thus reducing the need of clearing forest patches under regeneration.

3. Loss of carbon stocks through fire, illegal felling, and land clearing

The Project has reduced the risk of leakage, illegal logging, and fire by building strong partnerships with households in the Project Boundaries and its vicinity; thus preventing deforestation activities to begin in the first place. This includes giving out cook stoves and also paying for the riverine and traditional rural villagers in these locations to gain title. Also, capacity building workshops were held with cattle ranchers that work in the vicinity of the project to show them the benefits of intensified pasture management, thus preventing further LULC change in the area.

Illegal logging risks were mitigated through a number of measures including demarcating boundaries and posting signage, blocking machinery access through trenching and other methods, regular patrolling, and improved communications with local authorities in Portel through two-way radios and cell phones (where available).

Land grabbing was addressed in two ways. The Project's local team has met with new migrants and neighboring households and leaders, as well as the municipal authorities, to make sure the Project Boundaries are known and to resolve any existing conflicts. Communities were encouraged to inform prospective migrants that the forests are protected and that there are no opportunities for new migrants to the area. Second, the project did demarcate boundaries with pillars and signage, maintaining regular patrols, and calling for the support of the local authorities and police.

Table 6. Risks and measures to the project benefits

Risk	Measure
Non continuity of the project activities	The project is backed by conservation agreements signed by the owners voluntarily

	<p>under prior and informed consent referring to the benefits and commitments to engage in a REDD strategy (see folder Land owners Agreements). Likewise, the strategy of permanent communication with the owners and community, and the good results of the project will allow continued ownership of the project by the owners. Policy changes will not affect our project area since this is being implemented on private land. The contract has been designed in such a way with the Land owner that even policy changes should not affect the conservation program of the project area.</p> <ul style="list-style-type: none"> • According to the conservation agreements the land owner is committed to conserve the productive systems implemented in their properties. Also, if a beneficiary wants/must sell the land, he/she may transfer the commitments and benefits to the new land owner; it will favor the permanence of project benefits regardless of changes in ownership. • Active participation of the community in the project management and effective communication showing the multiple benefits related to the project in every phase.
Invasion of project land by outsiders	Regular patrols, signage, purchasing of more vehicles to conduct patrols, increasing awareness of community members about conservation and the rules of the resource plan, strengthening and authenticating land rights.
Climate change /drought	Reducing deforestation – reduces carbon emissions and creates a better local ecosystem. Diversification of livelihood sources to reduce reliability on livestock.
Weak leadership /governance	Leadership training and capacity building activities for the community leadership and village leadership teams, measures to increase transparency around income and expenditure of funds.
Limited allocation of income	Most of the project activities are designed to reduce the maintenance costs and/or increase the profitability of the productive systems. Also, the land owners are trained along with the implementation of the activities, in order to enable that subsequently, the activities can and will be developed by themselves.
Forest fires and other threats	The land owners are trained by ARC in order to perform the technical tasks in an appropriate manner. In addition, ARC conducts regular visits

	to the properties which allow them to monitor as well as identify potential risks.
Policy change by local governments	REDD+ may undermine the decentralization of forest management systems in developing countries. Governments could be inclined to recentralize their forest management systems, because REDD+ requires governments to establish national carbon-oriented forest management plans, reliable baseline data, MRV mechanisms, and national institutions for the trading and payment of carbon stocks in the forests. If any policy change occurs, it should impact the project development positively.

The project is working rapidly to help all the families in this region gain their land tenure documents. Once this is present, a great deal of issues related to land conflict and the results of land conflict such as fire, illegal felling, and land clearing will be resolved.

2.1.19 Benefit Permanence (G1.11)

Community activities are designed to transform local economies over the life of the Project. In this regard, the focus of the project developed local businesses and income-generating activities that are critical components of a long-term low carbon economy. Project activities that met this overarching objective focus on education, sustainable agriculture, community-based ecotourism and sustainable management of natural resources. These activities reduced the necessity of community members to deforest and degrade the Project Area. During the Project Lifetime, this will be achieved, for example, by facilitating better education through training farmers in sustainable agriculture.

The project focuses on three principal strategies to ensure the maintenance and enhancement of the project benefits beyond the project lifetime. For this monitoring period the focus is the same.

1. Skill and capacity development.
2. Goal of permanent Land ownership
3. Health benefits

1. The skills are learnt by the communities throughout the project's lifetime. These relate to better land resource management. The project has initiated several awareness programs for efficient use of land in agricultural practices and has also provided cook stoves which have the benefit of reducing the time of Farinha production and the overall cooking time. The protection of the forests itself ensures lesser degradation as there is a greater potential to provide timber and non-timber forest products on a sustainable basis. The community has been made aware and trained in alternative crops of agroforestry such as black pepper, honey or andiroba oil. Around 200 community members have received training during this monitoring period.

2. The goal of permanent land ownership to the communities is one of the main initiatives of the project and this provides permanent ownership even beyond the project lifetime. This allows the community to implement the skills and learnings on their own land which is self-sustainable and provides benefits beyond the project's lifetime. Around 220 CARs have been distributed during this monitoring period.

3. The health benefits to the women and to the overall community is expected to continue beyond the project's lifetime as well. In a 2002 report, WHO listed indoor smoke from solid fuels among the top 10 risks to human health¹². "Day in and day out, and for hours at a time, women and their small children breathe in amounts of smoke equivalent to consuming two packs of cigarettes per day," WHO reported in the 2006 report Fuel for Life⁽¹²⁾: Household Energy and Health. As greenhouse gas emissions have increased, the smoke from kitchens in the developing world has escalated from a local to a worldwide threat. The average cooking fire produces about as much carbon dioxide as a car, and it produces more soot, also known as black carbon⁽¹²⁾. Reducing these emissions may be among the fastest, cheapest ways to fight global climate change. 50 women have received cook stoves which translates to improved livelihood during this monitoring period.

The permanence of the benefits associated with the project are captured during the feedback from the community during the periodic community meetings in which around 78% of them prefer to continue the good practices.

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

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

2.1.20 Financial Sustainability (G1.12)

Funding for Project's activities is secured by committed funds lent to the Non-Profit charity Friends of the Riverine, initially in small amounts, but with USD 4 million in 2021. After 2022 the project is expected to generate enough revenue from carbon credit sales to cover Project costs and pay back a non-interest USD 4-million-dollar load. The Project financial analysis makes clear how important the revenue generated through carbon credits is to protect the Project Area and to implement the Project's activities.

The charity is funded to demonstrate their commitment to cover future costs until the project receives credits for the emissions achieved since the Project start date until validation date.

Considering current carbon market assumptions and the potential for generation of GHG Emissions Reductions, the financial flow of the Project presents quite attractive results. The funds should be able to provide all essential services that the government is incapable of providing, as well as a R\$400 reais allowance, and have over 70 full time security staff and social/trainer workers.

Other information related to the financial analysis of the Project, and financial health statements of the proponent institutions are considered commercially sensitive information and were shared with the audit team on a confidentiality basis.

2.1.21 Grouped Projects

This is not a grouped Project.

¹² Fuel for Life – World Health Organization (2006)
<https://www.who.int/airpollution/publications/fuelforlife.pdf>

2.2 Without-project Land Use Scenario and Additionality

2.2.1 Land Use Scenarios without the Project (G2.1)

For the determination of the land use scenario in the absence of the Project (baseline scenario) the approved methodology VCS VM0015 version 1.1 was used.

The analysis of deforestation, vector agents and hidden causes, as well as the probable scenarios of land use in the absence of the Project were performed based on the baseline scenario and are detailed in section 3.1.4 of the PD.

The range of potential land use scenarios and the associated drivers of land use changes most likely to occur within the project zone in the absence of the project, are:

- Deforestation for the expansion of livestock activities
- Deforestation for the expansion of the agricultural frontier and crops

The project has already identified 30 different groups that would immediately move into the area in the absence of the project and start industrial destruction of the forest.

In order to mitigate these risks, the project has several proposals for training activities directed to the population with aims at Improving local livelihoods for villagers, Capacity building and training with appropriate and adaptive forestry practices contributing to guaranteed security in the intervention area. Improvement in their health and education systems. As well as a clear definition of land ownership for the rural riverine and traditional rural village people, who act as a buffer for these agents.

Moreover, it is foreseen to maintain a better water table level and the precipitations patterns in a microclimate environment by maintaining a forest cover, which at the same time provides protection to extreme events such as reducing the impact during heavy rains, soil erosion and maintenance of the air temperature

As seen on Map 19, the deforestation scenario in the southern part of the project Reference Region. Without intervention, the private the land would immediately face a bombardment of land grabbers. Currently, the project is facing a bombardment of land grabbers. The threat in this region is extremely high.

2.2.2 Most-Likely Scenario Justification (G2.1)

In the absence of the project, the most likely activities are livestock development which leads to grazing and expansion of the agricultural frontier; all these activities are practiced traditionally for survival, which gives continuity to management practices that are generally detrimental to natural resources. In turn, this affects the loss of soil fertility gradually, increases erosion and decreases topsoil, and as a result, a decrease in productivity is achieved with unprofitable products. It has also got direct impacts on flora and fauna. Due to native forest loss, we may have to lose many endemic species in the area which leads to ecological imbalance. Illegal logging, deforestation due to the expansion of township, and grazing will continue in the project area without the project activity.

However, these activities continue to be perform as traditional methods by involving low capital investment and the implementation of known techniques. The age-old methods of cultivation, livestock breeding and other old traditional methods of cooking, all are important characteristics when taking into account that much of the rural population in the prioritized area corresponds to adult age groups, culturally more established to the knowledge acquired from their parents and less willingness to change their traditional

systems of production. Without the implementation of this project, the surrounding population will continue the same old traditional methods which leads to deforestation of native forests.

2.2.3 Community and Biodiversity Additionality (G2.2)

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

The present scenario with the development of the REDD+ Project is socially, environmentally and economically positive. Sustainable development activities are an important path for the conservation of forests and for the improvement of the local economy of communities. The Project seeks to improve lifestyle management of locals, revenue generation and control of the forest loss by conducting proper training programs annually. In the area of agriculture and livestock, agroecological production techniques, increased productivity in smaller areas, and the strengthening of production networks can contribute to reductions in environmental impacts as well as enhancing socioeconomic improvements for the region's population.

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

The project, together with its mechanisms, guarantees the permanence of the forest and the consequent conservation of biodiversity, maintenance of ecosystem services, water quality and climate regulation. In the without Project scenario, the forest environment is being replaced by areas that are more and more anthropized through deforestation¹³ (FEARNSIDE, 2006). As explained in regards to the scenarios, which is presented with and without REDD, through secondary data, the importance of the implementation of the project and development of the Project is reiterated.

The scenarios outlined above are consistent with enforced mandatory applicable laws and regulations of the country. The Project area is a private land which is in line with the approval of the district governments of Paragominas. The Project would not have been implemented due to financial constrain, ARC has taken initiative and have invested significant VCS and CCB expenses prior to project registration under VERRA considering the future VCS revenue to implement the planned activities under REDD+. Even though the old and new version of the Brazilian Forestry Code indicates that 80% of the forest within a privately owned area should be preserved, it is well known from the literature and re-affirmed by our historical analysis with Landsat TM imagery and interviews with local experts, that such regulation is weakly enforced.

However, no national or district government funds are made available for the management of the project, nor are there any finance requirements imposed on the management of native forest lands.

For further details on Project additionality for community and biodiversity please refer to sections 4.1.4 – Without-Project Scenario: Community and 5.1.3 – Without-Project Scenario: Biodiversity.

¹³ (Fearnside, Philip. (2006). *Dams in the Amazon: Belo Monte and Brazil's Hydroelectric Development of the Xingu River Basin*. Environmental management. 38. 16-27. 10.1007/s00267-005-0113-6.).

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

Not applicable. Besides the GHG emission reductions and CCB certification, the project intends to offer no other benefits of the project as offsets directly or indirectly. Thus, there are no costs related to these benefits and there is no risk related to these benefits.

2.3 Stakeholder Engagement

2.3.1 Stakeholder Access to Project Documents (G3.1)

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

Writing: a printed version of each document related to the Project, such as the summary of Project design document in local language. Full reports are at the office in Portel, Para. This includes the PD, MR as well as all other documents. In addition, numerous pamphlets are provided to the community related to our goals for the plots for the poor program.

Virtual: documents related to the Project are available through virtual means on website ribeirinho.org.

Oral: information and news about the Project will also be conveyed orally during one-on-one meetings. This will be shared via community leaders as well.

2.3.2 Dissemination of Summary Project Documents (G3.1)

All the documents/results are published in the project website and communicated in Portuguese in a simple language format to the council of stakeholders for their awareness and free participation.

Apart from the survey teams, the main form of communication followed was one-to-one meetings with the community in which the feedback on the benefits provided were communicated, which are set for 3 times per year per family. Further during this period, the benefits were mainly related to Skill and capacity development, Goal of permanent Land ownership and improved land management practices which were categorized as both long and short-term benefits in the relevant sections of the MR. A sample of the survey forms and attendance records of one-to-one meetings has been submitted to the VVB.

2.3.3 Informational Meetings with Stakeholders (G3.1)

During all consultations, aspects of the climate change and carbon markets were addressed by providing information and general concepts in simple and local language formats (Portuguese) that could be understood by all participants. The documentation and information regarding the Project were made available to the community through the following mechanisms:

- At the beginning of each meeting, participants received a summary sheet of the Project for them to understand the Project.
- During the meetings aspects related to forest carbon project, specific project activities and participants were explained.
- There were question and answer sessions after the talks. The questions of the participants were resolved and all observations were heard and taken into consideration.

- The information provided, included contacts (phone number and email) of the people in charge of the Project documentation (project developers), in order to give to the attendants, were made available for the possibility to permanently communicate their concerns and/or comments.

- Once the project document is ready, it will be published on the website of the CCB for public comments.

In addition to the topics mentioned above, during the local consultation the possible impacts that the project that might have individual or collective actors in terms of economic, social and biodiversity aspects were analyzed. This analysis was performed through the use of questions, comments and opinions regarding to the exposed topics. The result of the evaluation was assigned to each impact with a rating of positive, negative or neutral according to the effect on the quality of life of each participant.

During the local consultation, all participants were informed about the validation and registry process while pointing out that an external auditor (a validation and verification body) who visits the area of influence executes this process, interacts with stakeholders, evaluates the project information, and issues a report of the evaluation.

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

Through carbon benefits workshop all participants were explained the benefits of the project and the potential costs and risks that they could expect due to the implementation of the project. However, the project activities have been designed in conjunction with the owners in order to minimize possible negative impacts.

In addition, in every consultation workshop each participant interested in being involved in the project received a one-on-one interview with a questionnaire on it. The technician asked each head of household if they wanted to be involved in the project. If the household stated yes, the interview question was filled out. If they stated no, then the house where they lived was marked with GPS on the questionnaire.

In very few cases people wanted to think about it. Other cases people were not home to be interviewed. The technician leader makes it an effort to send a boat back to the houses that were missed in order to encounter the community members that were not at home.

All interviews that have taken place focused on how the proposed project would affect the communities, what the communities would have to put in place to qualify for carbon benefits, and how project activities relate to existing land use plans and user-rights conferred to the villages through the creation of the Wildlife Management Area. The communities identified 4 areas of risk involved with participation in the project:

Area	Risk	Mitigation
Grazing	Better quality grazing could attract others to the area and lead to increased pressure	The resource management plan plays out the rules for incursions by non-natives into the community grazing lands
Finance	Increased revenue could lead to corruption and theft	Project structure including checks and financial transparency will be a linchpin of all project dealings and activities

Culture	Project could threaten the ancient culture in the area due to exposure	The project is based on the resource management plan which was designed by the communities specifically to protect their culture and traditional natural resource uses
Land use	The project could affect the way land is used in the community and restrict access	The project is based on the resource management plan which was designed by the communities specifically to protect traditional land uses

2.3.5 Information to Stakeholders on Validation and Verification Process (G3.3)

The Project's executive summary, including project information and project benefits has been translated into Portuguese and is posted in public places in communities throughout the Project Zone.

During community meetings, held by project staff as part of the project outreach process, the monitoring and verification processes were described.

A poster/notice in Portuguese advertising the Project's public comment period and the validation /verification field visit was posted in communities throughout the Project Zone.

2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

The project Proponent actively has 6 technicians working in the field in constant contact with the local households. In the rare event that someone from the team is not in the field, there are two people in the city of Portel that are able to communicate with the riverine and traditional rural villager people.

The Project Proponent has actively communicated to community members and stakeholders about the start of the Public Comment Period and the methods with which they can submit comments on the Project as well as how to view full project documentation. This was accomplished by communicating the Project - Public Comment Period and Verification field visit dates to previously identified stakeholders, community leaders, leaders of the faith communities and public officials. They were then requested to pass that information onto their communities.

Six weeks prior to the site visit in March 2020, verbal communication took place, and it was requested that up to 1 person from all 50 families be prepared to answer questions of the auditor. One-on-one interviews were arranged.

2.3.7 Stakeholder Consultations (G3.4)

The Project designed its activities based on the results of the PRA. The intention, since the beginning, was to develop activities that were in tune with local livelihoods and the best way to do so was by first consulting with local stakeholders.

All Project activities are based fundamentally on local customs and needs. Such activities do not constitute dramatic changes on local ways of life or customs but only provide knowledge and finance to improve and make more efficient what is already happening on the ground.

The team was able to consult with the community originally prior to July 2016.

The technicians who go to the land stay in the houses of the riverine people and traditional rural villagers while doing survey work, eat at their table and greatly support the project, this has greatly help build trust with the stakeholders. 50 households are involved.

Apart from the survey teams, the main form of communication followed was one-to-one meetings with the community. This is necessary for the project to do Plots For the Poor, as we must collect mothers' names, the ID numbers known as RG, and the tax ID numbers known as the CPF in these consultations. If this data is not collected, or not collected correctly in the one-on-one meeting, then the team has to go back to that house at a great expense to the project. Thus, clean and clear communication is of the utmost importance to prevent two trips to the same house, in a short period of time.

2.3.8 Continued Consultation and Adaptive Management (G3.4)

The team has had at least one person or another that is known by most of the families. They were hired as they know each family in the project area. Their local knowledge facilitated the warm reception for the project. They are both the project guides and pilots for the technicians and team. They know first-hand everyone in the community and this knowledge allows there to be a seamless communication between the project team and the local communities. It may require a cell phone call to Camerao, who calls on the radio to the specific river to reach the family.

Throughout the lifetime of the project, we maintain a direct line of communication with community members, and relevant stakeholders. This establishes a commitment to communication and consultation to keep stakeholders informed of project activities including restoration, maintenance, monitoring and the CCB validation and verification process.

With-project scenario there is an increase to the socio-ecological resilience, reduce vulnerability and improve adaptation capacity through a better management of the natural resources, including adaptive management. In addition to this, forest protection in the project area does provide a healthy ecosystem with much greater adaptation potential to climate change, with a higher resistance and recovery capability to extreme meteorological phenomena and a wide range of benefits to the neighboring people.

Hence, there is no change in the consultative and adaptive management system during this monitoring period.

2.3.9 Stakeholder Consultation Channels (G3.5)

The technicians who go to the land stay in the houses of the riverine people and traditional rural villagers while doing survey work, eat at their table and greatly support the project, this has greatly help build trust with the stakeholders.

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community.

The project has 6 local technicians that live in Portel, who are reachable at all times by the local population. In addition to this the local community population has the project email, and most families have 1 working cell phone in order to reach the team.

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

Consultations have made sure to engage with both men and women, and more marginal stakeholder groups in culturally appropriate ways to ensure that the project can take into account a wide range of perspectives. Apart from the survey teams the main form of communication followed was one-to-one meetings with the community.

In the decision-making process, the main aspect that always came to mind was that of land rights, eviction and stability, as well as “threats from people who are there to steal their land”. The main decision from 95% of them during the one-on-one meetings, is that of land rights and solutions to resolve the instability and threats.

2.3.11 Anti-Discrimination Assurance (G3.7)

The project has company policies to prevent discrimination and outline a course of action, should it occur, the human resource (HR) policy provides a clear statement on discrimination relating to gender, religion or sexual discrimination. Discrimination is considered a level A misconduct under the HR policy. Where discrimination occurs within the company, partner organizations or within project areas (project participants), actions are outlined in the grievance policy to ensure that any discrimination is dealt with by the senior management. All company employees and field partners sign a code of conduct when they sign on to work for the project. No such related incidents have been reported for this monitoring period.

2.3.12 Feedback and Grievance Redress Procedure (G3.8)

There have been no grievances. The riverine and traditional rural villagers are grateful to all help the project provides.

For the Land Tenure program, when the Land Tenure certificates are delivered with a team of 1 technician and 1 local support staff and meet one-on-one to explain all about the document and the land tenure boundaries. During the delivery process, the team will request help for any issues with the documents and will assure to change the documents if necessary.

The conflict resolution approach has been sequentially adopted and responds to the conformity or inconformity of the complainer to the proposed solution. The evaluator may also propose a specific approach for the resolution depending on the complexity of the case and the assessment of the same.

The present mechanism does not exclude the right of local people to present the case to any public entities estimated to be convenient. Actually, during the census, the Project's management team had informed local people of the creation of such committee and were informed of their right to present grievances directly to public entities, making a clear point that all claims and/or complaints were addressed equally *notwithstanding the line of grievance*. No such related incidents have been reported for this monitoring period.

The legal system in Brazil takes 5 to 10 years, if not longer, to resolve such issues, so this is only used in cases of land grabbers invading the project area. The court case for land grabbers takes years, but at least during these years the land grabber is unable to actually deforest and utilize the land until the judge makes a decision. Thus, the goal of the project is to use the courts to stall land grabbers until Brazil takes climate change and preservation seriously. If a land grabber in 2020 can be stalled until 2030, in 2030, even if a decision as not favorable for the project, the laws and regulations in Brazil should be more considerate to preservation, versus the current system of mass deforestation promoted by nearly all levels of government.

PP has a clear grievance redress mechanism which is outlined in the company grievance policy. The grievance policy is also part of the files kept at the PP's office. The policy defines a grievance and its scope and outlines both an informal and formal procedure for managing grievances. Under the informal procedure, affected person first discuss with a director or another member of the management team. The director will attempt to resolve the grievance on an informal basis, taking advice, if necessary, from other parties. The director and affected person will work together to resolve the problem. If a grievance cannot be resolved via informal discussions, the formal procedure may then be used. The formal procedure requests the grievance to be in written form (or if not possible, by telephone to the director). An investigation is arranged within 1 week (7 days) to gather additional information, followed by a grievance hearing. The hearing should occur within 10 working days of the investigation being completed. Additional details, including the contact numbers of the directors, are included in the grievance policy, available in both English and Portuguese.

2.3.13 Accessibility of the Feedback and Grievance Redress Procedure (G3.8)

Accessibility of the feedback and grievance procedure is ensured as grievances can be reported at multiple levels. Individual community members have direct communication access to technicians and social-worker staff, which are almost always in the project area, the community has bi-annual meetings designed for this specific purpose, and the leadership have a direct formal channel to air grievances and general feedback. Furthermore, the concept of feedback and grievance and the channels using the mechanism have been explained to the community at all these levels.

The person in charge of the feedback and grievance redress procedure (for both channels mentioned in section 2.3.12) must be available during the days and times previously agreed with the community, to receive and/or make calls. In addition, the project is planning to set up several offices in each river to be able to provide video-conference technology to a centralized office in Portel town, bearing that the project is able to generate sufficient carbon sales. This video conference technology will allow individuals to voice grievances when they live in remote areas of the project, and have a proper redress on a live video feed; thus, they will not need to look for the technicians in the field.

Besides, the contact information was provided during the local stakeholder's consultation. This should allow direct communication with property owner representatives and answering questions that will arise during the project implementation.

2.3.14 Worker Training (G3.9)

Project activity #1 is designed to provide training to local community groups that will generate the required capabilities to undertake forest monitoring as well as monitoring for social and biodiversity variables.

The Project ensures that all members of the community groups have the same opportunity to attend capacity building workshops and participate in demonstrational activities, regardless of race, religion, sexual orientation, or gender. Although the opportunity to actively participate in all the activities of the Project exists, it is finally a decision of each stakeholder to participate with no pressure.

The team added 7 new staff members who were hired by the project owner and did not bring back 4 old staff members due to the distance they lived from the project area. The existing staff trained the newly appointed staff and handed over the responsibilities prior to the new staff starting to work independently.

Special attention was given to under-represented groups (elder people, women and children) to be aware of the on-going training workshops and activities. The content and language of capacity training and demonstrational activities were adopted accordingly to each participating group. The Project considers developing and implementing workshops specifically designed for age classes groups to better transmit the information.

Capacity building is a relevant aspect in the implementation and operation of the project. In order to achieve the goals successfully the member of the community must be trained to have the skills and knowledge to effectively carry out the work.

2.3.15 Community Employment Opportunities (G3.10)

The Project has design employment opportunities to make sure underrepresented groups of local community have equal opportunities of finding employment within the Project management and demonstrative activities.

Employment positions that require demanding physical work and a higher risk (i.e. on the ground monitoring of former logging trails, sampling biomass in forest plots, monitoring of Project Boundaries by boat to detect illegal logging activities, setting and revisiting biodiversity camera traps) were filled by persons between the age of 18 and 60 years and/or according to the experience and physical strength of a person, assessed on an individual basis.

Other employment opportunities that require less physical effort and by their nature are less risky, were set aside for elderly people or less physically apt people. Such activities can be but are not limited to: social assessment surveying and monitoring, running demonstrative activities to other members of the local communities and to neighbor communities, actively participating in setting up demonstrative activities (i.e. home gardens, forest gardens, improved fallows, energy efficient cook stoves, etc.).

Around 14 people have been employed of which 4 are women for this monitoring period.

2.3.16 Relevant Laws and Regulations Related to Worker's Rights (G3.11)

The local community has received clear and adequate information about the requirements of national and international regulations on worker's rights before entering in a contract agreement with the project.

The project makes sure to comply with the applicable national regulations on worker's rights. This is assured by yearly audits held by a third party that are identified in the census that was done. Such audits announced to the community and community leaders that they are encouraged to meet with the audit entity. In this way, local people can rest assure that all their complaints about worker's rights are known in a straightforward and clear way.

The following is a list of Brazil's relevant laws and regulations covering worker's rights:

- The Brazilian Constitution, Chapter II-Social Rights, Articles 7- 11 which addressed: on Minimum wage, Normal working hours, Guidance on vacation and weekly leave, Guidance on maternity and paternity leave, Recognition of collective bargaining, and Prohibition of discrimination.
- In addition to the Constitution, there are two additional decrees related to Brazilian labor laws. Consolidação das Leis do Trabalho (CLT): DECRETO-LEI N.o 5.452, DE 1o DE MAIO DE 1943 (Consolidate of Working Laws)35. This decree gives more clarification on: the Hourly, daily, weekly and monthly work hours of Employment of minors and women. Establishes a minimum wage of Worker safety and safe working environments. And defines penalties for non-compliance by employers establishes a judicial work-related process for addressing all worker related issues.

- Estatui normas reguladoras do trabalho rural: LEI No 5.889, DE 8 DE JUNHO DE 1973 (Establishes Regular Norms for Rural Workers)36. This is a complimentary law to the aforementioned 1943 decree because prior to 1973, rural workers did not have the same rights as urban workers. In 1973, this law was established to specify the equality between urban and rural workers, along with compensation for overtime.

Hence it is stated that the project complies with relevant horst country rules for this monitoring period as there have been no reported incidents to the contrary.

Brazil has more labor law legal cases than the rest of the world combined. Due to this, the project has been focused to hire most of the staff as “autonomous contractors” to prevent a devastating lawsuit that is common:

- *Law 605/1949 - Repouso Semanal Remunerado (Paid Weekly Rest);*
- *Law 2.959/1956 - Contrato por Obra ou Serviço Certo (Contract for Work or Right Service);*
- *Law 3.030/1956 - Desconto por Fornecimento de Alimentação (Discount for Food Supply);*
- *Law 4.090/1962 - Gratificação de Natal;*
- *Law 4.749/1965 - 13º Salário*
- *Law 4.886/1965 - Representantes Comerciais Autônomos (Autonomous Business Representatives);*
- *Law 4.950-A/1966 - Remuneração de Profissionais (Engenharia, Química, Agron. e Veter.) (Remuneration of Professionals (Engineering, Chemistry, Agron. And Veter.);*
- *Law 5.859/1972 - Empregado Doméstico (Housekeeper);*
- *Law 5.889/1973 - Trabalho Rural (Rural Work);*
- *Law 6.019/1974 - Trabalho Temporário Urbano (Temporary Urban Work);*
- *Law 6.494/1977 - Estagiários (Trainees);*
- *Law 6.919/1981 - FGTS de Diretores (FGTS of Directors);*
- *Law 6.932/1981 - Médicos Residentes (Resident Doctors);*
- *Law 7.418/1985 - Vale-Transporte (Transportation vouchers);*
- *Law 8.036/1990 - Lei do FGTS (FGTS Law);*
- *Law 8.906/1994 - Advogados (Lawyers);*
- *Law 9.601/1998 - Banco de Horas e Contrato por Prazo Determinado (Bank of Hours and Contract for Term Determined);*
- *Law 10.101/2000 - Participação dos Trabalhadores nos Lucros ou Resultados (Workers' Participation in Profits or Results);*
- *Law 10.607/2002 - Declara Feriados Nacionais (National Holidays);*
- *Law 10.748/2003 - Programa Primeiro Emprego – PNPE (First Job Program);*
- *Law 10.820/2003 - Desconto de Prestações em Folha de Pagamento (Discount on Payroll Benefits);*

2.3.17 Occupational Safety Assessment (G3.12)

Project activities do not hold risk besides those inherent to the day-to-day life in the forest. Project activities do not require the use of heavy machinery or dangerous substances. Nevertheless, the Project management team has provided adequate protection equipment to employees working in forest monitoring activities. Also, monitoring staff are equipped with first aid kits. Protection equipment does include but is not be limited to:

Hard hat

- Cap with the company's logo
- Reflective/fluorescent security vest with the company's logo
- Rubber boots
- Gloves
- Two-way radios
- GPS
- Camera
- Field backpack
- Camel pack
- LED Flashlight
- Whistle
- Machete
- First aid kit

Risks for each type of work are assessed and safety guidelines are developed in order to help identify and reduce such risks. Guidelines are written in clear and adequate language and distributed among workers. Additionally, workers receive safety instructions to make sure any doubts and suggestions are taken care of. During this period such training was provided to 11 people who have been employed of which 3 are women.

Picture 21, 22, 23: Survey Equipment





2.4 Management Capacity

2.4.1 Project Governance Structures (G4.1)

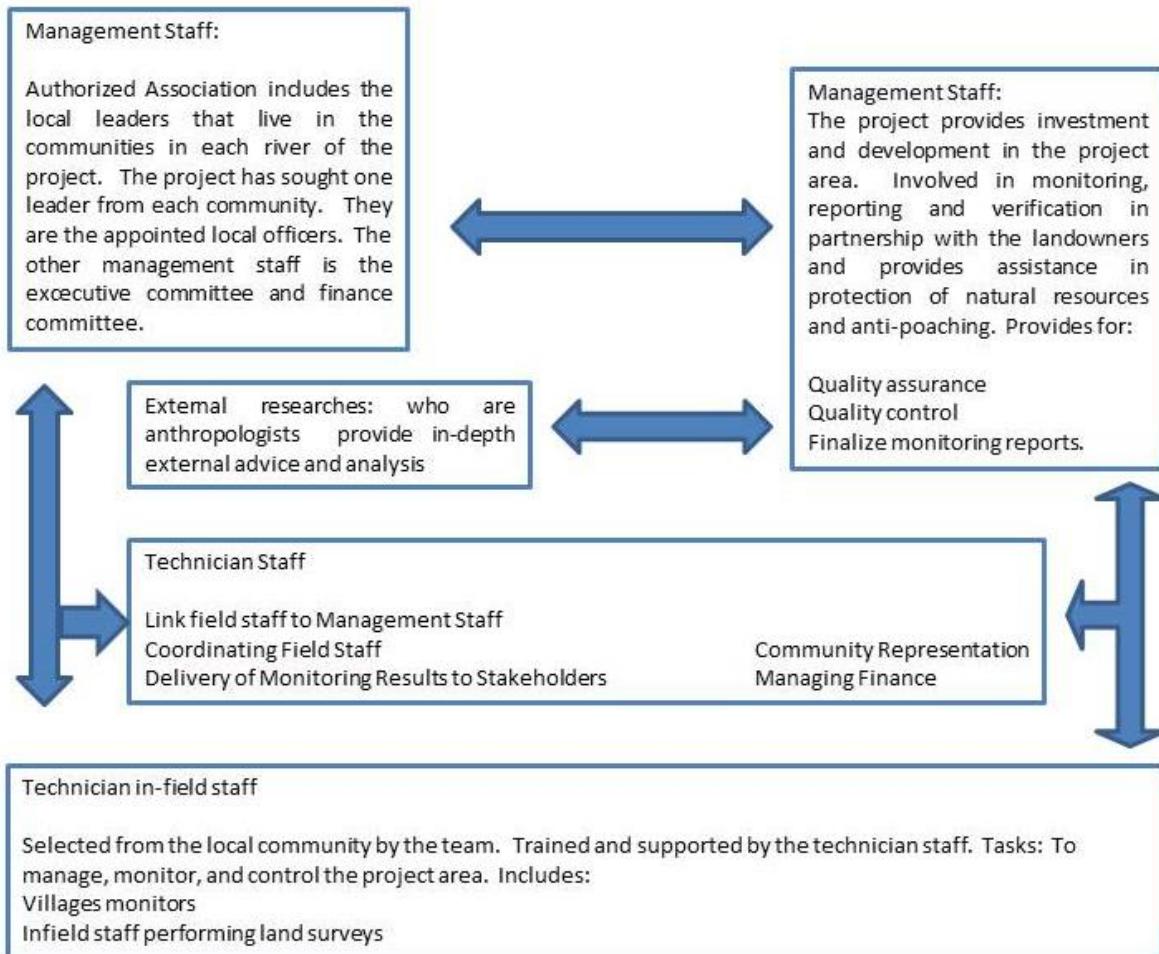
The current governance structure of the project is composed of the project proponent and landowners:

Project Proponent: Friends of the Riverine, and 875 families

- Coordinates owners of the land around the project
- Represents landowners
- Sets conservation agreements with the owners
- Manages resources for implementation
- Hires/implements project activities
- Hires/implements the monitoring Project

Landowners

The land owners are linked to the project by the conservation agreements signed between each of them and the Project Proponent. Their participation in the project is completely voluntary, through free, prior and informed consent and through free commitments and the benefits expected. Management capacity is explained below;



2.4.2 Required Technical Skills (G4.2)

Project participants and their activities are summarized below. All project participants have consulted for, worked on or have been involved in a REDD market. All team members have experience of more than 10 years working in rural land. All team managers are trained to be able to handle the current situations. For each specialty field such as geography or law, the professionals have licenses for this work. The attorneys for the project are licensed with the property government law entities to be able to practice law.

- Knowledge of the region and social science/local community related skills like handicrafts.
- Experience in sustainable practices for local/rural development, conservation and management of biodiversity and ecosystem services.
- Knowledge in planning, execution and control of administrative and financial resources. Extensive experience and skills in managing resources from donors and co-operators.
- Experience in carbon markets, VCS and CCB standards.
- Experience in biodiversity monitoring, sampling methods of wildlife, and ecosystem assessment using quality indicators.

- Extensive experience in working with the community and environmental education.
- Knowledge of the area and experience in field implementation of restoration activities, crop improvement, woodlots, silvo-pastoral systems, efficient stoves, and solar power panels.
- Abilities to manage the geographical information system and databases of property owners, as well as to generate all required cartographic analysis.

2.4.3 Management Team Experience (G4.2)

The project is a woman operated and executed Projecdt.

Dr. Laura Carolina Vieira, doctorate in Anthropology, Post Graduate from the University Federal of Para. Bachelors in History from the Federal University of Parana. Member of the Research Group of Anthroplogy and Tourism for the Amazon (GATA). The author of the following papers on anthropology: 1.) VIEIRA, L. C.. The Erveiras women of Ver-O-Peso and heritage views. PATHS OF HISTORY UNIMONTES) (ONLINE), v. 24, p. 97, 2020. 2.) VIEIRA, L. C.. First steps in the herbal sector. Four Fields Notebook, vol. 1, p. 35-38, 2019. 3.) VIEIRA, LC The Varied Agencies of the Herb Sector of the Ver-o-Peso Fair and the Hegemonic Urban Context: commodification of cultural goods in gentrification processes in the Eastern Amazon.. In: XIII RAM - Anthropology Meeting of Mercosur, 2019, Porto Alegre. RAM 2019, 2019. 4.) VIEIRA, L. C.. Correspondences and Dynamics between the Herb Sector in the Ver-o-Peso Market and the Urban Context. In: 31st RBA - Brazilian Meeting of Anthropology, 2018, Brasília. Proceedings of the 31st RBA, 2018. 5.) VIEIRA, L. C.. Tourism and the Smell Bath: Mechanisms Used in the Ver-o-Peso Fair for the Composition of Cultural Imagery in Belém, Pará. In: V Transborders, 2020, Manaus, Tefé. Transborder, 2020. 6.) VIEIRA, L. C.. Knowledge of the Forest, Products in the City? Rebuttals of the herb culture as a traditional Amazonian practice in relation to metropolitan socioeconomic projects. In: IV Ecuadorean Anthropology Meeting - Diversities, Adversities, Resistances., 2019, Salvador. IV REA, 2019. 7.) VIEIRA, L. C.. Tourism and the Smell Bath: Mechanisms Used in the Ver-o-Peso Fair for the Composition of Imagery Cultural de Belém, Pará. 2020. (Presentation of Work/Communication). 8.) VIEIRA, L. C.. The Photogenic Posing of Erveiras in Belém do Pará: strategy and self-esteem for Ver-o-Peso stallholders. 2020. (Presentation of Work/Congress). 9.) VIEIRA, L. C.. The Erveiras do Ver-O-Peso women and heritage views. 2020. (Presentation of Work/Communication). 10.). VIEIRA, L. C.. The Varied Agencies of the Herb Sector of the Ver-o-Peso Fair and the Hegemonic Urban Context: commodification of cultural goods in gentrification processes in the Eastern Amazon. 2019. (Presentation of Work/Communication. 11.) VIEIRA, L. C.. Knowledge of the Forest, Products in the City. Rebuttals of herb culture as a traditional Amazonian practice in relation to metropolitan socioeconomic projects.. 2019. (Presentation of Work/Congress). 12.) VIEIRA, L. C.. In the light of Ethnoecology: The Herb Market and its materials as sensory powers for perceptions, representations and identities. 2018. (Submission of Work/Other). 13.) VIEIRA, L. C.. Correspondences and Dynamics between the Herb Sector in the Ver-o-Peso Market with the Urban Context.. 2018. (Presentation of Paper/Congress). 14.) VIEIRA, L.C.; OLIVEIRA, K. . Curatorship of the Collection of the Textual, Sound and Visual Documentation Unit of MAE. 2016. (Presentation of Work/Congress). The goal I have for the project is to end the poverty situation in Portel via the programs environmental payments.

Ana Paula Soares Farias - Graduated in the course of Social Sciences at the Federal University of Pará (2021). Acting as a scholar in the project of Academic Monitoring (PGRAD-UFPA) entitled "Gender relations and cultural practices in the field of Paraense culture", which enabled the experience in teaching practice. Scientific Initiation Scholar in the years 2018 to 2020 where I developed studies in the research line gender and artisanal fisheries in protected areas of the Amazon in the project " The role of women in fisheries governance and management of fishery resources in the Japurá River region, Amanã Sustainable Development Reserve, Amazonas." (2018-2020). Member of the research group GEPTIGAM- Study Group on Traditional Populations, Identity, Gender and Environment (UFPA). The Ribeirinho REDD Project the focus is equality, gender equality, woman's rights, human advancement, and overseeing the technicians for the Acai and honey bee project to make sure it fulfills all the requirements set out by VERRA.

Dr. Paula Tavares, a vet erinarian with a focus on wild animals. At the beginning of my graduation, completed an internship at a veterinary hospital that only attended to conventional pets (dogs and cats) but it was not exactly my lifes goal, so I went looking for an internship in other places, until I was welcomed at Jardim Bosque Rodrigues Alves, there I had contact with the local wildlife and felt at home, during this period I participated in some projects and one of them was the monitoring of sea turtles on the beaches of Curuçá. After 2 years at Bosque Rodrigues Alves, I decided to go out and try something new, so I volunteered for the Environmental Police Battalion for about a year, I even won a decoration. At the end of graduation I went to southern Brazil (Santa Catarina) to do my mandatory internship in the Beach Monitoring Project - PMP. There I had contact with marine animals, most were birds (birds are my biggest passion) but there were also some dolphins and turtles. Now that I'm graduated, my main area of expertise is Fauna Rescue, which I still practice today. Author: Academic work "Environmental Enrichment Tool to Improve the Well-Being of Manatees (*Trichechus inunguis*, LINNAEUS, 1758) In Captivity at the Bosque Rodrigues Alves Zoo and Botanical Gardens in Belém do Pará, Brazil". No II Congress of Veterinary Doctors of the Legal Amazon - Amazonvet / I National Congress of Wild Animals, at banner category, from August 20th to 22nd, at Hangar - Amazon Convention and Fair Center, Belém / To Brazil. Co-Author: Academic work on "Hemipenectomy in Iguana iguana". Featured in the banner category, at the 41st Physician Week Veterinary - Semavet / 9th Paraense Symposium on Veterinary Medicine. On September 4th and 5th, 2017, at the Hotel Sagres, in Belém / Pará, Brazil. Co-author: Academic work "Effect of Environmental Enrichment on the Well-Being of the Smell Monkey (*Saimiri Sciureus*, LINNAEUS, 1758) In Captivity at the Bosque Rodrigues Alves Zoo and Botanical Garden in Belém / Pará, Brazil". Displayed in the banner category at the II Congress of Veterinary Doctors of the Legal Amazon - Amazonvet / I National Congress of Wild Animals, held from August 20 to 22, at Hangar - Amazon Convention and Fair Center, Belém / Pará, Brazil. Co-author: Academic work "Analysis of the Environmental Enrichment Technique for Ocelot (*Leopardus pardalis*, LINNAEUS, 1758) In Captivity at the Bosque Rodrigues Alves Zoo and Botanical Garden in Belém do Pará, Brazil". Displayed in the banner category at the II Congress of Veterinary Doctors of the Legal Amazon - Amazonvet / I National Congress of Wild Animals, held from August 20 to 22, at Hangar - Amazon Convention and Fair Center, Belém / Pará, Brazil. The Ribeirinho REDD project is a perfect REDD project in a region that is at incredibly high risk of full conversion and the programs I am conducting for the project will both save numerous endangered species but also train the locals to monitor their own activities to protect those species.

Mirian Costa e Silva, Graduated from the technical school of residence health in 2019, has a professional training course in urgency and emergency / basic health care by the Federal University of Pernambuco, ethical and legal practices of care in UBS (basic health unit) by the Federal University of Science and Health of Porto Alegre, strategic actions for the elderly by the Oswaldo Cruz Foundation, comprehensive care for children with alterations in growth and development, related to childhood infections 1 and 2 by the Aggeu Magalhaes Institute, strategic actions for the health of indigenous and quilombolas by the Oswaldo Cruz Foundation. Worked in UBS, "better at home" program of the federal government, social action with indigenous people and as doula in humanized births. My responsibility is to focus on the Water Well program, clean water for everyone, the stove program – eco stoves to prevent respiratory issues, and the Health Clinic set up.

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

Dr. Paresh Patel - hired by the Syndicato of Rural Producers to prepare the PD, MR, PD in local language and MR in local language. Dr. Paresh Patel has consulted on the writing and calculations of numerous REDD carbon credit projects in the past. His expertise comes from more than 10 years as a forestry

engineer, having a PhD in Environmental Sciences. Dr. Paresh Patel's work is limited in the VERRA REDD field, as purely a document preparation person. Dr. Paresh Patel's expertise has been accumulated over the years working in the Democratic Republic of the Congo, monitoring forest timber extraction and FSC forestry in a sustainable manner. Dr. Paresh has also worked in Bolivia, for a charity hoping to help develop a system to track sustainable logs from the farm to the mill. Dr. Paresh has worked for 2 years in Borneo studying the impact of illegal logging on the local indigenous population and how their livelihoods have been altered.

2.4.5 Financial Health of Implementing Organization(s) (G4.3)

The project is funded by a loan to the landowners. A zero interest loan in the quantity of USD 4 million dollars.

2.4.6 Avoidance of Corruption and Other Unethical Behavior (G4.3)

As a collaborative effort, the project team is committed to upholding a high level of integrity and professionalism throughout all aspects of project design and implementation. We have a zero-tolerance attitude towards corruption and unethical behavior, and are not involved in, or complicit in, any form of corruption such as bribery, embezzlement, fraud, extortion, and collusion.

2.4.7 Commercially Sensitive Information (*Rules 3.5.13 – 3.5.14*)

There is no commercially sensitive information in this Project document itself. Supporting documents which include commercially sensitive information are not made publicly available include: the MOU; Contracts with Buyers and Service Providers; and documents related to project financials.

2.5 Legal Status and Property Rights

2.5.1 Statutory and Customary Property Rights (G5.1)

In Brazil over 3 million properties have no title, no registry. The basis of ownership is only the property tax receipt registered with the city where the property is located.

The riverine for the land have the Cadastrol Ambiental Rural, which is sufficient for small plots to be able to make decisions on what they want to do with it.

Below is an example of a Cadastrol Ambiental Rural Certificate, 100% of the project proponents have the following certificate that was funded by the project.



RECIBO DE INSCRIÇÃO DO IMÓVEL RURAL NO CAR

Registro no CAR: PA-1505809-BB81.666B.F3BB.47CE.B1E9.7314.BFC4.0507

Data de Cadastro: 18/06/2019 00:11:31

INFORMAÇÕES ADICIONAIS

Foi detectada uma diferença entre a área do imóvel rural declarada conforme documentação comprobatória de propriedade/posse/concessão [213,0 hectares] e a área do imóvel rural identificada em representação gráfica [214,1212 hectares].

REPRESENTAÇÃO GRÁFICA



IDENTIFICAÇÃO DO PROPRIETÁRIO/POSSUIDOR

CPF: 006.043.032-03

Nome: ADELSON MARTINS RAMOS

ÁREAS DECLARADAS (em hectares)

CAR - Cadastro Ambiental Rural

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2.5.2 Recognition of Property Rights (G5.1)

Name of the Law	Description	Project Compliance
Law number 4771, September 15 th , 1965 (D.O.U of September 16 th , 1965)	<p>The Brazilian Forest code of 1965 – Brazilian Forest Code – provides for example:</p> <p>II – Area of Permanent Preservation: protected area in the terms of article 20 and 30 of this law, covered or not by native vegetation, with the role of protecting the water resources, landscape, geological stability, biodiversity, flux of genes of plants and animals, protection of the soil and securing a good environment for the human population;</p> <p>III – Legal Reserve Areas: area located in the property or “posse rural” excluding the areas of permanent preservation, for the sustainable use of the natural resources, conservation and restoration of the ecological process, biodiversity conservation and refugee and protection of native animals and plants; Art. 150 – It is prohibited under empirical form the exploration of primitive forest of the Amazon watershed, but can only be explored in accordance to technical management plans approved by act of Public authorities, to be issued in a <i>one year term</i>.</p>	All properties have legal reserve areas and APPs defined. In accordance with the CARs (Environment Rural Registry) at SEMA (Environment State Institute).
Normative Instruction number 003 of May 23 th , 2007 – Executive office of Environment, Science and Technology - SECTAM	<p>Regulatory of the Environmental Rural Registry - CAR in the state of Pará and providence of other requirements.</p> <p>Art 1 – establish criteria and procedures for implementation of the CAR – PA as an instrument for identification of the rural properties in the state of Pará that must be issued by</p>	Development of CAR in all land plots in the Project Area.

	<p>SECTAM-PA in accordance with this Normative Instruction.</p> <p>Art 2 – It is necessary for all rural properties in the state of Pará to be registered in the CAR-PA, even the properties that have no production activity.</p> <p>Art 3 – The issuance of the CAR-PA, as toll for identification of the property was done only once for each property. It has a registry number with a sequential number. This number is in all licenses, authorizations, and other documents issued for the environmental regularization of the rural property. This registry number is linked to the land, independent of if the land is sold, transferred or taken possession by another person.</p> <ul style="list-style-type: none"> – There is no concession of any license for the land that has no registry at CAR-PA. <p>Art 4 – In the CAR-PA all the basic data of the rural property is mentioned; Total area- AT, Area of permanent preservation – APP, legal reserve areas – ARL, and area of alternative use of the soil – AUAS. In addition, the name and profession of the land owner, geographic coordinates and other information required by complementary laws is included.</p>	
Federal Decree number 5.975/2006	<p>Art. 10 – Forest exploration and succession formations that require shallow harvest of the forest are only allowed under specific authorization for alternative land uses issued by SISNAMA.</p> <p>By alternative land use is understood any conversion of the forest to other land cover, such as settlements, agriculture, pasture, industry, energy generation, mining, and transportation.</p>	All properties have legal reserve areas and APPs defined in accordance with the CARs (Environment Rural Registry) at SEMA (Environment State Institute).

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

Free, Prior and Informed Consent (FPIC) is the principle that a community has the right to give or withhold its consent to proposed projects that may affect the lands they customarily own, occupy or otherwise use.

The project proposes a conduct process of FPIC to continue the informative process initiated with the PRA in order to promote a reasonable understanding about what the project is and what their activities will do. It ensures an equitable participation in decision-making processes and the involvement of the population in the implementation of the proposed project.

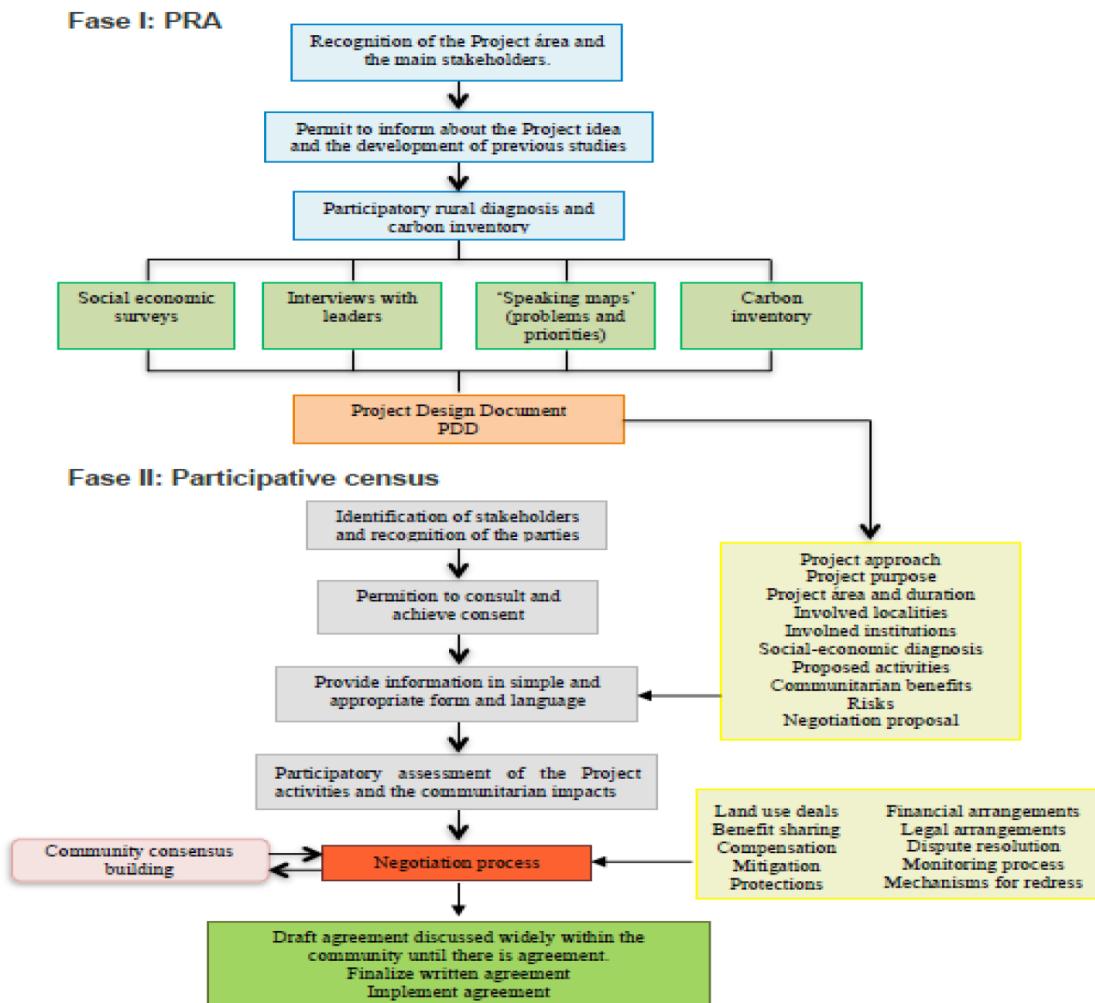
In this regard, we consider the following elements conductors for this process, avoiding the exercise of coercion, intimidation or manipulation (FREE);

- *Consent is required in advance to any authorization or beginning of the activities (PRIOR);*
- *Providing information that covers the following information:*
 - a. The nature, importance, rhythm, reversibility and approach of the project and the proposed activities;
 - b. The purpose of the project and its activities;
 - c. The duration of the project;
 - d. The area where the project and its activities were developed, as well as the localities involved;
 - e. The results of the initial diagnosis of the economic, social, cultural and environmental situation, including possible risks and benefits;
 - f. The institutions and staff that intervene in the implementation project; and
 - g. The procedures the project may include (claims resolution mechanism);
- *The consultation must be carried out through the establishment of a frank dialogue within an atmosphere of mutual respect, good faith and full and equitable participation (CONSENT);*
- *The process must include genre perspective. Women participation is essential, as well as the involvement of children, young people and vulnerable groups.*

It is important to mention that the definite protocol for FPIC was produced and developed after experience from working on other REDD projects in the region. This experience allowed a duplication of the way that interviews were conducted with the local population.

The following flowchart intends to represent the protocol to be followed in order to comply and ensure that the FPIC standards and criteria are implemented.

Figure 25: Flowchart for FPIC



2.5.4 Property Rights Protection (G5.3)

Our project activities do not lead to involuntary removal or relocation of property rights holders from their lands or territories and does not force rights holders to relocate activities important to their culture or livelihood. If in the future any relocation of activities needs to be undertaken, it will take place with a written agreement that demonstrates that the agreement was made with the free, prior, and informed consent of those concerned and includes provisions for just and fair compensation. However, technically under Brazilian law the only way to remove a property owner is by buying their property from that person in an agreement – in a real estate transaction.

All residents even land grabbers are permitted to keep the land they have taken up to 100 hectares.

However, land grabbing or other agrobusiness driven sources of deforestation, will not and have not been tolerated. These cases are aggressively pursued within the legal system of Brazil by the project's landowners.

2.5.5 Illegal Activity Identification (G5.4)

Illegal activities in the area are constituted by unplanned timber extraction. Such logging operations are evidenced by the proliferation of pioneer roads as presented in Map 12. It is known from literature that extractive operations will take advantage from the fact that local farmers don't have land titles to displace them or to gain access to the forest resources nearby villages (Araujo, Bonjean et al. 2009). At the same time, illegal logging operations thrive whenever there are forested areas that seem to be under no-use and where the presence of the landowner is not made evident (Margulis 2004).

The Project has trained local community members to work as monitoring staff in the Project Area and the LMA. This is the main activity to identify, prevent, and avoid illegal activities from taking place in the Project Area.

As support measures against illegal activities, the Project did provide land titles against conservation results to households living within the Project LMA Boundaries and did provide support to neighboring communities to achieve land tenure on unused public lands.

Stakeholders in neighboring communities were encouraged to report encroachers and illegal loggers trying to get into nearby forests. The Project did proceed to make the respective denounce to local authorities just as the situation is occurring in the Project Area. Through this mechanism the project was generating positive leakage.

2.5.6 Ongoing Disputes (G5.5)

There are no ongoing disputes to the land. However, the illegal loggers and NGOs funded by the illegal loggers are very upset that the project paid for 875 families to gain land tenure certificates, as they needed to keep these people poor, in order to control and walk on them.

2.5.7 National and Local Laws (G5.6)

Brazil is one of the signatories of the Kyoto protocol. The project is in compliance with this regulatory framework, because in the AFOLU scope, conservation is one of several mechanisms by which GHG emissions are expected to be reduced.

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

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

Nationally, the most significant effort to date was the submission of Bill No. 195/2011, which "establishes the national system to reduce emissions from deforestation and degradation, conservation, sustainable forest management, maintenance and increase of carbon stocks (REDD+), and other provisions", which are still in progress.

In addition, in December 2015, the National Strategy for REDD+ of Brazil (ENREDD+) was instituted by MMA Ordinance No. 370, a document that formalizes to Brazilian society and the UNFCCC signatory countries how the Brazilian government has structured its efforts and aims to improve them by 2020, contributing to climate change mitigation by controlling deforestation and forest degradation, promoting forest recovery and promoting sustainable development.

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

- Law 12,651 of 05/25/2012: It provides for the protection of native vegetation; amending Laws No. 6938, of August 31st, 1981, Law No. 9393, of December 19th, 1996, and Law No.11428 of December 22nd, 2006; revoking Laws No. 4771, of September 15th, 1965, and No. 7754 of April 14th, 1989, and Provisional Measure No. 2166-67, of August 24th, 2001; and other measures.
- Law No. 12187 of 12/29/2009: It established the National Policy on Climate Change (PNMC) and provides other measures.
- Provisional Measure No. 571, of 05/25/2012: It amends Law 12651 of May 25th, 2012, which provides for protection of native vegetation; amending Laws No. 6938, of August 31st, 1981, Law No. 9393, of December 19th, 1996, and Law No.11428 of December 22nd, 2006; revoking Laws No. 4771, of September 15th, 1965, and No. 7754 of April 14th, 1989, and Provisional Measure No. 2166-67, of August 24th, 2001.
- Law No. 58,054 of 3/23/1966: It promulgates the Convention for the protection of flora, fauna and scenic beauties of the American countries.
- Decree No. 96944 of 10/12/1988: It created the Program in Défense of the Ecosystem Complex of the Legal Amazon, and other measures.
- Decree No. 2661 of 7/8/1998: It regulates the sole paragraph of art. 27 of Law 4.771 of September 15th, 1965 (Forest Code), by establishing precautionary standards for activities involving fire in agropastoral and forestry practices, and other measures.
- Decree No. 2959 of 2/10/1999: It provides for measures to be implemented in the Legal Amazon, for monitoring, prevention, environmental education, and forest fire fighting.
- Decree No. 5975 of 11/30/2006: It regulates art. 12, final part, 15, 16, 19, 20 and 21 of Law 4771 of September 15th, 1965, art. 4, item III, of Law 6938 of August 31st, 1981, art. 2 of Law No. 10650, of April 16th, 2003, amends and adds provisions to Decrees 6514/08 and 3420/00, and other provisions.
- Decree No. 7390 of 12/9/2010: Regulates articles 6, 11 and 12 of Law 12187 of December 29th, 2009, establishing the National Policy on Climate Change (PNMC), and other measures.
- Decree-Law No. 5452 of 05/01/1943: Approves Labor Laws Consolidation. CONAMA Resolution No. 16 of 12/07/1989: It establishes the Integrated Program for Assessment and Environmental Control of the Legal Amazon.
- CONAMA Resolution No. 378 of 10/19/2006: It defines undertakings potentially responsible for national or regional environmental impact for purposes of item III, paragraph 1, art. 19 of Law 4771 of September 15th, 1965, and other measures.
- CONAMA Resolution No. 379 of 10/19/2006: It creates and regulates the data system and on forest management under the National Environmental System - SISNAMA.
- CONAMA Administrative Rule No. 218 of 5/4/1989: It provides for felling and exploration of native forests and successors forest formations of the Atlantic Forest, and other measures.
- IBAMA Administrative Rule No. 37 of 4/3/1992: Recognizes as Official List of Brazilian Endangered Flora Species the list found in the Administrative Rule.
- Ministry of Environment Administrative Rule No. 103 of 4/5/2006: It provides for the implementation of the Document of Forest Origin - DOF, and other measures.

- Ministry of Environment Administrative Rule No. 253 of 8/18/2006: It establishes, from the 1st of September, 2006 and on, under the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), the Document of Forest Origin (DOF), replacing the Authorization for Transportation of Forest Products (ATPFs).
- Administrative Rule 1896 of 09/12/2013: It amends Regulatory Norm No. 31. Ministry of Environment Administrative Rule No. 1 of 9/5/1996: It provides for Obligatory Reforestation and Forest Integrated Plan.
- Ministry of Environment Administrative Rule No. 07 of 4/27/1999: It provides for the authorization for deforestation in the Legal Amazon States.
- Ministry of Environment Administrative Rule No. 02 of 5/10/2001: It provides for the economic exploration of forests in rural properties located in the Legal Amazon, including Legal Reserve areas and with exception of permanent preservation established in current legislation, which will be carried out through multiple use sustainable forest management practices.
- IBAMA Normative Instruction No. 30 of 12/31/2002: It informs the geometric volume calculation of standing trees, applying the volume equation that specifies it, and other measures.
- IBAMA Normative Instruction No. 112 of 08/21/2006: It regulates the Document of Forest Origin - DOF, established by Ordinance Ministry of Environment Administrative Rule .253 of August 18th, 2006. (Amended by IBAMA Normative Instruction No. 134 of November 22nd, 2006)
- Ministry of Environment Administrative Rule No. 06 of 12/15/2006: It provides for the reforestation and consumption of forest raw materials, and other measures.
- IBAMA Normative Instruction No. 178 of 6/23/2008: It defines guidelines and procedures, provided by IBAMA, for consideration and approval on the issue of forest suppression authorizations and other forms of native vegetation in an area greater than two thousand hectares in rural properties located in the Legal Amazon, and a thousand hectares in rural properties located in the remaining regions of the country.
- Regulatory Norm No. 31 of 03/03/2005: Approves the Regulatory Norm for Safety and Health at Work in Agriculture, Cattle Raising, Forestry, Forest Exploration, and Aquafarming.

2.5.8 Approvals (G5.7)

The Project is developed on privately owned land and complies with all the required laws and regulations regarding forest protection in private lands. Given the fact that in Brazil there are not regulations regarding REDD projects and the fact that the Project will not undertake extractive activities but will preserve 100% of its Project Area, permits are not required from municipal, state or federal authorities.

There are no current approval processes in Brazil for REDD carbon credit projects.

As the project is 100% on private property, and has no indigenous or traditional people overlapping the project area, and as Brazil permits, Brazilians are allowed to do any project on their land.

2.5.9 Project Ownership (G5.8)

The project is set up by the project land owners. As listed in the title deeds, the owners of the land have the right to set up the project.

The owners of the land have signed with the Project Proponent various contracts allowing and giving permission to complete the project.

2.5.10 Management of Double Counting Risk (G5.9)

To date, the State of Pará, Brazil does not have a defined State REDD+ Strategy or any Forum for Climate Change registry, that would be the main organization to lead discussions on the subject, is currently inactive. In addition, the State Government does not provide formal procedures for registering or recognizing private voluntary projects under any jurisdiction REDD+ project. Also, the project does not intend to get the project registered in any other carbon market registry. Hence, it is concluded that there will be no issues of double counting of carbon credits generated from the project.

If there is a jurisdictional program on a national scale, the project will make appropriate arrangements so that the carbon credits are not sold twice.

2.5.11 Emissions Trading Programs and Other Binding Limits

The project will not sign up to other emissions trading programs and is not restricted by other binding limits. Brazil does not have any emissions trading programs.

2.5.12 Other Forms of Environmental Credit

The project is not involved in any other form of environmental credit.

2.5.13 Participation under Other GHG Programs

The project is not involved in other GHG programs.

2.5.14 Projects Rejected by Other GHG Programs

The project has not been submitted to any other GHG program.

2.5.15 Double Counting (G5.9)

The carbon credits generated from the project will be registered under the Verified Carbon Standard and sold under that mechanism. Credits from the project will not be registered or sold under any current regulatory scheme, as these schemes currently do not allow REDD credits to be sold. If and when the credits become eligible under a regulatory scheme, the proper procedures will be taken to ensure that credits are not sold twice.

3 CLIMATE

3.1 Application of Methodology

3.1.1 Title and Reference of Methodology

The project has been developed using the guidelines in VCS VM0015 REDD Methodology: Methodology for unplanned deforestation V1.1.

As part of the first validation of the project has followed the following documents and tools:

- VCS Tool VT001 Version 3.0 – Tool for demonstration and Assessment of Additionality in AFOLU Project Activities.

- VCS AFOLU Non-Permanence Risk Tool Version 3.1.

3.1.2 Applicability of Methodology

Table 7 indicates the applicability conditions to the VM0015 methodology and explains how the Project meets each criteria.

Applicability Conditions	Project Compliance to the methodology
Baseline activities may include planned or unplanned logging for timber, fuel-wood collection, charcoal production, agricultural and grazing activities, as long as the category is unplanned deforestation according to the most recent VCS AFOLU requirements.	The activities in the baseline are unplanned timber logging and grazing activities.
Project activities may include one or a combination of the eligible categories defined in the description of the scope of the methodology.	The main Project activity is to protect the forest. As a secondary activity it is envisioned to control logging activities to provide timber resources to local settlers.
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 agroforestry systems meeting the definition of "forest".	The Project Area is more than 90% Dense Ombrofile Forest. Forests in the Project Area are primary, Secondary, and degraded forests all of them in compliance with Brazil's definition of forest.
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.	Landsat TM images from the year 2004 to 2014 before the Project start date have been analyzed to identify only forested areas according to Brazil's definition of forest.
The Project Area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm. If the Project Area includes a forested wetlands growing on peat (e.g. peat swamp forests), this methodology is not applicable.	The Project doesn't include forested wetlands.

3.1.3 Project Boundary

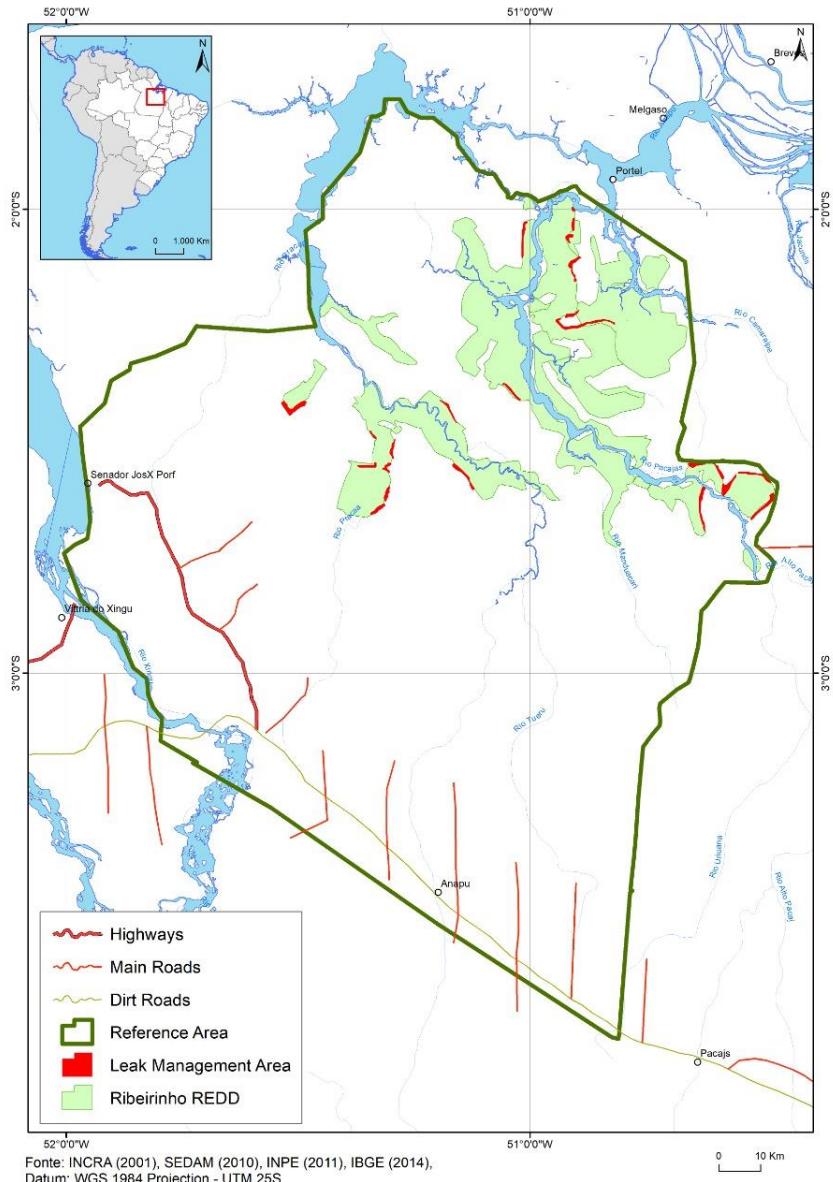
The physical locations where project activities take place are presented in the below figures: project boundary and leakage management areas.

Step 1.1 of VM0015 Project Spatial Boundaries

1.1.1 - Region of Reference

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

Figure 26. Location of the Reference Region, Project Area, and Leak Management Area



Reference Region:

Area: 1,991,227ha.

Historical deforestation rate: 1.91%.

Vegetation: Dense Ombrofile Forest.

Elevation range: 0-100m.

Average slope: 6° degrees

Annual average precipitation: 2181mm.

Agents and drivers of deforestation: main agents of deforestation are cattle ranchers (preceded by illegal loggers and squatters) followed by small-scale farmers (Riverine and traditional rural villagers).

Land Tenure: both public and private lands.

Law enforcement on land tenure rights: weak.

In defining the spatial boundary of the reference region, environmental characteristics (river basin boundaries), deforestation direction vector, and land tenure situation were considered. The boundary of the reference region followed the guidelines described on page 17 of the VM0015 methodology, with the final area within the range suggested by footnote 05 (page 18 of methodology VM0015). The reference region may include one or several discrete areas. It must be larger than the project area and include the project area.

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

1. Deforestation agents and vectors - improved infrastructure (such as roads, railroads, bridges, hydroelectric reservoirs, etc.) is expected to develop near the project area, new industries have been planned already in and around the project area where impact on forest cover was similar to the one expected from the old improved infrastructure in the project area.
2. Landscape configuration and ecological conditions - these are uniform throughout the RRD. Although some areas may present slight variations in slope, elevation and precipitation fall within the same range in all the areas of the RRD. Vegetation is mostly Ombrophilous Forest with evidence of agricultural plots no further than 3km from navigable rivers due to cassava crops implemented by local population. The RRD complies with the requirements of the VM0015 methodology in terms of representativeness of the characteristics found in the PA by satisfying all of the four landscape configurations and ecological conditions.
3. Socioeconomic and cultural conditions - the legal status of the land (private) is a unique patch of land present in the most deforested and degraded lands as compared in the baseline case within the project area of the reference region. The legal status of the private land is not biasing with the baseline of the project area. Table 8 presents the carbon pools used to account for carbon stocks for the Project.

Below, the mentioned figure shows the Forest typologies identified in the Reference Region. The classes of vegetation type found in the project area occupied 100% of the Reference Region. Based on these results, it is believed that the requirement that at least 90% of the project area have forest classes found in at least 90% of the reference region is met.

Figure 27. Map of the forest types in the reference region

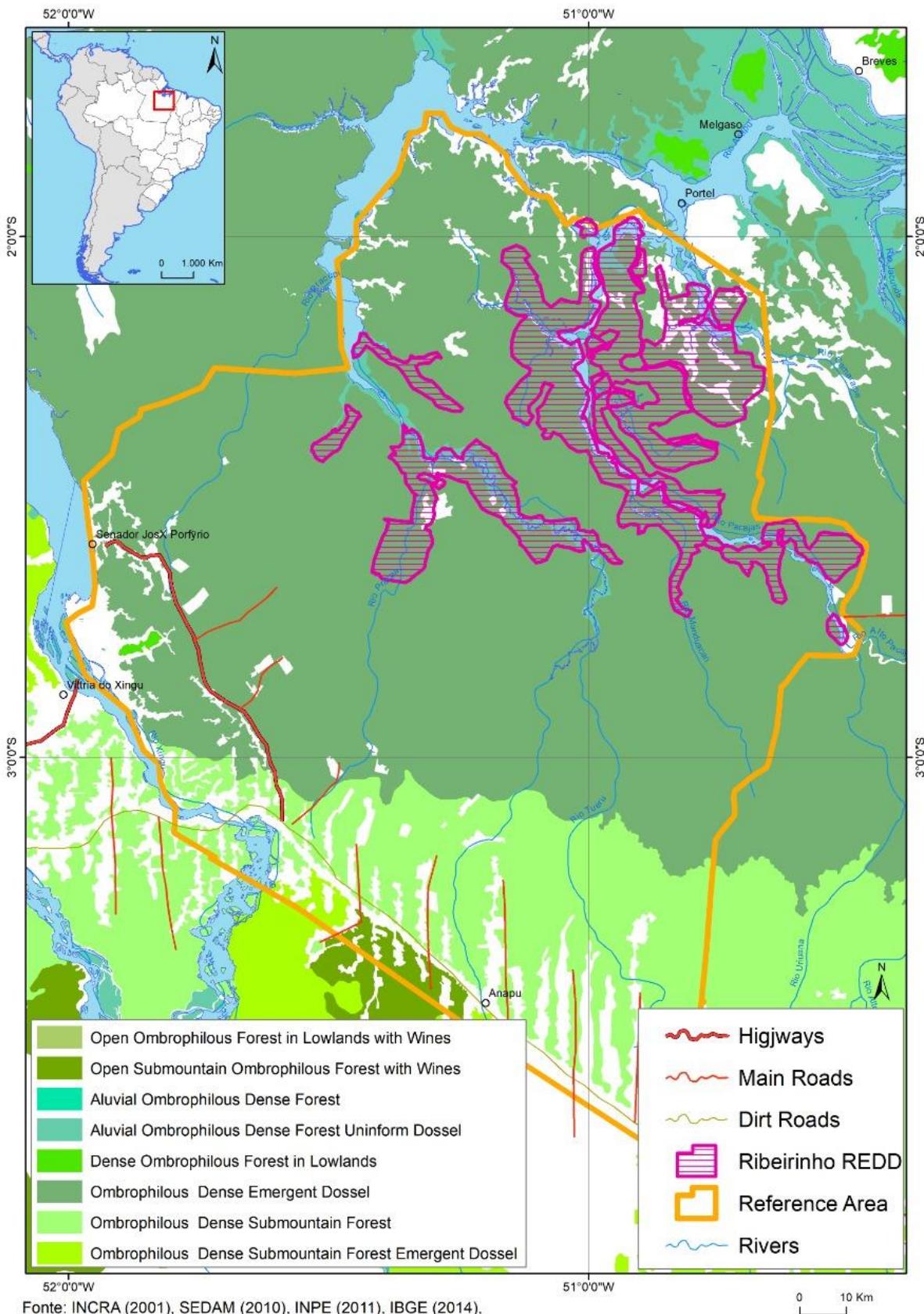


Table 8: Main forest typologies identified in the Reference Region of the Project

<u>Class of vegetation</u>	<u>Reference region</u>			
	<u>Area (ha)</u>	<u>% of Total</u>	<u>% Cumulative</u>	<u>Rank</u>
<u>Emergent Canopy Lowland Dense Ombrophilous Forest</u>	577,832	29	29	1
<u>Non-forest classes</u>	378,974	19	48	2
<u>Submontane Open Ombrophilous Forest with Vines</u>	261,742	13	61	3
<u>Emergent Canopy Submontane Dense Ombrophilous Forest</u>	225,659	11	72	4
<u>Uniform Canopy Submontane Dense Ombrophilous Forest</u>	189,031	10	82	5
<u>Pioneering Formations with fluvial and / or lacustrine influence - herbaceous without palms</u>	121,927	6	88	6
<u>Lowland Dense Ombrophilous Forest</u>	119,271	6	94	7
<u>Submontane Dense Ombrophilous Forest</u>	62,841	3	97	8
<u>Uniforme Canopy Alluvial Dense Ombrophilous Forest</u>	53,018	3	100	9
<u>Alluvial Dense Ombrophilous Forest</u>	932	0	100	10
<u>Total</u>	1,991,227	100%		

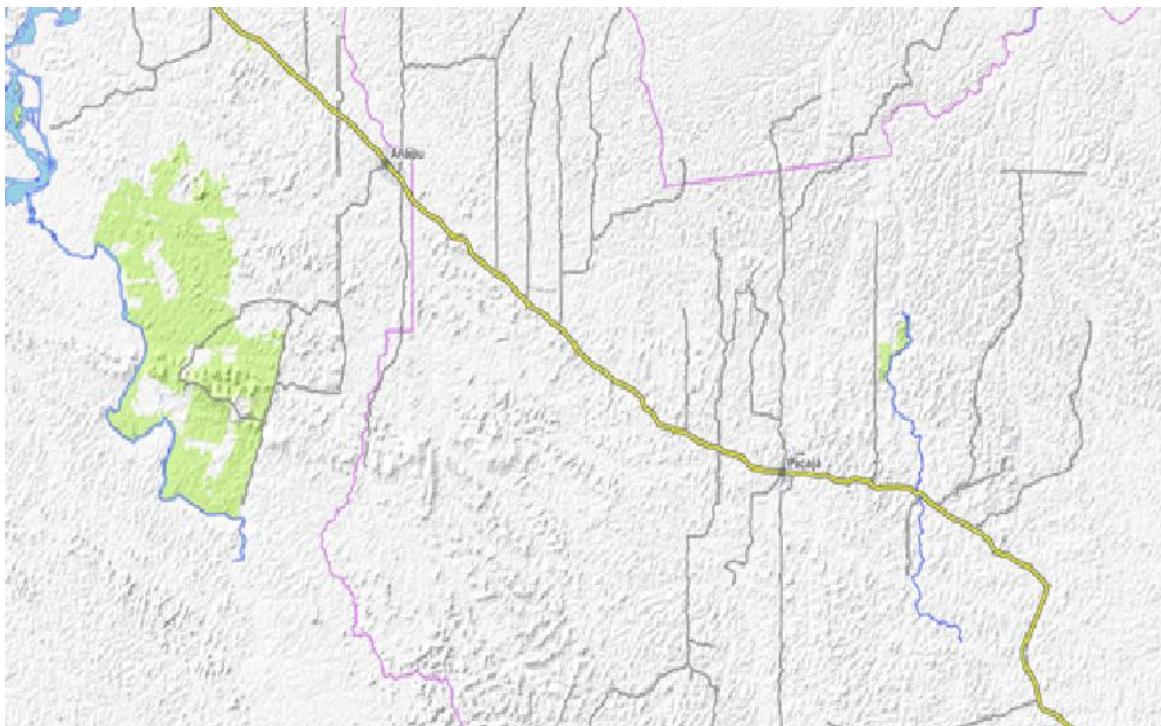
Table 9: Main forest typologies identified in the Project Area of the Project

<u>Class of vegetation</u>	<u>Project Area</u>			
<u>Class of vegetation</u>	<u>Project Area</u>			
	<u>Area (ha)</u>	<u>% of Total</u>	<u>% Cumulative</u>	<u>Rank</u>
<u>Emergent Canopy</u> <u>Lowland Dense</u> <u>Ombrophilous</u> <u>Forest</u>	79,669	35.71%	36%	<u>1</u>
<u>Non-forest classes</u>	52,421	23.50%	59%	<u>2</u>
<u>Submontane Open</u> <u>Ombrophilous</u> <u>Forest with Vines</u>	31,424	14.09%	73%	<u>3</u>
<u>Sustenance Farms</u> <u>of the Riverine</u> <u>intermixed with the</u> <u>forest</u>	23,123	10.37%	84%	<u>4</u>
<u>Emergent Canopy</u> <u>Submontane</u> <u>Dense</u> <u>Ombrophilous</u> <u>Forest</u>	17,553	7.87%	92%	<u>5</u>
<u>Uniform Canopy</u> <u>Submontane</u> <u>Dense</u> <u>Ombrophilous</u> <u>Forest</u>	8,432	3.78%	95%	<u>6</u>
<u>Pioneering</u> <u>Formations with</u> <u>fluvial and / or</u> <u>lacustrine influence</u> <u>- herbaceous</u> <u>without palms</u>	5,642	2.53%	98%	<u>7</u>
<u>Lowland Dense</u> <u>Ombrophilous</u> <u>Forest</u>	3,245	1.45%	99%	<u>8</u>
<u>Submontane</u> <u>Dense</u> <u>Ombrophilous</u> <u>Forest</u>	1320	0.59%	100%	<u>9</u>
<u>Uniforme Canopy</u> <u>Alluvial Dense</u> <u>Ombrophilous</u> <u>Forest</u>	185	0.08%	100%	<u>10</u>
<u>Alluvial Dense</u> <u>Ombrophilous</u> <u>Forest</u>	71	0.03%	100%	<u>11</u>
<u>Total</u>	<u>223,085</u>	<u>100.00%</u>		

Total Area includes Project Area as well as the Sustenance farms intermingled into this project area.

Elevation: The dimensions below 350m cover 90% of the Reference Region. About 89% of the Project Area is with dimensions lower than 350m which is shown in the below mentioned figure 28.

Figure 28. Map of the elevation in the reference region



(Source: <https://elevation.maplogs.com>)

Table 10: Elevation (class of 50 meters) in the Reference Region and Project Area of the Project

<u>Elevation (class in meters)</u>		<u>Reference Region</u>			<u>Project Area</u>		
<u>Min</u>	<u>Max</u>	<u>Area (ha)</u>	<u>% of Total (ha)</u>	<u>% Cumulative</u>	<u>Area (ha)</u>	<u>% of Total (ha)</u>	<u>% Cumulative</u>
1	50	995,614	50	50	159,970	80	80
51	100	696,929	35	85	37,993	19	99
101	150	298,684	15	100	1,999	1	100
Total (ha)		1,991,227	100%		199,962	100%	

Project Boundary:

Area: 223,085 ha.

Includes both the Leakage Management Area (LMA) and the Project Area (PA) and Social Outreach Area where the team goes to do social work. It is a much larger area, as the project's goal is to bring stability to the region.

1.1.2 Project Area

Project Area: 199,962 hectares – Project Crediting Area

Vegetation: 100% forested Dense Ombrofile Forest.

Human Density: No humans.

Land Tenure: The Private Property placed into the project.

Land tenure rights and law enforcement: Titled property recognized on the Federal level, but weak local enforcement of private property land rights.

Deforestation Prior to the Project Start: 18,452 hectares were already deforested in sustenance plots.

1.1.3 Leakage belt

The leakage belt was defined using the mobility approach (option II available in VCS Methodology VM0015). This option was selected because there are no data or studies in the Reference Region that prove that "economic gains" is a vector that represents more than 80% of deforestation observed in the historical reference period. Analyses carried out with data from the Terraclasse Project (INPE and EMBRAPA, 2012) have demonstrated that more than 40% of the deforested area in the Reference Region is not converted to productive uses, remaining as capoeiras or secondary vegetation. According to the socioeconomic study carried out in this project, deforestation is the result of a chain of actions related mainly to land insecurity and lack of command-and-control actions of state and municipal institutions (Ecoporé, 2015).

1.1.4 Leakage Management area

Area: 16,503 hectares.

Vegetation: Mix between dense Ombrofile forest, and riverine Cassava plantations.

Land Tenure: Small land grabber claims of less than 1000 hectares on top of public land and riverine and traditional rural village plots which the project has already provided the Cadastrol Ambiental Rural for 50 of these plots. With the aim to provide the Cadastrol Ambiental Rural for the remaining area.

Law enforcement on land tenure rights: weak.

Project Goal: In the LMA bring stability here by helping the riverine clarify land rights will greatly bring stability to the area around the project.

Table 11: Carbon pools included/excluded (Refer to Table 3 - VM0015)

Carbon pools	Included / TBD/ Excluded	Justification / Explanation of choice
Above-ground	Included	Carbon stock change in this pool is always significant.
Below-ground	Included	Included to account for all the trees biomass.
Dead wood	Excluded	This pool is less present in the baseline scenario than in the Project scenario, thus is conservatively excluded.
Harvested wood products	Excluded	This pool didn't pass the 5% significance test.

Litter	Included	According to the VM0015 methodology (version 1.1) it can be included.
Soil organic carbon	Excluded	Not to be measure when forest is converted to pastures in the baseline scenario according to VCS VM0015 methodology.

Table 12: Gas inclusion or exclusion

Gas		Included?	Justification/Explanation
Baseline	CO ₂	Excluded	Registered as changes in carbon stocks
	CH ₄	Excluded	Considered insignificant, according to VCS Program updates, on May 24 th , 2010
	N ₂ O	Excluded	Considered insignificant, according to VCS Program updates, on May 24 th , 2010
Livestock Activities	CO ₂	Excluded	Not a significant source
	CH ₄	Excluded	The project does not include livestock activities, so it is conservative to exclude such emissions once they are present in the baseline scenario
	N ₂ O	Excluded	

		The project does not include livestock activities, so it is conservative to exclude such emissions once they are present in the baseline scenario
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Step 1.2 of VM0015 – Temporal Boundaries

1.2.1: Starting date and end date of historical reference period

The historical period of this REDD+ Project is limited to the years 2000 to 2014. These dates were defined mainly considering the data availability of PRODES Project, used to generate land cover maps and meet the requirements of methodology VM0015 (Figure 29) Land-use and Land-cover change map from 2000 to 2014; The 2017 to 2020 deforestation rate has greatly increased in the reference period.

1.2.2: Starting date of the project crediting period of the AUD project activity

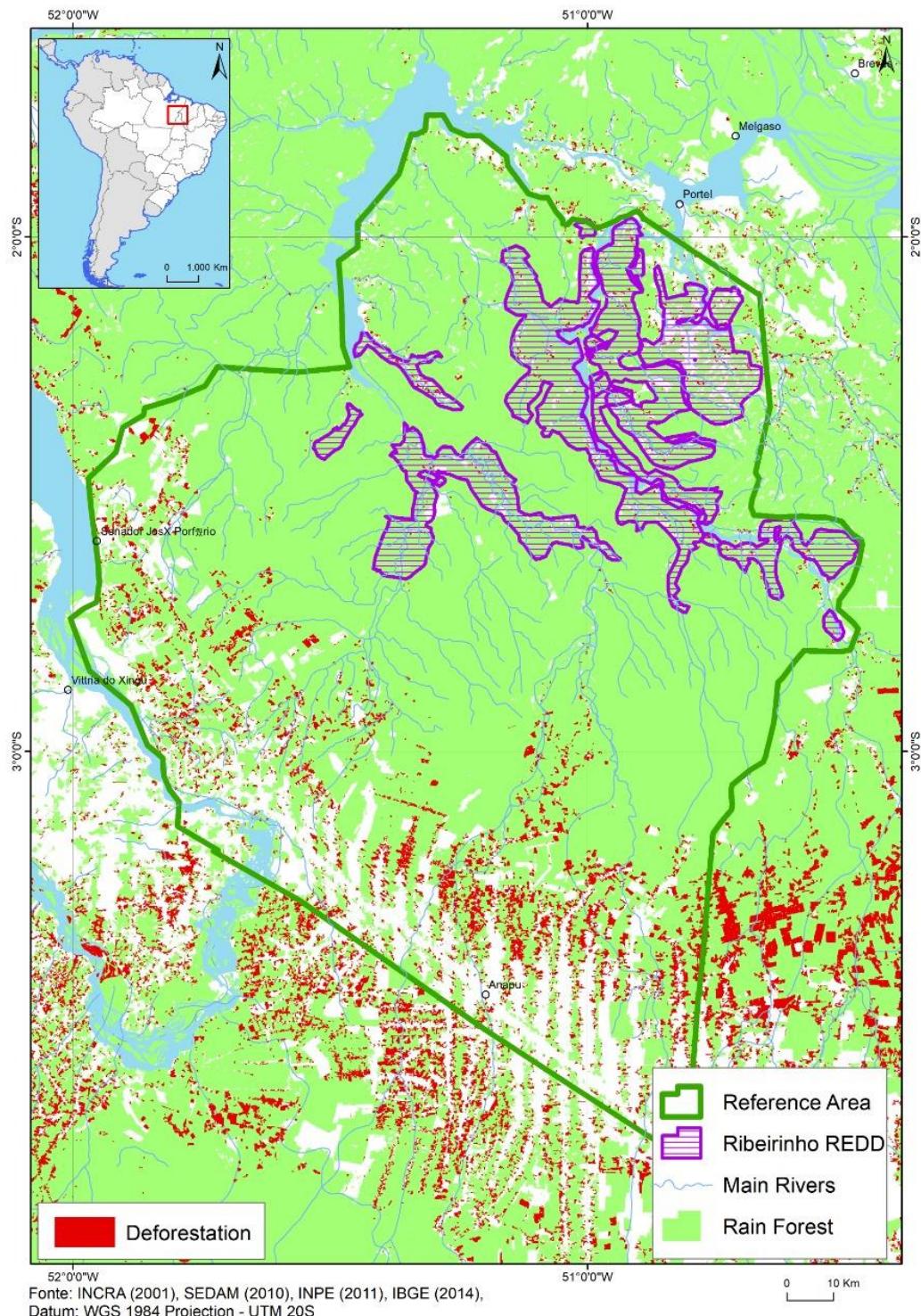
The start date of the crediting period is 01/01/2017 to 31/12/2046 and deforestation of the baseline scenario was modelled until the year 2046 (+30 years);

1.2.3: Starting date and the end date of the first fixed baseline period

The fixed baseline period is 10 years, as determined by methodology VM0015 (page 30). The baseline scenario will be reassessed in the year 2026;

1.2.4: Monitoring period

The monitoring period for land use and change is one year, starting from the year 2015
Figure 29: Land-use and Land-cover change map from 2000 to 2014



3.1.4 Baseline Scenario

The baseline scenario identifies two deforestation processes happening simultaneously in the RRD, related by a common but non-exclusive chain of events. Regardless of the process, eventually the most profitable final land-use is the one that will prevail.

Therefore, in the RRD there are two well-defined fronts of deforestation that are linked by a common dynamic, a Pioneer and a Consolidated Frontiers.

On one side, there is a Pioneer Frontier where Riverines and traditional rural villagers live alongside the shores of primary and secondary rivers within the LMA. At the same time, squatters and illegal loggers encroach unprotected dense forests building pioneer roads from secondary rivers, away from primary rivers and out of sight of law enforcers and legal landowners. On the other side, there is a Consolidated Frontier, close to main roads like the Transamazonica highway (BR-230) and where deforestation is already wide spread. Here small and medium size cattle ranchers expand secondary and tertiary roads, extract valuable timber species and then deforest through slash and burn. In this region the non-taken lands have been exhausted, making the 7 large forest landowners just to the north of this region a prime target by these small and medium size cattle farmers.

Pioneer Frontier

From our Social Assessment we know that riverine and traditional rural villagers have as main economic activity small-scale cassava agriculture to produce and sale farinha. Riverine and traditional rural villagers slash young trees in abandoned fallows, take the cut timber and then apply fire to clear the land and have it ready to plant cassava. Should be remarked that from our study we know riverine won't set cassava fields any further than 3km from the river shores. At the same time, riverine extract timber as a secondary economic activity. Although it is a secondary economic activity, timber extraction provides higher revenues that are used to pay for education and health care. From our Social Assessment study, we know a household extracts between one or two trees per year.

Simultaneously, there are invaders (squatters/ land grabbers), illegal selective loggers and cattle ranchers. These three agents form part of a single deforestation process. Squatters/land grabbers and illegal selective loggers conduct their activities in what is known as the "pioneer frontier" which is the area far from developed roads, deep into the forest. They have a low opportunity cost and they clear forested areas not only for the timber but also for the expectation of selling such land in the future (after getting some sort of land possession right, the same type of right the project pays for the riverine and traditional rural villagers to gain). Usually, illegal selective loggers share the land with small and medium scale cattle ranchers, who start growing pasture underneath the degraded forest. After a couple of years of logging, ranchers will buy the lands from loggers and land grabbers and perform slash and burn on the remaining trees. Under this approach, deforestation can appear from one year to the other.

The squatters/land grabbers from our study number in the thousands of potential violators. These potential land grabbers use the ambiguous ownership rights of the riverine and traditional rural villagers to "claim" the region is a conflict region; thus their actions are acceptable due to the words they use as their justification for their actions. The region in reality is only a conflict region due to the existence of these land grabbers and the world conflict region is their justification.

Two other large landowners released security in 2010 due to the world financial crisis as their businesses broke and were 100% invaded in a matter of months. In some cases, land grabber claims and squatter claims layered as many as 10 people claiming the same location. There was so much leakage due to these two landowners, that other large landowners had to multiply security on their land due to the "free-for-all" invasion. After nine years both of these properties have had all wood of value stripped and have hundreds of claims. The motivation of these land grabbers is simple: 1000 hectares claimed is worth 1 million dollars in a sale with a possession document. The motivation for the land grabbing is 100% based on financial incentive.

Consolidated Frontier

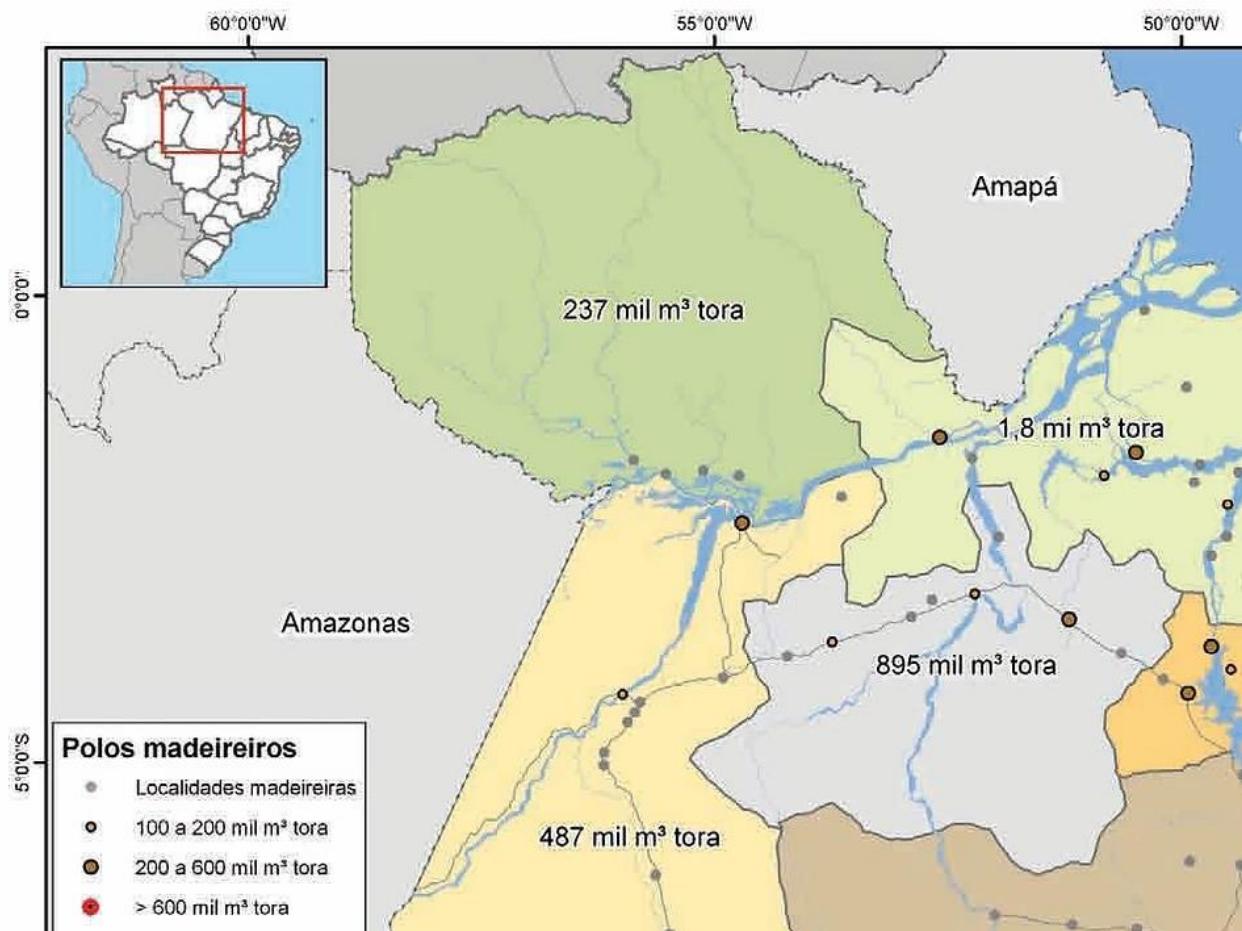
In the case of large-scale cattle ranchers, they operate in what is known as the “consolidated frontier” which is the area closer to the Transamazonica federal highway (BR-230) and the Senador Jose Porfirio state highway (PA-167). In this area, deforestation agents have developed over the years a complex network of secondary and tertiary roads from where deforestation expands. This road-expansion process was already in place at the start of the historical deforestation period and has increased over the years.

As with the Pioneer Frontier, this area started to be colonized by logging companies and other opportunistic agents that set the infrastructure for final land users (cattle ranchers) to buy the lands with degraded forest, apply slash and burn and develop pastures. This process was the norm at the beginning as cattle ranchers establishing in the area were colonizing it taking advantage of the economic incentives generated by the government, and at the time they wouldn't have enough capital to cover the costs of timber extraction and transportation.

Nowadays the situation has changed. Thanks to subsidies, tax breaks, and high demand for meat, and cattle, ranchers in this area have become well-capitalized agents that can undertake timber extraction and posterior deforestation if they need more areas to develop pastures. Therefore, these agents clean the forest directly, keeping valuable timber species for sale and applying fire to what is left thus pushing northwards the deforestation frontier (Fearnside 2001; Margulis 2004; May 2011)¹⁶.

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

Figure 30: Map of the forest biomass of the project area (https://abibbrasil.wixsite.com/brazilbiomass/potencial_biomassa_para)



Modeling based approach was used for the selection of the baseline. With this approach, the rate of baseline deforestation was estimated using a model that expresses deforestation as a function of driver variables selected by the project proponents. Such driver variables may be spatial and consistency with the analysis of step 3 must exist. Several remote sensing technologies are being developed (Assessing Forest Biomass and Exploration in the Brazilian Amazon with Airborne InSAR: an Alternative for REDD. The Open Remote Sensing Journal. 5. 10.2174/1875413901205010021.) to provide accurate estimates of forest biomass to guarantee that REDD can effectively reduce carbon emissions from deforestation and forest degradation. X/P-band InSAR combines the potential for wall-to-wall data acquisition in very large areas and estimation of forest biomass in conditions - such as with the presence of cloud cover, and dense vegetation – that other remote sensing technologies face difficulties to deliver. We confirmed the results of the studies demonstrating that, when Hint is available, forest biomass estimation is improved substantially. This can overcome the known limitation of using P-band backscatter alone for biomass estimation, i.e., signal saturation above a certain biomass threshold. It was evident from the study that cattle ranching and timber logging are the main drivers of deforestation in and around the project area.

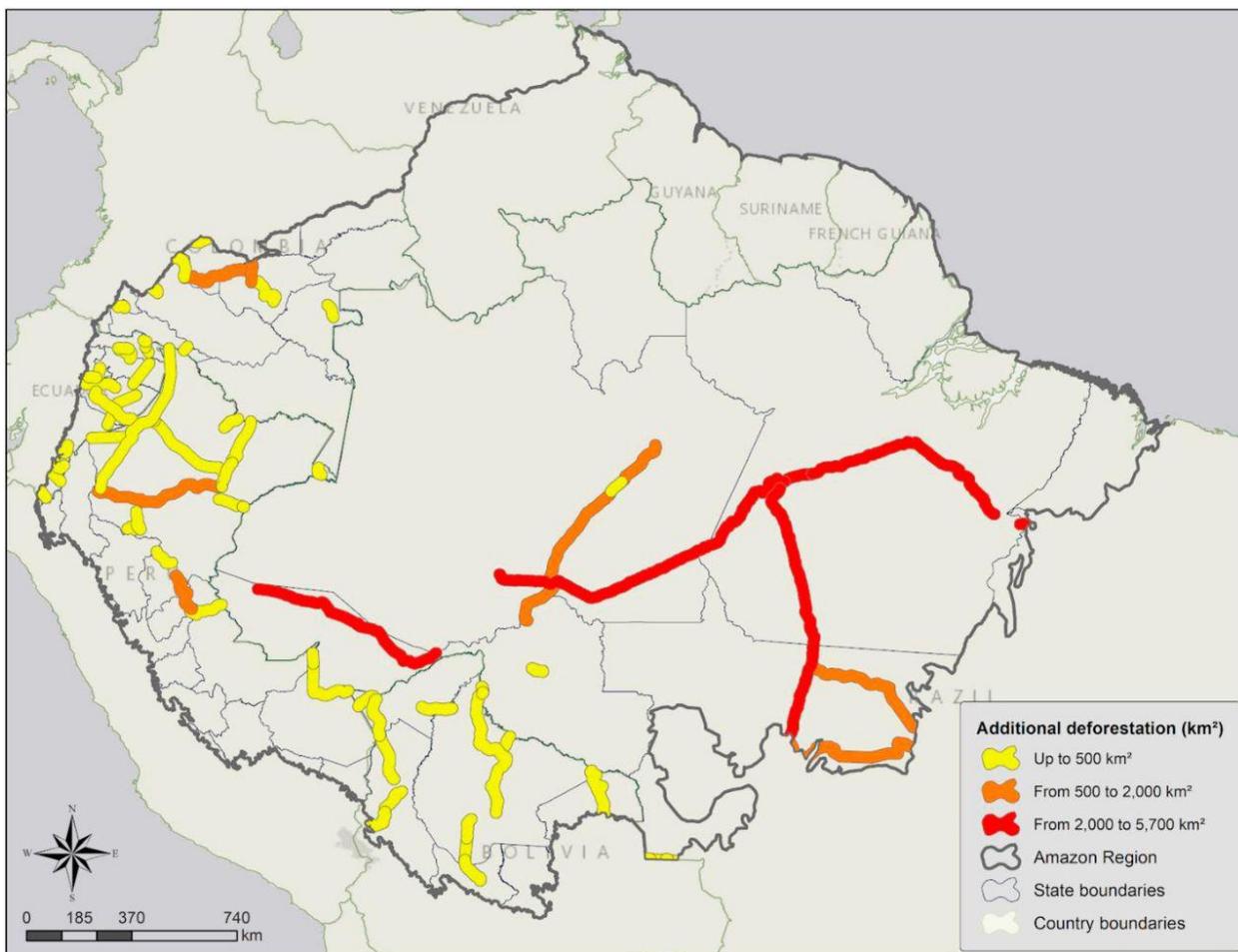
The pioneer frontier is the area of the project boundaries and its immediate vicinity. In this southern part of the RRD, landless people or communities colonize river shores and develop small villages; illegal loggers open penetration roads to access valuable timber resources; squatters (invaders) clear-cut patches of forest through slash and burn to prove land ownership and attempt a future land re-sale.

The rapidly expanding network of roads into the Amazon is permanently altering the world's largest tropical forest. Most proposed road projects lack rigorous impact assessments or even basic economic justification. Vilela et.al, 2020, analyzes the expected environmental, social and economic impacts of 75 road projects, totaling 12 thousand kilometers of planned roads in the region. They found that all projects, although in different magnitudes, will negatively impact the environment. Forty-five percent will also generate economic losses, even without accounting for social and environmental externalities. Canceling economically unjustified projects would avoid 1.1 million hectares of deforestation and USD 7.6 billion in wasted funding for development projects. For projects that exceed a basic economic viability threshold, we identify the ones that are comparatively better not only in terms of economic return but also have lower social and environmental impacts. We find that a smaller set of carefully chosen projects could deliver 77% of the economic benefit at 10% of the environmental and social damage, showing that it is possible to have efficient tradeoff decisions informed by legitimately determined national priorities.

⁷Sambatti, 2012) (Sambatti, Julianno & Leduc, Raphael & Lübeck, Dieter & Moreira, João & Santos, João. (2012).

⁸Thais Vilela, Alfonso Malky Harb, Aaron Bruner, Vera Laísada Silva Arruda, Vivian Ribeiro, Ane Auxiliadora Costa Alencar, Annie Julissa Escobedo Grandez, Adriana Rojas, Alejandra Laina, and Rodrigo Botero. 2020. A better Amazon road network for people and the environment. PNAS.vol(117)13:7095–7102.

Figure 31. Primary, secondary and tertiary road network in and around the project area



Squatters thrive on land speculation and use the network of tertiary roads to encroach the Project Area and clear it to claim ownership. Squatters will implement small-scale grazing to prevent the forest from regenerating and to prove that the land is under productive use, aiming at obtaining land ownership titles. Once ownership is granted, they sell their land to larger-scale ranchers.

Ranchers will expand pastures and grazing activities not only because it is a profitable activity but also to keep proving land ownership. The use of the network of tertiary roads allows ranchers to speed-up the consolidation process of the pioneer frontier.

Given the fact that pioneer roads are becoming tertiary roads by connecting with the network of the internal highway network, it is expected that the Project Area will suffer the same pressures and average deforestation rates that affected the consolidated frontier during the historical deforestation period.

Due to its massive size, the deforestation in Brazil beginning in the 1970s and 1980s led to international attention to protect the rainforest habitat. Deforestation in Brazil is largely driven by large scale forest conversion to cattle and later to soy cultivation. In the Brazilian Amazon, about 80% of the deforested areas are within 30 km of an official road. Much of this forest loss is located along the Trans Amazonian highway running east-west from the dry northeast coast into Para in the central Amazon, and along the soy highway running south-north from Mato Grosso into the interior of Para.

In a without project scenario, it is likely that deforestation in the area will continue at a conservative rate of 1.7 % per year which can be used for baseline projections. Deforestation in the Brazilian Amazon surpassed

10,000 square kilometers in 2019, the first-time forest clearing in Earth's largest rainforest has topped that mark since 2008, according to revised data from Brazil's national space research institute INPE.

Deforestation mostly occurred close to rivers, in sandy plains and valleys. Historically, the main proximate cause of deforestation in the territory has been to extend pasture for extensive cattle ranching. Cattle ranching requires good access to surface waters (rivers and small streams), which are concentrated in the plains and valleys. Moreover, the low fertility of sandy soils does not have a negative effect on pasture productivity in these extensive systems.

Figure 32. Deforestation rate of Amazon area in Brazil from 1988 to 2019

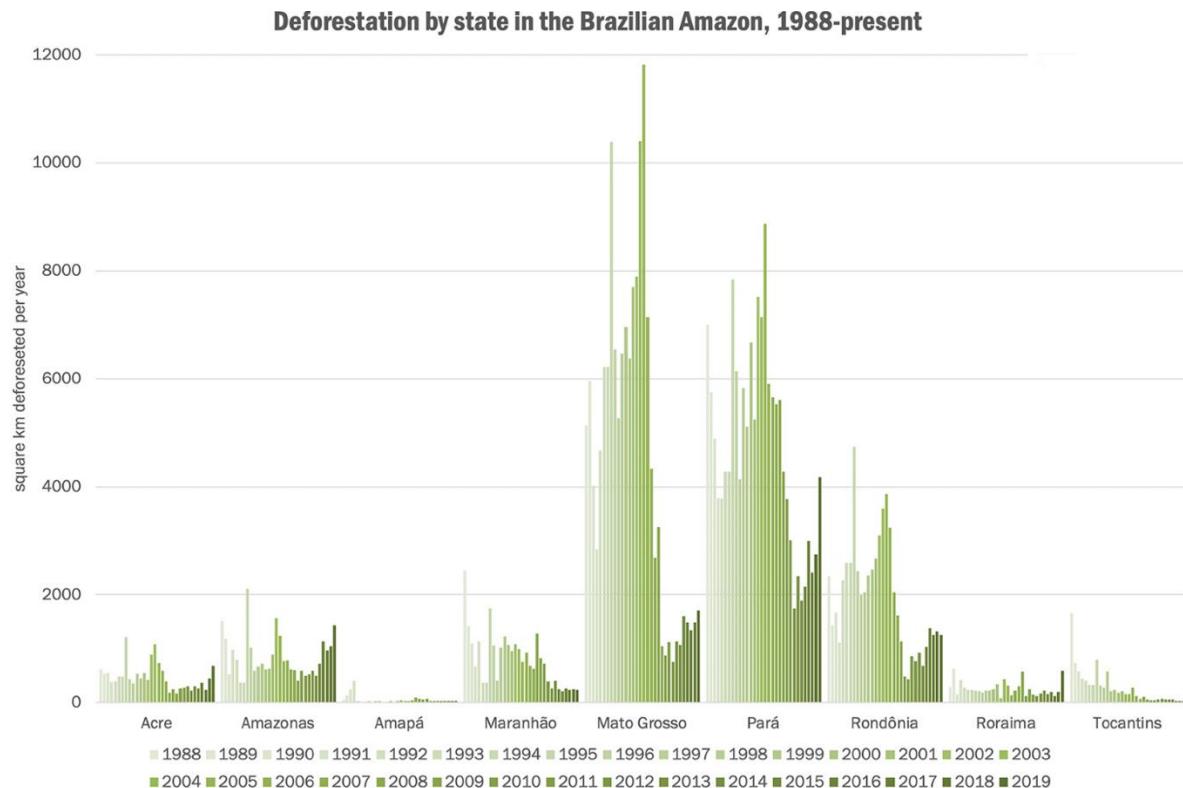
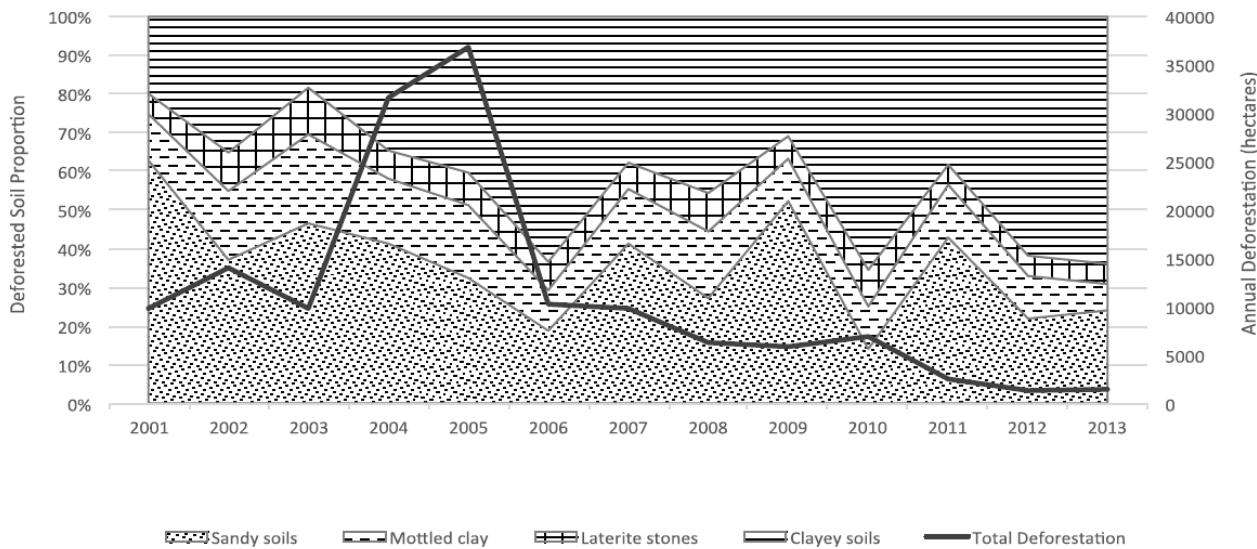


Figure 32, explains the deforestation rate in the Amazon states of Brazil from the year 1988 to 2019. It is clearly evident from INPE studies that the State of Para is one of the most deforested areas in the Amazon portion of Brazil.

Land use and land cover data in Brazil are organized according to the country's six major terrestrial biomes Amazônia (mainly tropical rain forest), Cerrado (tropical savanna), Caatinga (semi-arid deciduous shrubland and semi-deciduous dry forests), Mata Atlântica (tropical and subtropical forest, much depleted), Pantanal (extensive wetlands) and Pampa (mainly natural grassland). Each of these biomes has unique inter-annual and seasonal variability, presenting unique challenges for mapping land cover and land use.

Soils in the Project Area and its surroundings are showed in the figure below. Latossolo Amarelos contain clay B-horizon with a range from 15% to over 60%. It is possible to define a sort of intermediate texture of the soil (15% to 35% of clay), clay (35% to 60% of clay) and other clay (more than 60% of clay). With reference to land use possibilities, Rodrigues et al. (2003) mentions that Oxisols, due to their chemical characteristics unfavorable for agricultural activities, it requires correction, especially in relation to high acidity and high aluminum content. The application of lime and chemical and organic fertilizers can easily correct these limiting characteristics in order to increase concentration and retention capacity of soil nutrients. Soils in the Project Area are showed below in Figure 33.

Figure 33. Distribution of annual deforested areas as a function of soils type



Step 2 of VM0015 - Analysis of Historical Land-Use and Land-Cover Change

2.1 Collection of appropriate data sources

For the mapping of the changes in the classes of use and soil cover, data from the PRODES Digital program (INPE, 2014) were used in vector format (shapefile) with spatial resolution of 30 meters. A total of 83 Landsat satellite images were used to map forest, non-forest vegetation, hydrography and anthropogenic vegetation (deforestation) (Table 13). According to the methodology of PRODES Câmara et al. (2006) (Câmara G, Valeriano D, Soares JV (2006) Metodologia para o Cálculo da Taxa Anual de Desmatamento na Amazônia Legal. INPE, São José dos Campos), these images underwent geometric correction with a displacement error of less than 1 pixel (30 x 30 m). These images cover the historical reference period (2000 to 2014) and can be located through four Orbit/Point in the Landsat scene.

Table 13. Data used to identify and map historical LU/LC change analysis in the project (Table 5 of methodology VM0015, page 30)

Vector (Satellite or Airplane)	Sensor	Number of Images	Mean Spatial Resolution (m)	Acquisition Date/Year	Mean Coverage of Study Area (%)
Satellite	Aster	12	15	2010	23
Satellite	CBERS	7	20	2006	81
Satellite	ISS	1	27.31	2014	24

Satellite	Landsat 1	8	70	1972	85
Satellite	Landsat 2	10	76	1974	93
Satellite	Landsat 3	4	80	1978	90
Satellite	Landsat 4	2	45	1982	100
Satellite	Landsat 5	69	30	1990	99
Satellite	Landsat 7	15	30	2012	93
Satellite	Landsat 8	6	30	2014	99
Satellite	Sentinel 1	1	5	2015	100
Satellite	Sentinel 2	3	20	2016	54
Satellite	STS	1	541	2002	78

2.2 Definition of classes of Land-Use and Land-Cover

The soil cover classes used in this Project are represented in Table 14 and Figure 55. The following are the description the classes used in the Project and its area at the beginning of the historical period (2000):

- Forest (1,293,784ha): area of forest remnant belonging to different Phyto-physiognomies of the ombrophilous forest;
- Non-forest vegetation (339,536ha): area consisting of vegetation with physiognomy diverse from forest such as Arboreal-Shrub Savannah (Savanna), Gramineous-Woody Savannah (Clear Field of Savanna), Campinarana, among others;
- Hydrography (60,732ha): water bodies (rivers, lakes, streams, among others);
- Anthropogenic Vegetation (Deforestation – 297,175ha): area where there was forest, but that was removed through the shallow cutting process (removal of forest cover). These areas are converted to other uses of land, different from forest areas (mosaic of different types of vegetation that includes pastures, plantations and secondary vegetation, according to Fearnside, 1996).

Table 14. List of all land use and land cover classes existing at the Project start date within the Reference Region (Table 6 of methodology VM0015, page 32)

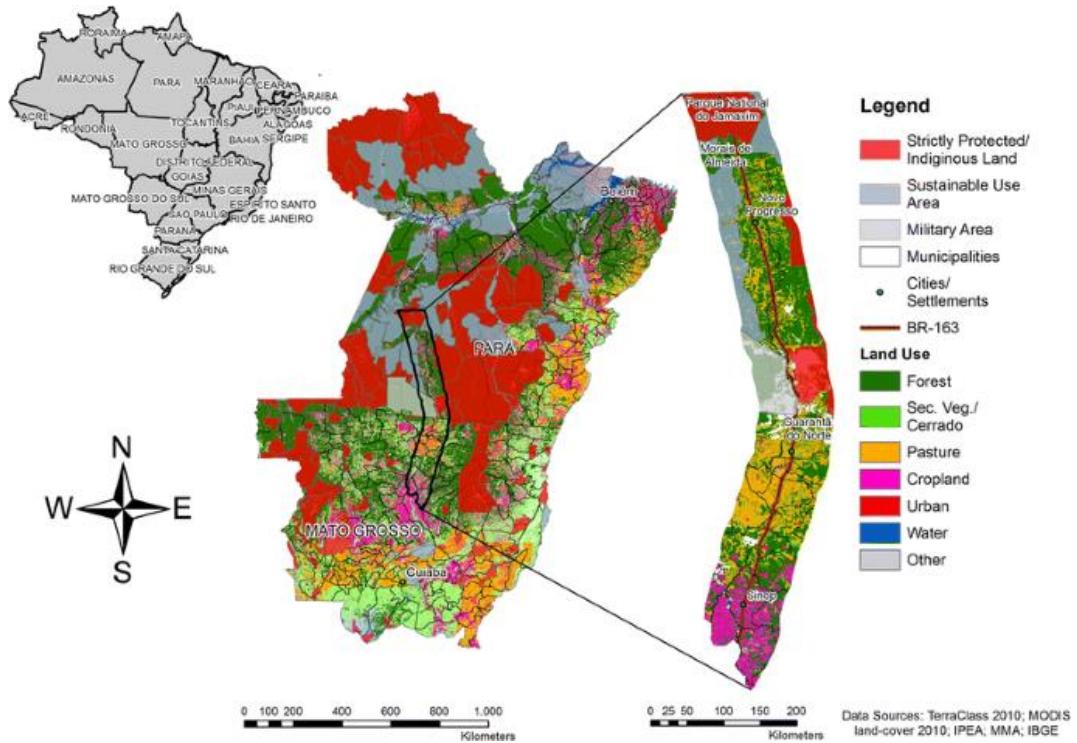
Class identifier		Presence in ¹	Baseline activity ²	

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

Note: ¹RR: Reference Region; LK: Leakage Belt; LM: Leakage Management Area; PA: Project Area.

²LG: Logging; FW: Fuel-Wood Collection; CP: Charcoal Production.

Figure 34. Land Use and Land Cover Map and Deforestation for the sub-period analyzed



2.3 Definition of categories of land-use and land-cover change

For the Project, the transition between two categories of land use was projected, with the change of areas with forest cover to areas of anthropized vegetation (deforestation) (Table 15).

Table 15. List of land-use and land-cover change categories (Table 7b of methodology VM0015, page 33)

ID _{cl}	Name	Trend in Carbon Stock	Presence in	Activity in the Baseline case ¹			Name	Trend in Carbon Stock	Presence in	Activity in the Project case ¹		
				LG	FW	CP				LG	FW	CP
I1/F1	Forest	Decreasing	PA	Yes	Yes	No	Deforestation	Constant	LM	Yes	Yes	No
I2/F1	Forest	Decreasing	LK	Yes	Yes	No	Deforestation	Constant	LM	Yes	Yes	No

Note: ¹LK: Leakage Belt; PA: Project Area; ²LG: Logging; FW: Fuel-Wood Collection; CP: Charcoal Production.

2.4 Analysis of the historical Land-Use and Land-Cover change

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

2.4.1 Pre-processing

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

- Selection of images with lower cloud cover and acquisition date closer to dry season in the Amazon and with adequate radiometric quality;
- Georeferencing of 30-meter spatial resolution images in 1:100,000 scale maps and NASA Orthorectified MrSID format images.

2.4.2 Interpretation and classification

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

2.4.3 Post-processing

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

2.4.4 Results

The results of the post-processing step are shown in the below represented Figure 35 and Table 16 below.

Figure 35: Land Usage and forest cover in the Reference Region based on date from 2000 to 2014.

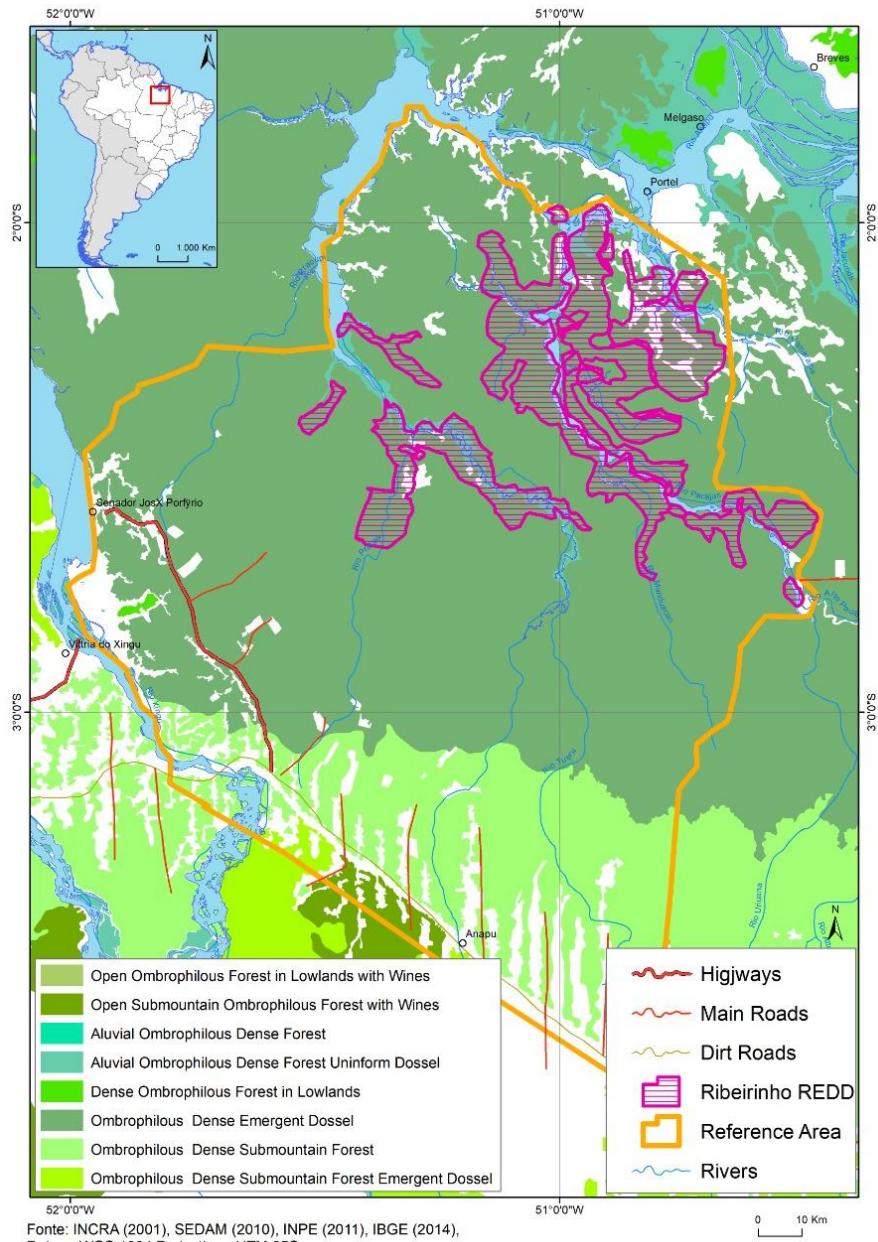


Table 16. Matrix of the soil cover map (PRODES, 2014) of the Reference Region generated from satellite images of Google Earth

		Reference				Total	User	Commission
		Water	Deforestation	Forest	Non-Forest		Accuracy	Error
Classified	Water	7				7	100%	0%
	Deforestation		56	17		73	93%	7%
	Forest	3	13	132	7	155	92%	8%
	Non-Forest		2	3	24	29	91%	9%

Total	10	71	152	31	264	
Producer Accuracy	80%	84%	97%	84%		92%
Omission Error	20%	16%	3%	16%		
Map Accuracy						92%

Results are interpreted in section 2.5 - Map accuracy assessment.

2.5 Map accuracy assessment

PRODES data were validated from a comparison of Landsat images collected in the year 2014, as well as high spatial resolution images available in Google Earth and the soil cover map generated by INPE for the year 2014. About 264 points were randomly distributed in the reference region. For each point a visual interpretation was made in the 1:50,000 scale of the predominant class at the point (classes: Forest, Non-Forest, Water and Deforestation). Then the classification through visual interpretation was compared with the classification generated by INPE through the confusion matrix (Congalton, 1999) (Congalton, R.G. and Green, K. (1999) Assessing the Accuracy of Remotely Sensed Data Principles and Practices. Lewis Publishers, Boca Raton). The overall accuracy of the 170 points evaluated was 91%.

2.6 Results in change history analysis in Land-Use and Land-Cover

Based on the data obtained in the previous steps, the analysis of the historical change in land cover between 2000 and 2014 was carried out in the Reference Region of the project area. The subtraction map analysis resulted in a deforested area between 2000 and 2014 of approximately 102,923ha (6% of forest remnant in 2000).

Below, the mentioned table shows the changes occurring from the Forest class to the Deforestation class, with a decrease in the carbon stock (annual deforestation that occurred between 2000 and 2014 in the Reference Region).

Initial class (2000)							
ID _{cl}		Name	Forest	Non-forest vegetation	Hydrography	Anthropized vegetation	Total (ha)
			I1	I2	I3	I4	
Class LU/LC final (2014)	F1	Forest	1,190,861	0	0	0	1,190,861
	F2	Non-forest	0	339,536	0	0	339,536
	F3	Hydrography	0	0	60,732	0	60,732
	F4	Deforestation	102,923	0	0	297,175	400,098
Total (ha)			1,293,784	339,536	60,732	297,175	1,991,227

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

3.1 Identification of agents of deforestation

- a) Name of the agents of deforestation in the Reference Region: the main agents of deforestation are squatters for grazing, agriculture and other activities such as timber extraction.
- b) Relative importance of the amount of historical deforestation assigned to each agent or group: the identified squatters account for 100% of the unplanned deforestation observed in the Reference Region.

c) Brief Description: the deforestation agents of the project region are mostly migrants who came especially from other cities in the northern region of the country and the northeast region. These agents are historically attracted to the region by enterprises such as those linked to the project, infrastructure projects, mining, among others. In addition to the possibility of job offer, such agents are attracted by the possibility of taking on indefinite or theoretically disputed areas. Such agents usually invade areas belonging to the project claiming to be in lands that belong to the state government or federal government. They clean up areas aiming to take ownership, build improvements, and initiate small-scale plantations and small-scale animal husbandry. Through these activities, which impact and change the forest cover, the squatters seek to legitimize their occupation⁹

⁹LIMA and POZZOBON,2005) (LIMA, Deborah and POZZOBON, Jorge. Socioenvironmental Amazon: ecological sustainability and social diversity. Estud. av. [online]. 2005, vol.19, n.54, pp.45-76. ISSN 0103-4014.

3.2 Identification of deforestation drivers

a) Driver variables that explain the quantity (hectares) of deforestation

- Population growth
- Demand for new areas for agriculture and small pasture
- Illegal logging of timber

Population growth:

1. Brief description: The Reference Region is located in a new frontier of expansion of the Amazon region, presenting a process of constant migration of workers to support the projects in the region. In the past, the installation of the major construction projects started the irregular formation of the encampment, which housed most of the manual workers who served the construction project. This is a common phenomenon in the Amazon region, where it is estimated that on average 40% of the migratory population of medium and large projects end up establishing themselves in the regions, after the completion of the construction of the projects. Among the infrastructure projects in the vicinity of the Reference Region, which are a major influence on population growth, the construction of the Belo Monte Power plant. A road connecting Belo Monte directly to Belem would result in the frontier having a new influx of settlers.
2. Likely future development: The influence of the infrastructure projects on the deforestation dynamics of the region was simulated in the deforestation model following the same methodology as the REDD+ Project. The main assumption was that population growth may increase the risk of deforestation in the vicinity of the Belo Monte hydroelectric plant, and new highways in the region as well as new power transmission lines.
- 3 The Mayor of Portel Para's singular goal as Mayor is to make a paved road connecting the city of Portel to the Transamazonica highway, which will go directly next to the Ribeirinho REDD+ Project. The official population data (IBGE) refer to municipalities, since these are areas of great extensions and the Reference Region is constituted by several parts of the same, besides the data outdated, it is not possible to accurately raise the population numbers of the project region, because of this, it is considered that the population projection data have low accuracy to be projected.
4. Measures that will be implemented: Infrastructure projects represent a real possibility of developing and attracting investments to more remote regions in the Amazon, but generate speculative processes that do not correspond to real demand. In these processes, hundreds of families are attracted to these regions with prospects of jobs and a new life, a fact that does not become reality in most cases. The tendency of marginalization of a large part of the population, due to the lack of employment and infrastructure in urban areas, directly influences the demand for rural areas and the exploitation of natural resources. In this context, the project intends to work directly with the rural populations in the project zone, fomenting actions that provide socioeconomic development in the field, the application of responsible agricultural practices and the reduction of predatory exploitation of natural resources. In this way, the project aims to propagate responsible and whenever possible sustainable practices in the region, generating socioeconomic development and mitigating the impacts generated by population growth.

Demand for new areas for agriculture and small pasture:

1. Brief description: Between 2000 and 2014 102,923 hectares were deforested in the Reference Region, representing an annual average of 7,352 hectares. According to Poema (2005), with the deforestation greatly increasing over the last 5 years from 2016 thru 2021. According to data collected in the field and presented by these authors, a rural family deforests an average of 1 ha/year for planting the plot, or up to 2 ha/year considering that most of the families maintain two plots. This can have an impact on the forest between 2,500 and 5,000 ha per year in the region. In addition to the area opened annually by rural families, the dynamics of demand for agricultural areas is influenced by population growth in the region, since rural population growth is directly related to deforestation, as highlighted in the analysis of deforestation agents.
2. Impact on agent group's decision to deforest: The demand for new areas of agriculture is influenced by two main factors: the lack of technical knowledge of the rural families, who need to enlarge the cultivated area due to the low productivity of the plantations; and population growth, which increases the pressure for natural resources in rural areas that are easily accessible. Since, in the scenario without project, there is no prospect of a shift from productive systems to a model of agriculture less impacting to the environment, added to the tendency of population growth in the region, the most probable behavior of the agents is

related to the practices implemented in the scenario business as usual, increasing the demand for new areas.

3. Likely future development: According to IBGE data, during the reference period analyzed (2000-2014), there was a 43% increase in the area used for agriculture in the municipalities of the Reference Region (SIDRA/IBGE, 2014). In addition, it is important to note that IBGE data are official and refer to the formal agricultural production in these municipalities. On the other hand, much of the agro-extractive production in the region still informal and there are no clear Figures for the total area used for agriculture by the rural population of the region. Nevertheless, the indicators of population growth and deforestation in the region in recent years point to a constant trend of increasing demand for agricultural areas.

4. Measures that will be implemented: The actions planned to be implemented during the project management plan will have as main objective the promotion of socioeconomic development in the field, offering alternatives for families to diversify and increase their productions. Through the provision of technical assistance and organizational support, the project aims to reduce the progress of families over the forest, as well as to provide for the reforestation of degraded areas with the use of species of economic interest.

5. A neighboring landowner in 2010 stopped security on 69,696 hectares of land and the agriculture invaders came in over 18 months and claimed the entire area and today over 25,000 hectares of this formerly private property has been deforested with 100% of the area deforested. The speed of conquest and destruction for an area that has a loss in power vacuum is the highest in Brazil. There is an insatiable appetite for abandoned properties.

Illegal logging of timber:

1. Portel, Para is a mafia town where 90% of the population directly or indirectly work in the illegal logging sector or benefit from that sector. Their strategy is simple: The current system is working very well for them, so stop anyone that wants to change this system.

2. The illegal loggers have done everything in their power to stop the riverine to gain the land document for this project. They have campaigned against helping them, threatened staff, and even made numerous denunciations against the neighboring two REDD projects. The illegal loggers now are focused on usurping the area where they cut illegally and do their own REDD projects. The goal is to control to stop legitimate REDD projects to be present, setting up their own projects and then carrying on the business as usual of extracting illegally, threatening the riverine if they do not co-operate.

3. Brief description: Brazil is one of the countries with extensive tropical forests and home to 60% of the Amazon rainforest. The country has 27 states with a total land cover of 850 million hectares, where 463 million hectares are estimated to be forested. In addition, natural forests account for the vast majority and plantations account for less than 2%.

4. This region is a place with numerous murders linked to the illegal loggers. Many people have died for denunciation illegal loggers to the police. Requiring REDD projects in the region to operate in a very clandestine way to stop the threat. The illegal loggers have infiltrated every aspect of society and since the police rent boats for raids, they illegal loggers have a mechanism where they use Whatsapp to inform all boat rental people in the entire region including the neighboring counties – not to rent boats if they find out there is a police raid planned.

5. DEMA the environmental police in Belem can't get funding from the State Government for police raids in the region. There is no funding from the government as too many Elected State Politicians make their living from the illegal wood trade, specifically in Portel. So even making denunciations to the police DEMA is not enough, it must DEMA needs funding.

6. Occasionally the federal government will want to have results so they push the state politicians to do the raids on the illegal loggers, however the raids are typically tiny and the big barges are warned before hand by the politicians approving the budget for this.

7. There are 30 different illegal logging groups in Portel. There are 5 large licensed cutting projects. The way the mafia works is they snatch and grab wood from one location and they barge it to the 5 large licensed cutting operations and then the barge departs from this location and is taken to Belem. So even the legitimate operations are laundering the wood for the illegal operations.

8. A local Sindicato named the Sindicato of Workers which is funded by a major illegal logger in the region in 2014 came up with a strategy of setting up large community titles in the region (in most cases under false pretenses). The riverine are lied to that these community titles are good for the family and of great financial benefit. What actually happens is the illegal loggers become president of massive areas that are now community titles. The project has 1,252 families that are wanting individual title and there are another 1000 families in community titles that wanted to have the Cadastrol Ambiental Rural certificate for and individual land, but could not gain this because they were not allowed as they are in a virtual prison with the community title.

3.3 Identification of underlying causes of deforestation

1. Brief Description: Based on the data and information presented in the socioeconomic diagnoses carried out by the project (FAO, 2018) and other survey studies used as reference, deforestation data (PRODES, 2014), land use after deforestation (INPE and EMBRAPA, 2014) and consultations with local experts, it was possible to find conclusive evidence explaining the relationships among agents, drivers, underlying causes and the deforestation pressure in the Reference Region. Thus, the hypothesis presented is that population growth influenced by infrastructure projects and undertakings projects in the region, coupled with the inefficiency of the government for regularization and monitoring of rural properties, the precariousness of public services and the weak performance of the State to curb illegal activities, contribute to the deforestation scenario observed during the period analyzed. Considering these evidences, the tendency for the baseline in the future is to maintain the influence of the agents, drivers and underlying causes evidenced during the historical period analyzed in the Reference Region.

2. Impact on agent group's decision to deforest: The opening of roads followed by the consolidation of infrastructures are the main steps for the expansion of deforestation in frontier areas, as is the case of the Reference Region. Therefore, as new infrastructure projects are implemented, and access logistics becomes more attractive to the region, different agents may be drawn in search of natural resources such as timber and mining, or real estate speculation.

3. Likely future development: Consolidated infrastructure projects such as the highway from Belem to Altamira cutting through the project area and the road from the town of Portel to the Transamazonia highway, represent a great potential of influence in the deforestation, causing, besides social impacts, great pressure on natural resources of the region. In addition, the context of fragility, or in some cases non-existent, governance of the federal and state governments (Pará and Amapá) may aggravate these problems, resulting in impunity for most illegal practices and potentially causing a significant increase in deforestation in the region.

4. Measures that will be implemented: the actions proposed by the project should counterpoint the trend of continuity of the activities carried out in the business-as-usual scenario. Through actions that encourage the responsible exploitation of natural resources, low carbon agriculture and the recovery of degraded areas, the project should promote the conservation of natural resources coupled with socioeconomic development. From these initiatives it is expected that most of the potential impacts that would be generated by the agents, drivers and underlying causes will be mitigated in the project scenario.

3.4 Analysis of chain of events leading to deforestation

The chain of events leading to deforestation in the project region is initially driven by planning for infrastructure implementation, which promote migratory movements along with the need to open up forest areas, generating real estate speculation and access to previously remote areas. This happened in the 1960's with the construction of the Transamazonica highway to the south of the project.

The population growth generated by the investments in infrastructure and enterprises/undertakings installed in the region, initially demand the opening of areas for roads, delimitation of urban areas and areas for installation of improvements. In a second moment, with the growth of the migratory process, many of these people settle in rural and peripheral areas of the enterprises/undertakings. These agents began to live on agro-extractive production, mixing extractive practices with subsistence agriculture, standing out in the Anapu Valley the production of cassava and the extraction of Brazil nuts (GRUPO ORSA/ICCO/BOP INOVATION, 2010).

In the common practice scenario of carried out by the agents identified in the region, it is characterized the opening of plots for the implementation of agricultural crops. The practices adopted by these agents, such as fires, and deforestation to the edge of the rivers, besides generating environmental impact, reduce the productivity of the plantations, generating the need to open new forest areas to maintain production. This context is directly related to other factors, such as low diversification of production and low productivity, and the difficulty of accessing public policies, which results in low levels of income for these agents.

Over the years infrastructure projects generate a great social burden for the region, since they foment the population growth in regions of low government performance, which, in turn, does not offer the basic conditions to provide the adequate development of these regions. This scenario results in the growth of illegal activities, the disfigurement of forests, and the disorderly occupation of the territory.

The deforestation identified in the project region within the historical reference period shows great influence from the proximity of roads, branches, navigable rivers and previously deforested areas. This pattern is common throughout the Amazon, but becomes more evident in the project region, since most of the region's forests are still preserved due to difficult access.

Conclusion

Based on the data and information presented in the socioeconomic diagnoses carried out by the project (Casa da Floresta, 2016, Coutinho, 2018) and other studies used as reference (POEMA, 2005, ORSA/ICCO/BOP INOVATION GROUP, 2010), deforestation data (PRODES, 2014), land use after deforestation (INPE and EMBRAPA, 2014) and consultations with local experts, it was possible to find conclusive evidence explaining the relationships among agents, drivers, underlying causes and the deforestation pressure in the Reference Region. Thus, the hypothesis presented is that population growth influenced by infrastructure projects and undertakings projects in the region, coupled with the inefficiency of the government for regularization and monitoring of rural properties, the precariousness of public services and the weak performance of the State to curb illegal activities, contribute to the deforestation scenario observed during the period analyzed. Considering these evidences, the tendency for the baseline in the future is to maintain the influence of the agents, drivers and underlying causes evidenced during the historical period analyzed in the Reference Region.

Step 4 of VM0015 - Projection of Future Deforestation

4.1 Projection of the quantity of future deforestation

The Reference Region is not stratified, since the characteristics of the agents, drivers and causes of deforestation are the same throughout its area.

Selection of the baseline approach

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

In addition, a correlation analysis was performed among the data collected for different variables (IBGE/SIDRA) of the project region during the historical reference period and deforestation evidenced in the same period. These variables could be used to perform a modeling, however in this analysis no variable had an adequate correlation index. Therefore, the evaluation of variables explaining deforestation (Figure 36, Figure 37 and Figure 38) showed low correlation index, it was chosen the "a" approach (historical average) to design the baseline of future deforestation.

Figure 36. Correlation between the variables of Deforestation and cattle herd (grazing)

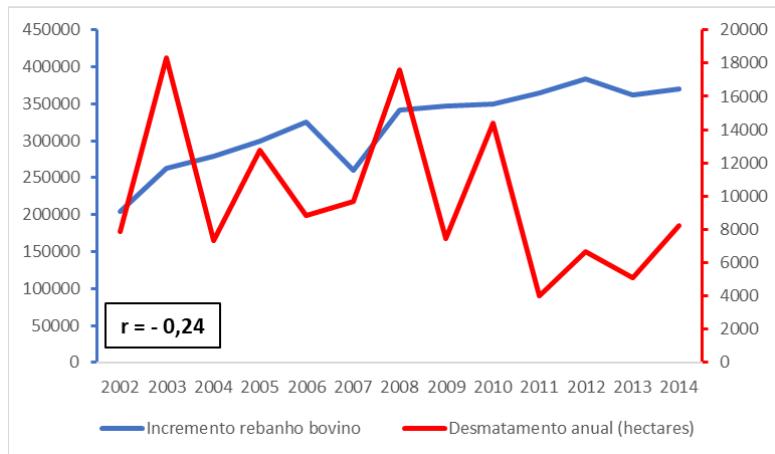


Figure 37. Correlation between the variables of Deforestation and timber production

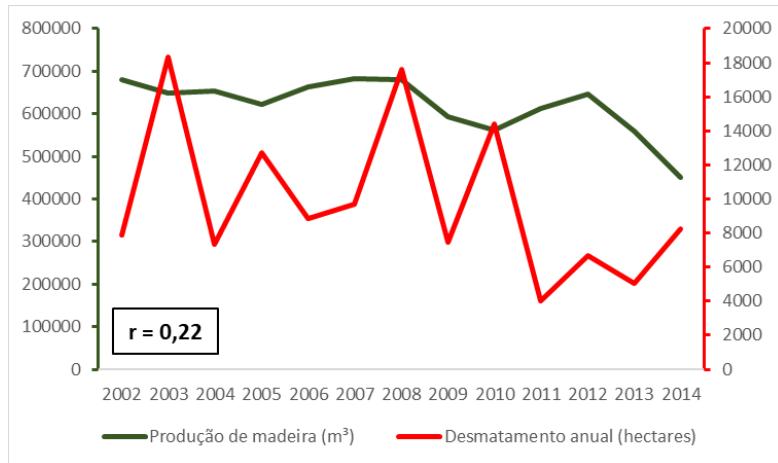
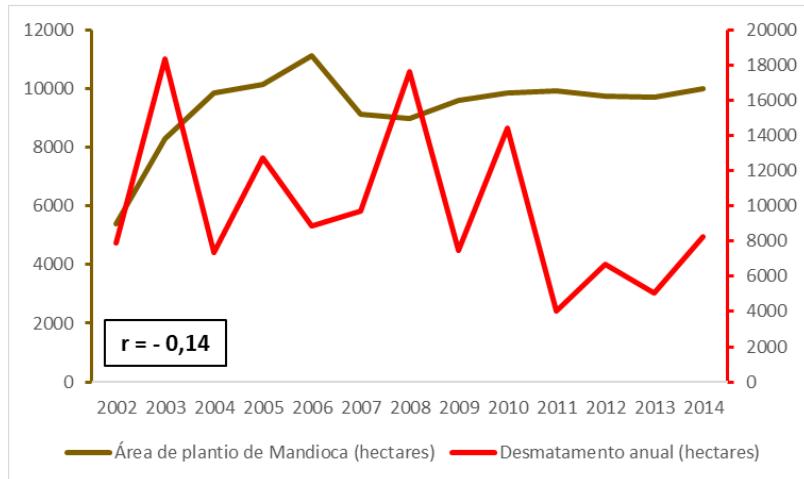


Figure 38. Correlation between the variables of Deforestation and Area for plantations



4.1.2 Quantitative projection of future deforestation

Projection of the annual areas of baseline deforestation in the Reference Region

As presented in the previous item, method "a" (historical average) was selected to estimate future deforestation and to design the annual deforestation areas in the baseline in the Reference Region. The annual area of deforestation at baseline in year t within the Reference Region was calculated according to Equation 3 of methodology VM0015 version 1.1 (page 44):

$$ABSLRRi,t = ARRi,t-1 * RBSLRRi,t \quad (2)$$

Where:

$ABSLRRi,t$: annual area of baseline deforestation in stratum I within the Reference Region at year t (ha/year);

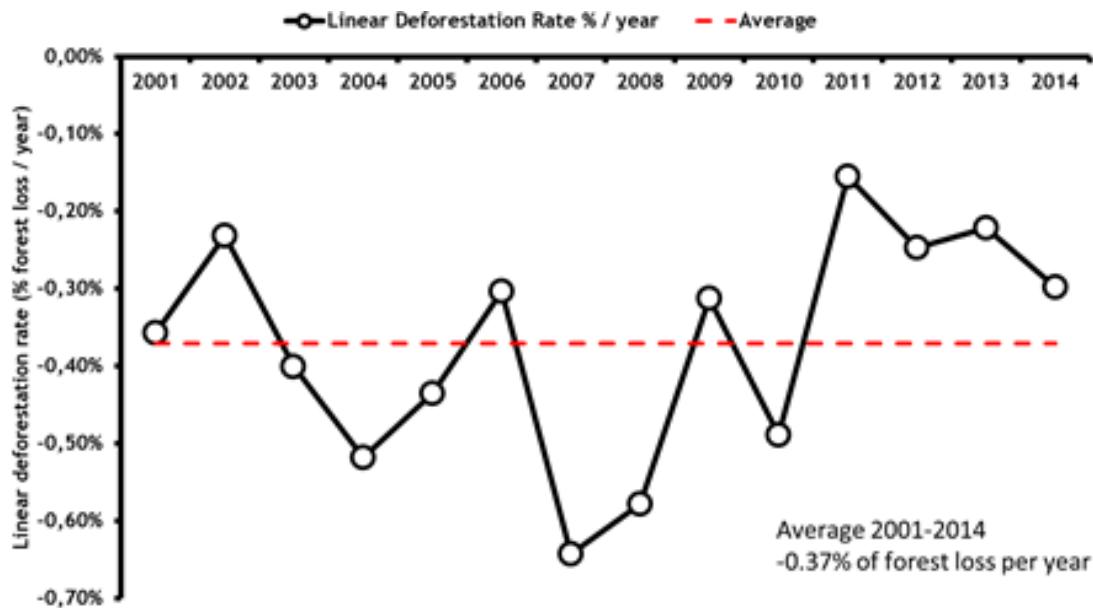
ARR_{i,t-1}: area with forest cover in stratum i within the Reference Region at year t-1 (ha); RBSLR_{Ri,t}: deforestation rate applicable to stratum i within the Reference Region at year t (%); t: 1, 2, 3 ... T, a year of the proposed project crediting period (dimensionless);

i: 1, 2, 3 ... IRR, a stratum within the Reference Region (dimensionless).

The rate of deforestation observed between 2000 and 2014 was obtained using Equation 7 in Puyravaud (2003), and the value obtained was -0.37% (Figure 39). The projected deforestation over the 30-year period (2015-2044) in the Reference Region is presented in the calculation sheet.

¹⁰Jean-Philippe Puyravaud, Standardizing the calculation of the annual rate of deforestation, Forest Ecology and Management, Volume 177, Issues 1–3, 2003, Pages 593–596.

Figure 39. Historical deforestation rate



Projection of the annual areas of baseline deforestation in the Project Area and Leakage Belt

Spatially designed deforestation was used for the entire Reference Region for baseline estimation in the Project Area and in the Leakage Belt produced in step 4.2.4 of methodology VM0015 (page 54).

4.2 Projection of the location of future deforestation

In this section, projection of the future location of the risk of deforestation for the year 2046 as of the preparation of the factors maps, or that encourage the occurrence of deforestation. This was done using the TerrSet software, Land Change Modeler (LCM) module. Following are more details on these steps.

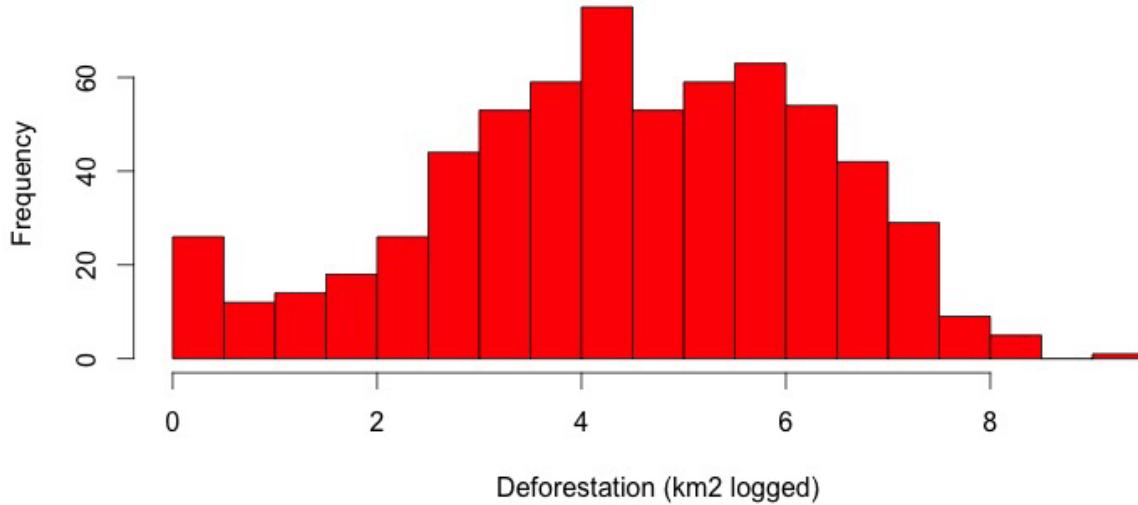
4.2.1 Preparation of factor maps

As of the previous steps, were identified the variables which may influence the occurrence of deforestation within the reference region. The below mentioned Figure and Table present the variables considered as Factors Variable in the deforestation risk model.

Below Figure shows the histogram of these variables as a function of Forest areas in 2000 that changed to Deforestation in 2014. The distance maps were generated using the DIST module of the TerrSet and represent the Euclidean distance of each variable of origin considered. It can be observed in Figure that the areas up to 15 km (15,000 meters) of the change variables (deforestation areas between 2000 and 2014), cumulative deforestation up to 2000 (variable dst_dsm), roads and exterior roads concentrate the majority of Forest areas in 2000 converted to Deforestation in 2014.

In relation to the other variables considered, the dst_para_NavRivers (distance from navigable rivers) has a high concentration of deforestation up to 25 km and between 30 and 80 km. The variable ev_geologia0014 showed a small concentration up to the probability of 0.06, and high concentrations in the values of probability above 0.11. This variable shows the empirical probability of deforestation from the geological type. Finally, the variable srtm (elevation) presented a concentration of deforestation between 2000 and 2014 up to altitude of 210 meters and slope of less than 9.08 degrees.

The construction of these variables (functions used, data source) is described in below Table. Histogram of the variables used in the deforestation risk model is mentioned below;



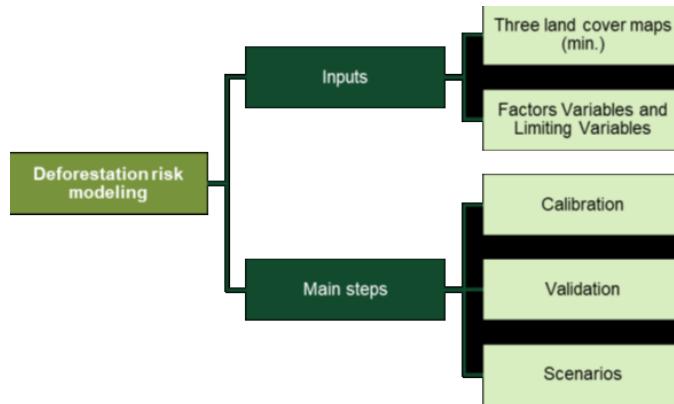
List of variables, maps and factor maps (Table 10 of methodology VM0015, page 53)

Factor Map		Source	Variable represented		Meaning of pixel categories or values		Other maps and variables used to create the Factor Map		Algorithm or equation used	
I	D		Variation	Variation	Variation	Meaning	I	D		
1	dst_mudanca	INPE	meters	Euclidean distance of deforestation increment cells within the historical period	0	155,19	Distance variation	1	desmatamento_00_14	Distance (TerrSet)
2	dst_assentamentos	INCRA	meters	Euclidean distance of the INCRA settlements	0	105,933	Distance variation	2	assentamentos_INCRA	Distance (TerrSet)
3	dst_dsm	INPE	meters	Euclidean distance from cumulative deforestation up to 2000	0	158,215	Distance variation	3	desmatamento_ate_00	Distance (TerrSet)
4	slope	NASA	degrees	Average declivity per pixel of 100 x 100 meters	0	51.4	Slope variation	4	slope	None
5	srtm	NASA	meters	Average elevation per pixel of 100 x 100 meters	0	683	Elevation variation	5	srtm	None
6	dst_estradas	Imazon	meters	Euclidean distance of official and unofficial roads	0	159,219	Distance variation	6	estradas_imazon	Distance (TerrSet)

4.2.2 Preparation of deforestation risk maps

The deforestation risk models are developed from a series of minimum inputs and main steps (Figure 40). The minimum inputs are at least three land cover maps covering the beginning, an intermediate point and the end of the historical period and the factors variables and limiting variables to the occurrence of deforestation. Among key steps include calibration, validation, and scenario generation.

Figure 40. Scheme for the generation of deforestation risk models



Calibration

In the calibration step the first two land cover maps are combined with factors variables and limiting variables using a mathematical model. The objective of this phase is to find out about in what conditions deforestation occurs and to represent these conditions through an equation or a set of equations. In this project we used the the Land Change Modeler (LCM) module that conducts this calibration phase as follows:

The first step is to identify the importance of the factors' variables for the occurrence of deforestation. This was done using the method called Similarity Weight (SANGERMANO et al., 2010) (Sangermano, Iorencia & Eastman, Ronald & Zhu, Honglei. (2010). Similarity Weighted Instance-based Learning for the Generation of Transition Potentials in Land Use Change Modeling. T. GIS. 14. 569-580). The method uses the loosest neighborhood K logic to identify the relevance of each variable that is considered as a vector to predict locations with the potential for occurrence of the Forest-Deforestation transition. The logic used by SimWeight initially consists of the analysis of the relevance of each variable for the occurrence of deforestation, calculating the importance weight of the variable by the following equation (Equation 3).

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

$$PI = 1 - (DPchange/DPStudyArea)$$

Where:

PI = importance weight;

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

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

Then SimWeight calculates the risk of deforestation by combining change cells and persistence. For this was used only the information of the variables with PI greater than 0.1. This information was combined by the following formula adapted from Sangermano et al. (2010) (Equation 4):

Formula to calculate the Deforestation Risk:

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

Where:

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

c = number of cells/pixels of change;

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

i = change pixel identifier;

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

The use of Equation 4 results in a map with transition potential, which detects the areas with favorable conditions of deforestation occurrence over areas with the Forest class (Figure 62). This map is given as the starting point for allocating future rates of deforestation, and from this the annual rates are allocated along with some dynamic variables. The accessibility variable of old deforestation is an example of a dynamic variable.

Validation

The validation consists of comparing the result of the already calibrated mathematical model with the factors variables with a real data. It is generated in this phase, a land cover map simulated of the third point of time of the historical period. The next step is to compare this simulated map with the actual land cover map from the third point of time.

Scenarios

In the scenario step the future deforestation rates are projected for a given time horizon and some main assumptions are assumed. In this REDD+ Project the projection period of deforestation is from 2017 to 2046 and the assumed assumption was that the annual rate of historical deforestation occurred between 2000 and 2014 would reproduce steadily.

Figure 41: Deforestation rate of Project area from 2000 to 2018

Red is from 2008 to 2018, and the area, with the darkest red being more recent in the last 3 years.

White is primarily deforestation from 1995 to 2008.

Figure 41: Deforestation in the Reference Region

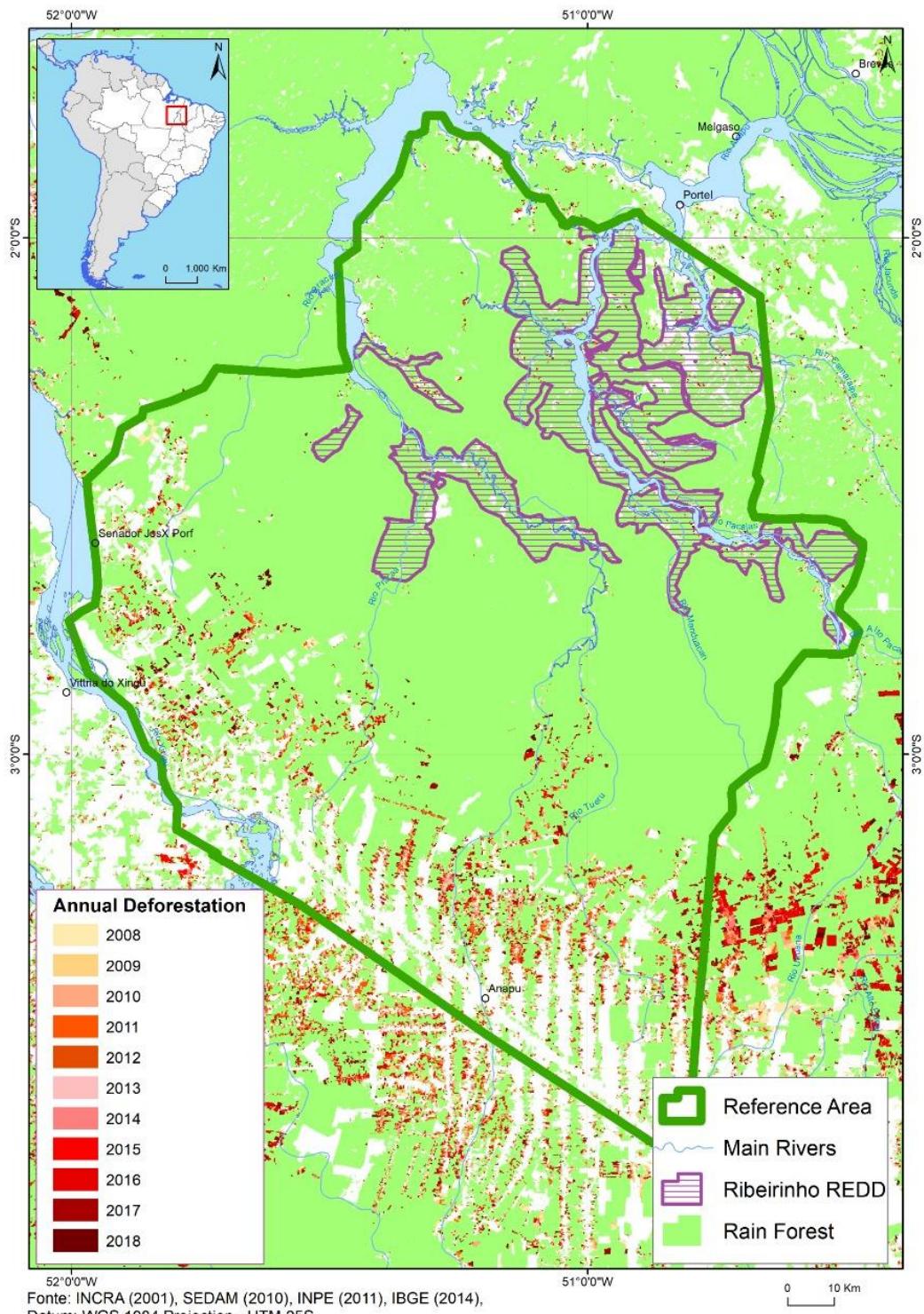


Figure 42: Deforestation in the southern part of the Reference Region showing secondary and tertiary roads

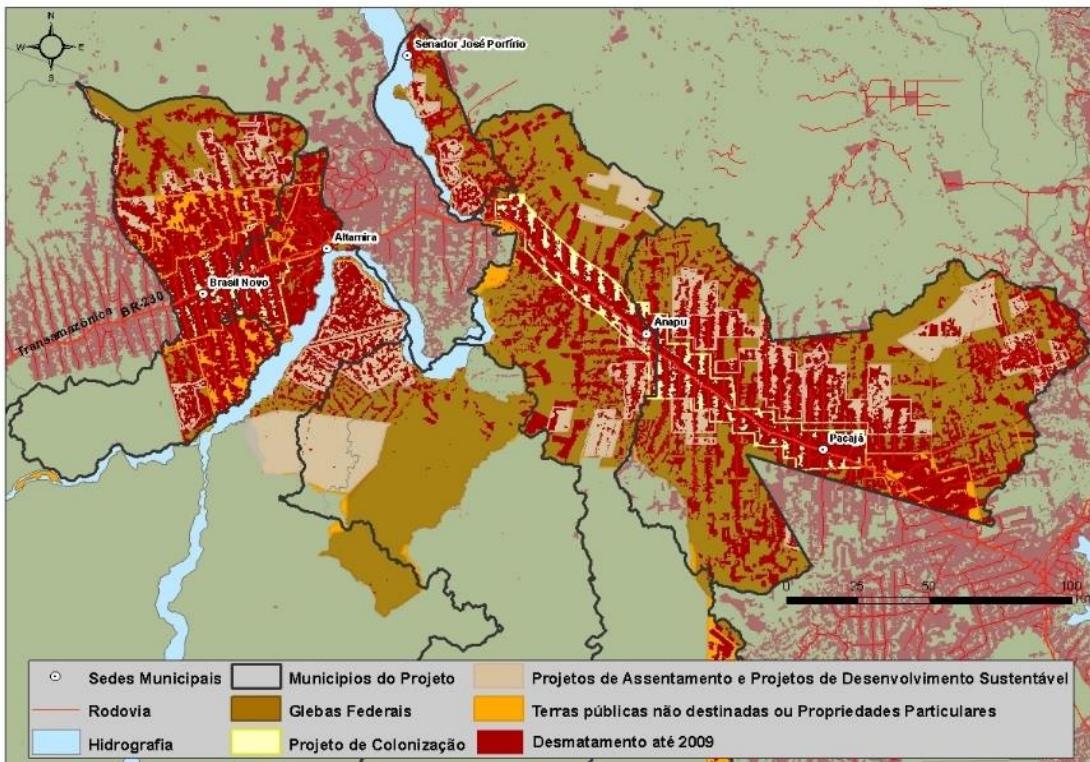
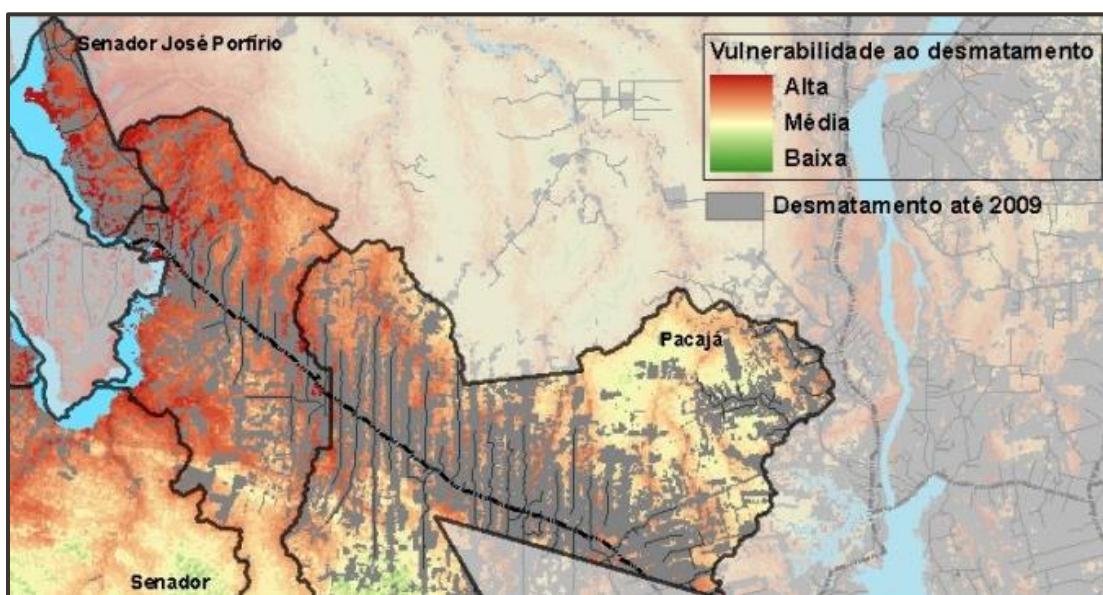


Figure 43: Deforestation in the southern part of the Reference Region and showing high risk for the project area. (Alta translates in English to high, Média to medium, and Baixa to low)



4.2.3 Selection of the most accurate deforestation risk map

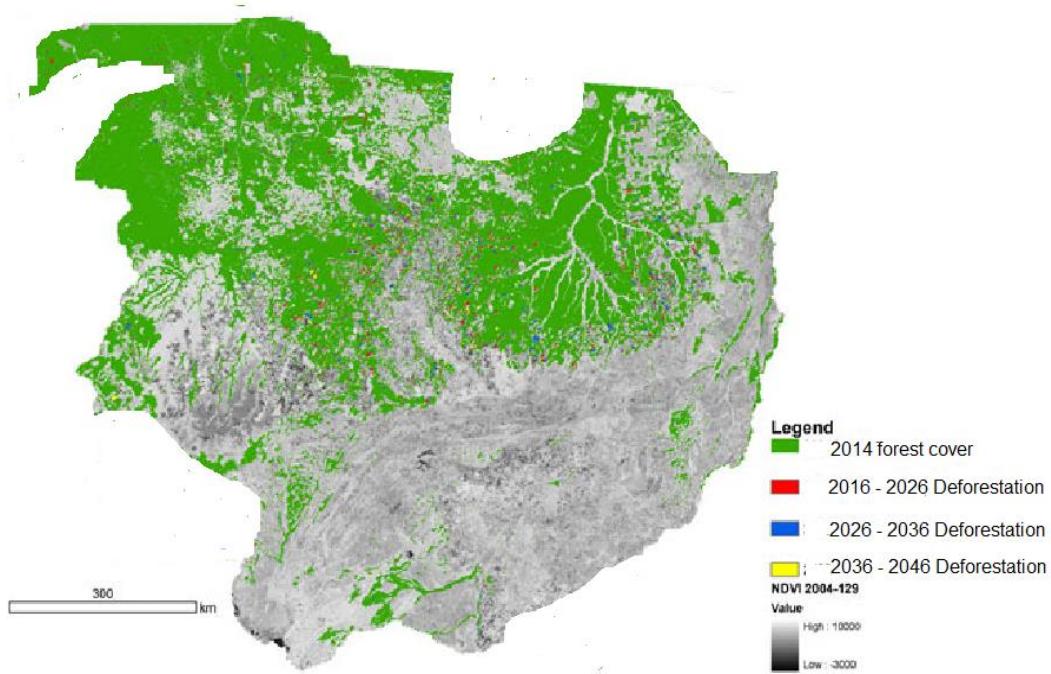
The assessment on the quality of the generated model was conducted applying option "a" - calibration and confirmation using two historical subperiods - available in VM0015 methodology version 1.1 (page 53). Deforestation data, occurred between 2000 and 2007, were used to calibrate the model, while the deforestation map occurred by 2014 was used for the confirmation process. In this process, a deforestation map for 2014 was simulated from the data observed in the years 2000-2007.

The FOM technique (Figure of Merit) was applied to evaluate the accuracy of the map simulated in 2014. The FOM is the reason of the intersection of observed changes (changes between reference map at time 1 and time 2), and simulated changes (changes between the reference map at time 1 and the reference map at time 2), to gather the observed change and the expected variation, according to VM0015, equation 9.

This method points out that the minimum threshold for the best adjustment measured by FOM must be defined by the net change observed in the reference region for the model calibration period. The net change observed must be calculated as the total area of change being modelled in the reference area during the calibration period, as a percentage of the total area of the reference area, and the FOM value should be the minimum equivalent to this amount. If the FOM value is below this threshold, the project proponent must demonstrate that at least three models were tested (resulting in at least three risk maps), and the one with the best FOM was used.

The threshold of net changes observed in the reference region was 0.07, and the FOM value obtained by applying VM0015 equation 9 was 0.73; thus, as the FOM for the first produced risk map is above the minimum threshold, it was not necessary create other two models to perform the allocation of the future deforestation (VM0015 Step 4.2.4). As a result, the deforestation risk map developed at this stage showed acceptable accuracy to project land use changes by 2046 at Project reference region. Below mentioned map is the demonstration of model evaluation method with FOM tool (Figure 44).

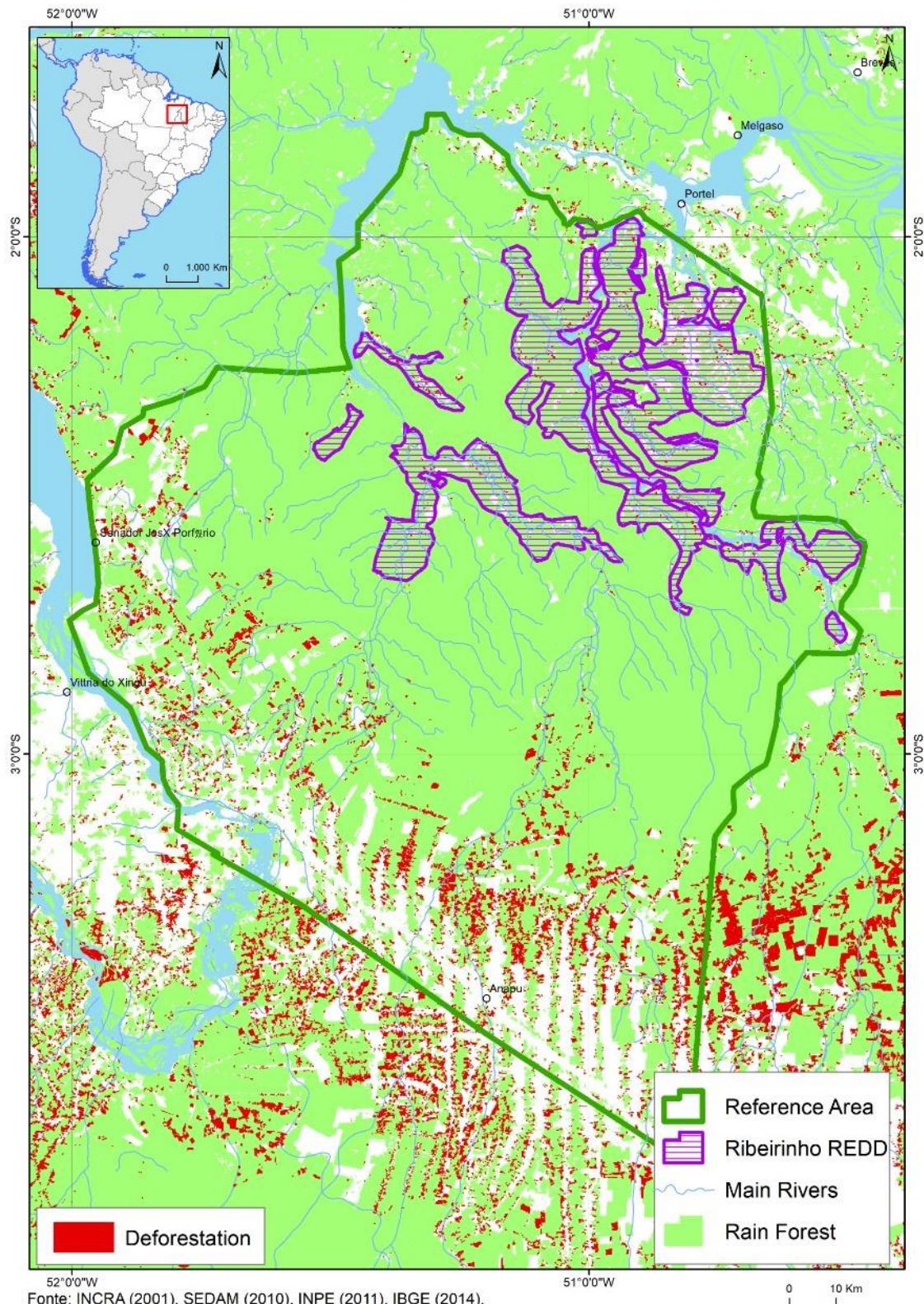
Figure 44: Map demonstration of model evaluation method with FOM tool



4.2.4 Mapping of the locations of future deforestation

For the projection of future deforestation, the whole historical period of the project (2000-2014) was considered, with annual deforestation maps projected between 2017 and 2046. The deforestation rate calculated for the historical period was projected until the year 2046. For the spatial allocation of deforestation, the starting point was the combination of the auxiliary variables identified in the model calibration.

The old deforestation distance variable was calculated dynamically in each model interaction. The entire process was conducted in TerrSet software. Figure below shows deforestation in the Reference Regions, Project Area and Leakage Belt (Tables 9b and 9c of methodology VM0015, pages 49 and 50).
 Index A – Reference region, B – Project area, C- Leakage area and D – Future deforestation rate.



Fonte: INCRA (2001), SEDAM (2010), INPE (2011), IBGE (2014),
 Datum: WGS 1984 Projection - UTM 20S

Conclusion

Therefore, in the RRD there are two well-defined fronts of deforestation that are linked by a common dynamic. Now, according to our Social Assessment study, riverine and traditional rural villagers have some experience on timber extraction; thus, once the deforestation of the consolidated frontier or that of the pioneer frontier reaches them, it is most likely that riverine and traditional rural villagers will engage in commercial logging activities, giving space to pastures to develop and causing the traditional way of life to go from a self-sufficient life to a more typical life with high poverty.

In a without project scenario, it is likely that deforestation in the area will continue at a conservative rate of 1.91 % per year which can be used for baseline projections.

3.1.5 Additionality

For the additionality analysis the most recent version of the VCS "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities - VT0001", Version 3.0, is used. The steps defined by the tool for this analysis are as follows:

The tool is applicable under the following conditions:

a) AFOLU activities are 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;	All project activities are legal and do not lead to violation of any applicable law. The national and sectoral policies relevant to this project are those derived from laws pertaining to natural resources and forestry activities in Brazil.
b) The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.	The most plausible baseline scenario is determined following the stepwise approach of the VCS Tool for the demonstration and assessment of Additionality, Ver 3.0. The determination of the baseline scenario was done using determined literatures, public available data from authentic sources, direct field observation, GIS information and scientific research.

The possible identified scenarios are evaluated taking into account investment barriers, historical context, cultural practices, and sector policies in Brazil. Such analysis aims to prove that the Project activity is not the most financially attractive or technically feasible land-use scenario to develop in the Project Area.

Step 1. Identification of the alternative scenarios of land use to the activities of the Project.

This step includes identifying the credible land-use scenarios for the Project Area and assessing the consistency of each scenario based on local regulations.

Sub-step 1a: Identification of alternative land use scenarios for proposed REDD project activities.

Land-use scenarios for this Project have been identified using primary and secondary sources which includes research papers and other documented materials from government and private institutions of information. Primary sources include social assessment activities undertaken for the Project Boundaries through the months of December 2016 and June 2017.

Using these sources of information, three possible scenarios have been identified. These scenarios are:

1. Forest encroachment by pioneer activities (real estate) followed by deforestation to implement pastures

The baseline scenario is a continuation of Business as Usual (BAU) activities in the region if the landowner doesn't implement any type of monitoring or productive activity in the Project Area. Many threats such as deforestation, illegal logging, manmade fires and losing land ownership by illegal means and many other problems have to be faced by the land owner.

Cattle ranching is the main deforestation activity in the RRD. Cattle ranchers can expand their activities by their own means (in the case of well-capitalized agents) or as part of a process that includes pioneer agents such as selective loggers and squatters (in the case of small and medium size ranchers). Interactions among these agents are the result of common drivers and underlying forces of deforestation that are based mostly on securing land ownership and also in economic profits.

Interaction between pioneer and final agents, as viewed from the standpoint of biological interaction, can be one of mutualism or at least of commensalism. For example, in the case of loggers and ranchers, loggers can act independently from the existence of grazing activities. However, grazing activities take advantage of the network of penetration roads built by loggers and usually the revenues from timber extraction are used to finance the implementation of cattle¹¹ (Margulis 2004).

Intermediary agents with low opportunity costs (squatters) who precede cattle ranching, are probably the direct responsible for much of the deforestation (Margulis 2004). For most of the agents the main driver of deforestation in the area is land speculation, followed by generation of economic revenue (Barreto 2011). Land speculation arises from the expectation of a future re-sale of land. Such speculation is generated by widespread unclear land tenure, bizarre regulations that do not provide security for landowners (Araujo, Bonjean et al. 2009) (Araujo, Claudio & Araujo Bonjean) and from known corruption and weak enforcement at local-level institutions (Larson 2008). Economic revenue is generated by the extraction and sale of timber, changes in land-use from forest to pasture (and implementation of grazing activities), and the sale of meat in the domestic rather than in the international market (Hecht 1993).

¹¹ (Margulis 2004) (Margulis, Sergio. 2004. Causes of Deforestation of the Brazilian Amazon. World Bank Working Paper; No. 22. Washington, DC: World Bank).

¹² (Kirby, K.R., W.F. Laurance, A.K. Albernaz, G. Schroth, P.M. Fearnside, S. Bergen, E.M. Venticinque and C. da Costa. 2006. The future of deforestation in the Brazilian Amazon. *Futures* 38: 432-453)

¹³ (Manuela Barreto. 2011. CORPORATE SOCIAL RESPONSIBILITY AS A SOURCE OF ORGANIZATIONAL MORALITY, EMPLOYEE COMMITMENT AND SATISFACTION. *Journal of Organizational Moral Psychology*. 1:2(97-124)

¹⁴ Catherine & Combes, Jean-Louis & Combes Motel, Pascale & Reis, Eustaquio. (2009). Property rights and deforestation the Brazilian Amazon. *Ecological Economics*. 68. 2461-2468. 10.1016/j.ecolecon.2008.12.015.

¹⁵ (Michael L.HechtMichael V.SedanoSodeny R.Ribeau.1993.Understanding culture, communication, and research: Applications to Chicanos and Mexican Americans.*International Journal of Intercultural Relations*.17(2):157-165).

Land speculation and associated deforestation have their origin on economic incentives given the fact that a cleared area is worth 5 to 10 times more than the same forested area (Kirby, Laurance et al. 2006) and that squatters operate under the expectation of future land resale (Margulis 2004).

At the same time, the Brazilian Constitution of 1988 incentivizes squatters to invade and clear forested land. Under this provision, squatters have the right to claim public or private land that is not under productive use. The Constitution indicates that it is a legal activity to encroach private property if this is not under use, so a squatter can get land-use rights after one year of occupation and full-ownership after proving 5 years of continuous use, as long as the landowner does not manifest legal opposition (Araujo, Bonjean et al.2009).

Land encroachment by squatters is facilitated by the use of the network of unplanned roads developed by illegal loggers that operate in the area. As confirmed by the analysis of the historical reference period using Landsat TM imagery, loggers will continue to build new roads as long as these provide access to profitable timber, moving the logging pressure far from primary roads into areas where the forest resources are abundant (Christopher P Barber (2014). Roads, deforestation, and the mitigating effect of protected areas in the Amazon. Biological Conservation.177:203–209) and regardless of increasing distances to selling points (Pfaff 2009) (Joppa LN, Pfaff A (2009) High and Far: Biases in the Location of Protected Areas. PLoS ONE 4(12): e8273). Also, the historical reference period analysis shows that old pioneer roads linger over time and given the fact that any road will resist so much time in the forest without maintenance (Margulis 2004), it can be inferred that these roads are being used by pioneer agents.

From the literature it is known that, although there is a time gap of 10 or more years between the implementation of logging activities and the development of cattle ranching, the use of the pioneer roads network by ranchers quickly consolidates a pioneer frontier and make it evolve (Mertens, Poccard-Chapuis et al. 2002. Crossing spatial analyses and livestock economics to understand deforestation processes in the Brazilian Amazon: the case of Sao Felix do Xingu in South Para. Agricultural Economics 27:269–294), thus reducing the time the gap for the creation of a consolidated deforestation frontier (Margulis 2004).

Nowadays, these pioneer roads have begun to connect with the network of tertiary and secondary roads that lead to the Transamazonica highway, which has been verified by on-the-ground testimonies results from the PRA and through the analysis of Alos Palsar imagery from 2012. By doing so, pioneer roads cannot longer be differentiated from tertiary roads thus becoming part of one single network.

Now, keeping a cleared land in the Amazonia is a high-maintenance and costly activity. Cattle ranching is a very cheap and self-sustained mean to keep forest from re-growing, to prove land ownership and to generate revenues in the short and medium term. Therefore, although cattle ranching is a highly productive activity (mostly for large and well-capitalized agents) because of its low implementation/operational costs, the financial and tax benefits this activity receives and the growing demand of meat in the domestic market (Margulis 2004), it is an activity mostly implemented as an effective way to claim land ownership (Hecht 1993).

Therefore, depending on the scale of the agent, cattle ranching can be present at an area far from primary roads or the “pioneer frontier” or in an area close to primary roads or the “consolidated frontier” (Margulis 2004). In our case, the baseline scenario presents deforestation happening simultaneously in both fronts.

2. Timber extraction by the legal Riverine landowners.

The forest in the Project Area is rich in valuable species that could be easily extracted and commercialized by the landowner.

According to the current Forest Code, the landowners could extract timber in all his area, including the 80% that should be kept as legal reserve. The provision under the legal reserve indicates that a landowner must keep 80% of his land as forest (Government, 2012).

(<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5530639/>).

The issue is that as long as the landowner keeps 80% of his land under the Brazilian definition of forest, any exploratory activity will be legal. However, such definition won't prevent the forest ecosystem to become fragmented thus loosing biological richness.

3. Proposed AUD activities under REDD+ Project

The Project's main activity is to continue monitoring in order to remove and prevent unplanned logging and encroachment activities, which results in the prevention of deforestation activities in the project area. In order to improve monitoring results, local villages within the Project's Boundary will be offered the opportunity to participate as paid monitoring staff.

At the same time, it is a fact that the lack of land ownership promotes deforestation, so the Project –in and around the project area – in an agreement and in close participation with the landowner, will provide legal land titles to villagers within the Project's Boundary who develop their activities in the LMA and actively participate –and provide proven results- on forest conservation.

Detailed description of each activity follows as below;

- i) Providing training on forest and biodiversity monitoring and management and opportunities to work as a monitoring/enforcement staff

The Project will have monitoring and enforcement brigades that are responsible for protecting subsectors of the Project Area, running demonstrational activities and performing biodiversity monitoring. A leader that is a trained technician or park ranger and a group of local villagers from within or around the Project Boundary will form such brigades. Eventually, brigade leaders will be local villagers that demonstrate exceptional capabilities and proved commitment to forest conservation.

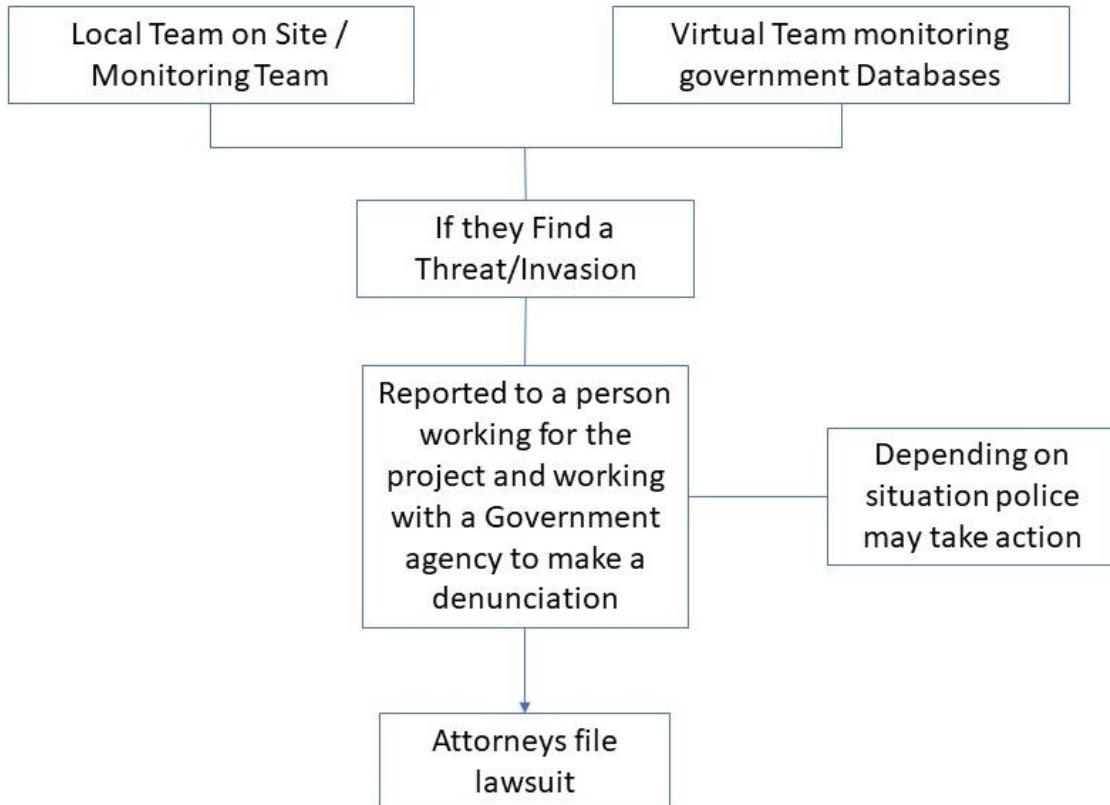
Monitoring staff will communicate any sightseeing of illegal activities to the brigade leader who in turn will be in charge of communicating all events to a base office in Belem or Sao Paulo. The staff at the Sao Paulo office will make the appropriate reports to local authorities for them to go to the Project Area and deal with agents encroaching the Project Area.

Training for monitoring staff

Local villagers who wish to participate in the monitoring program will receive free training in methodologies and procedures to monitor the Project Area and to report any findings. Monitoring staff will be divided in groups dedicated to the surveillance of the Project Area, groups in charge of running demonstrational activities/social surveys and a group in charge of performing biodiversity monitoring.

In order to offer the same chances for all local villagers willing to engage in the monitoring activities, monitoring staff position will be rotational in the case that the supply of workforce is higher than the available jobs. The rotation period should be determined once the project's activities are implemented and the supply of work force is adequately determined based on the census information. Figure 45 shows how brigades will be organized and Figure 46 shows the process to report illegal activities in the Project Area.

Figure 45. Local organization of monitoring tasks



ii) Enhancing community's organizational capabilities

The Project management team will support local villages that wish to improve their level of organization and governance. To do this, the management team will engage local leaders to assess the best way on how to develop an organization system that works best, given the particular needs and economic activities of the villagers.

Villagers in the area usually see local priests, either Christian or Evangelic, as leaders. Therefore, developing and maintaining a good relation with local priests will be the first step to develop this proposed activity.

iii) Provide legal land-ownership rights versus results for conservation

The main objective of this activity is to create a sense of ownership and respect over the forest resource through an incentive as evidence shows that secured land tenure is a main factor to reduce deforestation.

The Project's Management Team, in cooperation with the landowner, have put forward a proposal to regularize land tenure status of those villagers living in the LMA. The landowner has signed an agreement to provide official land-use rights to villagers in the LMA with the hopes that they will own these lands in 40 years. Requirements to participate in this activity will be clearly explained to local villagers through workshops as part of the FPIC process during the census.

As a requirement to receive a land title, each villager will have to sign a conservation agreement that will mainly state that granted lands cannot be sold, productive activities cannot expand into the Project Area, and that the land-use of the land cannot change into mining or pasture implementation. Such conservation agreement will be drafted collaboratively with local villagers under several PRA workshops as part of the census process.

Villagers in the LMA will be offered the opportunity to receive legally recognized land-use rights against the provision of conservation services to the Project such as, but not limited to, surveillance of illegal activities in the area and the premise of not encroaching in the Project Area. Such land-use rights will be renewed every year accordingly to effective conservation results. At the end of the Projects' lifetime each villager actively and effectively engaged in the proposed activity will receive an official title over his/her land under the binding conditions of the conservation agreement.

iv) Providing capacity building on steps to gain land use rights over Government owned forests

The Project cannot sign agreements as those explained in the aforementioned item number three with families living outside the Project Boundaries. However, the Project aims at providing guidance to these families on how to achieve land-use rights on lands that are not privately owned.

The idea is that the Project will provide capacity building in many areas not only to those families living within the LMA but also to those families in the proximities to help reduce the risk of leakage and to promote sustainable development in the area. So, it doesn't make any sense to provide all this training to families if they feel insecure about their rights over land, and then moving somewhere else. The Project will invest resources in training all these families in order to have them realize the benefits of it and making them to stay and support the Project protecting the forest.

Although the Project cannot guarantee that all families living outside the LMA will achieve a land use permit, the management team will make the best effort to engage local authorities in Portel and to coordinate with local leaders to develop the best approach to solve this issue.

v) Providing capacity building in agroforestry techniques and implement agroforestry

The Project LMA will be used as a showcase for local families to receive capacity training and to participate in agroforestry techniques. The Project will provide economic support to train and to implement agroforestry schemes such as home gardens, improved fallows, forest gardening and forest farming.

Through agroforestry it can be possible to diversify crops and to enhance productivity. This in turn will reduce the amount of land required to practice agriculture, which in turn reduces the risk of deforestation due to small-scale agriculture. Also, through forest gardening and forest farming, villagers will come to see how the forest can provide benefits other than timber.

Agroforestry systems can be very simple to implement and can require low-maintenance. Such systems help diversifying food production and increases food security in areas of low productivity such as the acidic soils of the Amazon.

vi) Providing capacity building on improved efficiency cook stoves

In order to reduce the amount of firewood needed to produce cassava, the Project LMA will be used as a showcase for local families to receive capacity training and to participate on demonstrative activities on how to implement an energy efficient cook stove. The Project will provide economic support to train and to build such efficient cook stoves to those families willing to participate in the activities both in and outside the LMA.

Different types and sizes of energy efficient cook stoves will be tested to find the one that fits best for the necessities of local families. With this learning curve it will be easier to replicate the experience among other conservation Projects in the region.

vii) Providing capacity building to develop small sustainable business

The Project Proponent will set a trust fund setting aside a percentage of the net income from the sale of carbon credits. Such fund will be additional to the budget envisioned for the Project activities.

The Project will provide – in partnership with local communities- capacity building to local families to develop and submit business plans (individually or in groups) to apply for funding to start small sustainable business that take advantage from non-timber products in the Project Area and LMA (i.e. based on agroforestry production, seed collection, etc.). The idea is to replace their dependence on timber extraction and sale for sustainable activities that can provide the same or better level of annual income.

viii) Providing capacity building to cattle ranchers that move inside the Project Boundary

Although is not possible to control the decisions of stakeholders in the area it is possible to influence them if they find some benefit in changing their business-as-usual behavior.

The Project cannot offset the opportunity cost of cattle ranchers so the best it can do is to prevent leakage by providing training on the benefits and techniques of improved pastures managements. Brigades will conduct regular visits made around the perimeter of the project area to neighboring invader origins in order to meet and invite participation in leakage preventive measure activities.

This way, it is expected that cattle ranchers will internalize the benefits of making their activities more efficient in terms of land use thus requiring less area and in turn reducing the risk of deforestation outside the Project Area.

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

We base our consistency analysis in the laws and regulations which is presented in Table 17 below:

Table 17: Relevant Laws and Regulations Applicable to the Project to Demonstrate Baseline Scenarios Consistency

Law / Regulations	Description Relevant to the Project
Forest Code, Law 12.651, May 25 th , 2012	The Forest Code indicates that all landowners of forestlands in the Legal Amazonia should preserve 80% of their land as a legal reserve. However, a landowner can explore the legal reserve of his property as long as the legal reserve stays as forest (according to Brazil's definition).
Constitution of the Federative Republic of Brazil, 1988	Chapter II Indicates that is legal to occupy unused (or not under a productive activity) either public or private land. Such land can be expropriated for the benefit of that who put it to generate benefits for the society.
Normative instruction number 5, December 11 th , 2006	Provides technical procedures for development, presentation, execution and feasibility assessment for Sustainable Forest Management Plan (PMFs) in primary forest and its successions in the Legal Amazon.

Resolution number 406, February 2 nd , 2009 – Minister of environment – National council for environment	Article 1st establishes technical parameters for development, presentation, implementation and technical evaluation of Sustainable Forest Management Plans (PMFS) with timber processing purposes from native forests and its succession in the Amazon biome. It will have to be applied by any level of competence by the units of the National System for the Environment (SISNAMA) observing what is written in this resolution.
Normative Instruction number 2, June 27 th , 2007 – MMA	It provides modifications on the Normative instruction number 5, December 2006. Article 1st. The articles 8th, 28th and 43rd of the Normative Instruction No 5, December 5 th , 2006, published in the official daily noticed of December 13 th , 2006, section 1, page 155 and 159, has the following written: "I – maintenance of at least 10% of the number of trees per species, in the exploration area UPA, which attend the criteria of selection for harvest previously indicated in the PMFS, respecting the limits of at least 3 trees per species per 100 ha, in each UT; and II – maintenance of all trees which abundance of trees with DBH is superior to the DMC is the same or below 3 trees per 100 hectares in the UPA area, for each UT."
Normative Instruction number 012, November 30 th , 2006 – SECTAM	Establish norms and procedures to guide the use of the Forest Guidance note – GFPA. For transport of products and/or sub-products from forest in Pará. Article 1st – the use of Forest guidance note – GF – PA for the transport of products and or sub-products from forest in Pará, which is written in article 6th item V, of State decree number 2592, November 27 th , 2006. Article 2nd – Forest Guidance note – GF-PA will be issued on the following models for the diverse modalities defined in this Normative Instruction: I. GF Model 1 – GF1-PA; II. GF Modelo 2 – GF2-PA; III. GF Model 3 – GF3-PA; e IV. GF Model 4 – GF4- PA.
Normative Instruction number 014, November 30 th , 2006 – SECTAM	Defines the requirements to register activities in a database for activities for technical defense – CTDAM. Considering the necessity to regulate item I, from article 1st, from decree number 5741, December 19 th , 2002, that established the activities for technical environment defense database, considering the necessity to publish the list of professionals able to develop the environmental Projects in the state of Pará; AGREE: Article 1st – define the necessary documents for the annual registry of the database for the activities for technical environment defense.
Normative Instruction number 7/2006, September 27 th , 2006 – SEMA, regarding the Sustainable Forest Management Plan (PMFS)	Article 10, The Sustainable Forest Management Plan (PMFS) must follow. I – the intensity of harvest no higher than 30 m3/hectare in case machines are used for harvest. In this case the initial rotation is 35 years; II – harvest intensity no higher to 10 m3/hectare in case no machine is used for harvesting. It is understood by harvest intensity: the commercial volume of the harvest trees, estimated by volumetric equations presented in the PMFS base on the inventory 100%, expressed in cubic meters per unit of work (UT). Article 20, The PMFS must follow the criteria for tree selection: I – diameter at breast high lower than 50cm, except in the cases where technical justification based on forest inventory data; II – present in the forest inventory 100% density equal or below 3 units for 100 hectares.

Now, we present first a consistency analysis for the three scenarios, the two without-project scenarios and the project scenario.

1. Forest encroachment by pioneer activities followed by deforestation to implement pastures

The scenario of pastures implementation consists in two different processes that include a set of activities happening simultaneously within the Reference Region of the Project. For this reason, it is necessary to break it down in its individual components, as presented below:

A. Small-scale slash and burn subsistence agriculture along river shores:

Landless people can occupy, gain land-use rights and eventually land titles over public or private forested land that is under no-productive use (land with forest cover is assumed under no use). In the case of private land invasions, it is legal unless the legal landowner makes a claim to INCRA stating his land is being invaded and cannot be expropriated (Araujo, Bonjean et al. 2009).

So, settlements can be created but registration takes time and is not usually done. Settlers can gain legal land-use rights to undertake sustainable land uses after proving five consecutive years of productive use of the land. After this five-year period, settlers can start the process to gain property titles. In both cases, given the long distances to the closest town (Portel), it is not common for settlers to undertake such regularization processes (Araujo, Bonjean et al. 2009).

If the landowner doesn't prove that there are productive activities going on in his/her land (either extractive or non-extractive) then settlers are not acting outside the law when developing a village.

Settlement areas allow landless people to establish and develop small-scale productive activities for self-consumption and to make small economic profits (i.e., non-industrial scale agriculture). Thus, settlers use one of the most common practices in tropical forests to prepare the land for agricultural activities, known as slash and burn which requires the clearing of a small patch of forested land and then burning of the trees that have been cut using a controlled fire. Once the land is ready for agriculture, settlers grow mainly cassava (for consumption and to make "farinha") and other crops.

B. Progressive unplanned timber extraction and post-extraction pastures implementation:

As previously explained, when the presence of a landowner is not made evident by monitoring or other activities, private lands are susceptible to invasion. Invaders make a profit by grabbing forested lands that seem to be free or under no-productive use (or with forest cover), claiming land titles and finally selling the land to final deforestation agents. (Fearnside 2001; Margulis 2004).

Squatters are supported by the current Constitution of 1988, under the provision that public or private land that is not under productive use can be claimed by someone else (Araujo, Bonjean et al. 2009).

Unplanned logging activities are not legal, but there is a state-wide lack of enforcement capacity by IBAMA, which is the institution in charge of environmental monitoring (BRITO 2005, Brito, B., Barreto, P. and Rothman, J. 2005 Brazil's new environmental crimes law: an analysis of its effectiveness in protecting the Amazonian forests. Newsletter INECE no. 11, Belém, Brazil); (Millikan et al., 2015, The context of REDD+ in Brazil Drivers, agents and institutions, Center for International Forestry Research). Lack of enforcement in Portel, Para – which is the smallest administrative unit that encompasses the Project – is made evident by the increasing deforestation area according to INPE (INPE 2012). Also, most of the timber in Brazil is known to come from illegal sources (May, Millikan et al. 2011).

Additionally, logging companies may have forest concessions for sustainable timber extraction but due to corruption and weak law enforcement, some of these companies illegally extract timber from areas outside their concessions with no regards on sustainable forestry practices. As a result, illegal logging is widely spread not only in Portel (which is the one of the administrative units that encompasses the Project) but entirely in the state of Para as well (Henrique M. Pereira, 2010, Scenarios for Global Biodiversity in the 21st Century, science. Vol (330) 6010:1496- 1501).

This is also evident by the fact that forest cover loss is increasing in the Project's reference region while illegal logging rates have been decreasing in the last years. In a study developed by IMAZON, it was reported that 435 authorizations for forest management activities in Pará were issued, spanning 280,000

hectares. From this sum, 90% were proved to have legal issuance documents, while 10% had irregularities, such as: the authorized area for exploration was smaller than the area in which the operation took place, the authorized area for exploration was in an already deforested location, or the income of the commercialized wood did not correspond to the area explored (Pedro et al.2018, Fake legal logging in the Brazilian Amazon. science advances. 4(8): eaat1192).

As for cattle ranching, this is a legal activity to undertake in the area. Cattle ranching will start at small scale with squatters and then will scale-up with the arrival of larger agents. In both cases, cattle ranching is used to prove land ownership and of course because of the economic revenues that generates.

2. Timber extraction by the legal landowner

As mentioned before, timber extraction is a legal activity as long as the landowner keeps 80% of his land as a legal reserve. Even so, exploratory activities for timber extraction area allowed to be performed in the legal reserve area as long as this area stays as forest according to the Brazilian definition (1ha with 30% of canopy cover with trees of at least 5 meters high).

In conclusion, a landowner can legally extract timber from his area as long as 80% of his/her area complies with the country's definition of forest.

3. Proposed AUD Project activities

The Project activities aim to conserve the forest, generate long-term positive impact on the climate, communities, and biodiversity. Therefore, the Project activities comply with national and local regulations like the Forest Code and the Constitution of 1988.

Conclusion: The Consistency Analysis shows that all three scenarios are in compliance with mandatory legislation and regulations taking into account their enforcement in the region. In the case of unplanned logging that is an agent that precedes deforestation by ranchers, it has been proven that the lack of enforcement is widely spread not only in Portel but also in the entire Para region.

Sub-step 1c: Selection of the baseline scenario

Described in Section 3.1 – Application of the Methodology, specifically in item 3.1.4 – Baseline scenario.

STEP 2. Investment analysis to determine that the proposed Project activity is not the most economically or financially attractive of the identified land-use scenarios

Sub-step 2a: Determine appropriate analysis method

Due to the fact that the Project is a conservation Project with no other sources of income besides carbon revenues, a simple cost analysis will be applied to prove additionality. Given that carbon credit revenue is the only source of financing for this Project, without this source (or the future expectation of carbon finance) no AUD activities could be implemented and BaU baseline scenarios would take place in the Project Area.

Consequently, in the absence of VCS-related income, it is expected that the project activity will generate no revenue, and therefore the simple cost analysis is the appropriate method to demonstrate that the project activity is financially less attractive than alternatives.

Since the beginning of the Project, the AUD activities were envisioned to be feasible only if carbon credits revenue would be available. Furthermore, initial financing for the Project, received exclusively from private investors will cover 100% of the Project's costs over the first years. Again, this is a clear indication that without carbon finance Project activities cannot be undertaken and therefore are additional.

Sub-step 2b: Option 1 – Simple cost analysis

The simple cost analysis is basically a Project cost description along the crediting period. It aims to demonstrate all the costs associated to the development and implementation of the Project. When Projects have no other revenue but the carbon credits, it is allowed to use this financial analysis.

Annual project operational expenditures (both planned and actual), covering governance and administration as well as protection and management, for the 2016 to 2020 years are detailed in the table below. Anticipated operational expenditures, with full implementation of the project activity, are expected to be similar to or more than the “planned” budget figures below.

Table 18. Annual project operational expenditures

	2017	2017	2018	2018	2019	2019	2020	2020	2021	2021
	Planned	Actual								
Costs	R\$	US\$	r\$	US\$						
Salary and Allowance for Guards	50,000	25,456	50,000	34,524	50,000	45,788	100,000	150,000	150,000	300,000
Virtual Security - registering the property with INCRA, the Environmental Ministry so land invaders see it is owned with the hopes they will not invade	60,000	60,000	65,000	65,000	65,000	65,000	65,000	70,000	80,000	150,000
Survey work in the field related to the work	150,000	324,535	150,000	364,543	150,000	424,500	150,000	535,350	150,000	780,000
Legal fees each year to target the illegal loggers invading the land	30,000	28,404	30,000	23,900	30,000	84,230	74,230	44,480	74,230	44,480
Project Proponent Payments to Landowner(riverine) to cover landowner related land expenses	0	0	0	0	0	0	0	0	0	0
Travel	100,000	52,545	100,000	45,360	100,000	57,824	100,000	34,355	100,000	54,353

Managers	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	
Cook Stoves	0	0	100,000	89,100	0	0	0	0	0	0
Oil/petrol/ for boats	25,000	36,239	36,000	37,242	36,000	35,343	36,000	35,634	36,000	35,334
Education/ Workers Teacher - go through project requirements, teach about alternative agroforestry crops and interviews	0	0	5,000	5,600	5,000	5,200	5,000	5,425	5,000	25,425
TOTAL	\$565,000	\$677,179	\$686,000	\$815,269	\$586,000	\$867,885	\$680,230	\$1,025,244	\$745,230	\$1,389,592

Budget expenditures for the project, in the absence of carbon revenue, are far below what is needed for the effective protection and management of the area. Actual expenditures ranged from 30% to 35% of planned expenditures for the 2016-2020 (June 2020) period (analysis above in table 18). A “low end” estimate of required annual expenditure of US\$418,000 far exceeds actual total annual expenditures for 2016-2020 (till date) of ~US\$2,203,282 (Table 13, accounting data). As stated, the US\$418,000 suggested budget is a low-end estimate - effective anti-poaching efforts at the project area costs the equivalent of 150 km² which would put the corresponding project budget requirement at approximately US\$700,000. Not surprisingly, with so little financing available, most (>90%) of company expenditures currently go to core governance and administrative costs, and the remainder of only 15.7% is spent on resource management and protection imposing a further constraint on implementation of the REDD project.

The Project is uniquely disadvantaged due to its remoteness and difficulty of access, and poor potential for photographic tourism; photo-tourism is a key determining factor in the few “strongly financially viable” forest areas in the state of Para in Brazil. Current projects currently have no accommodation infrastructure to facilitate tourism. While PP currently has some hope to generate some revenue from VCS which is essential to achieve effective resource protection and effectively carry out the project REDD activity.

Comparing the annual budget spent from 2016-2019 destined for management of the project, to the estimated required annual budget of US\$500,000 on an average; current revenue sources is “zero”. And as explained above, other activities like small-scale agriculture, tourism revenue is expected to be zero without effective management and protection measures in place.

In conclusion, it is demonstrated that a large amount of initial capital is required for the set-up of the Project.

As demonstrated above, the project without the financial benefits of VCS-related carbon payments is not financially competitive with reasonable alternative economic activities.

STEP 3. Barrier analysis

Not applicable.

STEP 4. Common practice analysis

The project activity, Alternative 2, involving sufficient financing and effective implementation of current REDD project is not a common practice. The clearly-demonstrated financial challenges of the PP are not peculiar to forest areas in Brazil. Most forest areas are not earning sufficient revenue to cover costs. Brazil needs compensation if it is to protect the Amazon.

An evaluation from National and Subnational Analysis for the Period 2009 through 2016 from a forest trend REDDX report states that;

“More financial resources are needed. Over US\$2.2 billion has been committed to the development of REDD+ activities in Brazil from 2009 through September 2016, and this helped Brazil to become a global leader in reducing its emissions from deforestation. But in order to continue this progress and meet its current and future deforestation reduction goals, they need to find additional resources that are predictable and can generate a large [number] of resources for performance-based payments”.

Similarly, a recent evaluation of the financial viability of forests in Brazil (2016) assessed more than half of those forest types evaluated as “marginally viable” or “non-viable.”

Thus, a native amazon forest with sufficient financing for effective management and protection, in the absence of carbon revenue (or other as yet to be developed alternative revenue sources), cannot be characterized as a common practice.

¹²Andreea Leonte, 2019, <https://www.ft.com/content/37179794-cef8-11e9-b018-ca4456540ea6>.

Results of the Additionality Analysis:

As demonstrated, the project activity, without revenue from carbon credits, faces severe financial constraints, and is not a common practice in the region. Therefore, the project is determined to be additional.

3.1.6 Methodology Deviations

No Deviations

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

Development of the project baseline emissions from unplanned deforestation, both rate and location, was conducted in conformance with the VCS REDD methodology VM0015 Ver1.1.

Step 5 of VM0015 - Definition of the Component of Changes in Land Use and Coverage in the Baseline activity data calculation by forest class:

5.1 Calculation of baseline activity data per forest class

This calculation combined the maps (Figure 36 to 39 and 41) of annual baseline deforestation of each future year with the land-use and land-cover map (Figure 34) for the initial situation in Step 2 to produce a set of maps showing for each forest class the polygons that would be deforested each year in absence of the project activity. Were extract from these maps the number of hectares of each forest class that would be deforested and the results of the baseline projections showed a deforestation of approximately 563,638 hectares in the reference region, 49,910 hectares in the Project Area between 2017 and 2046 and 513,729 hectares in the Leakage Belt.

Table 19. Annual areas deforested per forest class icl within the Project Area in the baseline case (Table 11b of VM0015)

IDz >	1	Total baseline deforestation in the reference region	
		ABSLR Rt	ABSLRR
Name >	Zone 1	Ha	ha
Project year t	ha		
0	-	-	-
1	18,788	18,788	18,788
2	18,788	18,788	37,576
3	18,788	18,788	56,364
4	18,788	18,788	75,152
5	18,788	18,788	93,940
6	18,788	18,788	112,728
7	18,788	18,788	131,516
8	18,788	18,788	150,304
9	18,788	18,788	169,092
10	18,788	18,788	187,880
11	18,788	18,788	206,667
12	18,788	18,788	225,455
13	18,788	18,788	244,243
14	18,788	18,788	263,031
15	18,788	18,788	281,819
16	18,788	18,788	300,607
17	18,788	18,788	319,395
18	18,788	18,788	338,183
19	18,788	18,788	356,971
20	18,788	18,788	375,759
21	18,788	18,788	394,547
22	18,788	18,788	413,335
23	18,788	18,788	432,123
24	18,788	18,788	450,911
25	18,788	18,788	469,699
26	18,788	18,788	488,487
27	18,788	18,788	507,275
28	18,788	18,788	526,063
29	18,788	18,788	544,851
30	18,788	18,788	563,638

Table 20. Annual areas deforested per forest class icl within the Project Area in the baseline case (Table 11b of VM0015)

Area deforested per forest class icl within the project area		Total baseline deforestation in the project area	
$ID_{icl} >$	1 Ombrophile Dense	annual $ABSLPA_t$ ha	cumulative $ABSLPA$ ha
Project year t	Ha		
1	1,695.9	1,695.9	1,695.9
2	2,248.2	2,248.2	3,944.1
3	2,571.6	2,571.6	6,515.7
4	2,457.8	2,457.8	8,973.5
5	2,256.0	2,256.0	11,229.4
6	1,913.2	1,913.2	13,142.6
7	1,948.1	1,948.1	15,090.7
8	1,719.1	1,719.1	16,809.9
9	1,578.2	1,578.2	18,388.0
10	1,447.5	1,447.5	19,835.5
11	1,349.2	1,349.2	21,184.7
12	1,325.9	1,325.9	22,510.6
13	1,259.9	1,259.9	23,770.6
14	1,134.5	1,134.5	24,905.0
15	1,223.7	1,223.7	26,128.7
16	1,244.4	1,244.4	27,373.1
17	1,214.7	1,214.7	28,587.8
18	1,214.7	1,214.7	29,802.5
19	1,209.5	1,209.5	31,011.9
20	1,228.9	1,228.9	32,240.8
21	1,303.9	1,303.9	33,544.8
22	1,275.5	1,275.5	34,820.2
23	1,557.5	1,557.5	36,377.7
24	1,655.8	1,655.8	38,033.4
25	1,632.5	1,632.5	39,665.9
26	1,760.5	1,760.5	41,426.4
27	1,773.5	1,773.5	43,199.9
28	1,886.0	1,886.0	45,085.9
29	2,267.6	2,267.6	47,353.6
30	2,556.1	2,556.1	49,909.7

Table 21. Annual areas deforested per forest class icl within the Leakage Belt in the baseline case (Table 11c of VM0015)

Area deforested per forest class icl within the leakage belt		Total baseline deforestation in the leakage belt	
Name >	$ID_{icl} >$	annual $ABSLLK_t$ ha	cumulative $ABSLLK$ ha
Project year t	Ha		
1	17,092.1	17,092.1	17,092.1
2	16,539.7	16,539.7	33,631.8
3	16,216.3	16,216.3	49,848.2
4	16,330.2	16,330.2	66,178.3
5	16,532.0	16,532.0	82,710.3
6	16,874.8	16,874.8	99,585.1
7	16,839.8	16,839.8	116,424.9
8	17,068.8	17,068.8	133,493.7
9	17,209.8	17,209.8	150,703.5
10	17,340.4	17,340.4	168,044.0
11	17,438.8	17,438.8	185,482.7
12	17,462.0	17,462.0	202,944.8
13	17,528.0	17,528.0	220,472.8
14	17,653.5	17,653.5	238,126.3
15	17,564.2	17,564.2	255,690.5
16	17,543.5	17,543.5	273,234.1
17	17,573.3	17,573.3	290,807.3
18	17,573.3	17,573.3	308,380.6
19	17,578.5	17,578.5	325,959.1
20	17,559.1	17,559.1	343,518.2
21	17,484.0	17,484.0	361,002.2
22	17,512.5	17,512.5	378,514.7
23	17,230.5	17,230.5	395,745.2
24	17,132.2	17,132.2	412,877.4
25	17,155.5	17,155.5	430,032.8
26	17,027.4	17,027.4	447,060.3
27	17,014.5	17,014.5	464,074.7
28	16,901.9	16,901.9	480,976.7
29	16,520.3	16,520.3	497,497.0
30	16,231.9	16,231.9	513,728.8

5.2 Calculation of baseline activity data by post-deforestation class:

As available in methodology VM0015, method 1 was used to determine the substitute class of forest cover in the baseline of the Project (indicated as anthropic Vegetation in Balance). Table 22 shows the area of the project zone, which comprises the Project area, the leakage belt and the leakage management areas, as well as the corresponding areas of each class of use and coverage after deforestation.

Table 22: Areas of the reference region covering different combinations of potential post deforestation classes

Zone		Name		Total of all other LU/LC classes present in the zone		Total Area					
		Zone									
		ID _{fcl}	1								
Idz	Name	Ha	%	Area	% of Zone	Area	% of Zone				
1	Ribeirinho REDD+	199,962	100	20,133.00	12.15%	199,962	100				
Total Area per class fcl		199,962	100	20,133.00	12.15%	199,962	100				

The reference region for rate of deforestation (RRD) has a total area of 1,991,227 ha and is delineated as shown in Figure 68. It excludes the project area and leakage belt, and all non-forested areas at the start of the historical reference period in the year 2005. Further, the reference region has been defined with knowledge of the drivers of unplanned deforestation in the region. A guiding principle in the delineation of the reference region was, to the extent possible within the requirements of the VM0015 methodology, to reflect political boundaries (districts), to facilitate any eventual alignment with an anticipated Government of Brazil jurisdictional REDD framework. The main agents of deforestation in the RRD are small scale farmers who intend on establishing croplands through conversion of forest land. The proportion of agriculturalist to ranchers is the same in the RRD as is expected in the project area in the baseline case. Landscape factors (i.e., soil type, vegetation type, elevation, and slope) do not drive agricultural decisions for small scale farmers. Maps of the landscape factors, including forest type, soil type, slope, and elevation that were used to help define the reference region and ensure similarity to the project area can be found in the project database. Incorporation of these landscape factors had little effect on delineating the RRD as almost all land in the RRD is suitable for conversion to agricultural land. Land tenure was also used to help delineate the RRD. Specifically, national parks, forest reserves, and game reserve were excluded from the RRD as these areas differ from the privately-owned project area. Comparison of the area covered by landscape factors, transportation networks and human infrastructure are detailed in the Table 23 below.

Figure 47: Reference Region for Rate (RRD) and Reference Region for Location (RRL)

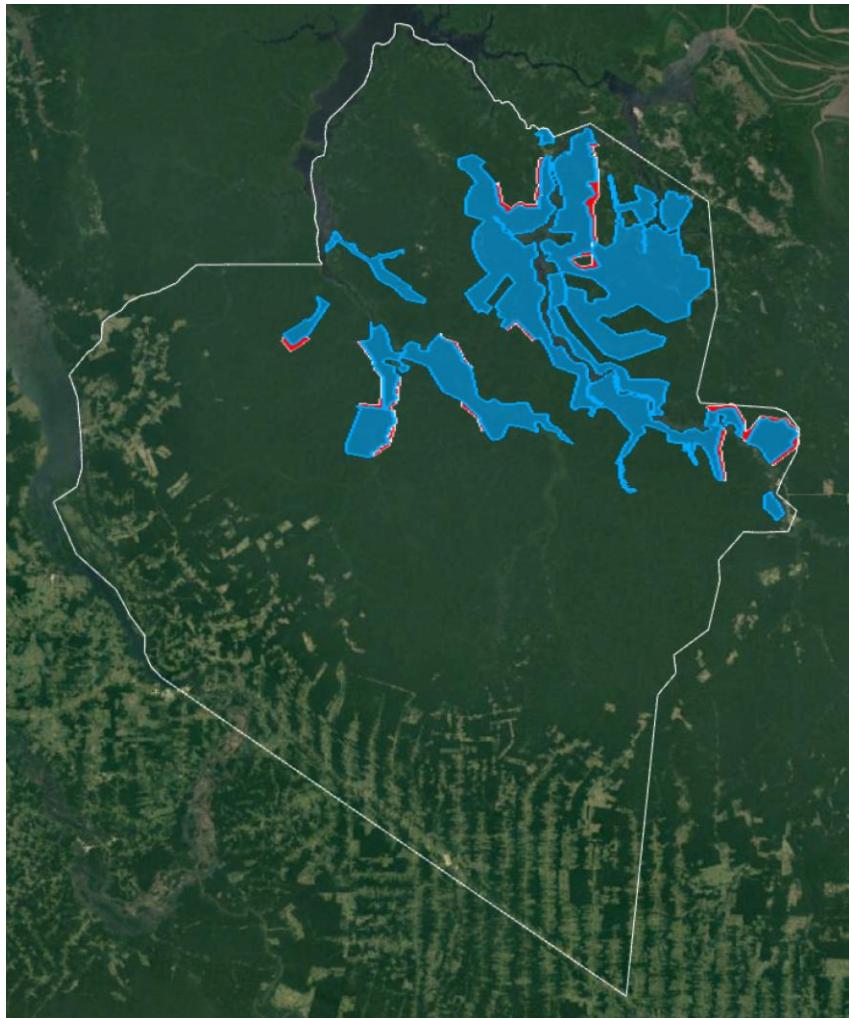


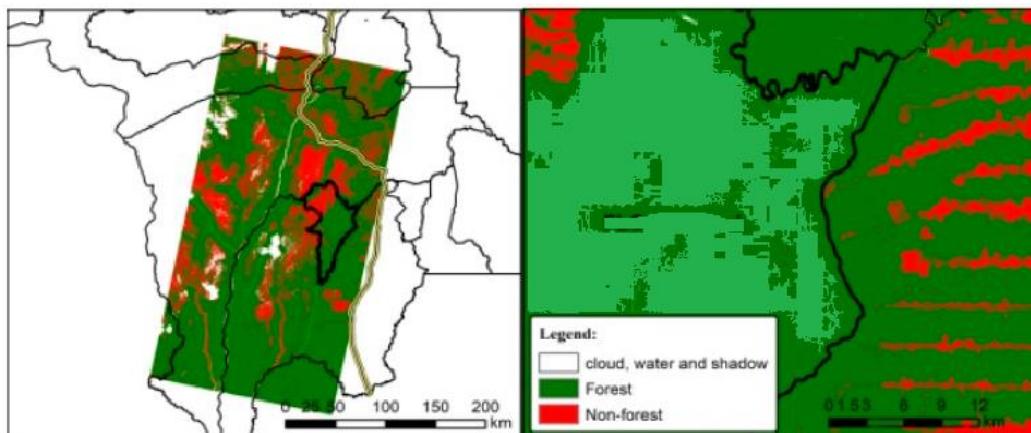
Table 23. Criteria for defining the boundary of the RRD and leakage belt.

ID _{cl}	Class Identifier Name	Broad class	Trend in Carbon stock	Presence in ²	Activities in the baseline case ³		
					LG	FW	CP
001	Ombrofile Forest	Forest Land	decreasing	RR	yes	no	No
002	Grassland	Grassland	constant	RR	no	no	No
003	Cropland	Crop Land	constant	RR	no	no	No
004	Ombrofile Forest	Forest Land	decreasing	PA	yes	no	No
005	Grassland	Grassland	constant	PA	no	no	No
006	Cropland	Crop Land	constant	PA	no	no	No
007	Ombrofile Forest	Forest Land	decreasing	LK	yes	no	No
008	Grassland	Grassland	constant	LK	no	no	No
009	Cropland	Crop Land	constant	LK	no	no	No

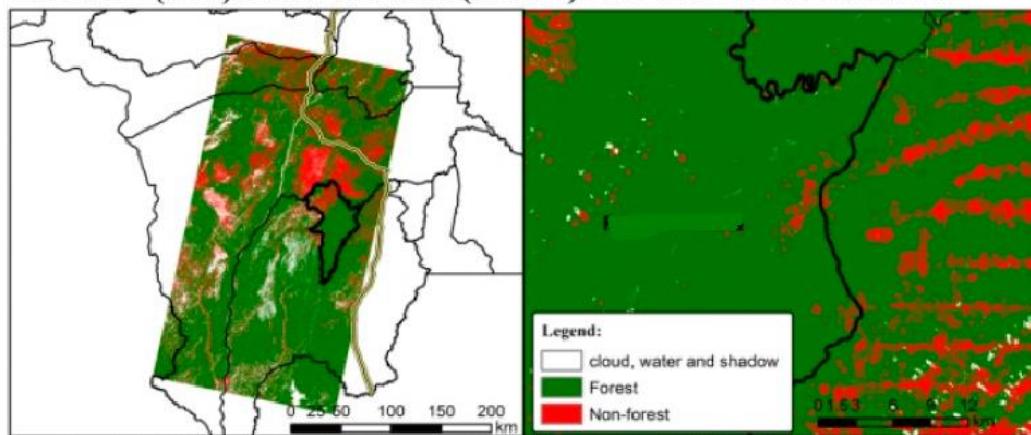
The area of the RRD is larger than the minimum required (MREF). The MREF was calculated to

be 1,991,227ha. The reference region for projecting location of deforestation (RRL) is delineated as shown in Figure 48. The entire RRL is located within the outer perimeter of the RRD and has an area of 3,982,454 hectares. Conservation lands removed include national parks, forest reserves, and game reserves.

Figure 48. Forest/non-forest map, with the non-forest class



Landsat 8 (OLI)/Path: 232/Rows (Mosaic): 059-060/Period: 10/04/2015



Landsat 8 (OLI)/Path: 232/Rows (Mosaic): 059-060/Period: 01/10/2017

Table 24. Annual areas deforested in each zone within the Project Area in the baseline case (Table 13b of VM0015)

Area established after deforestation per zone within the project area		Total baseline deforestation in the project area	
IDz >	1	ABSLPA _t	ABSLPA
Name >	Zone 1	Ha	ha
Project year t	ha		
0	0	0	0
1	1,696	1,695.864851	1,695.864851
2	2,248	2,248.217476	3,944.082328

3	2,572	2,571.608943	6,515.691271
4	2,458	2,457.775147	8,973.466418
5	2,256	2,255.978872	11,229.44529
6	1,913	1,913.183917	13,142.62921
7	1,948	1,948.110195	15,090.7394
8	1,719	1,719.149037	16,809.88844
9	1,578	1,578.150357	18,388.0388
10	1,448	1,447.500205	19,835.539
11	1,349	1,349.189199	21,184.7282
12	1,326	1,325.905013	22,510.63321
13	1,260	1,259.933154	23,770.56637
14	1,134	1,134.457265	24,905.02363
15	1,224	1,223.71331	26,128.73694
16	1,244	1,244.410364	27,373.14731
17	1,215	1,214.658349	28,587.80566
18	1,215	1,214.658349	29,802.464
19	1,209	1,209.484085	31,011.94809
20	1,229	1,228.887573	32,240.83566
21	1,304	1,303.914394	33,544.75006
22	1,275	1,275.455945	34,820.206
23	1,557	1,557.453304	36,377.65931
24	1,656	1,655.764309	38,033.42362
25	1,632	1,632.480124	39,665.90374
26	1,761	1,760.543145	41,426.44688
27	1,773	1,773.478803	43,199.92569
28	1,886	1,886.019034	45,085.94472
29	2,268	2,267.620964	47,353.56569
30	2,556	2,556.086153	49,909.65184

Table 25. Annual areas deforested in each zone within the Leakage Belt in the baseline case (Table 13c of VM0015)

IDz >	1	Total baseline deforestation in the leakage belt	
		ABSLLK _t	ABSLLK
Name >	Zone 1	Ha	ha
Project year t	ha	Ha	ha
0		0	0
1	17092.09	17,092.09	17,092.09
2	16539.73	16,539.73	33,631.82
3	16216.34	16,216.34	49,848.16
4	16330.17	16,330.17	66,178.33

5	16531.97	16,531.97	82,710.30
6	16874.77	16,874.77	99,585.07
7	16839.84	16,839.84	116,424.91
8	17068.80	17,068.80	133,493.71
9	17209.80	17,209.80	150,703.51
10	17340.45	17,340.45	168,043.96
11	17438.76	17,438.76	185,482.72
12	17462.04	17,462.04	202,944.77
13	17528.02	17,528.02	220,472.78
14	17653.49	17,653.49	238,126.28
15	17564.24	17,564.24	255,690.51
16	17543.54	17,543.54	273,234.05
17	17573.29	17,573.29	290,807.34
18	17573.29	17,573.29	308,380.64
19	17578.47	17,578.47	325,959.10
20	17559.06	17,559.06	343,518.16
21	17484.04	17,484.04	361,002.20
22	17512.49	17,512.49	378,514.69
23	17230.50	17,230.50	395,745.19
24	17132.19	17,132.19	412,877.38
25	17155.47	17,155.47	430,032.85
26	17027.41	17,027.41	447,060.25
27	17014.47	17,014.47	464,074.72
28	16901.93	16,901.93	480,976.66
29	16520.33	16,520.33	497,496.98
30	16231.86	16,231.86	513,728.85

Table 26. Physical Boundaries of the project

Reference Region for Deforestation (RRD)	<p>Area: 1,991,227ha Historical deforestation rate: 1.91% Vegetation: Ombrophilous Forest Elevation range: 0 to 150m Average slope: 12° Annual average precipitation: 2000mm Agents and drivers of deforestation: main agents of deforestation are cattle ranchers (98%) followed by small-scale farmers (2%) Land Tenure: both public and private lands Law enforcement on land tenure rights: weak</p>
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Project Boundary (PB)	Refers to the total area under control of the Project Proposer and includes the Project Area and LMA Area: 350,000 ha Agents and drivers of deforestation: small-scale Farmers, illegal logging, grazing and others Land Tenure: private lands Law enforcement on land tenure rights: weak
Project Area (PA)	Forested land where GHG emission reduction benefits will be accounted. The Minimum Mapping Unit (MMU) was the Brazilian definition of Forest, which is 1ha with more than 30% forest cover, and 5 meters of tree height Area: 199,962ha Vegetation: Ombrophilous Forest Elevation range: 0-40m Average slope: 6° Annual average precipitation: 2300 mm Land Tenure: private lands Law enforcement on land tenure rights: weak
Leakage Belt (LK)	Cumulative of areas that presents the highest risk of deforestation due to displacement of deforestation agents by the Project Activities Area: 16,503ha Agents and drivers of deforestation: illegal loggers, squatters, and small-scale farmers
Leakage Management Areas (LMA)	Non-forest areas within the PB. It is currently in these areas that local population and communities live and where the Project Activities will take place. Area: 16,503ha

Project Area:

The project area consists of one contiguous parcel of land near the Portel and other two municipalities of the Belem boundary in north east Brazil which is under threat of deforestation. The project proponents are undertaking project activities in and around the project area to mitigate deforestation pressures and stop deforestation. The total project area is 199,962 hectares and was 100% forested at the start of the project. The project areas boundaries were delineated and georeferenced as part of the establishment of the REDD project.

Leakage Belt:

The leakage belt is the area surrounding or in the immediate vicinity of the project area where leakage caused by activity displacement is expected to occur. Parts of the leakage belt boundaries were delineated

and georeferenced were delineated and georeferenced as part of the establishment of the project, as the leakage belt shares a border with the project area. See Figure 26 (Leakage Belt Map).

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

Does not apply.

Step 6 of VM0015 - Estimation of Changes in Carbon Stocks and non-CO₂ Emissions at Baseline

The estimate of the carbon stock for the Forest class was reached through forest inventory carried out by the project's technical team in the year 2019. The main results found in this study will be described below:

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

The implementation of the forest inventory in the REDD project area adopted the recommendations presented in the VCS approved methodology VM0015, distributing the plots proportionally to the area of each typology and considering a uniform distribution of plots in the management area. Physical Parameters in a total of 3 strata were identified in the Project area, which resulted in a total of 146 planned initial sample units. In addition, it was also considered an analysis for the plots implanted in managed areas and unmanaged areas. All plots were evenly distributed to cover much of the Project area.

Average carbon stocks are estimated for:

1. Forest classes existing within the project area
2. Forest classes existing within the leakage belt
3. Post-deforestation classes projected to exist in the project area in the baseline case
4. Post-deforestation classes projected to exist in the leakage belt in the project case
5. Non-forest classes existing in leakage management areas

According to E. Tomppo et al. (eds.), National Forest Inventories (2010), the permanent plots may be having a circular, square or rectangular shape. However, the most used shape is the square one in tropical forests. Based on this guideline, the inventory was carried out in 1-hectare square plots, as it was found that with this format and dimension it is possible to obtain greater representativity and less difficulty of operation.

For each plot, data will be collected from the arboreal stratum, collecting individuals with Diameter at the Chest Height (DCH) of more than 15 centimeters and for better ordering each plot was divided into subunits of 0.25 hectares. Each implemented plot received an identification plate with the unit number, this numbering was allocated at the start point of each plot, and was also done for the subunits (Figure 49).

Figure 49. Allocation of sample forest inventory units in the Project Area



Estimated Variables: Biomass and Carbon

Dry Biomass

The above-ground dry biomass of the Project area was estimated using allometric equations, and ten different models were tested (Chave et al., 2005; Tre allometry and improved estimation of carbon stocks and balance in tropical forests. *Oecologia* 145(1):87-99). All of them adopt the diameter above the soil (DCH> 10 cm) of the trees sampled as an independent variable, while others consider, in addition to the DCH, the basic density of the tree species. DCH values above the maximum value used for the development of the allometric equations tested were truncated to the maximum value. Basic wood density values were obtained from the Global Wood Density Database. Due to the fact that the database reports

more than one density value per species, the average of the values reported by species for the Project region was preferably used.

For cases where this information was not present, the global averages of the values reported for the species were adopted. However, when species-specific values were not available, the average biomass of the arboreal genus was adopted, according to the standard procedure typically reported in the literature (IPCC default values). We emphasize that below-ground biomass is already included in the estimation. To quantify the biomass, we used the allometric equation described by Nogueira et al. (2008) (Euler MeloNogueira, 2008. Estimates of forest biomass in the Brazilian Amazon: New allometric equations and adjustments to biomass from wood-volume inventories. Forest Ecology and Management.256(11):1853-1867), showing more appropriate for the region of study. The following is a description of equation 23:

$$B = \exp (-1.715 + 2.413 * \ln(DAP))$$

Where:

B: dry biomass (kg);

DCH: Diameter at Breast height (1.30cm).

Carbon Content

In accordance with the methodology VM0015, the carbon stocks were quantified in tons of carbon dioxide equivalent per hectare (tCO₂-e ha⁻¹). For calculations and conservatively, the estimated carbon stocks considered only the biomass reservoirs above and below the ground. The following equation was used for the conversion of the dry biomass into tCO₂-e ha⁻¹ based on the sampled trees and their respective plots and subplots (equation 24):

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

Where:

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

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

FC: fraction of biomass carbon.

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

Sampling Effort

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

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

Where:

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

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

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

N: possible number of sample plots.

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

Number of Individuals

A total of 8,668 individuals species distributed in 376 species were identified in the 75 inventoried plots. The identified species that presented the greatest wealth were: *Breu vermelho* (4,90%), *Cariperana* (3,97%), *Mandioqueira escamosa* (1,56%) and *Cupiúba* (3,41%).

The 378 identified species are distributed in 58 families, in addition to 2 unidentified class, and the families that showed the greatest diversity were: Fabaceae (23.4%), Sapotaceae (6.5%), Lecythidaceae (7.3%) and Lauraceae (3.7%).

Carbon Stock

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

For the estimation of the carbon stock an average final stock of total dry biomass 45,948 tCO₂-e ha⁻¹, was obtained, considering only one stratum. Considering the strata of forest typology, the typology that presented the highest carbon stock was the Montane Dense Ombrophilous Forest 604,545 tCO₂-e ha⁻¹.

Calculation of Reduced Emissions

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

Table 27. Estimated values of carbon stocks per hectare of initial forest classes icl existing in the Project Area and Leakage Belt (Table 15a of VM0015)

Project year <i>t</i>	Initial forest class <i>icl</i>								
	Name: IDicl		1						
	Average carbon stock per hectare ± 90% CI								
<i>Cabicl</i>		<i>Cbbicl</i>		<i>Clicl</i>		<i>Ctotcl</i>			
<i>C stock</i> tCO ₂ e ha ⁻¹		± 90% CI tCO ₂ e ha ⁻¹		<i>C stock</i> tCO ₂ e ha ⁻¹		± 90% CI tCO ₂ e ha ⁻¹		<i>C stock</i> tCO ₂ e ha ⁻¹	
0	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
1	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
2	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
3	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
4	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
5	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
6	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
7	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
8	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
9	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
10	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
11	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
12	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
13	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
14	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
15	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
16	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
17	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
18	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
19	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
20	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
21	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
22	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
23	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
24	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
25	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
26	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
27	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
28	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
29	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	
30	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69	

Where:

$Cabici$: Average equivalent carbon stock per hectare for the above-ground biomass reservoir for the initial forest class;

$Cbbicl$: Average equivalent carbon stock per hectare for the below-ground biomass reservoir for the initial forest class;

$Cdwicl$: Average equivalent carbon stock per hectare for the dead biomass reservoir for the initial forest class;

$Ctoticl$: Average carbon stock per hectare for the total biomass reservoir for the initial forest class.

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

The methodology VM0015 (Section 6.1.1, page No. 62) allows the use of estimates from local studies, and thus a value of 60.1 tCO₂e ha⁻¹ was taken as reference for the carbon stock of the anthropic vegetation class in equilibrium, the class projected to exist in the project area and the leakage belt in the Project scenario. This estimation of carbon stock was obtained by Weighted average (by area obtained in Terra Class database):2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 6: Grassland, pg. 6.27, Table 6.4 (for Pasture: 76.1% of area) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, V. 4, Chapter 4: Forest Land, pg. 4.63, Table 4.12 (for Pasture with regeneration: 23.9% of area). Wanderlli & Fearnside, P.M. 2015. Deforestation soars in the Amazon. Nature 521:423), through a long-term study of the landscape and average vegetation composition in deforested areas of the Brazilian Amazon, which consists of a matrix composed of pastures, small-scale agriculture and secondary vegetation, usually found in a post-deforestation scenario in the Amazon.

¹⁶2006 IPCC Guidelines for National Greenhouse Gas Inventories

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

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

8. Expert review was not necessary;
9. Data are not maintained only in a central storage repository.

6.1.2 Calculation of the carbon stock change factors

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

To calculate this decay, VM0015 version 1.1 applies a linear function to account for the initial carbon stock decay for the initial forest class (icl) and an increase in the carbon stock in the class after deforestation (fcl). Table 28 shows how the carbon stock change factor was calculated below.

Table 28.

Year after deforestation		$\Delta Cab_{icl,t}$	$\Delta Cbb_{icl,t}$	$\Delta Cl_{icl,t}$
1	t^*	-422.9	-9.47	-7.88
2	t^*+1	0	-9.47	0
3	t^*+2	0	-9.47	0
4	t^*+3	0	-9.47	0
5	t^*+4	0	-9.47	0
6	t^*+5	0	-9.47	0
7	t^*+6	0	-9.47	0
8	t^*+7	0	-9.47	0
9	t^*+8	0	-9.47	0
10	t^*+9	0	-9.47	0
11	t^*+10	0	0.00	0
12	t^*+11	0	0.00	0
13	t^*+12	0	0.00	0
14	t^*+13	0	0.00	0
15	t^*+14	0	0.00	0
16	t^*+15	0	0.00	0
17	t^*+16	0	0.00	0
18	t^*+17	0	0.00	0
19	t^*+18	0	0.00	0
20	t^*+19	0	0.00	0
21	t^*+20	0	0.00	0
22	t^*+21	0	0.00	0
23	t^*+22	0	0.00	0
24	t^*+23	0	0.00	0
25	t^*+24	0	0.00	0

26	t*+25	0	0.00	0
27	t*+26	0	0.00	0
28	t*+27	0	0.00	0
29	t*+28	0	0.00	0
30	t*+29	0	0.00	0

Table 29. Carbon stock change factor for forest class fcl or z zones (Method 1) (Table 20b of VM0015)

		Zone 1			
Year after deforestation		$\Delta Cab_{z,t}$	$\Delta Cbb_{z,t}$	$\Delta Cl_{z,t}$	$\Delta Tot_{z,t}$
1	t*	1.93	1.93	1.93	5.805
2	t*+1	1.93	1.93	1.93	5.805
3	t*+2	1.93	1.93	1.93	5.805
4	t*+3	1.93	1.93	1.93	5.805
5	t*+4	1.93	1.93	1.93	5.805
6	t*+5	1.93	1.93	1.93	5.805
7	t*+6	1.93	1.93	1.93	5.805
8	t*+7	1.93	1.93	1.93	5.805
9	t*+8	1.93	1.93	1.93	5.805
10	t*+9	0.00	0.00	0.00	0.00
11	t*+10	0.00	0.00	0.00	0.00
12	t*+11	0.00	0.00	0.00	0.00
13	t*+12	0.00	0.00	0.00	0.00
14	t*+13	0.00	0.00	0.00	0.00
15	t*+14	0.00	0.00	0.00	0.00
16	t*+15	0.00	0.00	0.00	0.00
17	t*+16	0.00	0.00	0.00	0.00
18	t*+17	0.00	0.00	0.00	0.00
19	t*+18	0.00	0.00	0.00	0.00
20	t*+19	0.00	0.00	0.00	0.00
21	t*+20	0.00	0.00	0.00	0.00
22	t*+21	0.00	0.00	0.00	0.00
23	t*+22	0.00	0.00	0.00	0.00
24	t*+23	0.00	0.00	0.00	0.00
25	t*+24	0.00	0.00	0.00	0.00
26	t*+25	0.00	0.00	0.00	0.00
27	t*+26	0.00	0.00	0.00	0.00
28	t*+27	0.00	0.00	0.00	0.00

29	t*+28	0.00	0.00	0.00	0.00
30	t*+29	0.00	0.00	0.00	0.00

6.1.3 Calculation of baseline changes in carbon stock:

For the calculation of the baseline changes in carbon stock of the Project area (Table 30) and leakage belt (Table 31) year t was used; Method 1 of VM0015 version 1.1, according to equation 10 on page 72 of VM0015 version 1.1. is used.

Table 30. Table 21.a.1. Baseline carbon stock change in the above-ground biomass in the reference region

Carbon stock changes in the above-ground biomass per initial forest class icl		Total carbon stock change in the above-ground biomass of the initial forest classes in the reference region		Carbon stock changes in the above-ground biomass per post deforestation zone z		Total carbon stock change in the above-ground biomass of post-deforestation zones in the reference region		Total net carbon stock change in the above-ground biomass of the reference region	
$ID_{icl>}$	1	$\Delta Cab_{BSLRR_{id,t}}$	$\Delta Cab_{BSLRR_{icl}}$	$ID_{iz>}$	1	$\Delta Cab_{BSLRR_{R_{z,t}}}$	ΔCab_{BSLRR_z}	ΔCab_{BSLRR_t}	ΔCab_{BSLRR}
Nam e >		annual	cumulative	Nam e >		annual	cumula tive	annual	Cumulative
Proj ect year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Proj ect year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
-	-	-	-	-	-	-	-	-	-
1	(1,29,22, 352)	(1,29,22, 352)	(1,29,22,3 52)	1	36,3 52		36,3 52	36,352	(1,29,58, 704)

2	(1,29,22, 352)	(1,29,22, 352)	(2,58,44,7 04)	2	36,3 52		36,3 52	72,703	(1,29,58, 704)	(2,59,17,4 07)
3	(1,29,22, 352)	(1,29,22, 352)	(3,87,67,0 56)	3	36,3 52		36,3 52	1,09,0 55	(1,29,58, 704)	(3,88,76,1 11)
4	(1,29,22, 352)	(1,29,22, 352)	(5,16,89,4 08)	4	36,3 52		36,3 52	1,45,4 06	(1,29,58, 704)	(5,18,34,8 14)
5	(1,29,22, 352)	(1,29,22, 352)	(6,46,11,7 60)	5	36,3 52		36,3 52	1,81,7 58	(1,29,58, 704)	(6,47,93,5 18)
6	(1,29,22, 352)	(1,29,22, 352)	(7,75,34,1 12)	6	36,3 52		36,3 52	2,18,1 09	(1,29,58, 704)	(7,77,52,2 21)
7	(1,29,22, 352)	(1,29,22, 352)	(9,04,56,4 64)	7	36,3 52		36,3 52	2,54,4 61	(1,29,58, 704)	(9,07,10,9 25)
8	(1,29,22, 352)	(1,29,22, 352)	(10,33,78, 816)	8	36,3 52		36,3 52	2,90,8 12	(1,29,58, 704)	(10,36,69, 628)
9	(1,29,22, 352)	(1,29,22, 352)	(11,63,01, 168)	9	36,3 52		36,3 52	3,27,1 64	(1,29,58, 704)	(11,66,28, 332)
10	(1,29,22, 352)	(1,29,22, 352)	(12,92,23, 520)	10	36,3 52		36,3 52	3,63,5 16	(1,29,58, 704)	(12,95,87, 036)
11	(1,29,22, 352)	(1,29,22, 352)	(14,21,45, 872)	11	36,3 52		36,3 52	3,99,8 67	(1,29,58, 704)	(14,25,45, 739)
12	(1,29,22, 352)	(1,29,22, 352)	(15,50,68, 224)	12	36,3 52		36,3 52	4,36,2 19	(1,29,58, 704)	(15,55,04, 443)
13	(1,29,22, 352)	(1,29,22, 352)	(16,79,90, 576)	13	36,3 52		36,3 52	4,72,5 70	(1,29,58, 704)	(16,84,63, 146)
14	(1,29,22, 352)	(1,29,22, 352)	(18,09,12, 928)	14	36,3 52		36,3 52	5,08,9 22	(1,29,58, 704)	(18,14,21, 850)
15	(1,29,22, 352)	(1,29,22, 352)	(19,38,35, 280)	15	36,3 52		36,3 52	5,45,2 73	(1,29,58, 704)	(19,43,80, 553)
16	(1,29,22, 352)	(1,29,22, 352)	(20,67,57, 632)	16	36,3 52		36,3 52	5,81,6 25	(1,29,58, 704)	(20,73,39, 257)
17	(1,29,22, 352)	(1,29,22, 352)	(21,96,79, 984)	17	36,3 52		36,3 52	6,17,9 76	(1,29,58, 704)	(22,02,97, 961)
18	(1,29,22, 352)	(1,29,22, 352)	(23,26,02, 336)	18	36,3 52		36,3 52	6,54,3 28	(1,29,58, 704)	(23,32,56, 664)
19	(1,29,22, 352)	(1,29,22, 352)	(24,55,24, 688)	19	36,3 52		36,3 52	6,90,6 79	(1,29,58, 704)	(24,62,15, 368)
20	(1,29,22, 352)	(1,29,22, 352)	(25,84,47, 040)	20	36,3 52		36,3 52	7,27,0 31	(1,29,58, 704)	(25,91,74, 071)
21	(1,29,22, 352)	(1,29,22, 352)	(27,13,69, 392)	21	36,3 52		36,3 52	7,63,3 83	(1,29,58, 704)	(27,21,32, 775)

22	(1,29,22, 352)	(1,29,22, 352)	(28,42,91, 744)	22	36,3 52		36,3 52	7,99,7 34	(1,29,58, 704)	(28,50,91, 478)
23	(1,29,22, 352)	(1,29,22, 352)	(29,72,14, 096)	23	36,3 52		36,3 52	8,36,0 86	(1,29,58, 704)	(29,80,50, 182)
24	(1,29,22, 352)	(1,29,22, 352)	(31,01,36, 448)	24	36,3 52		36,3 52	8,72,4 37	(1,29,58, 704)	(31,10,08, 885)
25	(1,29,22, 352)	(1,29,22, 352)	(32,30,58, 800)	25	36,3 52		36,3 52	9,08,7 89	(1,29,58, 704)	(32,39,67, 589)
26	(1,29,22, 352)	(1,29,22, 352)	(33,59,81, 152)	26	36,3 52		36,3 52	9,45,1 40	(1,29,58, 704)	(33,69,26, 293)
27	(1,29,22, 352)	(1,29,22, 352)	(34,89,03, 504)	27	36,3 52		36,3 52	9,81,4 92	(1,29,58, 704)	(34,98,84, 996)
28	(1,29,22, 352)	(1,29,22, 352)	(36,18,25, 856)	28	36,3 52		36,3 52	10,17, 843	(1,29,58, 704)	(36,28,43, 700)
29	(1,29,22, 352)	(1,29,22, 352)	(37,47,48, 208)	29	36,3 52		36,3 52	10,54, 195	(1,29,58, 704)	(37,58,02, 403)
30	(1,29,22, 352)	(1,29,22, 352)	(38,76,70, 560)	30	36,3 52		36,3 52	10,90, 547	(1,29,58, 704)	(38,87,61, 107)

Table 31. Table 21.a.2. Baseline carbon stock change in the below-ground biomass in the reference region

Carbon stock changes in the below-ground biomass per initial forest class icl		Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region		Carbon stock changes in the below-ground biomass per post deforestation zone z		Total carbon stock change in the below-ground biomass of post-deforestation zones in the reference region		Total net carbon stock change in the below-ground biomass of the reference region	
ID_{icl}	1	$\Delta Cab_{BSLRR_{icl,t}}$	$\Delta Cab_{BSLRR_{icl}}$	ID_{iz}	1	$\Delta Cab_{BSLRR_{z,t}}$	ΔCab_{BSLRR_z}	ΔCab_{BSLRR_t}	ΔCab_{BSLRR}
Name >		annual	cumulative	Name >		annual	cumulative	annual	Cumulative
Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	-	-	-	0	-	-	-	-	-
1	(2,87,888)	(2,87,888)	(2,87,888)	1	36,352	36,352	36,352	(2,51,536)	(2,51,536)
2	(2,87,888)	(2,87,888)	(5,75,776)	2	36,352	36,352	72,703	(2,51,536)	(5,03,072)
3	(2,87,888)	(2,87,888)	(8,63,663)	3	36,352	36,352	1,09,055	(2,51,536)	(7,54,609)
4	(2,87,888)	(2,87,888)	(11,51,551)	4	36,352	36,352	1,45,406	(2,51,536)	(10,06,145)
5	(2,87,888)	(2,87,888)	(14,39,439)	5	36,352	36,352	1,81,758	(2,51,536)	(12,57,681)
6	(2,87,888)	(2,87,888)	(17,27,327)	6	36,352	36,352	2,18,109	(2,51,536)	(15,09,217)
7	(2,87,888)	(2,87,888)	(20,15,214)	7	36,352	36,352	2,54,461	(2,51,536)	(17,60,753)
8	(2,87,888)	(2,87,888)	(23,03,102)	8	36,352	36,352	2,90,812	(2,51,536)	(20,12,290)
9	(2,87,888)	(2,87,888)	(25,90,990)	9	36,352	36,352	3,27,164	(2,51,536)	(22,63,826)
10	(2,87,888)	(2,87,888)	(28,78,878)	10	36,352	36,352	3,63,516	(2,51,536)	(25,15,362)
11	(2,87,888)	(2,87,888)	(31,66,765)	11	36,352	36,352	3,99,867	(2,51,536)	(27,66,898)
12	(2,87,888)	(2,87,888)	(34,54,653)	12	36,352	36,352	4,36,219	(2,51,536)	(30,18,434)
13	(2,87,888)	(2,87,888)	(37,42,541)	13	36,352	36,352	4,72,570	(2,51,536)	(32,69,971)

14	(2,87,88 8)	(2,87,88 8)	(40,30,42 9)	14	36,35 2		36,35 2	5,08,92 2	(2,51,53 6)	(35,21,50 7)
15	(2,87,88 8)	(2,87,88 8)	(43,18,31 6)	15	36,35 2		36,35 2	5,45,27 3	(2,51,53 6)	(37,73,04 3)
16	(2,87,88 8)	(2,87,88 8)	(46,06,20 4)	16	36,35 2		36,35 2	5,81,62 5	(2,51,53 6)	(40,24,57 9)
17	(2,87,88 8)	(2,87,88 8)	(48,94,09 2)	17	36,35 2		36,35 2	6,17,97 6	(2,51,53 6)	(42,76,11 6)
18	(2,87,88 8)	(2,87,88 8)	(51,81,98 0)	18	36,35 2		36,35 2	6,54,32 8	(2,51,53 6)	(45,27,65 2)
19	(2,87,88 8)	(2,87,88 8)	(54,69,86 7)	19	36,35 2		36,35 2	6,90,67 9	(2,51,53 6)	(47,79,18 8)
20	(2,87,88 8)	(2,87,88 8)	(57,57,75 5)	20	36,35 2		36,35 2	7,27,03 1	(2,51,53 6)	(50,30,72 4)
21	(2,87,88 8)	(2,87,88 8)	(60,45,64 3)	21	36,35 2		36,35 2	7,63,38 3	(2,51,53 6)	(52,82,26 0)
22	(2,87,88 8)	(2,87,88 8)	(63,33,53 1)	22	36,35 2		36,35 2	7,99,73 4	(2,51,53 6)	(55,33,79 7)
23	(2,87,88 8)	(2,87,88 8)	(66,21,41 8)	23	36,35 2		36,35 2	8,36,08 6	(2,51,53 6)	(57,85,33 3)
24	(2,87,88 8)	(2,87,88 8)	(69,09,30 6)	24	36,35 2		36,35 2	8,72,43 7	(2,51,53 6)	(60,36,86 9)
25	(2,87,88 8)	(2,87,88 8)	(71,97,19 4)	25	36,35 2		36,35 2	9,08,78 9	(2,51,53 6)	(62,88,40 5)
26	(2,87,88 8)	(2,87,88 8)	(74,85,08 2)	26	36,35 2		36,35 2	9,45,14 0	(2,51,53 6)	(65,39,94 1)
27	(2,87,88 8)	(2,87,88 8)	(77,72,96 9)	27	36,35 2		36,35 2	9,81,49 2	(2,51,53 6)	(67,91,47 8)
28	(2,87,88 8)	(2,87,88 8)	(80,60,85 7)	28	36,35 2		36,35 2	10,17,8 43	(2,51,53 6)	(70,43,01 4)
29	(2,87,88 8)	(2,87,88 8)	(83,48,74 5)	29	36,35 2		36,35 2	10,54,1 95	(2,51,53 6)	(72,94,55 0)
30	(2,87,88 8)	(2,87,88 8)	(86,36,63 3)	30	36,35 2		36,35 2	10,90,5 47	(2,51,53 6)	(75,46,08 6)

6.2 Baseline of non-CO₂ emissions from forest fires:

Non-CO₂ emissions were not considered and accounted for the REDD+ Project. Data related to forest fires are unavailable and of insufficient accuracy, emissions from biomass burning are not considered. Emissions from fires used to clear forests in the baseline can always be omitted as per the methodology.

Total baseline emissions = 1,130,905 tCO₂e

Average baseline emissions = 48,896 tCO₂e

Project Emissions

Step 7 of VM0015 - Ex ante estimation of actual carbon stock changes and non-CO₂ emissions in the Project Area

Non-CO₂ emissions were not considered and accounted for the Project.

7.1 Ex ante estimation of actual carbon stock changes

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

The Project Area has a forest management plan within its limits, which follows all the current regulations, norms and laws, aiming at the forest exploitation in a conscious way through low impact activities that conserve and allow the development of natural regeneration and, consequently, biomass and carbon stocks.

The Project does not include planned deforestation, logging or fuel wood collection and charcoal production activities thus Tables 25a,b,c,d and 26a,b,c,d of the vm0015 methodology do not apply to the Project.

The Project does not account for soil organic carbon thus Tables 18a,b as well as Tables 9a,b,c of the VM0015 methodology do not apply to the Project. Project emissions occurring due to manmade conditions has been calculated and mentioned in the below table.

Table 32. Ex ante estimated actual carbon stock decrease due to manmade fires in the Project Area (Table 23 of Methodology VM0015)

Initial Forest Class		Parameters																																		
ID cl	Name	%	Fburnt _{icl}	tCO ₂ e ha ⁻¹	Cab	tCO ₂ e ha ⁻¹	Cdw	tCO ₂ e ha ⁻¹	CL	%	Pburnt _{ab,icl}	%	Pburnt _{dwi,cl}	%	Pburnt _{l,icl}	%	CE _{ab,icl}	%	CE _{dw,icl}	%	CE _{l,icl}	%	tCO ₂ e ha ⁻¹	ECO2-ab	tCO ₂ e ha ⁻¹	ECO2-dw	tCO ₂ e ha ⁻¹	ECO2-l	tCO ₂ e ha ⁻¹	EBBCO2-tot	tCO ₂ e ha ⁻¹	EBBnN2O _{icl}	tCO ₂ e ha ⁻¹	EBBCH4 _{icl}	tCO ₂ e ha ⁻¹	EBBtot _{icl}
1	Ombr ofile Forest	96 %	- 68.7.8	0	- 7.9	96 %	0	10 0%	0.5	0	0.5	330.144	0	- 3.95	0	- 3.21	0	- 29.4	0	- 29.39	0	- 29.39	0	- 29.39	0	- 29.39	0	- 29.39	0	- 29.39	0	- 29.39				

Above-ground biomass calculations for DBH < 10cm were performed using allometric equations as described below;

Above-ground biomass for a DBH ≥ 10cm was calculated using Overman's equation (Overman, Witte et al. 1994) (Johannes Petrus Maria Overman, Hendrik Johannes Louis Witte and Juan Guillermo Saldarriaga.

1994. Journal of Tropical Ecology. 10(2):207-218) corrected for biomass moisture content. Overman's equation is presented below (Figure 37):

Figure 37: Original Overman's equation (Overman 1994)

No.	Regression model	Coefficient symbol	Coefficient value	Standard error	Width of 95% confidence interval	R ²	δB* (%)
1	DW = αDBH ^β	α	0.465	0.307	1.23	0.90	39.4
		β	2.202	0.151	0.61		

Araujo tested Overman's equation in a location 250Km from Belem in Para, obtaining predicted results within ±0.6% of the weight determined in the field (Araujo, Higuchi et al. 1999). Overman's equation used for our calculations is:

$$\begin{aligned} DB &= \alpha(DBH)^{\beta} \\ DB &= 0.465(DBH)^{2.202} \end{aligned}$$

Where:

Overman's coefficients: 0.465 and 2.202

Biomass results for 1 hectare of forest in the RRD, Project Area and Leakage Belt are showed in

Table 33: Carbon stocks per hectare of initial forest classes *icl* existing in the project area and leakage belt (Refer to Table 15.a – VM0015 methodology)

Project year	Initial forest class <i>icl</i>										
	Name:	1									
	ID <i>icl</i>										
	Average carbon stock per hectare ± 90% CI										
	<i>Cab</i> <i>icl</i>		<i>Cbb</i> <i>icl</i>		<i>Ccl</i> <i>icl</i>		<i>Ctot</i> <i>cl</i>				
	<i>C stock</i>	± 90% CI	<i>C stock</i>	± 90% CI	<i>C stock</i>	± 90% CI	<i>C stock</i>	± 90% CI	<i>C stock</i>	± 90% CI	
	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	tCO ₂ e ha ⁻¹	
0	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69			
1	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69			
2	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69			
3	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69			
4	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69			
5	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69			
6	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69			

7	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
8	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
9	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
10	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
11	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
12	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
13	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
14	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
15	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
16	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
17	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
18	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
19	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
20	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
21	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
22	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
23	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
24	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
25	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
26	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
27	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
28	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
29	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69
30	770.5	82.7	171.42	18.19	8.7	0.8	950.62	101.69

Table 34: Values to be used after discounts for uncertainties (Refer to Table 15.b – VM0015 methodology)

Project year t	Initial forest class i_{cl}									
	Name: IDicl	1								
	Average carbon stock per hectare $\pm 90\% \text{ CI}$									
	C_{abcl}		C_{bbcl}		C_{cl}		$C_{tot_{cl}}$			
	C_{stock} tCO ₂ e ha ⁻¹	$C_{stock\ change}$ tCO ₂ e ha ⁻¹	C_{stock} tCO ₂ e ha ⁻¹	$C_{stock\ change}$ tCO ₂ e ha ⁻¹	C_{stock} tCO ₂ e ha ⁻¹	$C_{stock\ change}$ tCO ₂ e ha ⁻¹	C_{stock} tCO ₂ e ha ⁻¹	$C_{stock\ change}$ tCO ₂ e ha ⁻¹		
0	687.8		153.23		7.9		848.93			
1	687.8		153.23		7.9		848.93			
2	687.8		153.23		7.9		848.93			
3	687.8		153.23		7.9		848.93			
4	687.8		153.23		7.9		848.93			
5	687.8		153.23		7.9		848.93			
6	687.8		153.23		7.9		848.93			
7	687.8		153.23		7.9		848.93			
8	687.8		153.23		7.9		848.93			
9	687.8		153.23		7.9		848.93			
10	687.8		153.23		7.9		848.93			
11	687.8		153.23		7.9		848.93			
12	687.8		153.23		7.9		848.93			
13	687.8		153.23		7.9		848.93			
14	687.8		153.23		7.9		848.93			
15	687.8		153.23		7.9		848.93			
16	687.8		153.23		7.9		848.93			
17	687.8		153.23		7.9		848.93			
18	687.8		153.23		7.9		848.93			
19	687.8		153.23		7.9		848.93			
20	687.8		153.23		7.9		848.93			
21	687.8		153.23		7.9		848.93			
22	687.8		153.23		7.9		848.93			
23	687.8		153.23		7.9		848.93			
24	687.8		153.23		7.9		848.93			
25	687.8		153.23		7.9		848.93			
26	687.8		153.23		7.9		848.93			

27	687.8		153.23		7.9		848.93	
28	687.8		153.23		7.9		848.93	
29	687.8		153.23		7.9		848.93	
30	687.8		153.23		7.9		848.93	

Carbon stock in post-deforestation class was obtained from the default values from IPCC 2003. This value was increased in 75% to account for the highest boundary of the error range Table 35;

Table 35: Long-term (20-years) average carbon stocks per hectare of post-deforestation LU/LC classes present in the reference region (Refer to Table 16 – VM0015 methodology)

Project year <i>t</i>	Post deforestation class <i>fcl</i>					
	Name:	Grassland				
	ID <i>fcl</i>	002				
	Average carbon stock per hectare ± 90% CI					
	<i>Cabfcl</i>	<i>Cbbfcl</i>	<i>Clfcl</i>	<i>Ctotfcl</i>		

	C stock tCO ₂ e ha ⁻¹	\pm 90% CI tCO ₂ e ha ⁻¹	C stock tCO ₂ e ha ⁻¹	\pm 90% CI tCO ₂ e ha ⁻¹	C stock tCO ₂ e ha ⁻¹	\pm 90% CI tCO ₂ e ha ⁻¹	C stock tCO ₂ e ha ⁻¹	\pm 90% CI tCO ₂ e ha ⁻¹
Average to be used in calculations							58.045	

As mentioned before the Project assumes only one Zone and one post-deforestation land-use class that is grassland Table 36:

Table 36: Long-term (20-years) area weighted average carbon stock per zone (Refer to Table 17 – VM0015 methodology)

Zone		Post - deforestation LU/LC - classe fcl						Area weighted long-term (20 years average carbon stocks per zone z			
		Cropland									
IDz	Name	Cabfcl C stock tCO ₂ e ha ⁻¹	\pm 90% CI tCO ₂ e ha ⁻¹	Cbbfcl C stock tCO ₂ e ha ⁻¹	\pm 90% CI tCO ₂ e ha ⁻¹	Clfcl C stock tCO ₂ e ha ⁻¹	\pm 90% CI tCO ₂ e ha ⁻¹	Cabz C stock tCO ₂ e ha ⁻¹	Cbbz C stock tCO ₂ e ha ⁻¹	Clz C stock tCO ₂ e ha ⁻¹	Ctot z C stock tCO ₂ e ha ⁻¹
1	Zone 1										58.045

As a result, the net emissions per ha from LULC-change in the Project Area is 583.5 tCO₂e/ha for Dense Forest and 573.6 tCO₂e/ha for Degraded Forest.

Carbon stock changes factors calculated with Method 1 are presented below (Tables 37 and 38). Table 20c of the VM 0015 methodology does not apply to the Project because it is only used when carbon stock change factor is calculated using Method 2.

Because the IPCC 2003 value for carbon stock in Grassland is a total, the value was divided by three to account for above-ground, below-ground and litter carbon pools. All three pools are required to undertake linear decay over a 10-year period, so there is no mathematical difference in how the total carbon stock is allocated among these three pools (Table 32);

Table 37: Carbon stock change factors for initial forest classes icl (Refer to Table 20.a – VM0015 methodology)

Year after deforestation		$\Delta Cab_{icl,t}$	$\Delta Cbb_{icl,t}$	$\Delta Cl_{icl,t}$
1	t*	-687.8	-15.32	-7.9
2	t*+1	0	-15.32	0
3	t*+2	0	-15.32	0
4	t*+3	0	-15.32	0

5	t*+4	0	-15.32	0
6	t*+5	0	-15.32	0
7	t*+6	0	-15.32	0
8	t*+7	0	-15.32	0
9	t*+8	0	-15.32	0
10	t*+9	0	-15.32	0
11	t*+10	0	0.00	0
12	t*+11	0	0.00	0
13	t*+12	0	0.00	0
14	t*+13	0	0.00	0
15	t*+14	0	0.00	0
16	t*+15	0	0.00	0
17	t*+16	0	0.00	0
18	t*+17	0	0.00	0
19	t*+18	0	0.00	0
20	t*+19	0	0.00	0
21	t*+20	0	0.00	0
22	t*+21	0	0.00	0
23	t*+22	0	0.00	0
24	t*+23	0	0.00	0
25	t*+24	0	0.00	0
26	t*+25	0	0.00	0
27	t*+26	0	0.00	0
28	t*+27	0	0.00	0
29	t*+28	0	0.00	0
30	t*+29	0	0.00	0

Table 38: Carbon stock change factors for final forest classes icl (Refer to Table 20.b – VM0015 methodology)

		Zone 1			
Year after deforestation		$\Delta Cab_{z,t}$	$\Delta Cbb_{z,t}$	$\Delta Cl_{z,t}$	$\Delta Tot_{z,t}$
1	t*	1.93	1.93	1.93	5.805
2	t*+1	1.93	1.93	1.93	5.805
3	t*+2	1.93	1.93	1.93	5.805

4	t*+3	1.93	1.93	1.93	5.805
5	t*+4	1.93	1.93	1.93	5.805
6	t*+5	1.93	1.93	1.93	5.805
7	t*+6	1.93	1.93	1.93	5.805
8	t*+7	1.93	1.93	1.93	5.805
9	t*+8	1.93	1.93	1.93	5.805
10	t*+9	0.00	0.00	0.00	0.00
11	t*+10	0.00	0.00	0.00	0.00
12	t*+11	0.00	0.00	0.00	0.00
13	t*+12	0.00	0.00	0.00	0.00
14	t*+13	0.00	0.00	0.00	0.00
15	t*+14	0.00	0.00	0.00	0.00
16	t*+15	0.00	0.00	0.00	0.00
17	t*+16	0.00	0.00	0.00	0.00
18	t*+17	0.00	0.00	0.00	0.00
19	t*+18	0.00	0.00	0.00	0.00
20	t*+19	0.00	0.00	0.00	0.00
21	t*+20	0.00	0.00	0.00	0.00
22	t*+21	0.00	0.00	0.00	0.00
23	t*+22	0.00	0.00	0.00	0.00
24	t*+23	0.00	0.00	0.00	0.00
25	t*+24	0.00	0.00	0.00	0.00
26	t*+25	0.00	0.00	0.00	0.00
27	t*+26	0.00	0.00	0.00	0.00
28	t*+27	0.00	0.00	0.00	0.00
29	t*+28	0.00	0.00	0.00	0.00
30	t*+29	0.00	0.00	0.00	0.00

Baseline carbon stocks calculated with Method 1 for the RRD, Project Area and Leakage Belt are presented below (Tables 39, 40, 41, 42, 43, 44, 45, 46 and 47). Tables 22a,b,c of the VM0015 methodology do not apply to the Project because those are meant for baseline carbon stocks calculated with Method 2.

Table 39: Baseline carbon stock change in above-ground biomass in the reference region (Refer to Table 21.a.1 – VM0015 methodology)

Carbon stock changes in the above-ground biomass per initial forest class <i>icl</i>	Total carbon stock change in the above-ground biomass of the initial forest classes in the reference region	Carbon stock changes in the above-ground biomass per post deforestation zone <i>z</i>	Total carbon stock change in the above-ground biomass of post-deforestation zones in the reference region	Total net carbon stock change in the above-ground biomass of the reference region

<i>ID icl></i>	1	ΔCab $BSLRR_{id,t}$	ΔCab $BSLRR_{icl}$	<i>ID iz></i>	1		ΔCab b $BSLR_{z,t}$	ΔCab $BSLRR_z$	ΔCab $BSLRR_t$	ΔCab $BSLRR$
Nam e >		annual	cumulative	Nam e >			annu al	cumula tive	annual	Cumulative
Proj ect year <i>t</i>	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Proj ect year <i>t</i>	tCO ₂ - e	tCO 2-e	tCO ₂ - e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
-	-	-	-	-	-	-	-	-	-	-
1	(1,29,22, 352)	(1,29,22, 352)	(1,29,22,3 52)	1	36,3 52		36,3 52	36,352	(1,29,58, 704)	(1,29,58,7 04)
2	(1,29,22, 352)	(1,29,22, 352)	(2,58,44,7 04)	2	36,3 52		36,3 52	72,703	(1,29,58, 704)	(2,59,17,4 07)
3	(1,29,22, 352)	(1,29,22, 352)	(3,87,67,0 56)	3	36,3 52		36,3 52	1,09,0 55	(1,29,58, 704)	(3,88,76,1 11)
4	(1,29,22, 352)	(1,29,22, 352)	(5,16,89,4 08)	4	36,3 52		36,3 52	1,45,4 06	(1,29,58, 704)	(5,18,34,8 14)
5	(1,29,22, 352)	(1,29,22, 352)	(6,46,11,7 60)	5	36,3 52		36,3 52	1,81,7 58	(1,29,58, 704)	(6,47,93,5 18)
6	(1,29,22, 352)	(1,29,22, 352)	(7,75,34,1 12)	6	36,3 52		36,3 52	2,18,1 09	(1,29,58, 704)	(7,77,52,2 21)
7	(1,29,22, 352)	(1,29,22, 352)	(9,04,56,4 64)	7	36,3 52		36,3 52	2,54,4 61	(1,29,58, 704)	(9,07,10,9 25)
8	(1,29,22, 352)	(1,29,22, 352)	(10,33,78, 816)	8	36,3 52		36,3 52	2,90,8 12	(1,29,58, 704)	(10,36,69, 628)
9	(1,29,22, 352)	(1,29,22, 352)	(11,63,01, 168)	9	36,3 52		36,3 52	3,27,1 64	(1,29,58, 704)	(11,66,28, 332)
10	(1,29,22, 352)	(1,29,22, 352)	(12,92,23, 520)	10	36,3 52		36,3 52	3,63,5 16	(1,29,58, 704)	(12,95,87, 036)
11	(1,29,22, 352)	(1,29,22, 352)	(14,21,45, 872)	11	36,3 52		36,3 52	3,99,8 67	(1,29,58, 704)	(14,25,45, 739)
12	(1,29,22, 352)	(1,29,22, 352)	(15,50,68, 224)	12	36,3 52		36,3 52	4,36,2 19	(1,29,58, 704)	(15,55,04, 443)
13	(1,29,22, 352)	(1,29,22, 352)	(16,79,90, 576)	13	36,3 52		36,3 52	4,72,5 70	(1,29,58, 704)	(16,84,63, 146)
14	(1,29,22, 352)	(1,29,22, 352)	(18,09,12, 928)	14	36,3 52		36,3 52	5,08,9 22	(1,29,58, 704)	(18,14,21, 850)
15	(1,29,22, 352)	(1,29,22, 352)	(19,38,35, 280)	15	36,3 52		36,3 52	5,45,2 73	(1,29,58, 704)	(19,43,80, 553)
16	(1,29,22, 352)	(1,29,22, 352)	(20,67,57, 632)	16	36,3 52		36,3 52	5,81,6 25	(1,29,58, 704)	(20,73,39, 257)

17	(1,29,22, 352)	(1,29,22, 352)	(21,96,79, 984)	17	36,3 52		36,3 52	6,17,9 76	(1,29,58, 704)	(22,02,97, 961)
18	(1,29,22, 352)	(1,29,22, 352)	(23,26,02, 336)	18	36,3 52		36,3 52	6,54,3 28	(1,29,58, 704)	(23,32,56, 664)
19	(1,29,22, 352)	(1,29,22, 352)	(24,55,24, 688)	19	36,3 52		36,3 52	6,90,6 79	(1,29,58, 704)	(24,62,15, 368)
20	(1,29,22, 352)	(1,29,22, 352)	(25,84,47, 040)	20	36,3 52		36,3 52	7,27,0 31	(1,29,58, 704)	(25,91,74, 071)
21	(1,29,22, 352)	(1,29,22, 352)	(27,13,69, 392)	21	36,3 52		36,3 52	7,63,3 83	(1,29,58, 704)	(27,21,32, 775)
22	(1,29,22, 352)	(1,29,22, 352)	(28,42,91, 744)	22	36,3 52		36,3 52	7,99,7 34	(1,29,58, 704)	(28,50,91, 478)
23	(1,29,22, 352)	(1,29,22, 352)	(29,72,14, 096)	23	36,3 52		36,3 52	8,36,0 86	(1,29,58, 704)	(29,80,50, 182)
24	(1,29,22, 352)	(1,29,22, 352)	(31,01,36, 448)	24	36,3 52		36,3 52	8,72,4 37	(1,29,58, 704)	(31,10,08, 885)
25	(1,29,22, 352)	(1,29,22, 352)	(32,30,58, 800)	25	36,3 52		36,3 52	9,08,7 89	(1,29,58, 704)	(32,39,67, 589)
26	(1,29,22, 352)	(1,29,22, 352)	(33,59,81, 152)	26	36,3 52		36,3 52	9,45,1 40	(1,29,58, 704)	(33,69,26, 293)
27	(1,29,22, 352)	(1,29,22, 352)	(34,89,03, 504)	27	36,3 52		36,3 52	9,81,4 92	(1,29,58, 704)	(34,98,84, 996)
28	(1,29,22, 352)	(1,29,22, 352)	(36,18,25, 856)	28	36,3 52		36,3 52	10,17, 843	(1,29,58, 704)	(36,28,43, 700)
29	(1,29,22, 352)	(1,29,22, 352)	(37,47,48, 208)	29	36,3 52		36,3 52	10,54, 195	(1,29,58, 704)	(37,58,02, 403)
30	(1,29,22, 352)	(1,29,22, 352)	(38,76,70, 560)	30	36,3 52		36,3 52	10,90, 547	(1,29,58, 704)	(38,87,61, 107)

Table 40: Baseline carbon stock change in below-ground biomass in the reference region (Refer to Table 21.a.2 – VM0015 methodology)

Carbon stock changes in the below-ground biomass per initial forest class icl		Total carbon stock change in the below-ground biomass of the initial forest classes in the reference region		Carbon stock changes in the below-ground biomass per post deforestation zone z		Total carbon stock change in the below-ground biomass of post-deforestation zones in the reference region		Total net carbon stock change in the below-ground biomass of the reference region	
ID_{icl}	1	$\Delta Cab_{BSLRR_{icl,t}}$	$\Delta Cab_{BSLRR_{icl}}$	ID_{iz}	1	$\Delta Cab_{BSLRR_{z,t}}$	ΔCab_{BSLRR_z}	ΔCab_{BSLRR_t}	ΔCab_{BSLRR}
Name >		annual	cumulative	Name >		annual	cumulative	annual	Cumulative
Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	-	-	-	0	-	-	-	-	-
1	(2,87,888)	(2,87,888)	(2,87,888)	1	36,352	36,352	36,352	(2,51,536)	(2,51,536)
2	(2,87,888)	(2,87,888)	(5,75,776)	2	36,352	36,352	72,703	(2,51,536)	(5,03,072)
3	(2,87,888)	(2,87,888)	(8,63,663)	3	36,352	36,352	1,09,055	(2,51,536)	(7,54,609)
4	(2,87,888)	(2,87,888)	(11,51,551)	4	36,352	36,352	1,45,406	(2,51,536)	(10,06,145)
5	(2,87,888)	(2,87,888)	(14,39,439)	5	36,352	36,352	1,81,758	(2,51,536)	(12,57,681)
6	(2,87,888)	(2,87,888)	(17,27,327)	6	36,352	36,352	2,18,109	(2,51,536)	(15,09,217)
7	(2,87,888)	(2,87,888)	(20,15,214)	7	36,352	36,352	2,54,461	(2,51,536)	(17,60,753)

8	(2,87,88 8)	(2,87,88 8)	(23,03,10 2)		8	36,35 2		36,35 2	2,90,81 2		(2,51,53 6)	(20,12,29 0)
9	(2,87,88 8)	(2,87,88 8)	(25,90,99 0)		9	36,35 2		36,35 2	3,27,16 4		(2,51,53 6)	(22,63,82 6)
10	(2,87,88 8)	(2,87,88 8)	(28,78,87 8)		10	36,35 2		36,35 2	3,63,51 6		(2,51,53 6)	(25,15,36 2)
11	(2,87,88 8)	(2,87,88 8)	(31,66,76 5)		11	36,35 2		36,35 2	3,99,86 7		(2,51,53 6)	(27,66,89 8)
12	(2,87,88 8)	(2,87,88 8)	(34,54,65 3)		12	36,35 2		36,35 2	4,36,21 9		(2,51,53 6)	(30,18,43 4)
13	(2,87,88 8)	(2,87,88 8)	(37,42,54 1)		13	36,35 2		36,35 2	4,72,57 0		(2,51,53 6)	(32,69,97 1)
14	(2,87,88 8)	(2,87,88 8)	(40,30,42 9)		14	36,35 2		36,35 2	5,08,92 2		(2,51,53 6)	(35,21,50 7)
15	(2,87,88 8)	(2,87,88 8)	(43,18,31 6)		15	36,35 2		36,35 2	5,45,27 3		(2,51,53 6)	(37,73,04 3)
16	(2,87,88 8)	(2,87,88 8)	(46,06,20 4)		16	36,35 2		36,35 2	5,81,62 5		(2,51,53 6)	(40,24,57 9)
17	(2,87,88 8)	(2,87,88 8)	(48,94,09 2)		17	36,35 2		36,35 2	6,17,97 6		(2,51,53 6)	(42,76,11 6)
18	(2,87,88 8)	(2,87,88 8)	(51,81,98 0)		18	36,35 2		36,35 2	6,54,32 8		(2,51,53 6)	(45,27,65 2)
19	(2,87,88 8)	(2,87,88 8)	(54,69,86 7)		19	36,35 2		36,35 2	6,90,67 9		(2,51,53 6)	(47,79,18 8)
20	(2,87,88 8)	(2,87,88 8)	(57,57,75 5)		20	36,35 2		36,35 2	7,27,03 1		(2,51,53 6)	(50,30,72 4)
21	(2,87,88 8)	(2,87,88 8)	(60,45,64 3)		21	36,35 2		36,35 2	7,63,38 3		(2,51,53 6)	(52,82,26 0)
22	(2,87,88 8)	(2,87,88 8)	(63,33,53 1)		22	36,35 2		36,35 2	7,99,73 4		(2,51,53 6)	(55,33,79 7)
23	(2,87,88 8)	(2,87,88 8)	(66,21,41 8)		23	36,35 2		36,35 2	8,36,08 6		(2,51,53 6)	(57,85,33 3)
24	(2,87,88 8)	(2,87,88 8)	(69,09,30 6)		24	36,35 2		36,35 2	8,72,43 7		(2,51,53 6)	(60,36,86 9)
25	(2,87,88 8)	(2,87,88 8)	(71,97,19 4)		25	36,35 2		36,35 2	9,08,78 9		(2,51,53 6)	(62,88,40 5)
26	(2,87,88 8)	(2,87,88 8)	(74,85,08 2)		26	36,35 2		36,35 2	9,45,14 0		(2,51,53 6)	(65,39,94 1)
27	(2,87,88 8)	(2,87,88 8)	(77,72,96 9)		27	36,35 2		36,35 2	9,81,49 2		(2,51,53 6)	(67,91,47 8)

28	(2,87,88 8)	(2,87,88 8)	(80,60,85 7)		28	36,35 2		36,35 2	10,17,8 43	(2,51,53 6)	(70,43,01 4)
29	(2,87,88 8)	(2,87,88 8)	(83,48,74 5)		29	36,35 2		36,35 2	10,54,1 95	(2,51,53 6)	(72,94,55 0)
30	(2,87,88 8)	(2,87,88 8)	(86,36,63 3)		30	36,35 2		36,35 2	10,90,5 47	(2,51,53 6)	(75,46,08 6)

Table 41: Baseline carbon stock change in litter biomass in the reference region (Refer to Table 21.a.3 – VM0015 methodology)

Carbon stock changes in litter per initial forest class icl		Total carbon stock change in litter of the initial forest classes in the reference region		Carbon stock changes in litter per post deforestation zone z		Total carbon stock change in litter of post-deforestation zones in the reference region		Total net carbon stock change in litter of the reference region	
ID_{icl}	1	$\Delta Cab_{BSLRR_{icl,t}}$	$\Delta Cab_{BSLRR_{icl}}$	ID_{iz}	1	$\Delta Cab_{BSLRR_{z,t}}$	ΔCab_{BSLRR_z}	ΔCab_{BSLRR_t}	ΔCab_{BSLRR}
Name >		annual	cumulative	Name >		annual	cumulative	annual	Cumulative

Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	0	0	0
1	(1,48,425)	(1,48,425)	(1,48,425)
2	(1,48,425)	(1,48,425)	(2,96,850)
3	(1,48,425)	(1,48,425)	(4,45,274)
4	(1,48,425)	(1,48,425)	(5,93,699)
5	(1,48,425)	(1,48,425)	(7,42,124)
6	(1,48,425)	(1,48,425)	(8,90,549)
7	(1,48,425)	(1,48,425)	(10,38,974)
8	(1,48,425)	(1,48,425)	(11,87,398)
9	(1,48,425)	(1,48,425)	(13,35,823)
10	(1,48,425)	(1,48,425)	(14,84,248)
11	(1,48,425)	(1,48,425)	(16,32,673)
12	(1,48,425)	(1,48,425)	(17,81,098)
13	(1,48,425)	(1,48,425)	(19,29,522)
14	(1,48,425)	(1,48,425)	(20,77,947)
15	(1,48,425)	(1,48,425)	(22,26,372)
16	(1,48,425)	(1,48,425)	(23,74,797)
17	(1,48,425)	(1,48,425)	(25,23,222)

Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	0		0	0
1	36,352		36,352	36,352
2	36,352		36,352	72,703
3	36,352		36,352	1,09,055
4	36,352		36,352	1,45,406
5	36,352		36,352	1,81,758
6	36,352		36,352	2,18,109
7	36,352		36,352	2,54,461
8	36,352		36,352	2,90,812
9	36,352		36,352	3,27,164
10	36,352		36,352	3,63,516
11	36,352		36,352	3,99,867
12	36,352		36,352	4,36,219
13	36,352		36,352	4,72,570
14	36,352		36,352	5,08,922
15	36,352		36,352	5,45,273
16	36,352		36,352	5,81,625
17	36,352		36,352	6,17,976

18	(1,48,42 5)	(1,48,42 5)	(26,71,64 6)	18	36,35 2		36,35 2	6,54,32 8	(1,12,07 3)	(20,17,31 9)
19	(1,48,42 5)	(1,48,42 5)	(28,20,07 1)	19	36,35 2		36,35 2	6,90,67 9	(1,12,07 3)	(21,29,39 2)
20	(1,48,42 5)	(1,48,42 5)	(29,68,49 6)	20	36,35 2		36,35 2	7,27,03 1	(1,12,07 3)	(22,41,46 5)
21	(1,48,42 5)	(1,48,42 5)	(31,16,92 1)	21	36,35 2		36,35 2	7,63,38 3	(1,12,07 3)	(23,53,53 8)
22	(1,48,42 5)	(1,48,42 5)	(32,65,34 6)	22	36,35 2		36,35 2	7,99,73 4	(1,12,07 3)	(24,65,61 2)
23	(1,48,42 5)	(1,48,42 5)	(34,13,77 1)	23	36,35 2		36,35 2	8,36,08 6	(1,12,07 3)	(25,77,68 5)
24	(1,48,42 5)	(1,48,42 5)	(35,62,19 5)	24	36,35 2		36,35 2	8,72,43 7	(1,12,07 3)	(26,89,75 8)
25	(1,48,42 5)	(1,48,42 5)	(37,10,62 0)	25	36,35 2		36,35 2	9,08,78 9	(1,12,07 3)	(28,01,83 1)
26	(1,48,42 5)	(1,48,42 5)	(38,59,04 5)	26	36,35 2		36,35 2	9,45,14 0	(1,12,07 3)	(29,13,90 5)
27	(1,48,42 5)	(1,48,42 5)	(40,07,47 0)	27	36,35 2		36,35 2	9,81,49 2	(1,12,07 3)	(30,25,97 8)
28	(1,48,42 5)	(1,48,42 5)	(41,55,89 5)	28	36,35 2		36,35 2	10,17,8 43	(1,12,07 3)	(31,38,05 1)
29	(1,48,42 5)	(1,48,42 5)	(43,04,31 9)	29	36,35 2		36,35 2	10,54,1 95	(1,12,07 3)	(32,50,12 4)
30	(1,48,42 5)	(1,48,42 5)	(44,52,74 4)	30	36,35 2		36,35 2	10,90,5 47	(1,12,07 3)	(33,62,19 8)

Table 42: Baseline carbon stock change in above-ground biomass in the project area (Refer to Table 21.b.1 – VM0015 methodology)

Carbon stock changes in the above-ground biomass per initial forest class icl		Total carbon stock change in the above-ground biomass of the initial forest classes in the project area		Carbon stock changes in the above-ground biomass per post-deforestation zone z		Total carbon stock change in the above-ground biomass of post-deforestation zones in the project area		Total net carbon stock change in the above-ground biomass of the project area	
$ID_{icl>}$	1	$\Delta Cab_{BSLPA_{icl,t}}$	$\Delta Cab_{BSLPA_{icl}}$	$ID_{iz>}$	1	$\Delta Cab_{BSLPA_{z,t}}$	ΔCab_{BSLPA_z}	ΔCab_{BSLPA_t}	ΔCab_{BSLPA}
Name >		annual	cumulative	Name >		Annual	Cumulative	annual	Cumulative
Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	0	0	0	0	0	0	0	0	0
1	(11,66,416)	(11,66,416)	(11,66,416)	1	-	-	-	(11,66,416)	(11,66,416)
2	(15,46,324)	(15,46,324)	(27,12,740)	2	3,281	3,281	3,281	(15,49,605)	(27,16,021)
3	(17,68,753)	(17,68,753)	(44,81,492)	3	7,631	7,631	10,912	(17,76,384)	(44,92,405)
4	(16,90,458)	(16,90,458)	(61,71,950)	4	12,607	12,607	23,519	(17,03,065)	(61,95,469)
5	(15,51,662)	(15,51,662)	(77,23,612)	5	17,362	17,362	40,881	(15,69,024)	(77,64,494)
6	(13,15,888)	(13,15,888)	(90,39,500)	6	21,727	21,727	62,608	(13,37,615)	(91,02,109)
7	(13,39,910)	(13,39,910)	(1,03,79,411)	7	25,429	25,429	88,037	(13,65,339)	(1,04,67,448)
8	(11,82,431)	(11,82,431)	(1,15,61,841)	8	29,198	29,198	1,17,235	(12,11,629)	(1,16,79,077)
9	(10,85,452)	(10,85,452)	(1,26,47,293)	9	32,524	32,524	1,49,760	(11,17,976)	(1,27,97,053)
10	(9,95,591)	(9,95,591)	(1,36,42,884)	10	35,578	35,578	1,85,337	(10,31,168)	(1,38,28,221)

11	(9,27,972)	(9,27,972)	(1,45,70,8 56)		11	38,37 8	38,37 8	2,23,71 6		(9,66,351)	(1,47,94,5 72)
12	(9,11,957)	(9,11,957)	(1,54,82,8 14)		12	40,98 9	40,98 9	2,64,70 5		(9,52,946)	(1,57,47,5 18)
13	(8,66,582)	(8,66,582)	(1,63,49,3 96)		13	43,55 4	43,55 4	3,08,25 9		(9,10,136)	(1,66,57,6 55)
14	(7,80,280)	(7,80,280)	(1,71,29,6 75)		14	45,99 2	45,99 2	3,54,25 1		(8,26,272)	(1,74,83,9 26)
15	(8,41,670)	(8,41,670)	(1,79,71,3 45)		15	48,18 7	48,18 7	4,02,43 8		(8,89,857)	(1,83,73,7 84)
16	(8,55,905)	(8,55,905)	(1,88,27,2 51)		16	50,55 5	50,55 5	4,52,99 3		(9,06,460)	(1,92,80,2 44)
17	(8,35,442)	(8,35,442)	(1,96,62,6 93)		17	52,96 2	52,96 2	5,05,95 5		(8,88,404)	(2,01,68,6 48)
18	(8,35,442)	(8,35,442)	(2,04,98,1 35)		18	55,31 3	55,31 3	5,61,26 8		(8,90,755)	(2,10,59,4 03)
19	(8,31,883)	(8,31,883)	(2,13,30,0 18)		19	57,66 3	57,66 3	6,18,93 1		(8,89,546)	(2,19,48,9 49)
20	(8,45,229)	(8,45,229)	(2,21,75,2 47)		20	60,00 3	60,00 3	6,78,93 4		(9,05,232)	(2,28,54,1 81)
21	(8,96,832)	(8,96,832)	(2,30,72,0 79)		21	62,38 1	62,38 1	7,41,31 5		(9,59,213)	(2,38,13,3 94)
22	(8,77,259)	(8,77,259)	(2,39,49,3 38)		22	64,90 4	64,90 4	8,06,21 8		(9,42,162)	(2,47,55,5 56)
23	(10,71,21 6)	(10,71,21 6)	(2,50,20,5 54)		23	67,37 1	67,37 1	8,73,58 9		(11,38,58 8)	(2,58,94,1 43)
24	(11,38,83 5)	(11,38,83 5)	(2,61,59,3 89)		24	70,38 5	70,38 5	9,43,97 4		(12,09,21 9)	(2,71,03,3 63)
25	(11,22,82 0)	(11,22,82 0)	(2,72,82,2 09)		25	73,58 8	73,58 8	10,17,5 62		(11,96,40 8)	(2,82,99,7 71)
26	(12,10,90 2)	(12,10,90 2)	(2,84,93,1 10)		26	76,74 7	76,74 7	10,94,3 09		(12,87,64 8)	(2,95,87,4 19)
27	(12,19,79 9)	(12,19,79 9)	(2,97,12,9 09)		27	80,15 3	80,15 3	11,74,4 63		(12,99,95 2)	(3,08,87,3 71)
28	(12,97,20 4)	(12,97,20 4)	(3,10,10,1 13)		28	83,58 5	83,58 5	12,58,0 47		(13,80,78 9)	(3,22,68,1 60)
29	(15,59,67 0)	(15,59,67 0)	(3,25,69,7 82)		29	87,23 4	87,23 4	13,45,2 81		(16,46,90 3)	(3,39,15,0 63)
30	(17,58,07 6)	(17,58,07 6)	(3,43,27,8 59)		30	91,62 1	91,62 1	14,36,9 02		(18,49,69 7)	(3,57,64,7 61)

Table 43: Baseline carbon stock change in below-ground biomass in the project area (Refer to Table 21.b.2 – VM0015 methodology)

Carbon stock changes in the below-ground biomass per initial forest class icl		Total carbon stock change in the below-ground biomass of the initial forest classes in the project area		Carbon stock changes in the below-ground biomass per post-deforestation zone z		Total carbon stock change in the below-ground biomass of post-deforestation zones in the project area		Total net carbon stock change in the below-ground biomass of the project area	
ID_{icl}	1	$\Delta Cab_{BSLPA_{id,t}}$	$\Delta Cab_{BSLPA_{id}}$	ID_{iz}	1	$\Delta Cab_{BSLPA_{z,t}}$	ΔCab_{BSLPA_z}	ΔCab_{BSLPA_t}	ΔCab_{BSLPA}
Name >		annual	cumulative	Name >		annual	cumulative	annual	cumulative
Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	0	0	0	0	0	0	0	0	0
1	(25,986)	(25,986)	(25,986)	1	-	-	-	(25,986)	(25,986)
2	(60,435)	(60,435)	(86,421)	2	3,281	3,281	3,281	(57,154)	(83,140)
3	(99,840)	(99,840)	(1,86,261)	3	7,631	7,631	10,912	(92,209)	(1,75,348)

4	(1,37,50 0)	(1,37,50 0)	(3,23,761)	4	12,60 7	12,60 7	23,519	(1,24,89 4)	(3,00,242)
5	(1,72,06 9)	(1,72,06 9)	(4,95,830)	5	17,36 2	17,36 2	40,881	(1,54,70 7)	(4,54,949)
6	(2,01,38 5)	(2,01,38 5)	(6,97,215)	6	21,72 7	21,72 7	62,608	(1,79,65 7)	(6,34,606)
7	(2,31,23 5)	(2,31,23 5)	(9,28,450)	7	25,42 9	25,42 9	88,037	(2,05,80 7)	(8,40,413)
8	(2,57,57 8)	(2,57,57 8)	(11,86,028)	8	29,19 8	29,19 8	1,17,235	(2,28,38 0)	(10,68,793)
9	(2,81,76 0)	(2,81,76 0)	(14,67,788)	9	32,52 4	32,52 4	1,49,760	(2,49,23 6)	(13,18,028)
10	(3,03,94 0)	(3,03,94 0)	(17,71,728)	10	35,57 8	35,57 8	1,85,337	(2,68,36 2)	(15,86,390)
11	(3,24,61 4)	(3,24,61 4)	(20,96,341)	11	38,37 8	38,37 8	2,23,716	(2,86,23 5)	(18,72,626)
12	(3,44,93 0)	(3,44,93 0)	(24,41,272)	12	40,98 9	40,98 9	2,64,705	(3,03,94 2)	(21,76,567)
13	(3,64,23 6)	(3,64,23 6)	(28,05,508)	13	43,55 4	43,55 4	3,08,259	(3,20,68 2)	(24,97,249)
14	(3,81,62 0)	(3,81,62 0)	(31,87,128)	14	45,99 2	45,99 2	3,54,251	(3,35,62 8)	(28,32,877)
15	(4,00,37 1)	(4,00,37 1)	(35,87,498)	15	48,18 7	48,18 7	4,02,438	(3,52,18 4)	(31,85,060)
16	(4,19,43 9)	(4,19,43 9)	(40,06,937)	16	50,55 5	50,55 5	4,52,993	(3,68,88 4)	(35,53,944)
17	(4,38,05 1)	(4,38,05 1)	(44,44,988)	17	52,96 2	52,96 2	5,05,955	(3,85,08 8)	(39,39,033)
18	(4,56,66 3)	(4,56,66 3)	(49,01,651)	18	55,31 3	55,31 3	5,61,268	(4,01,35 1)	(43,40,383)
19	(4,75,19 6)	(4,75,19 6)	(53,76,847)	19	57,66 3	57,66 3	6,18,931	(4,17,53 3)	(47,57,917)
20	(4,94,02 6)	(4,94,02 6)	(58,70,874)	20	60,00 3	60,00 3	6,78,934	(4,34,02 3)	(51,91,940)
21	(5,14,00 6)	(5,14,00 6)	(63,84,880)	21	62,38 1	62,38 1	7,41,315	(4,51,62 6)	(56,43,565)
22	(5,33,55 0)	(5,33,55 0)	(69,18,430)	22	64,90 4	64,90 4	8,06,218	(4,68,64 7)	(61,12,212)
23	(5,57,41 5)	(5,57,41 5)	(74,75,845)	23	67,37 1	67,37 1	8,73,589	(4,90,04 4)	(66,02,256)

24	(5,82,78 6)	(5,82,78 6)	(80,58,631)	24	70,38 5	70,38 5	9,43,974	(5,12,40 1)	(71,14,657)
25	(6,07,80 1)	(6,07,80 1)	(86,66,432)	25	73,58 8	73,58 8	10,17,56 2	(5,34,21 2)	(76,48,869)
26	(6,34,77 7)	(6,34,77 7)	(93,01,209)	26	76,74 7	76,74 7	10,94,30 9	(5,58,03 1)	(82,06,900)
27	(6,61,95 2)	(6,61,95 2)	(99,63,162)	27	80,15 3	80,15 3	11,74,46 3	(5,81,79 9)	(87,88,699)
28	(6,90,85 2)	(6,90,85 2)	(1,06,54,01 3)	28	83,58 5	83,58 5	12,58,04 7	(6,07,26 7)	(93,95,966)
29	(7,25,59 9)	(7,25,59 9)	(1,13,79,61 2)	29	87,23 4	87,23 4	13,45,28 1	(6,38,36 5)	(1,00,34,33 1)
30	(7,64,76 6)	(7,64,76 6)	(1,21,44,37 8)	30	91,62 1	91,62 1	14,36,90 2	(6,73,14 4)	(1,07,07,47 6)

Table 44: Baseline carbon stock change in litter biomass in the project area (Refer to Table 21.b.3 – VM0015 methodology)

Carbon stock changes in litter per initial forest class icl		Total carbon stock change in litter of the initial forest classes in the project area		Carbon stock changes in litter per post-deforestation zone z		Total carbon stock change in litter of post-deforestation zones in the project area		Total net carbon stock change in litter of the project area	
ID_{icl}	1	$\Delta Cab_{BSLPA_{icl,t}}$	$\Delta Cab_{BSLPA_{icl}}$	ID_{iz}	1	$\Delta Cab_{BSLPA_{z,t}}$	ΔCab_{BSLPA_z}	ΔCab_{BSLPA_t}	ΔCab_{BSLPA}
Name >		annual	cumulative	Name >		annual	cumulative	annual	cumulative
Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	0	0	0	0	0	0	0	0	0
1	(13,397)	(13,397)	(13,397)	1	-	-	-	(13,397)	(13,397)
2	(17,761)	(17,761)	(31,158)	2	3,281	3,281	3,281	(14,480)	(27,877)
3	(20,316)	(20,316)	(51,474)	3	7,631	7,631	10,912	(12,685)	(40,562)
4	(19,416)	(19,416)	(70,890)	4	12,607	12,607	23,519	(6,810)	(47,371)
5	(17,822)	(17,822)	(88,713)	5	17,362	17,362	40,881	(460)	(47,831)
6	(15,114)	(15,114)	(1,03,827)	6	21,727	21,727	62,608	6,613	(41,218)
7	(15,390)	(15,390)	(1,19,217)	7	25,429	25,429	88,037	10,039	(31,180)
8	(13,581)	(13,581)	(1,32,798)	8	29,198	29,198	1,17,235	15,617	(15,563)
9	(12,467)	(12,467)	(1,45,266)	9	32,524	32,524	1,49,760	20,057	4,494
10	(11,435)	(11,435)	(1,56,701)	10	35,578	35,578	1,85,337	24,143	28,637
11	(10,659)	(10,659)	(1,67,359)	11	38,378	38,378	2,23,716	27,720	56,356
12	(10,475)	(10,475)	(1,77,834)	12	40,989	40,989	2,64,705	30,514	86,871
13	(9,953)	(9,953)	(1,87,787)	13	43,554	43,554	3,08,259	33,601	1,20,472
14	(8,962)	(8,962)	(1,96,750)	14	45,992	45,992	3,54,251	37,030	1,57,501
15	(9,667)	(9,667)	(2,06,417)	15	48,187	48,187	4,02,438	38,520	1,96,021
16	(9,831)	(9,831)	(2,16,248)	16	50,555	50,555	4,52,993	40,724	2,36,745
17	(9,596)	(9,596)	(2,25,844)	17	52,962	52,962	5,05,955	43,367	2,80,112
18	(9,596)	(9,596)	(2,35,439)	18	55,313	55,313	5,61,268	45,717	3,25,829
19	(9,555)	(9,555)	(2,44,994)	19	57,663	57,663	6,18,931	48,108	3,73,937
20	(9,708)	(9,708)	(2,54,703)	20	60,003	60,003	6,78,934	50,295	4,24,231
21	(10,301)	(10,301)	(2,65,004)	21	62,381	62,381	7,41,315	52,080	4,76,311
22	(10,076)	(10,076)	(2,75,080)	22	64,904	64,904	8,06,218	54,827	5,31,138
23	(12,304)	(12,304)	(2,87,384)	23	67,371	67,371	8,73,589	55,067	5,86,206

24	(13,081)	(13,081)	(3,00,464)	24	70,385	70,385	9,43,974	57,304	6,43,510
25	(12,897)	(12,897)	(3,13,361)	25	73,588	73,588	10,17,562	60,692	7,04,202
26	(13,908)	(13,908)	(3,27,269)	26	76,747	76,747	10,94,309	62,839	7,67,040
27	(14,010)	(14,010)	(3,41,279)	27	80,153	80,153	11,74,463	66,143	8,33,183
28	(14,900)	(14,900)	(3,56,179)	28	83,585	83,585	12,58,047	68,685	9,01,868
29	(17,914)	(17,914)	(3,74,093)	29	87,234	87,234	13,45,281	69,320	9,71,188
30	(20,193)	(20,193)	(3,94,286)	30	91,621	91,621	14,36,902	71,428	10,42,616

Table 45: Baseline carbon stock change in above-ground biomass in the leakage belt (Refer to table 21.c.1 – VM0015 methodology)

Carbon stock changes in the above-ground biomass per initial forest class icl		Total carbon stock change in the above-ground biomass of the initial forest classes in the project area		Carbon stock changes in the above-ground biomass per post-deforestation zone z		Total carbon stock change in the above-ground biomass of post-deforestation zones in the project area		Total net carbon stock change in the above-ground biomass of the project area	
ID $icl>$	Name $>$	$\Delta Cab_{BSLLK_{icl,t}}$	$\Delta Cab_{BSLLK_{icl}}$	ID $iz>$	Name $>$	$\Delta Cab_{BSLLK_{z,t}}$	ΔCab_{BSLLK_z}	ΔCab_{BSLLK_t}	ΔCab_{BSLLK}
	1	annual	cumulative		1	Annual	cumulative	annual	cumulative

Project year <i>t</i>	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Project year <i>t</i>	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	-	-	-	0	-	-	-	-	-
1	(1,45,82,96 7.05)	(1,45,82,96 7.05)	(1,45,82,967. 05)	1	-	-	-	-	-
2	(1,41,11,69 9.79)	(1,41,11,69 9.79)	(2,86,94,666. 84)	2	4,2 04	4,204. 18	4,204.18	(1,45,82,96 7.05)	(1,45,82,967. 05)
3	(1,38,35,78 2.19)	(1,38,35,78 2.19)	(4,25,30,449. 03)	3	4,0 68	4,068. 31	8,272.49	(1,41,15,90 3.97)	(2,86,98,871. 02)
4	(1,39,32,90 5.18)	(1,39,32,90 5.18)	(5,64,63,354. 21)	4	3,9 89	3,988. 77	12,261.2 6	(1,38,39,85 0.50)	(4,25,38,721. 52)
5	(1,41,05,07 7.77)	(1,41,05,07 7.77)	(7,05,68,431. 98)	5	4,0 17	4,016. 77	16,278.0 3	(1,39,36,89 3.95)	(5,64,75,615. 47)
6	(1,43,97,55 0.42)	(1,43,97,55 0.42)	(8,49,65,982. 40)	6	4,0 66	4,066. 41	20,344.4 4	(1,41,09,09 4.54)	(7,05,84,710. 01)
7	(1,43,67,75 1.32)	(1,43,67,75 1.32)	(9,93,33,733. 72)	7	4,1 51	4,150. 72	24,495.1 6	(1,44,01,61 6.83)	(8,49,86,326. 84)
8	(1,45,63,10 0.98)	(1,45,63,10 0.98)	(11,38,96,83 4.70)	8	4,1 42	4,142. 13	28,637.2 9	(1,43,71,90 2.05)	(9,93,58,228. 88)
9	(1,46,83,40 1.06)	(1,46,83,40 1.06)	(12,85,80,23 5.76)	9	4,1 98	4,198. 45	32,835.7 4	(1,45,67,24 3.11)	(11,39,25,47 2.00)
10	(1,47,94,87 1.77)	(1,47,94,87 1.77)	(14,33,75,10 7.52)	10	4,2 33	4,233. 13	37,068.8 8	(1,46,87,59 9.51)	(12,86,13,07 1.50)
11	(1,48,78,75 0.72)	(1,48,78,75 0.72)	(15,82,53,85 8.24)	11	4,2 65	4,265. 27	41,334.1 5	(1,47,99,10 4.90)	(14,34,12,17 6.40)
12	(1,48,98,61 6.78)	(1,48,98,61 6.78)	(17,31,52,47 5.02)	12	4,2 89	4,289. 45	45,623.6 0	(1,48,83,01 5.98)	(15,82,95,19 2.39)
13	(1,49,54,90 3.97)	(1,49,54,90 3.97)	(18,81,07,37 8.99)	13	4,2 95	4,295. 18	49,918.7 8	(1,49,02,90 6.23)	(17,31,98,09 8.62)
14	(1,50,61,96 0.00)	(1,50,61,96 0.00)	(20,31,69,33 9.00)	14	4,3 11	4,311. 41	54,230.1 8	(1,49,59,19 9.15)	(18,81,57,29 7.77)
15	(1,49,85,80 6.74)	(1,49,85,80 6.74)	(21,81,55,14 5.74)	15	4,3 42	4,342. 27	58,572.4 5	(1,50,66,27 1.41)	(20,32,23,56 9.18)
16	(1,49,68,14 8.02)	(1,49,68,14 8.02)	(23,31,23,29 3.76)	16	4,3 20	4,320. 31	62,892.7 6	(1,49,90,14 9.01)	(21,82,13,71 8.19)
17	(1,49,93,53 2.44)	(1,49,93,53 2.44)	(24,81,16,82 6.19)	17	4,3 15	4,315. 22	67,207.9 9	(1,49,72,46 8.33)	(23,31,86,18 6.52)
18	(1,49,93,53 2.44)	(1,49,93,53 2.44)	(26,31,10,35 8.63)	18	4,3 23	4,322. 54	71,530.5 3	(1,49,97,84 7.66)	(24,81,84,03 4.18)
19	(1,49,97,94 7.12)	(1,49,97,94 7.12)	(27,81,08,30 5.75)	19	4,3 23	4,322. 54	75,853.0 7	(1,49,97,85 4.98)	(26,31,81,88 9.16)

20	(1,49,81,39 2.06)	(1,49,81,39 2.06)	(29,30,89,69 7.81)	20	4,3 24	4,323. 81	80,176.8 8	(1,49,85,71 5.88)	(29,31,69,87 4.70)
21	(1,49,17,37 9.18)	(1,49,17,37 9.18)	(30,80,07,07 6.99)	21	4,3 19	4,319. 04	84,495.9 3	(1,49,21,69 8.22)	(30,80,91,57 2.92)
22	(1,49,41,65 9.93)	(1,49,41,65 9.93)	(32,29,48,73 6.92)	22	4,3 01	4,300. 59	88,796.5 1	(1,49,45,96 0.52)	(32,30,37,53 3.43)
23	(1,47,01,05 9.78)	(1,47,01,05 9.78)	(33,76,49,79 6.70)	23	4,3 08	4,307. 59	93,104.1 0	(1,47,05,36 7.37)	(33,77,42,90 0.80)
24	(1,46,17,18 0.83)	(1,46,17,18 0.83)	(35,22,66,97 7.53)	24	4,2 38	4,238. 22	97,342.3 2	(1,46,21,41 9.05)	(35,23,64,31 9.86)
25	(1,46,37,04 6.90)	(1,46,37,04 6.90)	(36,69,04,02 4.43)	25	4,2 14	4,214. 04	1,01,556 .37	(1,46,41,26 0.94)	(36,70,05,58 0.80)
26	(1,45,27,78 3.53)	(1,45,27,78 3.53)	(38,14,31,80 7.96)	26	4,2 20	4,219. 77	1,05,776 .13	(1,45,32,00 3.30)	(38,15,37,58 4.09)
27	(1,45,16,74 6.82)	(1,45,16,74 6.82)	(39,59,48,55 4.78)	27	4,1 88	4,188. 27	1,09,964 .40	(1,45,20,93 5.09)	(39,60,58,51 9.19)
28	(1,44,20,72 7.50)	(1,44,20,72 7.50)	(41,03,69,28 2.28)	28	4,1 85	4,185. 09	1,14,149 .49	(1,44,24,91 2.59)	(41,04,83,43 1.78)
29	(1,40,95,14 4.73)	(1,40,95,14 4.73)	(42,44,64,42 7.02)	29	4,1 57	4,157. 41	1,18,306 .90	(1,40,99,30 2.14)	(42,45,82,73 3.91)
30	(1,38,49,02 6.23)	(1,38,49,02 6.23)	(43,83,13,45 3.25)	30	4,0 64	4,063. 54	1,22,370 .44	(1,38,53,08 9.78)	(43,84,35,82 3.69)

Table 46: Baseline carbon stock change in below-ground biomass in the leakage belt (Refer to Table 21.c.2 – VM0015 methodology)

Carbon stock changes in the below-ground biomass per initial forest class i_{cl}		Total carbon stock change in the below-ground biomass of the initial forest classes in the project area		Carbon stock changes in the below-ground biomass per post-deforestation zone z		Total carbon stock change in the below-ground biomass of post-deforestation zones in the project area		Total net carbon stock change in the below-ground biomass of the project area	
$ID_{icl}>$	1	$\Delta Cab_{BSLLK_{icl,t}}$	$\Delta Cab_{BSLLK_{icl}}$	$ID_{iz}>$	1	$\Delta Cab_{BSLLK_{z,t}}$	ΔCab_{BSLLK_z}	ΔCab_{BSLLK_t}	ΔCab_{BSLLK}
Name >		annual	cumulative <th>Name ></th> <td></td> <th>annual</th> <td>cumulative<th>annual</th><td>cumulative</td></td>	Name >		annual	cumulative <th>annual</th> <td>cumulative</td>	annual	cumulative
Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	Project year t	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	-	-	-	0	-	-	-	-	-
1	(3,24,083)	(3,24,083)	(3,24,083)	1	-	-	-	-	-
2	(6,37,693)	(6,37,693)	(9,61,776)	2	4,204	4,204	4,204	(6,33,489)	(9,57,572)
3	(9,45,171)	(9,45,171)	(19,06,947)	3	8,272	8,272	12,477	(9,36,898)	(18,94,470)
4	(12,54,807)	(12,54,807)	(31,61,754)	4	12,261	12,261	24,738	(12,42,546)	(31,37,016)
5	(15,68,270)	(15,68,270)	(47,30,024)	5	16,278	16,278	41,016	(15,51,992)	(46,89,008)
6	(18,88,233)	(18,88,233)	(66,18,257)	6	20,344	20,344	61,360	(18,67,888)	(65,56,896)
7	(22,07,533)	(22,07,533)	(88,25,790)	7	24,495	24,495	85,856	(21,83,038)	(87,39,934)
8	(25,31,174)	(25,31,174)	(1,13,56,964)	8	28,637	28,637	1,14,493	(25,02,537)	(1,12,42,471)
9	(28,57,489)	(28,57,489)	(1,42,14,453)	9	32,836	32,836	1,47,329	(28,24,654)	(1,40,67,125)
10	(31,86,282)	(31,86,282)	(1,74,00,735)	10	37,069	37,069	1,84,397	(31,49,213)	(1,72,16,337)

11	(31,92,85 5)	(31,92,85 5)	(2,05,93,590)		11	41,334	41,334	2,25,732		(31,51,52 1)	(2,03,67,858)
12	(35,34,42 6)	(35,34,42 6)	(2,41,28,015)		12	41,419	41,419	2,67,151		(34,93,00 6)	(2,38,60,864)
13	(38,72,90 6)	(38,72,90 6)	(2,80,00,922)		13	45,850	45,850	3,13,002		(38,27,05 6)	(2,76,87,920)
14	(42,05,47 6)	(42,05,47 6)	(3,22,06,398)		14	50,241	50,241	3,63,243		(41,55,23 4)	(3,18,43,155)
15	(45,34,68 5)	(45,34,68 5)	(3,67,41,083)		15	54,556	54,556	4,17,799		(44,80,12 9)	(3,63,23,284)
16	(48,60,82 8)	(48,60,82 8)	(4,16,01,911)		16	58,826	58,826	4,76,625		(48,02,00 2)	(4,11,25,286)
17	(51,94,69 8)	(51,94,69 8)	(4,67,96,609)		17	63,057	63,057	5,39,682		(51,31,64 1)	(4,62,56,927)
18	(55,23,56 4)	(55,23,56 4)	(5,23,20,173)		18	67,388	67,388	6,07,071		(54,56,17 5)	(5,17,13,102)
19	(58,54,19 6)	(58,54,19 6)	(5,81,74,368)		19	71,655	71,655	6,78,725		(57,82,54 1)	(5,74,95,643)
20	(61,84,65 6)	(61,84,65 6)	(6,43,59,024)		20	75,944	75,944	7,54,669		(61,08,71 2)	(6,36,04,355)
21	(65,14,30 6)	(65,14,30 6)	(7,08,73,330)		21	80,231	80,231	8,34,900		(64,34,07 6)	(7,00,38,431)
22	(68,45,91 9)	(68,45,91 9)	(7,77,19,250)		22	84,507	84,507	9,19,407		(67,61,41 2)	(7,67,99,843)
23	(71,71,37 6)	(71,71,37 6)	(8,48,90,625)		23	88,809	88,809	10,08,21 6		(70,82,56 7)	(8,38,82,410)
24	(74,93,84 0)	(74,93,84 0)	(9,23,84,465)		24	93,031	93,031	11,01,24 7		(74,00,80 9)	(9,12,83,219)
25	(78,20,81 7)	(78,20,81 7)	(10,02,05,28 3)		25	97,214	97,214	11,98,46 1		(77,23,60 3)	(9,90,06,822)
26	(81,44,06 6)	(81,44,06 6)	(10,83,49,34 9)		26	1,01,45 6	1,01,45 6	12,99,91 6		(80,42,61 1)	(10,70,49,43 3)
27	(84,66,11 4)	(84,66,11 4)	(11,68,15,46 3)		27	1,05,64 9	1,05,64 9	14,05,56 6		(83,60,46 4)	(11,54,09,89 7)
28	(87,86,59 1)	(87,86,59 1)	(12,56,02,05 4)		28	1,09,82 7	1,09,82 7	15,15,39 3		(86,76,76 4)	(12,40,86,66 1)
29	(90,99,73 5)	(90,99,73 5)	(13,47,01,78 9)		29	1,13,98 4	1,13,98 4	16,29,37 7		(89,85,75 1)	(13,30,72,41 2)
30	(94,07,87 5)	(94,07,87 5)	(14,41,09,66 4)		30	1,18,04 7	1,18,04 7	17,47,42 4		(92,89,82 9)	(14,23,62,24 1)

3.2.2 Project Emissions

Non-CO₂ emissions from fire areas accounted because fire is the main technology used to clear the forest (slash and burn). Parameters (Table 47) and baseline non-CO₂ emissions from forest fires in the project area (Table 48) are presented below:

Table 47: Parameters used to calculate non-CO₂ emissions from forest fires (Refer to Table 23 – VM0015 methodology)

Initial Forest Class		Parameters																																			
		ID cl	Name	%	Fburnt _{icl}	tCO ₂ e ha ⁻¹	Cab	tCO ₂ e ha ⁻¹	Cdw	tCO ₂ e ha ⁻¹	CL	%	Pburnt _{ab,icl}	%	Pburnt _{dw,icl}	%	Pburnt _{l,icl}	%	CE _{ab,icl}	%	CE _{dw,icl}	%	CE _{l,icl}	tCO ₂ e ha ⁻¹	ECO _{2-ab}	tCO ₂ e ha ⁻¹	ECO _{2-dw}	tCO ₂ e ha ⁻¹	ECO _{2-l}	tCO ₂ e ha ⁻¹	EBBCO _{2-tot}	tCO ₂ e ha ⁻¹	EBBnN ₂ O _{icl}	tCO ₂ e ha ⁻¹	EBBCH _{4,icl}	tCO ₂ e ha ⁻¹	EBBtot _{icl}
1	Ombr ofile	96 %	- 68.7.8	0	- 7.9	96 %	0	10 0%	0.5	0	0.5	-	330.144	0	-	3.95	-	3	0	-	29.4	-	29.39	tCO ₂ e ha ⁻¹	ECO _{2-ab}	tCO ₂ e ha ⁻¹	ECO _{2-dw}	tCO ₂ e ha ⁻¹	ECO _{2-l}	tCO ₂ e ha ⁻¹	EBBCO _{2-tot}	tCO ₂ e ha ⁻¹	EBBnN ₂ O _{icl}	tCO ₂ e ha ⁻¹	EBBCH _{4,icl}	tCO ₂ e ha ⁻¹	EBBtot _{icl}

Fores t 21

Table 48: Baseline non-CO₂ emissions from forest fires in the project area (Refer to Table 24 – VM0015 methodology)

Project year t	Emissions of non-CO ₂ gasses from baseline forest fires		Total baseline non-CO ₂ emissions from forest fires in the project area	
	$ABSPLA_{icl,t}$	$ID_{icl} = I$	annual	cumulative
			$EBBSSLPA_t$	$EBBSSLPA$
	ha	tCO ₂ -e ha ⁻¹	tCO ₂ -e	tCO ₂ -e
1	1,696	(29)	(49,842)	(49,842)
2	2,248	(29)	(66,076)	(1,15,919)
3	2,572	(29)	(75,581)	(1,91,500)
4	2,458	(29)	(72,235)	(2,63,735)
5	2,256	(29)	(66,304)	(3,30,040)
6	1,913	(29)	(56,230)	(3,86,269)
7	1,948	(29)	(57,256)	(4,43,525)
8	1,719	(29)	(50,527)	(4,94,052)
9	1,578	(29)	(46,383)	(5,40,435)
10	1,448	(29)	(42,543)	(5,82,977)
11	1,349	(29)	(39,653)	(6,22,631)
12	1,326	(29)	(38,969)	(6,61,600)
13	1,260	(29)	(37,030)	(6,98,630)
14	1,134	(29)	(33,342)	(7,31,972)
15	1,224	(29)	(35,966)	(7,67,938)

16	1,244	(29)	(36,574)	(8,04,512)
17	1,215	(29)	(35,699)	(8,40,211)
18	1,215	(29)	(35,699)	(8,75,911)
19	1,209	(29)	(35,547)	(9,11,458)
20	1,229	(29)	(36,118)	(9,47,576)
21	1,304	(29)	(38,323)	(9,85,899)
22	1,275	(29)	(37,486)	(10,23,385)
23	1,557	(29)	(45,774)	(10,69,160)
24	1,656	(29)	(48,664)	(11,17,823)
25	1,632	(29)	(47,979)	(11,65,803)
26	1,761	(29)	(51,743)	(12,17,546)
27	1,773	(29)	(52,124)	(12,69,670)
28	1,886	(29)	(55,431)	(13,25,101)
29	2,268	(29)	(66,647)	(13,91,747)
30	2,556	(29)	(75,125)	(14,66,872)

Total ex-ante estimated actual emissions of non-CO₂ gasses due to forest fires in the project area

The Project does not include planned deforestation, logging or fuel wood collection and charcoal production activities. Thus, Tables 25a,b,c,d and 26a,b,c,d of the vm0015 methodology, do not apply to the Project.

The Project has been effective in identifying illegal logging operations and invasion attempts since 2017 by undertaking on-site patrolling and reporting (FAO, 2019). As mentioned through the PD (particularly in Sections 2.4.1, and 2.4.6) unplanned deforestation is a process that requires loggers to open roads and squatters to invade the land. For this to happen, the management team should have left unspotted illegal logging operations and squatting in the PA to the point that significant extensions of forest are slashed and burned to implement pastures (because squatters will not invade small areas as they are driven by the expectation of selling the land to ranchers). Given the experience gained since 2014 on in-site monitoring and enforcement (which is proven by the fact that squatting initiatives have been stopped over the years as evidenced in the patrolling reports and as no ranching operations can be spotted in the PA during field visits), plus the additional funding to scale-up these activities and involvement of local villagers (the Project has secured funding for implementation for the first three years). The Project is conservative in assuming that it will prevent at least 95% of the deforestation in the project area.

In conclusion, the Project assumes an Effectiveness Index (EI) of 0.95. Ex-ante estimations of carbon stock changes due to unavoidable unplanned deforestation within the project area are presented below (Table 49):

Table 49: Ex-ante estimated net carbon stock change in the project area under the project scenario
(Refer to Table 27 – VM0015 methodology)

Project year t	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoidable unplanned deforestation		Total carbon stock change in the project case	
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CPAdP_{At}$	$\Delta CPAdPA$	$\Delta CPAiP_{At}$	$\Delta CPAiPA$	$\Delta CUDdP_{At}$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e	tCO ₂ -e
0	0	0	0	0	0	0	0	0

1	0	0	0	0	(60,290)	(60,290)	(60,290)	(60,290)
2	0	0	0	0	(81,062)	(1,41,352)	(81,062)	(81,062)
3	0	0	0	0	(94,064)	(2,35,416)	(94,064)	(94,064)
4	0	0	0	0	(91,738)	(3,27,154)	(91,738)	(91,738)
5	0	0	0	0	(86,210)	(4,13,364)	(86,210)	(86,210)
6	0	0	0	0	(75,533)	(4,88,897)	(75,533)	(75,533)
7	0	0	0	0	(78,055)	(5,66,952)	(78,055)	(78,055)
8	0	0	0	0	(71,220)	(6,38,172)	(71,220)	(71,220)
9	0	0	0	0	(67,358)	(7,05,529)	(67,358)	(67,358)
10	0	0	0	0	(63,769)	(7,69,299)	(63,769)	(63,769)
11	0	0	0	0	(61,243)	(8,30,542)	(61,243)	(61,243)
12	0	0	0	0	(61,319)	(8,91,861)	(61,319)	(61,319)
13	0	0	0	0	(59,861)	(9,51,722)	(59,861)	(59,861)
14	0	0	0	0	(56,243)	(10,07,96 5)	(56,243)	(56,243)
15	0	0	0	0	(60,176)	(10,68,14 1)	(60,176)	(60,176)
16	0	0	0	0	(61,731)	(11,29,87 2)	(61,731)	(61,731)
17	0	0	0	0	(61,506)	(11,91,37 8)	(61,506)	(61,506)
18	0	0	0	0	(62,319)	(12,53,69 8)	(62,319)	(62,319)
19	0	0	0	0	(62,949)	(13,16,64 6)	(62,949)	(62,949)
20	0	0	0	0	(64,448)	(13,81,09 4)	(64,448)	(64,448)
21	0	0	0	0	(67,938)	(14,49,03 2)	(67,938)	(67,938)
22	0	0	0	0	(67,799)	(15,16,83 1)	(67,799)	(67,799)

23	0	0	0	0	(78,678)	(15,95,510)	(78,678)	(78,678)
24	0	0	0	0	(83,216)	(16,78,725)	(83,216)	(83,216)
25	0	0	0	0	(83,496)	(17,62,222)	(83,496)	(83,496)
26	0	0	0	0	(89,142)	(18,51,364)	(89,142)	(89,142)
27	0	0	0	0	(90,780)	(19,42,144)	(90,780)	(90,780)
28	0	0	0	0	(95,969)	(20,38,113)	(95,969)	(95,969)
29	0	0	0	0	(1,10,797)	(21,48,910)	(1,10,797)	(1,10,797)
30	0	0	0	0	(1,22,571)	(22,71,481)	(1,22,571)	(1,22,571)

Table 50: Total ex-ante estimated actual emissions of non-CO₂ gasses due to forest fires in the project area (Refer to Table 28 – VM0015 methodology)

Project year <i>t</i>	Total <i>ex-ante</i> estimated actual non-CO ₂ emissions from forest fires in the Project area	
	<i>EBBPSPA_t</i>	<i>EBBPSPA</i>
	Annual	cumulative
	tCO ₂ -e	tCO ₂ -e
0	0	0
1	(2,492)	(2,492)
2	(3,304)	(5,796)
3	(3,779)	(9,575)
4	(3,612)	(13,187)
5	(3,315)	(16,502)
6	(2,811)	(19,313)
7	(2,863)	(22,176)
8	(2,526)	(24,703)
9	(2,319)	(27,022)
10	(2,127)	(29,149)
11	(1,983)	(31,132)
12	(1,948)	(33,080)

13	(1,852)	(34,932)
14	(1,667)	(36,599)
15	(1,798)	(38,397)
16	(1,829)	(40,226)
17	(1,785)	(42,011)
18	(1,785)	(43,796)
19	(1,777)	(45,573)
20	(1,806)	(47,379)
21	(1,916)	(49,295)
22	(1,874)	(51,169)
23	(2,289)	(53,458)
24	(2,433)	(55,891)
25	(2,399)	(58,290)
26	(2,587)	(60,877)
27	(2,606)	(63,483)
28	(2,772)	(66,255)
29	(3,332)	(69,587)
30	(3,756)	(73,344)

The total project emission calculated is 73,344 tCO₂e.

3.2.3 Leakage

Step 8 of VM0015 - Ex-ante leakage estimate

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

The Project's activities won't generate GHG emissions thus there won't be GHG emissions from leakage prevention activities. Tables 30a,b,c as well as Tables 34 and 35 of the VM0015 methodology do not apply to the Project. In the same way, the Project will not implement grazing activities in the LMA thus Tables 31, 32, and 33 of the VM0015 methodology do not apply.

GHG emissions by activity displacement could only be considered as leakage if such emissions are located within the leakage belt (LK) and happen above baseline projections. A mobility analysis was used to calculate the extent of the leakage belt of the Project and results from this analysis are presented in Section 3.1.3. (As indicated in the footnote in page 101 of the VCS VM0015 methodology "If deforestation agents do not participate in leakage prevention activities and project activities, the Displacement Factor shall be 100%. Where leakage prevention activities are implemented, the factor shall be equal to the proportion of the baseline agents estimated to be given the opportunity to participate in leakage prevention activities and project activities", thus, if all the agents are given the opportunity to participate in the activities of the Project, the LDF should be zero).

Starting from 2012 the cattle were gradually sold as they reached maturity for the marketing of their meat. Since January 2016, from the beginning of the Project until today, there are no cattle in the farm, except several milk cows owned by the farm keeper for his self-consumption. Because of that, no leakage management zone was identified.

Also, the VM0015 methodology indicates that the amount of leakage will depend on the Leakage Displacement Factor (LDF) which is equal to the proportion of agents of deforestation that do not participate in the Project's activities.

Following these guidelines, the Project will not generate displacement leakage as the Project's activities are designed to provide all the deforestation agents that arrive to the Project's Boundary with the opportunity to participate.

Total calculated leakage is 0.

3.2.4 Net GHG Emission Reductions and Removals

Step 9 of VM0015 – Net ex-ante reduction in anthropogenic GHG emissions significance Assessment

9.1 Significance assessment

Using the document *EB-CDM approved Tool for testing significance of GHG emissions in A/R CDM Project activities*, it was possible to verify that above-ground biomass will contribute 79% of the expected emissions in the baseline scenario and below-ground biomass will contribute 21%.

9.2 Calculation of ex-ante estimates of total net GHG emission reductions

Equation 19, suggested by VM0015, was used for the ex-ante estimation of the project emissions reductions.

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

Where:

$\Delta REDD_t$: Ex-ante estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t (tCO₂e);

$\Delta CBSLPA_t$: Sum of baseline carbon stock changes in the project area at year t (tCO₂e);

$\Delta EBBBSLPA_t$: Sum of baseline emissions from biomass burning in the project area at year t (tCO₂e);

$\Delta CPSPA_t$: Sum of ex-ante estimated actual carbon stock changes in the project area at year t (tCO₂e);

$\Delta EBBPSPA_t$: Sum of (ex-ante estimated) actual emissions from biomass burning in the project area at year t (tCO₂e);

ΔCLK_t : Sum of ex-ante estimated leakage net carbon stock changes at year t (tCO₂e);

ΔELK_t : Sum of ex-ante estimated leakage emissions at year t (tCO₂e);

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

9.3 Ex-ante calculation of Verified Carbon Units (VCUs)

To estimate the number of VCUs, we used equation 20 and 21 of VM0015. The Risk Factor parameter of the Project was estimated through the document *VCS AFOLU Non-Permanence Risk Tool*, resulting in 11.75%.

$$VCU_t = \Delta REDD_t - VBC_t$$

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

Where:

VCU_t : Number of Verified Carbon Units that can be traded at time t (tCO₂e);

$\Delta REDD_t$: Ex-ante estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t (tCO₂e);

VBC_t : Number of Buffer Credits deposited in the VCS Buffer at time t (t CO₂-e);

$\Delta CBSLPA_t$: Sum of baseline carbon stock changes in the project area at year t (tCO₂e);

$\Delta CPSPA_t$: Sum of ex-ante estimated actual carbon stock changes in the project area at year t (tCO₂e);

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

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

Table: Verified Carbon Units

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated Buffer Credits	Estimated net GHG emission reduction or removals (tCO ₂ e)
1	34,446.33	1,722	-	93,695	738,157
2	45,665.69	2,283	-	126,747	997,614
3	52,234.41	2,612	-	147,974	1,163,611
4	49,922.22	2,496	-	145,528	1,142,927
5	45,823.34	2,291	-	138,052	1,082,679
6	38,860.51	1,943	-	122,484	958,792
7	39,569.93	1,978	-	127,273	995,469
8	34,919.28	1,746	-	117,534	917,675
9	32,055.32	1,603	-	112,313	875,599
10	29,401.56	1,470	-	107,453	836,445
11	27,404.67	1,370	-	104,185	809,900
12	26,931.72	1,347	-	104,915	814,909
13	25,591.71	1,280	-	103,251	801,076
14	23,043.05	1,152	-	98,202	760,602
15	24,856.01	1,243	-	104,829	812,186
16	25,276.41	1,264	-	107,801	834,930
17	24,672.09	1,234	-	108,017	835,948
18	24,672.09	1,234	-	109,832	849,581

19	24,566.99	1,228	-	111,361	860,963
20	24,961.11	1,248	-	114,241	882,984
21	26,485.05	1,324	-	120,223	929,434
22	25,907.00	1,295	-	120,599	931,683
23	31,634.92	1,582	-	138,085	1,068,744
24	33,631.81	1,682	-	145,844	1,129,017
25	33,158.86	1,658	-	147,032	1,137,467
26	35,760.07	1,788	-	156,548	1,211,532
27	36,022.82	1,801	-	159,893	1,236,923
28	38,308.73	1,915	-	168,761	1,305,815
29	46,059.82	2,303	-	192,663	1,493,083
30	51,919.11	2,596	-	211,990	1,644,096
Total	1,013,763	50,688	-	3,867,325	30,059,842

Over its lifetime, the Project will generate: 30,059,842 Tradable VCUs for the period between April 1st, 2017 to March 31st, 2047.

3.3 Monitoring

3.3.1 Data and Parameters Available at Validation

Data / Parameter	Deforestation
Data unit	Hectare (ha)
Description	Maps of forest cover areas converted into non-forest cover areas
Source of data	Measured through data from the PRODES/INPE Project
Value applied	0.40%/year on average (2000-2014)
Justification of choice of data or description of measurement methods and procedures applied	Data from the PRODES Digital program (official mapping satellite of Brazilian Amazon Forest) were used to map the deforestation and production of the Forest Cover Excellence Brand Map. During the analyzed period, a total of 46 Landsat images were used. And for the classification of the images in the mapping of forest classes, non-forest vegetation, hydrography and deforestation, the ISOSEG method of unsupervised classification was used
Purpose of data	<ul style="list-style-type: none"> - Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	View the documents: <ul style="list-style-type: none"> - Câmara et al. 2006. Methodology for the calculation of the annual rate of deforestation in the Legal Amazon - Determination of the Forest Carbon Stock for the REDD+ Project

Data / Parameter	CF
Data unit	T
Description	Carbon contained in dry biomass
Source of data	Nogueira et al. (2008). Estimates of forest biomass in the Brazilian Amazon: New allometric equations and biomass adjustments of wood volume inventories. Forest Ecology and Management, v. 256, n. 11, p. 1853-1867, 2008
Value applied	0.485
Justification of choice of data or description of measurement methods and procedures applied	Value found in scientific literature
Purpose of data	<ul style="list-style-type: none"> - Determination of baseline scenario - Calculation of baseline emissions - Calculation of project emissions - Calculation of leakage
Comments	N/A

Data / Parameter	ABSLRRt
Data unit	Ha
Description	Annual area of baseline deforestation within the RR at year <i>t</i>
Source of data	Calculated, see Annex VM0015 tables
Value applied	Table 9a, 11a Annex VM0015 tables

Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLRR
Data unit	Ha
Description	Cumulative area of baseline deforestation in the reference region at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9a, 11a Annex VM0015 tables
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPAt
Data unit	Ha
Description	Annual area of baseline deforestation in the project area at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9b, 11b, 13b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA<i>i</i>,<i>t</i>
Data unit	Ha
Description	Area of initial (pre-deforestation) forest class <i>i</i> deforested at time <i>t</i> within the project area in the baseline
Source of data	Calculated, see VCS Annex
Value applied	Table 11b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1, 5.1 by applying land cover map to the result of Table 9b
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA<i>i</i>,<i>t</i>
Data unit	Ha
Description	Annual area of baseline deforestation within stratum (<i>i</i>) of the project area at year <i>t</i>
Source of data	Calculated, see VCS Annex
Value applied	Table 9b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1, 4.1.2.2
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPA
Data unit	Ha
Description	Cumulative area of baseline deforestation within the project area at year <i>t</i>
Source of data	Calculated, see VCS Annex
Value applied	Table 9b, Table 11b, Table 13b of Annex VM0015

Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of the VM0015 v1.1.
Purpose of data	Calculation of baseline emissions
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLPAz,t
Data unit	Ha
Description	Area of the zone z “deforested” at time t within the project area in the baseline case; ha
Source of data	Calculated, see VCS Annex
Value applied	Table 13b of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Equal to values of Table 11b grouped by zones
Purpose of data	Calculation of baseline emissions
Comments	Calculating net GHG emissions via post-deforestation C-stocks

Data / Parameter	ABSLLKt
Data unit	Ha
Description	Annual area of baseline deforestation within the leakage belt at year t
Source of data	Calculated, see VCS Annex
Value applied	Table 9c, 11c, 13c of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1.
Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLKicl,t
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Data unit	Ha
Description	Area of initial (post-deforestation) forest class fcl deforested at time t within the leakage belt in the baseline case
Source of data	Calculated, see VCS Annex
Value applied	Table 11c of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1, 5.1 by applying land cover map to the result of Table 9c
Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLKI,t
Data unit	Ha
Description	Annual area of deforestation in stratum (i) within the leakage belt at year t
Source of data	Calculated. See VCS annex – section 4
Value applied	Table 9c, 11c, 13c of Annex VM0015.
Justification of choice of data or description of measurement methods and procedures applied	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	ABSLLK
Data unit	Ha
Description	Cumulative area of baseline deforestation within the leakage belt at year t
Source of data	Calculated
Value applied	Table 9c, 11c, 13c of Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1.

Purpose of data	Calculation of leakage
Comments	Activity data for calculating GHG emissions in the baseline scenario

Data / Parameter	CFj
Data unit	Dimensionless
Description	Carbon fraction for tree tr, of species, group of species or forest type j
Source of data	IPCC GPG 2006 Chapter 6
Value applied	Forest classes: 0.5 Post-deforestation classes: 0.47
Justification of choice of data or description of measurement methods and procedures applied	Default values IPCC GPG 2006, Chapter 6
Purpose of data	Calculation of baseline emission
Comments	Conversion from biomass to CO ₂ e

Data / Parameter	Cabc1
Data unit	t CO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of LU/LC class cl
Source of data	Calculated, see calculation sheet
Value applied	forest class: bh-M: 250.75 bh-MB: 350.22 bh-PM: 196.63 bmh-M: 216.28 bmh-MB: 448.24 bmh-PM and and bmh-PMt: 460.92 bms-T: 169.23 bp-M: 183.36 bp-MB: 181.47 bp-PM: 398.95 bs-MB: 165.78
Justification of choice of data or description of measurement methods and procedures applied	Derived from forest inventory data, IDEAM. See VCS Annex.

Purpose of data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation

Data / Parameter	Rj
Data unit	Relation factor
Description	Root shoot ratio
Source of data	IPCC/Literature value
Value applied	0.24
Justification of choice of data or description of measurement methods and procedures applied	Default value of 0.24 from IPCC Guidelines for National Greenhouse Gas Inventories. 2006. Table 4.3/Mokany 2006
Purpose of data	Calculation of baseline emission
Comments	Belowground biomass estimation

Data / Parameter	Cbbcl
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Data unit	t CO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of LU/LC class cl
Source of data	Calculated, see Table Biomass, Annex GEI DB
Value applied	Forest class: bh-M=60.18 bh-MB=122.05 bh-PM=47.19 bmh-M=51.91 bmh-MB=107.58 bmh-PM and bmh-PMt=75.65 bms-T=40.62 bp-M=44.01 bp-MB=43.55 bp-PM=95.75 bs-T=39.79
Justification of choice of data or description of measurement methods and procedures applied	Calculated by applying the default value of 0.24 from IPCC Guidelines for National Greenhouse Gas Inventories. 2006. Table Table 4.3/Mokany 2006
Purpose of data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation

Data / Parameter	C _{tot} (cl)
Data unit	t CO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the below-ground biomass carbon pool of LU/LC class cl
Source of data	Calculated, see Table Biomass, Annex GEI DB
Value applied	Forest class: bh-M=310.92 bh-MB=630.61 bh-PM=243.82 bmh-M=268.19 bmh-MB=555.82 bmh-PM y bmh-PMt=390.85

	bms-T=209.85 bp-M=227.37 bp-MB=225.02 bp-PM=494.70 bs-T=205.57
Justification of choice of data or description of measurement methods and procedures applied	Derived from various forest inventory data. See Table Biomass, Annex GEI DB
Purpose of data	Calculation of baseline emission
Comments	Emissions factors for estimating GHG emissions from deforestation

Data / Parameter	C_{tot}icl,t
Data unit	t CO ₂ e ha ⁻¹
Description	Average carbon stock of all accounted carbon pools in forest class icl at time t
Source of data	Calculated, see Table Significancia, Annex VM0015
Value applied	Deemed de-minimus
Justification of choice of data or description of measurement methods and procedures applied	Significance analysis
Purpose of data	Calculation of baseline emission
Comments	N/A

Data / Parameter	C_{abf}fcl
Data unit	t CO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the above-ground biomass carbon pool of final post-deforestation class fcl
Source of data	Calculated, see table CarbonPostdef, Annex GEI DB
Value applied	Grassland: 17.95 Heterogeneous farmland: 23.74 Crops: 21.78

Justification of choice of data or description of measurement methods and procedures applied	Calculated according to requirements of VM0015 v1.1.
Purpose of data	Calculation of baseline emission
Comments	Calculate GHG emissions from deforestation

Data / Parameter	C_p
Data unit	t CO ₂ e ha ⁻¹
Description	Average carbon stock per hectare in the carbon pool p
Source of data	Table 20.a
Value applied	Table 20.a. Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Requirements of the VM0015 sec. 6.1.2.
Purpose of data	Calculation of baseline emission
Comments	Baseline GHG emissions estimates

Data / Parameter	C_{totfcl, t}
Data unit	t CO ₂ e ha ⁻¹
Description	Average carbon stock of all accounted carbon pools in non-forest class fcl at time t
Source of data	N/A
Value applied	N/A
Justification of choice of data or description of measurement methods and procedures applied	Leakage management activities do not decrease carbon stocks
Purpose of data	Calculation of baseline emission
Comments	N/A

Data / Parameter	ΔC_{abABSLKK}
Data unit	t CO ₂ e

Description	Cumulative baseline carbon stock changes for the above-ground biomass pool in the leakage belt
Source of data	Table 21.c.1, Annex VM0015
Value applied	See Table 21.c.1, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the leakage belt
Purpose of data	Calculation of leakage
Comments	N/A

Data / Parameter	ΔCbbABSLKK
Data unit	t CO ₂ e
Description	Cumulative baseline carbon stock changes for the below-ground biomass pool in the leakage belt
Source of data	Table 21.c.1 Annex VM0015
Value applied	See Table 21.c.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the leakage belt
Purpose of data	Calculation of leakage
Comments	N/A

Data / Parameter	ΔCabBSLPA
Data unit	t CO ₂ e
Description	Cumulative baseline carbon stock changes for the above-ground biomass pool in the project area
Source of data	Table 21.b.1 Annex VM0015
Value applied	See Table 21.b.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area
Purpose of data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	ΔCbbABSLPA
Data unit	t CO ₂ e
Description	Cumulative baseline carbon stock changes for the below-ground biomass pool in the project area
Source of data	Table 21.b.1 Annex VM0015
Value applied	See Table 21.b.1 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area
Purpose of data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	ΔCADLK
Data unit	t CO ₂ e
Description	Cumulative total decrease in carbon stocks due to displaced deforestation
Source of data	Table 34, 35, Annex VM0015
Value applied	See Table 34, 35, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting from displaced leakage
Purpose of data	Calculation of leakage
Comments	N/A

Data / Parameter	ΔCBSLPA
Data unit	t CO ₂ -e
Description	Total baseline carbon stock changes in the project area
Source of data	Table 36, Annex VM0015
Value applied	See Table 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	GHG accounting in the project area
Purpose of data	Calculation of leakage

Comments	N/A
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Data / Parameter	ΔCPSPA
Data unit	t CO ₂ -e
Description	Cumulative project carbon stock change within the project area at year t
Source of data	See Tables 27 and 36, Annex VM0015
Value applied	Tables 27 and 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculation of net GHG emissions reductions
Purpose of data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	ΔCUDdPA
Data unit	t CO ₂ -e
Description	Cumulative actual carbon stock change due to unavoidable unplanned deforestation at year t in the project area
Source of data	Table 27, Annex VM0015
Value applied	Effectiveness index: 40%
Justification of choice of data or description of measurement methods and procedures applied	Measure of project effectiveness
Purpose of data	Calculation of project emissions
Comments	N/A

Data / Parameter	ΔREDDt
Data unit	t CO ₂ -e
Description	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Source of data	See Table 36, Annex VM0015
Value applied	Table 36, Annex VM0015

Justification of choice of data or description of measurement methods and procedures applied	The cumulative result of applying the VM0015 methodology
Purpose of data	Calculation of project emissions
Comments	Final GHG calculations

Data / Parameter	DLF
Data unit	%
Description	Displacement leakage factor
Source of data	Table 34, Annex VM0015
Value applied	5
Justification of choice of data or description of measurement methods and procedures applied	ex-ante leakage
Purpose of data	Calculation of leakage
Comments	N/A

Data / Parameter	EI
Data unit	%
Description	ex-ante estimated Effectiveness Index
Source of data	Estimate generated by the project
Value applied	0.40
Justification of choice of data or description of measurement methods and procedures applied	Estimate generated by the project
Purpose of data	Calculation of project emissions
Comments	N/A

Data / Parameter	ELK
Data unit	t CO ₂ -e

Description	Cumulative sum of ex-ante estimated leakage emissions at year t
Source of data	Table 35, 36 Annex VM0015
Value applied	Table 35, 36 Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	The cumulative result of applying the VM0015 methodology
Purpose of data	Calculation of leakage
Comments	N/A

Data / Parameter	R_ft
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	VCS Non Permanence Risk analysis
Value applied	11.75
Justification of choice of data or description of measurement methods and procedures applied	see VCS Non-Permanence Risk Analysis
Purpose of data	Calculation of project emissions
Comments	N/A

Data / Parameter	VBC_t
Data unit	t CO ₂ -e
Description	Number of Buffer Credits deposited in the VCS Buffer at time t
Source of data	See Table 36, Annex VM0015
Value applied	Table 36, Annex VM0015
Justification of choice of data or description of measurement methods and procedures applied	Calculated
Purpose of data	Buffer calculation
Comments	N/A

3.3.2 Data and Parameters Monitored

Data / Parameter	ABSLLKt
Data unit	Ha
Description	Annual area of deforestation within the leakage belt at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	PP will be in charged for the climate monitoring according to the methodology VM0015 v1.1. Table 9c, 11c, 13c of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	GIS software
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by PP
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of leakage
Comments	N/A

Data / Parameter	ABSLPA
Data unit	Ha
Description	Cumulative area of deforestation within the project area at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	PP will be in charge for the climate monitoring according to the methodology VM0015 v1.1. Table 9b, 11b, 13b of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	GIS software
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by ARC
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of project emissions
Comments	N/A

Data / Parameter	ABSLPAt
Data unit	Ha
Description	Annual area of deforestation in the project area at year t
Source of data	Satellite images
Description of measurement methods and procedures to be applied	PP will be in charge for the climate monitoring according to the methodology VM0015 v1.1. Table 9b, 11b, 13b of Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	GIS software
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by PP
Purpose of data	Activity data for calculating GHG emissions. Calculated according to requirements of VM0015 v1.1.
Calculation method	Calculation of project emissions
Comments	N/A

Data / Parameter	ΔCPSPAt
Data unit	t CO ₂ -e
Description	Annual project carbon stock change within the project area at year <i>t</i>
Source of data	Satellite images and carbon stocks defined in 4.1
Description of measurement methods and procedures to be applied	PP will be in charge for the climate monitoring according to the methodology VM0015 v1.1. Table 27 and Table 36, Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures will be performed by PP
Purpose of data	Calculation of project emissions
Calculation method	Activity data for calculating GHG emissions reductions.
Comments	N/A

Data / Parameter	ΔREDD
Data unit	t CO ₂ -e
Description	Cumulative net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	PP will assign a QA/QC coordinator
Purpose of data	Calculation of project emissions
Calculation method	Final GHG calculations
Comments	N/A

Data / Parameter	ΔREDD_t
Data unit	t CO ₂ -e
Description	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year <i>t</i>
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	PP will assign a QA/QC coordinator
Purpose of data	Calculation of project emissions
Calculation method	Final GHG calculations
Comments	N/A

Data / Parameter	RfT
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	VCS Non-Permanence Risk analysis
Description of measurement methods and procedures to be applied	AFOLU Non permanence Risk Tool v.3.2
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	Buffer calculation

Data / Parameter	VBC_t
Data unit	t CO ₂ -e
Description	Number of Buffer Credits deposited in the VCS Buffer at time <i>t</i>
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	Buffer calculation

Data / Parameter	VCUt
Data unit	t CO ₂ -e
Description	Number of Verified Carbon Units (VCUs) to be made available for trade at time <i>t</i>
Source of data	Methodology VM0015 v1.1. Table 36, Annex VM0015
Description of measurement methods and procedures to be applied	According to the methodology VM0015 v1.1. Table 36, Annex VM0015.
Frequency of monitoring/recording	At each verification period
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	Buffer calculation

3.3.3 Monitoring Plan

The monitoring plan of the REDD+ Project is a combination of three components: climate, community and biodiversity. Friends of the Riverine is one of the proponents and implementing partners of this Project, being responsible for coordinating the monitoring processes during its life cycle. The climate aspects will be monitored directly by the Friends of the Riverine and the social and biodiversity aspects will be monitored by the land owners and partners hired with skills in the subject.

Monitoring Plan for Climate Impacts:

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

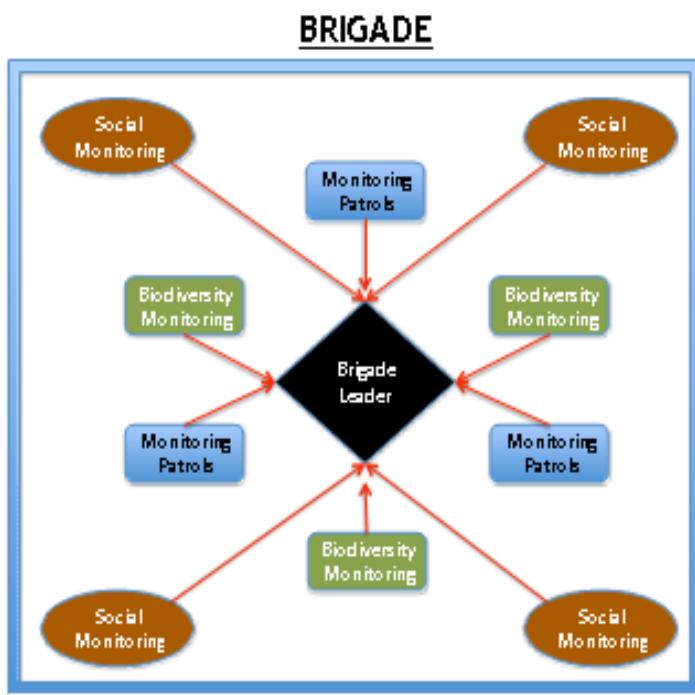
TASK 1. Monitoring changes in carbon stocks and GHG emissions for periodic verification.

1.1 Monitoring actual changes in carbon stocks and GHG emissions in the project area

1.1.1 Monitor the implementation of the project

This task will be the responsibility of Friends of the Riverine. To assure the most effective monitoring of the activities of the Project. Areas will be divided in brigades to better manage the extent of the Project Area and LMA. Brigade leaders will oversee the activities and compile and analyze the results from monitoring patrols (Figure 50). Brigade leaders will report to the Friends of the Riverine office in Portel, which in turn will report to the office in Belem. These two offices will be responsible of informing local authorities about illegal activities happening in the Project Area and to follow up the enforcement of the required measures to remove invaders.

Figure 50: Activities management in the Project



The activities of the Project and their monitoring can be grouped as follows:

1. Forest monitoring:

Monitoring of the forest cover was done mainly by remote sensing imagery. The choice of imagery depended on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e., Landsat), or radar (i.e., Alos Palsar), or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually or by periods depending on the availability of scenes. Therefore, verification event could occur annually or by periods.

The fixed degradation frontier map was updated at each verification event to account for areas that may have changed their carbon stocks due to un-avoided illegal logging activities. The fixed degradation frontier was assessed based on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e., Landsat), or radar (i.e., Alos Palsar), or a combination of both.

Starting in 2016, patrolling activities were scaled-up by hiring local people as forest monitoring patrols. They were responsible for each monitoring patrol who generate monthly reports unless illegal activities are spotted, in which case a report should be submitted immediately as described in the next section.

Of particular importance is the implementation of the surveillance system that allows for continuous monitoring of the Project Area to prevent the entry of squatters and illegal loggers. The objective of forest patrolling is to make evident the presence of the landowner and dissuade pioneer agents (i.e., loggers, squatters) from encroaching in the Project Area. This activity functions as a complement of remote sensing-based monitoring but does not replace it. Furthermore, the generation of carbon credits for avoided emissions do not rely on the results of patrolling,

The Project Area has been divided in patrols, based on river affluents, to facilitate monitoring such a large area. Each Patrol leader compile the information from patrolling reports into adequate digital format, all the information from the reports to keep track of the areas that are being patrolled each week and what are the findings of each patrol. Digital reports were sent to the office in Belem to be organized and stored.

Patrols identify illegal activities (invasions and timber extraction) and report them the patrol leader. If illegal activities are spotted, patrols should geo-reference the finding and make a short description of what was found. Patrols should approach squatters or loggers to let them know –in good terms- that this is private land, they cannot undertake such activities there and they should leave immediately.

With the information supplied by each patrol, patrol leaders fill-up a monitoring report that include at least the coordinates where the illegal activities are taking place, the date and a brief report of what was identified. Finally, each patrol leader submitted this information to the local police in Portel and to IBAMA in Portel and in Belem.

Monitoring reports should be numbered, filed appropriately, and be scanned to have digital copies in an archive as backup.

Once every two months, patrol leaders perform random site visits to verify that monitoring patrols are covering the assigned area and that each patrol is wearing the adequate field equipment. Patrol leaders should fill up a report that was submitted to office in Belem. A monitoring patrol that does not wear adequate field equipment or does not cover the designed monitoring route, will receive a warning. We have had no issues as these are good paying jobs in a very poor region, thus no one will risk job loss.

Maps, reports and records are available to validators at each verification event.

2. Biodiversity monitoring:

Monitoring will follow the guidelines described in section “B3. Biodiversity Impact Monitoring” of the associate CCB PDD.

Biodiversity activities and their indicators will be:

1. Biodiversity protection is directly related with ecosystem health, which is in turn linked to forest cover. Positive impacts on biodiversity will be estimated indirectly through remote analysis of forest cover. Preserving forest cover through avoided deforestation and degradation will allow the implication that net positive impacts on biodiversity are being generated.
2. Biodiversity spotting by local people. Local people participating in the biodiversity component of the project will be in charge of reporting animal spotting at the boundaries of the LMA and the PA. Spotting frequency and animal species identified will indirectly assess net positive impacts on ecosystem health.
3. Active biodiversity monitoring. Local people will be hired to monitor ants, bats and bryophytes. Results are a good indirect indicator of ecosystem health.

All information should be properly reported following the protocols developed by the project after the fieldwork. Reports should provide geo-referenced information about biodiversity spotting and data as determined by the protocols. All data from the reports should be input into electronic format prior to the analysis. Maps, reports and records will be available to validators at each verification event.

3. Social Monitoring:

Will be undertaken by social monitoring squads. There will be a person responsible for each monitoring squad who will generate monthly activities reports. Each squad will be in charge of specific villages and will use approved questionnaires to gather socio-economic data about the impacts of the activities from the Project. Questionnaires will also include a section for comments in order to include information that is not contained in the template.

Monthly reports will be submitted to the brigade leader who will input the information into electronic format to analyze it. The results from this analysis will be used to assess the impact of each activity and to identify villages that require particular attention.

The Project management teams in Protel and Belem will hold bimonthly meetings to assess the effectiveness of the activities in local villages. Based on the information supplied by the brigade leaders, the management teams will improve the proposed activities. Maps, reports and records will be available to validators at each verification event.

1.1.2 Monitoring change and land use within the project area

This task will be the responsibility of the project. According to the categories presented in Table 35 of the VM0015 methodology (Table 51), the Project will implement MRV to identify and assess LULC-changes within the Project Area.

Table 51: Categories that require MRV (refer to Table 35 – VM0015 methodology)

ID	Type	Conditions under which monitoring is mandatory	Explanations	Applicability to the Project
I	Area of forest land converted to non-forest land	Mandatory in all AUD project activities		Applicable
II	Area of forest land undergoing carbon stock decrease	Mandatory only for AUD project activities having planned logging, fuel-wood collection and charcoal production activities above the baseline	Change in carbon stock must be significant according to ex-ante assessment, otherwise monitoring is not required	Does not apply because none of the Project activities involve planned logging, fuel-wood collection and charcoal production
III	Area of forest land undergoing carbon stock increase	Mandatory only for AUD project activities wishing to claim carbon credits for carbon stock increase	Increase must be significant according to ex-ante assessment and can only be accounted on areas that will be deforested in the baseline case	Does not apply because the project will not claim carbon credits from carbon stock increase. Carbon stock is the amount of carbon that has been sequestered from the atmosphere and is now stored within the forest ecosystem, mainly within living biomass and soil, and to a lesser extent also in dead wood and litter. We are not accounting all the carbon pools for claims

Monitoring of forest cover will be done mainly via remote sensing imagery. The choice of imagery will depend on the availability of scenes, cloud cover, and related acquisition and processing costs.

Remote sensing imagery could be either satellite (i.e., Landsat), or radar (i.e., Alos Palsar), or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually or by periods depending on the availability of scenes. Therefore, verification event could occur annually or by periods.

LULC-change analysis will be done for the Reference Region, Project Area and Leakage Belt using the protocol described in detail in the excel sheet submitted to VVB. This imagery classification analysis will result in forest and non-forest classes that should be compared with the results from the deforestation model for the date of a specific verification event. The results from such analysis will be reported using the appropriate VCS tables and formats.

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

None of the cases presented in Section 1.1.3 of the VM0015 methodology apply to the Project (Table 52). So, the Project is not required to set sampling plots to measure carbon stocks in either the project area or leakage belt.

Table 52: Applicability criteria for monitoring non-CO₂ gasses

	ID	Type	Applicability to the Project
Within the Project Area			
Mandatory monitoring of the carbon stocks	I	Areas subject to significant carbon stock decrease in the project scenario according to ex-ante assessment	Does not apply
	II	Areas subject to unplanned and significant carbon stock decrease e.g., due to uncontrolled forest fires and other catastrophic events	Does not apply
	III	Area of forest land undergoing carbon stock increase	Does not apply
	Within Leakage Management Area		
Option monitoring of carbon stocks	IV	Areas subject to planned and significant carbon stock decrease in the project scenario according to ex-ante assessment	Does not apply
	Within the Project Area		
	V	Areas subject to carbon stock increase after planned harvest activities	Does not apply
	VI	Areas recovering after disturbances	Does not apply
	Within Leakage Management Areas		
	VII	Areas subject to carbon stock increase due to leakage prevention measures	Does not apply
	Within Leakage Belt		
	VIII	Areas undergoing significant changes in carbon stock	Does not apply

1.1.4 Monitoring of the impacts of natural disturbances and other catastrophic events

Catastrophic events are not expected in the Project Area or Leakage Belt. Nevertheless, if by any chance a catastrophic event presents during the Project's lifetime, such events will be evaluated and reported if significant. Monitoring will follow VM0015 Tables 20.f, 20.g, 21.f and 21.g to report reductions by catastrophic events.

1.1.5 Total ex-post estimated actual net carbon stock changes and GHG emissions in the project area

All ex-post estimations in the Project Area will be summarized using the format of Table 24 of the VM0015 methodology.

1.2 Monitoring of leakage

The Project is not expected to generate any type of leakage. Even so, as mentioned in item 1.1.2 of this Monitoring Plan, monitoring of the forest cover will be done mainly by remote sensing imagery. The choice of imagery will depend on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e., Landsat), or radar (i.e., Alos Palsar), or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually or by periods depending on the availability of scenes. Therefore, verification event could occur annually or by periods.

Any deforestation above the deforestation baseline found outside the Project's Boundaries will be considered to be leakage as described in the VCS VM0015 methodology.

Carbon stocks in pre- and post-deforestation classes are assumed to remain constant, as there are not significant decreases or increases of carbon stocks in the leakage belt.

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

The activities of the project won't generate GHG emissions. Only possibility of emissions is through forest fires, efficient methods are followed in the project area for the prevention of forest fires.

1.2.2 Monitoring of carbon stock decreases and increases in GHG emissions due to activity shifting leakage

It is not expected for the Project to generate any kind of leakage. Even so, LULC-change will be monitored periodically (annual or multi-annual depending on the frequency of the verification events) using the protocol described in detail in Annex submitted as part of the monitoring activities described in Section 1.1.2 of this monitoring plan.

For the case of the leakage belt, LULC-change analysis will be focused on assessing deforestation above baseline levels. If such deforestation is identified, results will be reported in Tables 29.a, 29.b and 29.c.

If deforestation above the baseline levels occurs in the leakage belt during the project lifetime, the exceeding carbon stock loss will be accounted for, and will be deducted from the non-permanence buffer.

1.2.3 Monitoring of increases in GHG emissions

The parameter values used to estimate emissions will be the same used for estimating forest fires in the baseline (table 18 of VM0015 methodology), except for the initial carbon stocks (Cab, CdW) which shall be those of the initial forest classes burned in the leakage belt area.

The results will be reported using the same table formats (Table 18 and 19 of the VM0015 methodology) used in the ex-ante assessment of baseline GHG emissions from forest fires in the project area.

TASK 2. Revisiting the projected baseline at fixed periods.

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

The project will be responsible for monitoring these variables based on VM0015. The biophysical variables, agents, vectors, and the underlying causes of deforestation, used to project future deforestation from the Reference Region will be reviewed at least every 10 years (fixed baseline period), but they can also be reviewed earlier depending on the requirements of the Project.

2.2 Adjust the component of use and land-use change of the baseline.

The project will be responsible for carrying out this part of the monitoring.

Step 4 of Part 2 of the methodology VM0015 will be repeated to consider at least the following 10-year period in the Reference Region (2018-2028). However, the baseline can be modified to consider earlier 10-year periods. Such changes in the baseline must be approved by the project and will require undergoing a verification process before they can be implemented.

Updating the baseline scenario will take place both in the modeling component of the system dynamics (which defines the amount of change) and the spatial component that defines the distribution of deforestation. Key variables that will be used to recalculate the baseline in the second 10-year period of the project are:

- Socio-economic information retrieved from the Project's monitoring activities
- Distance to new roads
- Average distance to selective logging activities from pioneer roads
- Distance to non-forest
- Planned infrastructure in the region

To collect this information, field visits, surveys and workshops will be held and forest cover dynamics will be assessed using available satellite and/or radar imagery.

2.3 Adjusting the carbon component of the baseline.

According to Section 1.1.3 (Section 1.1.3 of the applied methodology, page no.107) of this monitoring plan, it will not be necessary to adjust the carbon component of the baseline.

3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

It will be through the website of Friends of the Riverine that the monitoring plan, as well as the results obtained, will be available to the public. Statements of relevant and summary information addressed to communities and stakeholders will be transmitted through the REDD Technical Chamber and visits by Foundation technicians to rural communities will take place in the local language.

3.4 Optional Criterion: Climate Change Adaptation Benefits

Does not apply

3.4.1 Regional Climate Change Scenarios (GL1.1)

Does not apply

3.4.2 Climate Change Impacts (GL1.2)

Does not apply

3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

Does not apply

4 COMMUNITY

4.1 Without-Project Community Scenario

4.1.1 Descriptions of Communities at Project Start (CM1.1)

Land use without the project would be different from with the project. From these analyses we can come to the following conclusions about the without project scenario:

The following points were both visualized and discovered in the community meetings with the local Riverine population and traditional rural villagers. These are from discussions that the project has had and are information provided to the project by the Riverine and traditional rural villagers. The Riverine people and traditional rural villagers did not provide evidence to their thoughts, but the following are rational and logical based on what an outsider would expect from the region:

- As listed the people in the project area are Riverine people, or “river people”, they live along the banks of the river and are typically descendants of Europeans that worked as rubber tappers, and when the rubber tapping economy ended, they decided to stay in the forest. They are considered a traditional people in Brazil.
- The communities at the start of the project were more remote, they have no real communication, no internet (it had not yet arrived into this region at this time), the only time they communicated with the outside world is when they travelled to the city, which was very expensive at the time as there is only one government funded boat per week and it still had a fee.
- The environment ten years ago was much more tree cover in the region, as poverty increased the communities have had to increase Cassava production to chase after minuscule profits.
- The social economic situation was still at less than 1 dollar a day, and resulted in each community opening up a few hectares each year, as they believe that the most fertile soil remains right after a fire clearing a few hectares.
- The spiritual situation in the region is that everyone is a devote evangelical, nearly every community has a church and the churches may only have 4 or 5 houses that belong to the church. Most churches are made the same way as their houses, but some communities may have a church that cost more than all the houses combined.
- Of the various households in the LMA, they all have the basic beliefs that: the best way to survive is to grow Cassava, that no one wants to buy the products we produce as we are too remote, that God is supreme, and that trading between the other households is pointless, because if they can grow a product, we can as well.
- A few households have been able to have better conditions, they own a boat and are able to catch fish and sell them in the city.

- Life was definitely better at one time, there are old satellite TV antennas on properties that are probably left over from when Georgia Pacific had a large laminate operation in the region and the entire region had thousands of employees directly and indirectly associated with this business.
- The communities ten years ago were completely sustained on the Brazilian welfare system, but today with the new president welfare has been cut by half, thus making the communities more dependent on the success of the carbon credit project.
- Women are the head of the household, while the men are the head of land ownership. This is still the same, but it is interesting to know that women control the family.
- The local communities are made into two primary groups, male and female, with separate benefits for the males and females.
 - Each household refers to itself as a Villa or Village with a name, but in reality, it is a house, or a collection of houses all from the same family. Thus, for purposes of the project we refer to each household as a household, as it is more logical for outsiders to understand. A village sounds as if it is a collection of houses of various families, but that is not the case here. A household in the LMA is simply a house and other houses for the grown children. Typically, not more than 13 houses in total for the region, but in the case of Ribeirinho REDD+ Project, the houses are usually 1 to 3 houses.
- The community is not treated well by politicians or other groups in the region, they have restrictions on if they are allowed or not allowed to have livestock for personal use.
- The local politicians use and abuse the locals by convincing them to sign up to cutting programs, and then taking all the money for themselves.
- They have been told by local groups not to gain title and even told they are not allowed when clearly the law states differently.
- The illegal loggers make promises bringing them a better life, in exchange for the right to gain access to the land behind their house. They are paid pittances and millions of dollars of wood are basically taken.
- The local population uses an open fire cooking scenario with their pot of rice or beans sitting on two logs with the fire in between.
- Some houses have gas stoves, but they have no money to buy gas.
- There is an increase in agricultural area used to grow mainly cassava. Therefore, there is a projected substantial increase in the forest areas affected by slash and burn and incursion of illegal loggers and illegal activities (invasions) seeking areas to extract timber. It should be remarked that this is the most common perception of the future among households.
- Increase in timber extraction in the core sections of the project areas, with a related diminishment of timber resources nearby the households.
- Decline of fish stocks in rivers and water bodies due to over-fishing by large companies coming from Portel and Breves.

4.1.2 Interactions between Communities and Community Groups (CM1.1)

There are two community groups, male and female. The households make up those community groups. There are no sub-groups, or other groups that live in the land. All the people present are Riverine people and traditional rural villagers.

They are so intertwined with each other that they are all related and are 1st, 2nd, 3rd, or 4th cousins with each other. They are all brothers, or sisters, or sister in laws or brother in laws.

It is rarely an outsider moves to the region and marries into a riverine community and traditional rural villagers, but in the event this happened, they would enter into an area that is more remote.

The interactions between the project and the community group were a well-received interaction, they were very pleased to hear about the project. They are very much desperate for everything or anything they can gain from. In all questionnaires, there is always a 93% to 97% acceptance rate, with normally the 3% to 7% believing that they already have something we are offering.

The project has been helping people gain their land tenure documents. During the interview process 3% of the population thought they already had title for the land they were on but did not. The project has focused to help better explain that they do not have title, but would help them gain title.

4.1.3 High Conservation Values (CM1.2)

High Conservation Value	Caxiuana National Forest
Qualifying Attribute	The Caxiuana National Forest is considered the oldest in the Amazon region and the second oldest in Brazil. It is amongst the most known conservation units in the north of Brazil, and it has the presence of many important researchers from Brazil and abroad

Focal Area	On the northern border of the reference region there is a national conservation unit called National Forest Caxiuanã. It was created in 1961 and today it has an area of 322,694.34 hectares. The Conservation Units are types of conservation areas that were created to allow sustainable use of the forest and its natural resources
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4.1.4 Without-Project Scenario: Community (CM1.3)

1. Historical Area Characteristics, Context and Dynamics.

The project is located in a fast-changing region characterized by forests rich in valuable timber species, illegal logging, unclear land tenure laws, widespread land speculation, overall weak law enforcement and severe poverty. With these variables combined the results are no less than deforestation and destruction.

Pioneer agents open the path for deforestation agents who cut clear the forest as a measure of providing land ownership and implementing low-cost and practically self-sustained productive activities.

The predominant final land-use in the area is deforestation by cattle ranchers to implement pastures, which occurs simultaneously in two deforestation fronts.

The first is known as the “consolidated frontier”, which is the area close to primary roads (federal and state highways) and already occupied mainly by cattle ranching. This frontier continues to expand due to the creation and expansion of secondary and tertiary roads that allow deforestation agents to deforest by using slash and burn.

The second front, known as the “pioneer frontier”, refers to forested areas with low deforestation but with high degradation located far from primary roads, but easily accessible through navigable rivers. These areas are considered to be of “free access” whenever the presence of the legal landowner is not made.

The most likely land use scenario without the project has the following features, the same that have been projected by local households. From these analyses we can come to the following conclusions about the without project scenario:

- Drastic increase in people who would be settled in the project area within 5 years. The project has helped demarcate the Riverine and traditional rural village plots and this has given each family 100 hectares, this also has prevented settlers from taking this land. Either the project did this for the Riverine people and traditional rural villagers or a land grabber would do it for themselves. The land grabber would have one goal and that is to deforest the land, while the riverine would preserve 95% of the area.
 - Two evidences represent why the project would be completely invaded within 3 years if the project was to seize its security and land tenure operations: Megatown Trading Ltda. a Brazilian company owned by a person from São Paulo had 76,230 hectares in Portel, Pará, just north of the thousands of farms in Pacaja, Pará. They removed their security in 2010 and

within 2 years the land was completely claimed by new farmers and now the lands are being completely dismantled.

- A second case is a group named: Agropecuaria e Industrial Rio Tuere Ltda. This is owned by a Japanese group and they have 69,696 hectares in Portel, Para, slightly south of the project area between Anapu, Para and Pacaja, Para. In 2010 they removed their security and lost all their land to invasion in 3 years. Now the land of these two entities is lost to the title holders and over 500 land claims have been made on these properties. The properties are severely dismantled in the last 9 years and thus these are the predecessor examples to Ribeirinho REDD+ Project project. The evidence is an evidence of two example landowners that were decimated in the direct vicinity and neighbour to Anapu-Pacaja. This is the only region in Brazil that faces such aggressive land grabbing.
- Local population with no plans or hopes for other economic factors such as black pepper or honey production. Black Pepper is an expensive investment at over 15,000 dollars per hectare. There is no financing at the bank for this type of project, thus without Ribeirinho REDD+ Project this would never even been considered – so without the project this is not happening.
- The local Riverine population and traditional rural villager would not have access to markets for their projects as well. The project is building up a supply chain – that is in the discussion and planning stages – that has the goal to help bring the products to the market at market prices.
- The local Riverine population would not have cook stoves and thus would be cutting more wood to make the large open fire cooking scenario, causing there to be more forest degradation. As seen in the site visits the situation with their previous cook stoves was inhumane. The project brought 50 cook stoves in the PA and the LMA and is bringing 300 more cook stoves to the area outside the project area to the LMA and the Reference Region.
- Increase in agricultural areas use to grow mainly cassava. Thereby, it is projected substantial increase in the forest areas affected by slash and burn.
- Incursion of illegal loggers and illegal activities (invasions) seeking areas to extract timber. It should be remarked that this is the most common perception in each household.
- Increase in timber extraction in the core sections of the project areas, with a related diminishment of timber resources nearby the household.
- Decline of fish stocks in rivers and water bodies due to over-fishing by large companies coming from Portel and Breves.

According to the land use scenarios projected by local households, we summarized the Information in five possible outcomes:

- Cassava farming is incentivized thus occupying more and larger areas.
- The increment of Cassava plots pushes the agricultural frontier towards forest covered areas thus generating deforestation.
- Forested areas area degraded due to the dynamics of illegal logging activities.
- Fauna is even harder to find thus reducing the food options for local households.
- Degraded forest due to selective logging is sold to ranchers that implement pastures.

4.2 Net Positive Community Impacts

4.2.1 Expected Community Impacts (CM2.1)

Community Group	Riverine Community <ul style="list-style-type: none"> • Vila Do Boga • Monte Horebe • Laguinho Vila • Vila Aru • Jerusalem • Nossa Senhora do Perpetuo Socorro • Meniono Deus • Sao Joao Batista • Rio Pacaja • Ponte da Boia • Sao Jose • Vale da Bencao • Paraíso • Nossa Senhora de Nazare • Deus Provera • Parada • Bevenatu • Santo Antonio
Impact(s)	<ul style="list-style-type: none"> • Improved skills to have up-ward mobility due to land tenure documents. • Ability to sell the land they own, and have lateral mobility. • Capacity building of local people participating in the monitoring activities of the project. • Improved livelihood via more stability and stability to invest back into the land they now have tenure documents for. • Communities are trained to biodiversity monitor and report back any unique events.
Type of Benefit/Cost/Risk	<ul style="list-style-type: none"> • Actual benefit is upward mobility and wealth. Prior to the project each family owned nothing, now they have land, that is worth over 100,000 reais, which would place them into the rural middle class. • Capacity building related to the monitoring and management of the forest and biodiversity. • Very little cost, as the monitoring is done via cell phone camera when there is a unique event, such as a large carnivore enters the vicinity of the households. • Job opportunities.
Change in Well-being	<ul style="list-style-type: none"> • Improved livelihood – more aware of the fauna and flora.

Community Group	Riverine Community
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	<ul style="list-style-type: none"> • Vila Do Boga • Monte Horebe • Laguinho Vila • Vila Aru • Jerusalem • Nossa Senhora do Perpetuo Socorro • Meniono Deus • Sao Joao Batista • Rio Pacaja • Ponte da Boia • Sao Jose • Vale da Bencao • Paraíso • Nossa Senhora de Nazare • Deus Provera • Parada • Bevenatu • Santo Antonio
Impact(s)	<ul style="list-style-type: none"> • Better governance. • Trained to be the point person for the project to improve their level of organization, management and democratic governability. • An association was set up to help the governability it is called <i>Associacao de Ribeirinhos e Moradores de Portel, Para Ltda.</i> which was set up by the landowners to facility the social activities of the carbon credit project.
Type of Benefit/Cost/Risk	<ul style="list-style-type: none"> • Actual benefit is that the project will have a point of contact that is representative of the project in each section of the project area. • overall satisfaction of community feel they are actually represented.
Change in Well-being	<ul style="list-style-type: none"> • Better governance.

Community Group	Riverine Community <ul style="list-style-type: none"> • Vila Do Boga • Monte Horebe • Laguinho Vila • Vila Aru • Jerusalem • Nossa Senhora do Perpetuo Socorro • Meniono Deus • Sao Joao Batista • Rio Pacaja • Ponte da Boia • Sao Jose • Vale da Bencao • Paraíso • Nossa Senhora de Nazare • Deus Provera • Parada • Bevenatu • Santo Antonio
Impact(s)	<ul style="list-style-type: none"> • People trained in agroforestry techniques. • 5 Number of implemented agroforestry pilot projects. • Capacity building for Improved agricultural practices.
Type of Benefit/Cost/Risk	<ul style="list-style-type: none"> • Predicted benefit is that the riverine and traditional rural villagers will be able to sell their agroforestry production for a higher price than Casava, this will help improve livelihood. • Overall satisfaction and food security of community.
Change in Well-being	<ul style="list-style-type: none"> • Improvement in overall understanding that Casava, just because it is comfortable, is not the only option. • Understanding that other crops work in the region as well brings diversification.

Community Group	Riverine Community and traditional rural villagers <ul style="list-style-type: none"> • Vila Do Boga • Monte Horebe • Laguinho Vila • Vila Aru • Jerusalem • Nossa Senhora do Perpetuo Socorro • Meniono Deus • Sao Joao Batista
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	<ul style="list-style-type: none"> • Rio Pacaja • Ponte da Boia • Sao Jose • Vale da Bencao • Paraizo • Nossa Senhora de Nazare • Deus Provera • Parada • Bevenatu • Santo Antonio
Impact(s)	<ul style="list-style-type: none"> • 50 received land tenure document known as CAR. • Providing land ownership legal rights.
Type of Benefit/Cost/Risk	<ul style="list-style-type: none"> • The land title undermines the illegal loggers. • The land title brings stability to the local community. • It prevents land invasion by land invaders.
Change in Well-being	<ul style="list-style-type: none"> • Improvement in overall satisfaction and security of community.

Community Group	Women of the Riverine community and traditional rural villagers.
Impact	<ul style="list-style-type: none"> • 50 women were trained on the efficient cook stoves. • 50 cook stoves have been provided to the riverine people. • Improvement in health especially women and children. • Improvement in safety as the current cooking conditions were prone to house fires.
Type of Benefit/Cost/Risk	<ul style="list-style-type: none"> • Actual benefit is a better situation, easier cooking situation, time savings, better for environment as wood is not used. • Overall satisfaction and health of community.
Change in Well-being	<ul style="list-style-type: none"> • Improvement in overall satisfaction and health of community.

Community Group	<p>Riverine Community and traditional rural villagers</p> <ul style="list-style-type: none"> • Vila Do Boga • Monte Horebe • Laguinho Vila
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	<ul style="list-style-type: none"> • Vila Aru • Jerusalem • Nossa Senhora do Perpetuo Socorro • Meniono Deus • Sao Joao Batista • Rio Pacaja • Ponte da Boia • Sao Jose • Vale da Bencao • Paraiso • Nossa Senhora de Nazare • Deus Provera • Parada • Bevenatu • Santo Antonio
Impact(s)	<ul style="list-style-type: none"> • Improved skills to have up-ward mobility due to education training. • Ability to read and write. • incapacity building of local people participating in the monitoring activities of the project. • Improved livelihood via more stability and stability to join the public discussions and take independent decisions. • Communities are educated and trained to biodiversity monitor and report back any unique events. • Total of 43 people were given education, out of which 22 are females.
Type of Benefit/Cost/Risk	<ul style="list-style-type: none"> • Actual benefit is upward mobility and knowledge. Prior to the project each family had a greater number of illiterates. Now they have the ability to read and write • Capacity building related to the monitoring and management of the forest and biodiversity. • Very little cost, as the monitoring is done via cell phone camera when there is a unique event, such as a large carnivore enters the vicinity of the households. • Job opportunities.
Change in Well-being	<ul style="list-style-type: none"> • Improved livelihood and knowledge – more aware of their surrounding environment.

4.2.2 Negative Community Impact Mitigation (CM2.2)

There are no negative community impacts and hence there is no need for mitigation.

4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

The REDD+ Project proposes a socioeconomic development process for the communities involved in the Project, focusing in particular on social strengthening, through the consolidation of local social organizations and the provision of a differentiated Activities of Technical Assistance and Rural Extension (ATER) with a focus on diversification, increase and production commercialization, associated to activities with social and environmental focus, this includes numerous different programs and associations set up to organize the population such as the association of woman. To this end, training and direct training for producers will be carried out through participatory strategies with the joint construction of knowledge and the most appropriate techniques for the communities, maximizing the results to be obtained and continuously involving producers in management.

In the scenario without Project, as described in item 4.1.4 Scenario without Project: Community, the lack of public policies and the context of low income cause the communities of the Project Area to seek more favorable alternatives to increase income from increasing land use in an unplanned way. Another problem in the current scenario is inefficient and unprofitable agriculture and difficulties in market access that result in difficulties for the well-being of people living in these communities.

Net Positive community impacts are expected to be:

- A point of contact in each household for the project to be able to liaison to allow better communication for the project. Better reporting of events.
- Governance and an association were set up to help coordinate the giving and coordinate better interactions in the community. A better collective group to defend off illegal loggers and drivers of deforestation (land grabbers).
- Cook stoves to replace what appeared to be open fires, making cooking more efficient and easier.
- Land tenure inside the community group for each family.

Land title brings stability to the population, land title prevents displacements, brings security, and helps incentivize the population to reinvest into the land. It also defines the riverine location and where they can do their traditional crops, without entering into the project area.

In addition to the positive impacts, the Project, working on aspects of associative strengthening, improvement of family agriculture, provision of technical assistance and improvement in energy and communication systems, is intended to influence social issues and the living conditions of communities around the Project Area, in order to reduce social vulnerability and rural exodus, providing families with an improvement in the quality of life and income stability allowing families to obtain goods and services that promote economic and social well-being. Riverine community and the traditional village community groups identified under the stakeholder will have similar benefits.

4.2.4 High Conservation Values Protected (CM2.4)

The HCVs related to community well-being are not negatively affected by the project; on the contrary, only positive impacts are expected.

4.3 Other Stakeholder Impacts

4.3.1 Impacts on Other Stakeholders (CM3.1)

The Project is designed to generate only positive impacts to the stakeholders living in the LMA and it won't generate impacts to those living outside the 3km buffer identified during the PRA. No other stakeholders have been identified to use or depend from the resources in the Project's Area or LMA.

4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

As mentioned in the previous item, there are not expected negative offsite impacts thus no mitigation strategies are required.

4.3.3 Net Impacts on Other Stakeholders (CM3.3)

As shown in 4.3.1 and 4.3.2, the project is anticipated to generate positive impacts on the other stakeholders and no negative impacts, hence leaving a net positive impact overall.

4.4 Community Impact Monitoring

4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

The project proponents have designed a Social Impacts Monitoring Plan in accordance to the results obtained in the rural participatory diagnosis developed in the project area, initially considering the indicators for the products of the proposed activities based on the identification of the necessities indicated by the population and the strategies foreseen to accomplish the project goals.

The following Table (Table 53) shows a non-comprehensive list of activities and indicators that were considered during monitoring. A full and detailed list was presented in the monitoring plan that was developed and submitted within the first six months after validation.

Table 53: Some activities and indicators of the social monitoring during this monitoring period.

Activity	Product Indicator
1. Capacity building related to the monitoring and management of the forest and biodiversity. Opportunities to work as control/supervision staff.	<ul style="list-style-type: none"> The project has a highly qualified Bio-diversity Expert full time. 50 heads of households have been trained on monitoring. They were taught to identify fauna that entered the vicinity to their home. The Bio-diviesity and Technicians completing survey work in the project area and staying in the forest for long period of time are able to monitor biodiversity. Over the period 2017 thru 2021 the project was focusing on the goal of making sure the population had their land rights in able to do a project, focusing on a huge rush to complete this task.
2. Improving organizational Capacities of each community.	<ul style="list-style-type: none"> An informal Association of Womans is in place working with the village elders in order to help organize the project. 5 people one in each section of the project were trained on better organizational capacity. Number of local associations/organizations strengthened by the project activities such as The Sindicato of Rural Producers The project is using a local Radio Station to relay project messages and informing the local project proponents of events taking place.

3. Providing land ownership legal rights versus conservation results	<ul style="list-style-type: none"> • 1,252 families living inside the Project Area. • From 2017 to present all 1252 families agreed to complete the project and each have signed forms, of which have been provided to VERRA and VVB. • All 1252 families confirmed they want to participate and gain the project benefits.
4. Providing assistance to obtain land use rights over the forest owned by the private property landowners	<ul style="list-style-type: none"> • 1,252 familes living in the project area have gained their land rights and are duly registered with SEMA showing the right of possession .
5. Providing assistance and training in agroforestry Techniques and implementing pilot cases.	<ul style="list-style-type: none"> • Around 300 people have been given lessons and training in alternative crops of agroforestry such as Acai an honeybee production.
6. Capacity building related to efficient and improved cooking stoves and implementation of pilot demonstrative cases	<ul style="list-style-type: none"> • 300 water filters • 43 water wells • 300 cookstoves (to all the people that wanted cookstoves gained)
7. Capacity building on the development of small communitarian enterprises.	<ul style="list-style-type: none"> • 50 people trained for a fisheries project.

A Participatory Census was carried out previously to the design of the definite Monitoring Plan in the Project area. The collected information about the unsatisfied basic needs, health, education, family economy, communal organization, etc., produced the project baseline and also represented the social indicators to be monitored throughout the project's execution.

Likewise, in order to develop the social-environmental indicators for the results, several communitarian workshops took place as a fundamental part of the Social Communitarian Monitoring System which facilitate the follow-up and evaluation of the benefits of the project to improve the quality of life of the communities.

This system will eventually have communitarian monitors that continuously carry out the follow up activities evaluating the commitments, project activities and communities every 3 to 6 months. Also, the Communitarian Impacts Monitoring Plan will carry out an exhaustive annual assessment of the indicators. Until the communication monitors are in place and competent, the project has been sending technicians to the land on long term assignments to make sure the project is being properly conducted.

The Social Impacts Monitoring Plan aims at creating an association and mutual responsibility sense between the project and local communities in the management of social environmental impacts, as well as improving the perception of the social responsibility adopted by the project. The project is committed to develop a complete Social Impacts Monitoring Plan with the characteristics here mentioned in the first year from validation.

4.4.2 Monitoring Plan Dissemination (CM4.3)

All the documents/results are published in the project website and communicated in Portuguese in a simple language to the council of stakeholders for their awareness and free participation.

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community, in which the feedback on the benefits provided was communicated, periodically. Further during this period, the benefits were mainly related to skill and capacity development.

The plan was provided for local access via the project webpage.

In addition to this the technicians who travel to the land are required to carry all the most up-to-date documents and go through them with the communities at their request.

The head of each household were shown a hard copy of the results and a discussion took place to make sure that this person understood it.

4.5 Optional Criterion: Exceptional Community Benefits

The project does not seek to be validated to the Gold Level for exceptional community benefits

4.5.1 Exceptional Community Criteria (GL2.1)

Not Applicable

4.5.2 Short-term and Long-term Community Benefits (GL2.2)

Not Applicable

4.5.3 Community Participation Risks (GL2.3)

Not Applicable

4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

Not Applicable

4.5.5 Net Impacts on Women (GL2.5)

Not Applicable

4.5.6 Benefit Sharing Mechanisms (GL2.6)

Not Applicable

4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

Not Applicable

4.5.8 Governance and Implementation Structures (GL2.8)

Not Applicable

4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

Not Applicable

5 BIODIVERSITY

5.1 Without-Project Biodiversity Scenario

5.1.1 Existing Conditions (B1.1)

The Eastern Amazon, where the project is inserted, is an area that holds the biggest concentration of the timber industries (74% of timber production in Pará comes from the Eastern Amazon). The logging industry is responsible not only for feeding illegal logging schemes, but also cleaning the forest to build roads. Specifically, these roads built by the loggers are determining a new pattern of occupation inside public lands (IBGE 2007). Non-authorized logging is more concentrated in the extreme east of Pará, but it is moving towards the Xingu-Tocantins interfluvium (Veríssimo et al. 2011).

Animals of Interest to the project are the fact that in Portel there are only two rivers that still house Manatees, the riverine population have been killing the Manatees for meat and they are one year away of full extinction in all of the region of Portel, Breves, Bagre, Melgaco. The project is working to resolve this.

As part of the “without project” scenario, it is likely that the deforestation drivers continue to push forward, and human occupation follows this movement. The Eastern Amazon is the most populated region of the Brazilian Amazon and anthropogenic actions, such as forest cleaning, are one of the many aspects affecting local biodiversity, especially mammalian diversity rates (Lopes & Ferrari 2000).

It is likely that “without the project” a minimum of a 100% of the land claims would occur on all aspects of the land within 2 to 5 years, with massive small plots opened up to make claims within this period of time as well, and 50% deforestation within 15 to 20 years. (As seen with the cases of both Agropecuaria e Industrial Rio Tuere Ltda. and the company Megatown Trading Ltda. – when they removed their security, they had complete invasion in 2 years).

Highway paving is not only intrinsically connected with anthropogenic actions but also with either the expansion of the soybean industry or cattle raising activities. These commodities have experienced a considerable growth in 2005 and the constant market demands indicate that this growth tends to continue (Nepstad et al. 2006). Under the “without the project” scenario it can be inferred that this area might be affected by this expansion, causing biodiversity losses and soil degradation.

Regarding the species threatened with extinction, eleven of them are listed in threatened species provided by bodies such as IBAMA and IUCN, being: six species present in the IBAMA list and eight species in the IUCN list. Table 54 lists the endangered flora species according to the IUCN Red List of Threatened Species.

Picture 24: Picture of Carlos Soares petting a juvenile Sloth



Table 54: Flora species threatened according to the IUCN Red List of Threatened Species

IUCN Threat Category	Scientific Name
Critically Endangered (CR)	<i>Vouacpoua americana</i> Aubl.
Endangered (EN)	<i>Maniara elata</i> (F.Allemao ex Miq.) Monach
	<i>Pouteria amapaenses</i> Pires & T.D.Penn.
	<i>Virola surinamensis</i> (Rol.) Warb
Vulnerable (VU)	<i>Bertholletia excelsa</i> H. & B.
	<i>Joannesia princeps</i> Vell.
	<i>Pouteria krukovii</i> (A.C.Sm.) Baehni
	<i>Pouteria oppositifolia</i> (Ducke) Baehni

Table 55: Inventory of Flora documented in the project area: 274 different species.

<i>Common name</i>	<i>Scientific name</i>	
Abiu / Guajara caramurim	<i>Pouteria oposita</i> (Ducke) T.D.Penn.	1
Abiu amarelo	<i>Pouteria decorticans</i> Penn	1
Abiu arrepiado/ Abiu casca fiana/ Abiu nambuquiça	<i>Pouteria decorticans</i> Penn	1
Abiu casca grossa	<i>Planchonella pachycarpa</i>	1
Abiu goiaba / Abiu Goiabinha	<i>Pouteria decorticans</i> Penn	1
Abiu vermelho	<i>Pouteria torta</i> (mart) Radlk subsp. <i>Glabra</i> Penn	1
Abiurana / Abiurana Vermelha	<i>Franchetella amibifolia</i>	1
Abiurana Branca	<i>Pouteria reticulata</i> (Engl.) Eyma subsp. <i>reticulata</i>	1
Abiurana Preta	<i>Pouteria krukovii</i>	1
Acapu	<i>Vouacapoua americana</i>	1
Acapurana	<i>Campsiandra laurifolia</i> bBenth.	1
Acariquara	<i>Minquartia guianensis</i>	1
Acariquarana/ Araruta	<i>Rinorea paniculata</i> (Mart.) Kuntze	1
Achua/ Axixá/ Capoteiro	<i>Sterculia speciosa</i> K. Schum.	1
Amapa / Amapa doce	<i>Brosimum potabile</i>	1
Amapa amargoso	<i>Parahancornia fasciculata</i> (Poir.) Benoist	1
Amaparana	<i>Batocarpus amazonicus</i> (Ducke)	1
Amarelao / Garapeira	<i>Apuleia leiocarpa</i>	1
Ananim	<i>Simpsonia globulifera</i> L.	1
Andiroba	<i>Carapa guianensis</i>	1
Angelim	<i>Copaifera multijuga</i> Hayne	1
Angelim amargoso	<i>Vatairea sericea</i> Ducke	1
Angelim pedra	<i>Hymenolobium excelsum</i> Ducke	1
Angelim Rajado	<i>Zygia racemosa</i> (Ducke) Barneby & J.W.Grimes	1
Angelim vermelho	<i>Dinia excelsa</i>	1
Anuera	<i>Anaueria brasiliensis</i> Kosterm	1

Arapari	<i>Macrolobium multijugum</i> (DC.) Benth. var. <i>multijugum</i>	1
Araracanga	<i>Aspidosperma araracanga</i> Marc.-Ferr	1
Arataciu	<i>Anomalocalyx uleanus</i> (Pax & K.Hoffm.) Ducke	1
Bacuri	<i>Platonia insignis</i> Mart.	1
Bacuri pari	<i>Rheedia macrophylla</i> (Mart) Planch. & Triana	1
Barbatimão	<i>Stryphnodendron pulcherrimum</i> (Willd.) Hochr.	1
Breu amescla / Amesclao	<i>Trattinnickia mensalis</i> Daly	1
Breu barrote	<i>Tetragastris panamensis</i>	1
Breu branco	<i>Protium palidum</i> Cuatrec.	1
Breu sucuruba	<i>Trattinnickia rhoifolia</i>	1
Breu vermelho	<i>Tetragastris altissima</i> (Aubl.) Swart	1
Buiuçu / Olho de boi	<i>Ormosia coutinhoi</i> Ducke.	1
Burra Leiteira / Sorva	<i>Sapium marginatum</i> M. Arg	1
Cacauba	<i>Theobroma</i> sp.	1
Cacaui	<i>Theobroma sylvestre</i> Mart.	1
Caferana	<i>Pera eitenorum</i> Bigio & Secco	1
Cajuaçu / Cajui	<i>Anacardium giganteum</i> W.Hancock ex Engl	1
Canela de jacamim	<i>Rinorea riana</i>	1
Canela de Velho / Muuba vermelha	<i>Miconia</i> sp. Embrapa	1
Caniceira	<i>Pseudoxandra cuspidata</i> Maas	1
Carapanaua	<i>Aspidosperma carapanauba</i> Pichon	1
Caripe	<i>Licania octandra</i> (Hoffmanns. Ex. Roem & Schult.) Kuntze	1
Cariperana	<i>Licania apetala</i> (E.Mex.) Fritsch	1
Cariperana	<i>Licania apetala</i> (E.Mex.) Fritsch	1
Casca seca	<i>Sagotia brachysepala</i> (Müll.Arg.) Secco	1
Castanha do Para / Castanheira	<i>Bertholletia excelsa</i> Bonpl	1
Catuaba / Limorana	<i>Secondaria floribunda</i> A.DC	1
Cedro vermelho	<i>Cedrela odorata</i> L	1
Cedrorana	<i>Cedrelinga cateniformis</i> (Ducke) Ducke	1
Ceru	<i>Allantoma lineata</i> (Mart. & O.	1
Cipo	<i>Arauja sericifera</i> Brot	1
	NI	1
Cipo apui / Atraca	<i>Martinella obovata</i> (Kunth) Bureau & K.Schum.	1
Cipo cebola Braba / Cebolao	<i>Clusia grandiflora</i> Spligz.	1
Cipo cravo	<i>Tynanthus elegans</i> Miers	1
Cipo de fogo	<i>Doliocarpus dentatus</i>	1
Cipo escada de jabuti	<i>Bauhinia guianensis</i> Aubl.	1
Cipo Macaco	<i>Combretum fruticosum</i> (Loefl.) Stuntz	1
Cipo mereteteca	NI	1

Cipo unha de gato	NI	1
Cipo vermelho	<i>Combretum mellifluum</i> Eichler	1
Coco pau	<i>Couepia robusta</i>	1
Copaiba	<i>Copaifera duckei</i> Dwyer	1
	<i>Copaifera multijuga</i> Hayne,	1
Coração de Negro	<i>Swartzia</i>	1
Cumaru / Cumaru amarelo	<i>Dipteryx odorata</i> (Aubl.) Willd.	1
Cumaru preto	<i>Dipteryx</i> sp.	1
Cumaru vermelho	<i>Dipteryx</i> sp.	1
Cumarui	<i>Dipteryx</i> sp.	1
Cupiuba	<i>Gouania glabra</i> Aubl	1
Cupu	<i>Theobroma subicanum</i> Mart.	1
Curupixa	<i>Micropholis acutangula</i> (Ducke)	1
Embauba / Embauba branca	<i>Cecropiapalmata</i>	1
Embauba vermelha	<i>Cecropia glaziovii</i> Snelth	1
Embaubão / Embaubarana / Torém.	<i>Cecropia sciadophylla</i> Mart	1
Envira	<i>Annona</i> sp.	1
Envira amarela	<i>Duguetia echinophora</i> R.E.Fr	1
Envira branca	<i>Duguetia quitarensis</i> Benth	1
Envira preta / conduru	<i>Annona exsucca</i> DC	1
Envira quiabo	NI	1
Envira taia	<i>Annona ambotay</i> Aubl.	1
Envirão	<i>Onychopetalum amazonicum</i>	1
Escorega macaco	<i>Peltogyne panicula</i>	1
Fava amarela	<i>Vatarea guianensis</i> Aubl.	1
Fava amargosa / Impingenta	<i>Vatareopsis speciosa</i> Ducke	1
Fava atana	<i>Parkia gigantocarpa</i> Ducke	1
Fava bolacha	<i>Vatarea guianensis</i> Aubl	1
Fava Bolota / Visgueiro	<i>Parkia pendula</i> (Willd.) Walp.	1
Fava Branca	<i>Parkia paraensis</i> Ducke	1
Fava carocinho	NI	1
Fava core	<i>Parkia oppositifolia</i>	1
Fava japu	NI	1
Fava orelha de macaco	<i>Enterolobium schomburgkii</i> Benth.	1
Fava paramaça	NI	1
Fava paricá/paricá	<i>Schizolobiun Amazonico</i>	1
Fava tamanquare	NI	1
Fava tamboril	<i>Enterolobium maximum</i> Ducke	1
Fava timborana	<i>Pseudopiptadenia suaveolans</i>	1
Faveira Branca	<i>Parkia multijuga</i> Benth.	1
Freijo branco	<i>Cordia bicolor</i> A.DC.	1

Freijo cinza/ Freijo	Cordia Goeldiana	1
Goiaba da Mata / Goiabinha / Goiaba de anta / Muuba	Bellucia grossularioides (L.) Triana	1
Goiabão	Pouteria pachycarpa	1
Guajara	Chrysophyllum sp.	1
Guajara Bolacha	Syzygiopsis oppositifolia Ducke	1
Guajara cinza	Chrysophyllum sp.	1
Guajara de leite / Branco	Pouteria amelaniiifolia (Sandwith)	1
Guajara pedra	Neoxythecia elegans (A.DC.) Aubret	1
Guajara preto	NI	1
Guariuba / Oiticica	Clarisia racemosa Ruiz & Pav.	1
Inga	Inga alba (Sw.) Willd	1
Inga	Inga alba (Sw.) Willd	1
Inga branco	Inga capitata Desv	1
Inga peludo	Inga gracilis Ducke.	1
Inga vermelho	Inga edulis	1
Inga Xixica	Inga calantha Ducke	1
Ingaraná	Inga sellowiana Benth	1
Inháre	Abarema jupumba (Willd.) Britton & Killip var. Jupumba.	1
Ioizeiro	Brosimum guianensis	1
Ipe	Xylopia nitida Dunal	1
Ipe	Tabebuia sp.	1
Ipê Amarelo	Tabebuia serratifolia (Vahl) Nicols,	1
Ipeuba / ipé vermelho	Macrolobium bifolium (Aubl) Pers.	1
Itaúba / Itaúba amarela	Mezilaurus itaúba (Meissn.) Taubert ex Mez.	1
Itaúba Branca	Mezilaurus sp.	1
Itaúbarana	Guarea cinnamomea Harms	1
Jacareuba	Mezilaurus sp.	1
Jarana	Calophyllum brasiliense Cambess	1
Jarana branca	Lecythis lurida (Miers) S.A.Mori	1
Jarana vermelha	Lecythis sp.	1
Jatoba	Lecythis sp.	1
João mole	Hymenaea courbaril L.	1
Jutai	Neea floribunda	1
Jutai miri / Pororoca	Hymenaea Parviflora Huber.	1
Lacre / Lacre vermelho	Hymenaea sp.	1
Louro	Visnia latifolia	1
Louro abacate	Ocotea sp.	1
	Aniba williamsii O. C. Schmidt	1

Louro canela	Ocotea fragrantissima Ducke	1
Louro cuminho	Ocotea longifolia H.B.K.	1
Louro faia	Euplassa pinnata (Lam.) I.M. Johnst.	1
Louro jandauba	Aiouea sp	1
Louro pimento	Mezilaurus synandra (Mez) Kosterm	1
Louro preto	Ocotea sp.	1
Louro Rosa	Aniba terminalis Ducke.	1
Louro tamanquare / Tanaquare	Caraipa grandifolia Mart.	1
Louro Vermelho	Nectandra rubra	1
Macacuba	Platymiscium trinitatis Benth	1
Maçaranduba	Manilkara huberi	1
Macucu/ Macucu de sangue	Couepia elata Ducke	1
Mamorana / Manguirana	Eriotheca globosa (Aubl.) A.Robyns	1
Mamorana vermelha	Eriotheca sp.	1
Mamui	Jacaratia sp.	1
Mandioqueira / Mandioqueiro liso	Pouteria decorticans Penn	1
Manexico	Qualea paraensis Ducke.	1
Maparajuba	NI	1
Marapuama	Manilkara Bidentada (A.DC) A.Chev.	1
Maria Preta	Ptychopetalum olacoides Benth.	1
Marupa	Terminalia glabrescens Mart	1
Maruparana	Simarouba amara Aubl.	1
Matamata branco	Zanthoxylum huberi P.G.Waterman	1
Matamata preto	Eschweilera grandiflora (Aubl.) Sandwith	1
Matamata vermelho / Jibóia	Eschweilera blanchetiana	1
Melancieira	Eschweilera coriacea (DC.) S.A Mori	1
Meraquati	Eschweilera sp.	1
Merauba	Alexa grandiflora	1
Miri / Umiri	NI	1
Molongo	Mouriri callocarpa Ducke	1
Morototo	Humiria balsamifera (Aubl.) St. Hill	1
Morta	Molongum laxum (Benth.) Pichon	1
Muiracatiara	Schefflera morototoni	1
Muirapinima	NI	1
Muiratinga	Astronium lecointei Ducke	1
Mundurucu	NI	1
Murtinha / Murta	Naucleopsis glabra Spruce ex Pittier	1
Muruci/ Murici da mata	NI	1
Murupita	Pouteria cuspidata (A. DC.) Baehni	1
	Byrsomima crassifolia	1
	Sapium hippomane	1

Quaruba	<i>Vochysia maxima</i> Ducke	1
Quaruba cedro	<i>Vochysia vismiifolia</i> Spruce ex. Warm	1
Quaruba goiaba	<i>Erisma uncinatum</i> Warm	1
Quarubarana	<i>Erisma uncinatum</i> Warm	1
Quarubatinga	<i>Vochysia guianensis</i> Aubl	1
Quinarana	<i>Geissospermum sericeum</i> Benth. & Hook. f. ex Miers	1
Rajadinho	NI	1
Sapucaia	<i>Lecythis ollaria</i>	1
Seringa Preta	<i>Hevea</i> sp.	1
Seringarana / Seringa vermelha	<i>Hevea guianensis</i> Aubl	1
Seringueira / Seringa branca / Seringa amarela	<i>Hevea brasiliensis</i> (Willd. ex A.Juss.) Müll.Arg	1
Sororoca erva	<i>Stromanthus stromanthoides</i> (J.F.Macbr.) L.Andersson	1
Sucupira	<i>Bowdichia nitida</i>	1
Sucupira amarela	<i>Sweetia fruticosa</i> Spreng	1
Sucupira babona / Pele de sapo / Sucupira tonto	<i>Diplotropis purpurea</i> (Rich.) Amshoff	1
Sucupira Branca	<i>Ormosia</i> sp.	1
Sucupira preta	<i>Diplotropis peruviana</i> J.F.Macbr	1
Sucuuba	<i>Himatanthus articulatus</i> (Vahl) Woodson	1
Sumauma	<i>Eriotheca longitubulosa</i> A.Robyns	1
Tachi branco	<i>Macrosamanea pubiramea</i> (Steud.) Barneby & J.W.Grimes	1
Tachi preto	<i>Tachigalia paniculata</i>	1
Tachi vermelho	<i>Tachigali myrmecophila</i> (Ducke) Ducke	1
Tamanqueira	<i>Stryphnodendron pulcherrimum</i> (Willd.) Hochr	1
Tanibuca / Tanibuca amarela / Cinzeiro	<i>Buchenavia grandis</i> Ducke	1
Tanibuca branca	<i>Buchenavia parvifolia</i> Ducke	1
Tapereba / Cajá	<i>Buchenavia</i> sp.	1
Taperebarana	<i>Antrocaryon amazonicum</i> (Ducke) B.L.Burtt & A.W.Hill	1
Taquari	<i>Touroulia guianensis</i> Aubl	1
Taquarirana	<i>Alchornea discolor</i> Poepp	1
Tatajuba	<i>Mabea piriri</i> Aubl	1
Tatapiririca	<i>Maclura tinctoria</i> (L.) D.Don ex Steud. subsp. <i>tinctoria</i>	1
Tauari	<i>Tapirira guianensis</i> Aubl.	1
Tauari branco	<i>Couratari atrovinosa</i> Prance	1
Tento / Tento vermelho	<i>Couratari multiflora</i> (Sm.) Eyma	1
Tento branco	<i>Ormosia micrantha</i> Ducke	1
	<i>Diplotropis nitida</i> Benth.	1

Tento preto	Ormosia sp.	1
Tinteiro	Avicennia germinans (L.) L	1
Tucandedeira	NI	1
Uchirana / Tachirana	Vantanea parviflora	1
Ucubarana / Ucuuba do gapó	Iryanthera laevis Markgr	1
Ucuuba	Virola surinamensis	1
Ucuuba da terra firme	Iryanthera juruensis Warb	1
Urucurana	Bixa excelsa Gleason & Krukoff	1
Urucurana	Bixa excelsa Gleason & Krukoff	1
Uxi / Uchizeiro	Endopleura uchi	1
Virola / Virola terra firme / Casca de vidro	Virola albidiflora Ducke	1
Virola branca / Varzea / Igapó	Iryanthera ulei Warb.	1
Virola vermelha	Virola sebifera Aubl.	1
Total		274

The inventory of Flora within the project area, has resulted in a priority to conserve the flora on the below mentioned Table 56, which are targeted by illegal loggers.

Table 56: Inventory flora within the project area

Family	Species
Sterculiaceae	<i>Sterculia excels Mart.</i>
Leguminosae-Mimosoideae	<i>Anadenathera colubrine (Vell.) Brenan</i>
Vochysiaceae	<i>Callisthene major Mart.</i>
Caryocaraceae	<i>Caryocar microcarpum Ducke</i>
Sapotaceae	<i>Chrysophyllum lucentifolium</i>
Lecythidaceae	<i>Couratari oblongifolia Ducke et R.Knuth</i>
Leguminosae-Papilionideae (Fabaceae)	<i>Diplostropis purpurea</i>
Lauraceae	<i>Endlicheria paniculata (Spreng) J.F.Macbr</i>
Leguminosae-Mimosoideae	<i>Enterolobium schomburgkii (Benth.) Benth</i>
Sapotaceae	<i>Pouteria oblanceolata Pires</i>
Burseraceae	<i>Protium puncticulatum Macbr.</i>
Sterculiaceae	<i>Sterculia excelsa Mart.</i>
Leguminosae-Mimosoideae	<i>Zygia selloi</i>
Sapotaceae	<i>Manikara huberi (Ducke) Cheval.</i>
Burseraceae	<i>Protium heptaphyllum (Aubl.) March</i>

Table 57: Endangered: Species of avifauna for monitoring and Conservation

Species	Popular Name
<i>Penelope pileata</i>	jacupiranga
<i>Psophia viridis obscura</i>	jacamim-de-costas-verdes
<i>Guaruba guarouba</i>	ararajuba

<i>Pyrrhura lepida</i>	tiriba-pérola
<i>Pteroglossus bitorquatus bitorquatus</i>	araçari-de-pescoço-vermelho
<i>Synallaxis rutilans omissa</i>	João-teneném-castanho
<i>Phlegopsis nigromaculata paraensis</i>	mãe-de-taoca

Table 58: Endangered, At Risk or state priorities for conservation - Species of Mastofauna for monitoring and Conservation

Taxonomic Popular Name	
Dasypodidae	
<i>Priodontes maximus</i>	<i>tatu-canastra</i>
Cebidae	
<i>Saguinus niger</i>	<i>sagui-una</i>
<i>Cebus paella</i>	<i>macaco-precgo</i>
<i>Saimiri sciureus</i>	<i>macaco-de-cheiro</i>
Aotidae	
<i>Aotus azarae</i>	<i>macaco-da-noite</i>
Atelidae	
<i>Alouatta beizebul</i>	<i>guariba-pteto</i>
Felidae	
<i>Leopardus pardalis</i>	<i>jaguatirica</i>
<i>Leopardus tigrinus</i>	<i>gato-do-mato-pequeno</i>
<i>Puma concolor</i>	<i>onca-parda</i>
<i>Panthera onca</i>	<i>onca-pintada</i>
Canidae	
<i>Cerdocyon thous</i>	<i>graxaim</i>
Familia Tapiridae	
<i>Tapirus terrestris</i>	<i>anta</i>
Tayassuidae	
<i>Tayassu pecari</i>	<i>queixada</i>
Cervidae	
<i>Mazama Americana</i>	<i>veado-mateiro</i>

In the IUCN list, there are a total of nineteen species in the three categories preached by the organization, being a species of mammal in category EN (endangered), seventeen species of animals (seven species of birds, six species of mammals, two species of amphibians and two reptile species) in the VU category (vulnerable) and one mammal species in category CR (critically endangered) (Table 59). No species of endangered or CITES-listed fish were recorded.

Table 59: Species of wildlife endangered according to the IUCN Red Lists of Threatened Species

Birds		
IUCN Threat Categories	Popular Name	Scientific Name
Vulnerable (VU)	Pomba-Botafogo	<i>Patagioenas subvinacea</i>
	Mutum-Poranga	<i>Crax alector</i>
	Formigueiro-liso	<i>Myrmecocichla lugubris</i>
	Choquinha-Estriada	<i>Mymotherula surinamensis</i>
	Tucano-grande-de Papobranco	<i>Ramphastos tucanus</i>
	Tucano-de-bico-preto	<i>Ramphastos vitellinus</i>
	Azulona	<i>Tinamus tao</i>

Mammals		
IUCN Threat Categories	Popular Name	Scientific Name
Vulnerable (VU)	Queixada	<i>Tayassu pecari</i>
	Gato-do-mato-pequeno	<i>Leopardus tigrinus</i>
	Anta	<i>Tapirus terrestris</i>
	Macao-aranha-preto	<i>Ateles paniscus</i>
	Tamandua-bandeira	<i>Myrmecophaga tridactyla</i>
	Tatu-canastra	<i>Priodontes maximus</i>
Endangered (EN)	Ariranha	<i>Pteronura brasiliensis</i>
Critically Endangered (CR)	Macaco-Preto	<i>Chiropotus satanas</i>

Amphibians		
IUCN Threat Categories	Popular Name	Scientific Name
Vulnerable (VU)	Sapinho	<i>Anomaloglossus beebei</i>
	Sapo	<i>Atelopus spumarius</i>

Reptiles		
IUCN Threat Categories	Popular Name	Scientific Name
Vulnerable (VU)	Tracaja	<i>Podocnemis unifilis</i>
	Jabuti, jabutitinga	<i>Chelonoidis denticulatus</i>

According to the analysis of biodiversity survey carried out in 2016, in view of the panorama of the original forest cover of the area, which historically can be defined as composed of Amazonian terra firme forest, it is possible to highlight the predominance of forest birds registered in the remaining samples, which occupy the dark understory of the forests as well as large frugivorous growers of the upper canopy areas (60% of

species). The predominance of these species was expected, taking into account the high wealth that the forest areas present, as well as the predominance of these environments in the sampled regions.

Only a small fraction of these fragments remains with visible signs of anthropogenic disturbance. Considering the alteration of the original forest cover, the avifauna was also replaced by colonizing elements characterized by generalist species that commonly inhabit regions of capoeiras or even drastically recharacterized places (willis & Oniki 1988). In this sense, it is important to highlight the transitional areas, constituted by capoeiras as the second most representative environment in terms of use by birds (30% of species).

As a result of avifauna monitoring in 2016, in view of the panorama of the original forest cover of the area, which historically can be defined as composed of Amazon forest, we can highlight that the predominance of forest birds, registered in the remaining sampled birds that occupy the dark forest understory, as large frugivorous growers from the upper canopy forest (60% of species). The predominance of these species was expected, taking into account the high species richness of the forest areas as well as the predominance of these environments in the sampled regions.

In the considerations presented on the mastofauna in 2016, the study presents several species that indicate the quality of the environment. Although no sampled fragment has original characteristics of its landscape, it can be affirmed that these still represent areas of great importance for the maintenance of the local fauna.

Despite the strong recharacterization of the environment, the number of endangered species recorded was significant, according to the International Union for the Conservation of Nature (IUCN 2014) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 2014), (Ministry of Environment Machado et al., 2008. Rev. Bras. Zootec., 37 (6): 1121-1128) and List of endangered species of flora and fauna in the State of Pará. The vast majority of registered species are included in the Vulnerable Category (VU) or CITES Appendix I or II.

5.1.2 High Conservation Values (B1.2)

High Conservation Value	Caxiuana National Forest
Qualifying Attribute	The Caxiuana National Forest is considered the oldest in the Amazon region and the second oldest in Brazil. It is amongst the most known conservation units in the north of Brazil, and it has the presence of many important researchers from Brazil and abroad
Focal Area	On the northern border of the reference region there is a national conservation unit called National Forest Caxiuanã. It was created in 1961 and today it has an area of 322,694.34 hectares. The Conservation Units are types of conservation areas that were created to allow sustainable use of the forest and its natural resources

5.1.3 Without-project Scenario: Biodiversity (B1.3)

According to UNEP, the impacts of agriculture on ecosystem functions can be grouped into five areas: 1) soil structure; 2) nutrients and microorganisms; 3) water cycle; 4) complexity of the landscape; 5)

atmospheric properties. Agriculture affects soil structure and biota primarily through the reduction of organic material incorporated above the soil and roots, by ploughing the soil due to tillage and compaction livestock. In particular, in the high mountain areas, intensive soil management carried out in the clean crops have caused, among other adverse effects, lower carbon content and soil nitrogen.

The scenario in the absence of the REDD+ Project would be for the occupation of land squatters and small farmers, who would be impacting the forest areas through the opening of the forest by the cutting and burning system. These areas are cultivated for a short period of time, one or two years, and then abandoned due to the fact that the soil becomes unproductive, with the opening of new areas to raise subsistence agriculture.

In short, given the current conditions of the territory, it requires a type of sustainable productive activities with the environment and viable for producers. In the absence of the project, the municipalities selected for the project may affect biodiversity conditions, around the following effects:

Table 60: Impact on Bio-diversity in the Scenario without the project.

Scenario without Project	Environmental Impact	Impact on Bio-diversity
Expansion of the agricultural frontier and livestock areas	Deforestation, forest fragmentation and reduction of biological corridors	Loss of habitats for birds and mammals, endemic and migratory species threatened Timber threat of low frequency and high commercial value
	Simplification of the vertical structure of vegetation	Destruction of climatic shelters and predators for wildlife and sites for feeding and reproduction
Lack of technical assistance and education, which leads to continued poor agricultural practices	Degradation and soil compaction and even in areas of grazing stubbles	Extinction of native species intolerant to intensive livestock

		Loss of habitat quality and capacity of natural forest regeneration
	Low productivity and increased use of fertilizers	Threat to soil organisms that play important roles as predators, decomposers and parasitoids Reduction microfauna
	Pollution of water sources and wildlife due to the use of agrochemicals	Threat to aquatic wildlife and incidence

The permanence of natural environments in the Project Area is of extreme conservationist importance, since, in addition to promoting the conservation of biodiversity, it guarantees the maintenance of ecosystem services, such as pest and disease control, pollination, water quality, climate regulation and obtaining of resources for traditional communities. According to Silva et al. (2005) (Da Silva, José Maria & Rylands, Anthony & Fonseca, Gustavo. (2005). The Fate of the Amazonian Areas of Endemism. Conservation Biology. 19. 689 - 694), the connectivity between the fragments constitutes a large and resilient conservation system to mitigate future global changes, make significant improvements in the living standards of local populations, and provide global communities with ecological services. In addition, the REDD+ Project seeks to protect the High Conservation Value Areas (HCVA), stimulate and improve knowledge about local biodiversity through studies, for example, long-term monitoring, since knowledge about the flora and, more specifically, of the fauna of the region can still be considered scarce.

5.2 Net Positive Biodiversity Impacts

5.2.1 Expected Biodiversity Changes (B2.1)

Biodiversity conservation objectives

Through the long-term preservation of the amazon forest cover, the Project is expected to generate positive impacts on biodiversity by preserving habitats and floristic and fauna species that would otherwise be threatened by deforestation. Moreover, the protection of the forest by the status of REDD Area will lead to the elaboration of a management plan which will aim to guarantee the durability of local uses of forest: collection of NTFP, forest exploitation for local construction, and hunting. The Project presents specific objectives for biodiversity conservation in the project zone:

- Maintain forest cover and reduce habitat fragmentation;
- Maintain the integrity of the animal corridor;
- Conserve habitats and native species of Amazon;
- Ensure the conservation of threatened animal and plant species;
- Reduce human activities that do not comply with the conservation of biodiversity;
- Improved the natural resources management by local communities and facilitate their sustainable use;
- Raise awareness of environmental-related issues in local communities;
- Promote scientific research and monitoring of natural resources;
- Prevent and control the spread of invasive exotic species.

Expected positive impacts of the project on biodiversity

In the without-project scenario, biodiversity is affected by progressive decrease of forest cover due to slash and burn agriculture, extension of cattle pasture and the maintenance or increase of animal poaching. On the contrary project activities are expected to generate biodiversity benefits by the long-term protection of forest landscape, which contributes to the preservation and enhancement of the faunal and floristic populations. The expected positive impacts of project on biodiversity can be evaluated through defined biodiversity indicators that will be monitored and can be summarized as follows:

Biodiversity Element	<p>Monitor vegetation cover / land use patterns via satellites from both Google Earth, and the Brazilian Space Agency which has more up to date maps and fire situations.</p> <p>Monitor INCRA the federal land agency and ITERPA the state land agency for land claims in the project area which may show in very short order where someone plans to enter and start deforesting.</p> <p>http://terrabrasilis.dpi.inpe.br/app/map/deforestation?hl=pt-br</p> <p>This shows all the deforestation in the area, while the project area is able to contain most deforestation to very small “planned plots” so most tree cover and animal corridors stay intact. Just south of the project area is pure destruction in the same time period.</p>
Estimated Change	Maintenance or improvement of carbon stocks.
Justification of Change	Periodic analysis of satellite imagery and GIS analysis.

Biodiversity Element	Monitor area-limited species: species that require large patches to maintain viable populations, such as large carnivores. That have indicated potential habitat losses and prey availability.
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling.
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling.

Biodiversity Element	Monitor resource-limited species: species requiring specific resources, such as frugivorous species, nectar species, snags, etc. Bats can be great bio indicators as they have different feeding habits, such as insects, fruits, nectar/pollen, blood etc. They are also abundant through the region and its taxonomy has been well documented.
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling.
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling.

Biodiversity Element	<p>Monitor “special interest” species, critically endangered species, endangered species, and threatened species (IUCN, IBAMA).</p> <p>The local riverine people all have cell phones that they use primarily for pictures and since 2016 have been requested to monitor all animals of interest and take pictures of those animals.</p> <p>20 MP cameras are planned to be handed out to 5 locations that have high instances of bio-diversity so that the 5 designated monitors can take pictures. In addition to this all security personnel have cameras.</p>
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Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling.
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling.

5.2.2 Mitigation Measures (B2.3)

Although the Project activities are not fully implemented, monitoring and reporting activities to prevent and remove land grabbers and illegal logging activities (thus stopping the first stages of the deforestation process) have been happening on the ground since January 3rd, 2017. These activities help to ensure that local biodiversity is protected and that their ecosystems are not fragmented even when we still do not have an implemented biodiversity inventory.

Measure 1:

Under the water – the focus is Manatee preservation and preventing the imminent extinction event.

Measure 2:

On land the focus is on numerous mammals

Measure 3:

On both land and under the water, the goal is to re-vitalize the turtle population of Portel and release in 2022 a total of 70,000 juvenile turtles to the region in various locations in a breeding program.

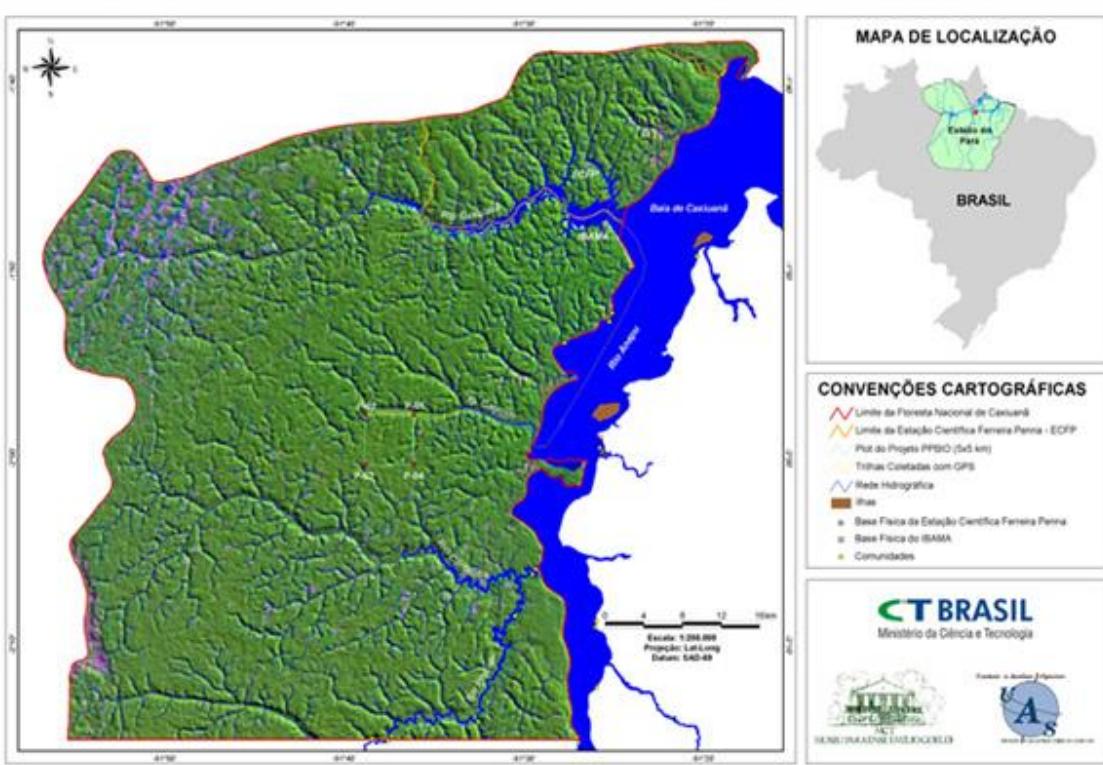
5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

Net impacts on biodiversity resulting from the project activity are expected to be positive, as outlined in the baseline scenario. Net positive impacts on biodiversity were demonstrated over time through periodic monitoring and reporting of biodiversity indicators as per the Biodiversity Monitoring Plan.

5.2.4 High Conservation Values Protected (B2.4)

The project area is numerous non-contiguous sections however working with neighbors to complete a contiguous protected area amongst landowners will bring a net positive gain for the project. A small section of a few thousand hectares borders the Reserve Caxiuna, thus with the connection of the reserve and the project area, an animal corridor is created. This is a high bio-diversity impact next to the project area.

Figure 51: Caxiuna Reserve



High Conservation Value	Caxiuana National Forest
Qualifying Attribute	The Caxiuana National Forest is considered the oldest in the Amazon region and the second oldest in Brazil. It is amongst the most known conservation units in the north of Brazil, and it has the presence of many important researchers from Brazil and abroad.
Focal Area	On the northern border of the reference region there is a national conservation unit called National Forest Caxiuanã. It was created in 1961 and today it has an area of 322,694.34 hectares. The Conservation Units are types of conservation areas that were created to allow sustainable use of the forest and its natural resources.

5.2.5 Species Used (B2.5)

An important role in the region's economy is filled by vegetable extraction and forestry, mainly as a source of subsistence for families. The vegetal extraction of the municipalities mainly counts on the management of non-timber forest products (NWFP) of native species in the region, such as brazil nuts and açaí berry.

In addition, the rural communities living in the Project Area are mainly engaged in the production of cassava, flour and cassava, according to the Family Diagnosis of the REDD+ Project. Crops of corn, banana, orange, cabbage, cupuaçu, eucalyptus and cacao are also employed by some local communities but in smaller scales than the others already mentioned.

5.2.6 Invasive Species (B2.5)

None of the Project's activities introduce invasive species or genetically modified organisms. The Project's developer only approves agroforestry activities that use native species commonly known to occur in the Para region and are not in the Global Invasive Species Database before approving the utilization of such particular species.

5.2.7 Impacts of Non-native Species (B2.6)

Not applicable

5.2.8 GMO Exclusion (B2.7)

Not applicable – the project has no activity involving any GMO

5.2.9 Inputs Justification (B2.8)

Not applicable

5.2.10 Waste Products (B2.9)

Not applicable

5.3 Offsite Biodiversity Impacts

5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

The conservation itself as the aim of the project is already a mitigation strategy. The entire area benefits since there is no activity involving any kind of human disturbance. Furthermore, conservation of the project area increases landscape integrity and adaptation, avoiding edge effect, as described in the "with project" scenario, benefiting biodiversity (Wunder 2008).

A representative conservation area in which biodiversity can persist guarantees the maintenance of ecological processes and contributes to avoid fragmentation of the ecosystem, both through timber extraction and agricultural activities. The project helps landscapes enhancing its ecological health, including its adaptability to climate change and consequently reducing offsite greenhouse gas emissions (Wunder 2008). Moreover, the conservation of this area maintains the microclimate, avoiding wildfires (Soares-Filho 2006).

Hence, as there are no offsite negative biodiversity impacts, there are no planned mitigation measures.

5.3.2 Net Offsite Biodiversity Benefits (B3.3)

The Project is expected to generate positive leakage on biodiversity by avoiding ecosystem fragmentation through voluntary engagement of neighbour communities in the Project's activities. As described above, the project focuses exclusively on conservation measures within the project boundaries and its buffer, which makes negative offsite effects unlikely to happen. Besides, monitoring of flora and fauna assures that any minimal offsite negative effect was taken care of immediately. The Project's activities do not involve the introduction of non-native species. Therefore, considering these activities and "with project" scenario, the effects of the project on biodiversity are positive.

5.4 Biodiversity Impact Monitoring

5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

Biodiversity Element	Monitor vegetation cover / land use patterns.
Estimated Change	Maintenance or improvement of carbon stocks.
Justification of Change	Periodic analysis of satellite imagery and GIS analysis.

Biodiversity Element	Monitor area-limited species: species that require large patches to maintain viable populations, such as large carnivores. That indicate potential habitat losses and prey availability.
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling.
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling.

Biodiversity Element	Monitor resource-limited species: species requiring specific resources, such as frugivorous species, nectar species, snags etc. Bats can be great bio indicators as they have different feeding habits, such as insects, fruits, nectar/pollen, blood etc. They are also abundant through the region and its taxonomy has been well documented.
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling.

Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling.
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Biodiversity Element	Monitor “special interest” species, critically endangered species, endangered species, and threatened species (IUCN, IBAMA). Monito “special interest species” that the project helps bring back into the environment in higher numbers such as Manatees and native Turtles
Estimated Change	Increase in number of specific category species noted by sightings during regular patrolling.
Justification of Change	Increase in number of specific category species as the project area is not disturbed by agents of deforestation. This is noted by sightings during regular patrolling.

5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

All the documents/results are published in the project website and communicated in Portuguese in a simple language to the council of stakeholders for their awareness and free participation. All Riverine people and traditional rural villagers know where the office is and there are staff in the project area that pass by their houses once in a while. In addition, the Riverine are able to contact as needed.

Apart from the survey teams the main form of communication followed was one-to-one meetings with the community in which the feedback on the benefits provided were communicated which are periodic. Further during this period, the benefits were mainly related to Skill and capacity development.

Any information the Riverine need is available to them, upon request or the website.

5.5 Optional Criterion: Exceptional Biodiversity Benefits

5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

Not Applicable

5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

Not Applicable