MONITORING REPORT "FORTALEZA ITUXI REDD PROJECT"

Document Prepared By Carbonext

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Project Title	Fortaleza Ituxi REDD Project
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Sustainable forest management is the main tool to guarantee the surveillance in the Project Area. The presence of workers in management activities is the first factor to inhibit the pressures of invasions inside the Project Area. Coupled with sustainable forest management, the project activity has increased surveillance to avoid further invasions in the Project Area. Additionally, two surveillance posts will also be placed around the farm and new motorcycles will be purchased, with a view to ensuring security at the project site and surrounding areas.

The start of the implementation of Forest Management Plan (Project Start Date) has been registered as 15/12/2013. Equipments for Forest Management have been placed in the Project Area and first presence for preliminary studies on operations have been performed in this period: it is assumed that the presence of personnel for these first forest management activities has created a perception in deforestation agents that the Project Area was being under increased surveillance by the Project Proponent. This Monitoring Report shows the results of project activities for the period within 15/12/2013 and 14/12/2015.

Owing to project activities (i.e. patrimonial surveillance associated with forest management), the project proponent could avoid deforestation inside the Project Area during the verified period.

Thus, the total GHG emission reductions generated in this monitoring period are estimated in 1,181,732 tCO_2, which corresponds to an annual average of 522,747 tCO_2.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 14 - Agriculture, Forestry, Land Use

Project Category: Avoided Unplanned Deforestation (AUD project activity)

This is not a grouped project.

1.3 Project Proponent

Organization name	Fazenda Nossa Senhora das Cachoeiras do Ituxi
Contact person	Ricardo Stoppe Júnior
Title	Project Proponent (Landowner)

Address	Estrada da Fazendinha, 5640 Centro, Carapicuíba – SP, Brazil
Telephone	55 (92) 3634-7521
Email	aamericardo@ig.com.br

1.4 Other Entities Involved in the Project

Organization name	Carbonext
Role in the project	Technical advisory in project development
Contact person	Janaína Dallan & Luiz Fernando de Moura
Title	Project Designer
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1.5 Project Start Date

15/12/2013 (Start of the implementation of Forest Management Plan; Equipments for Forest Management have been placed in the Project Area and first presence for preliminary studies on operations have been performed in this period: it is assumed that the presence of personnel for these first forest management activities has created a perception in deforestation agents that the Project Area was being under increased surveillance by the Project Proponent.)

1.6 Project Crediting Period

Start date: 15/12/2013

End date: 14/12/2043

Project duration: 30 years

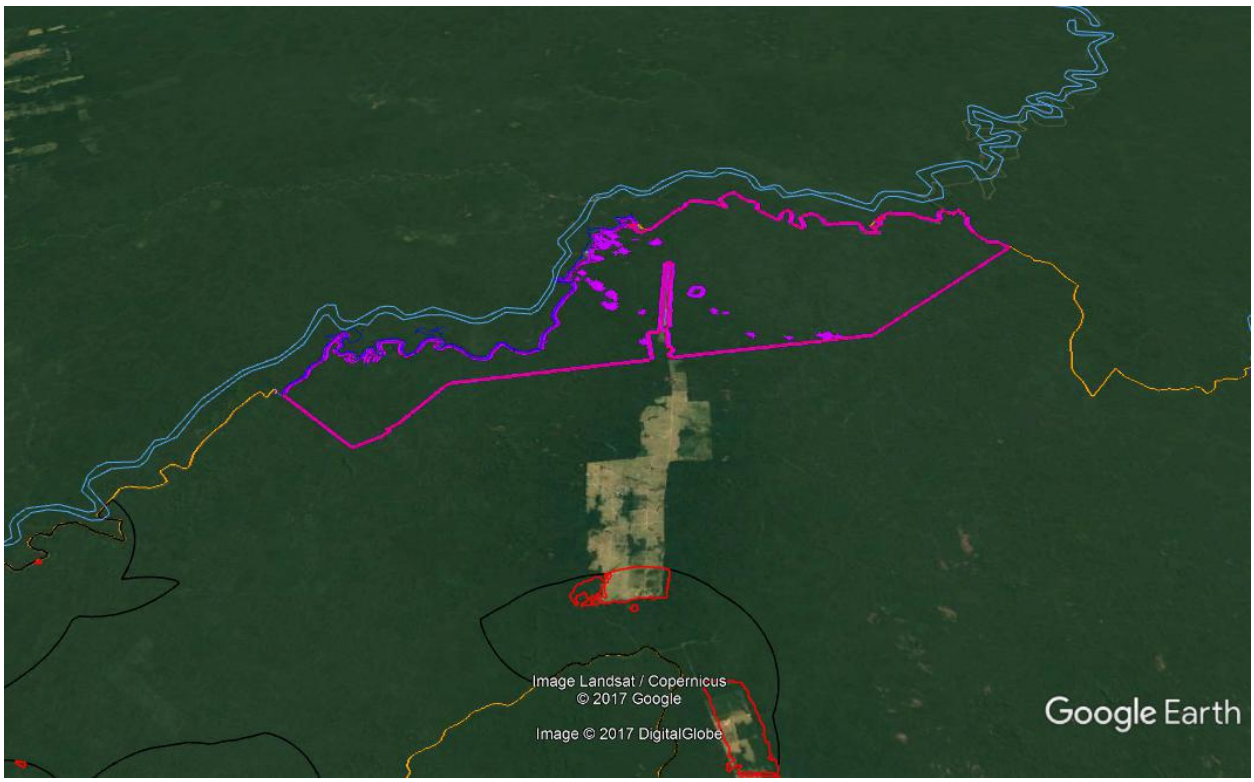
Date of the historical Reference Period: 15/12/2003 to 14/12/2013

Date of the first fixed baseline period: 15/12/2013 to 14/12/2023

1.7 Project Location

1) Name of the project area: "*Fazenda Nossa Senhora das Cachoeiras do Ituxi*"

2) Map of the project area:

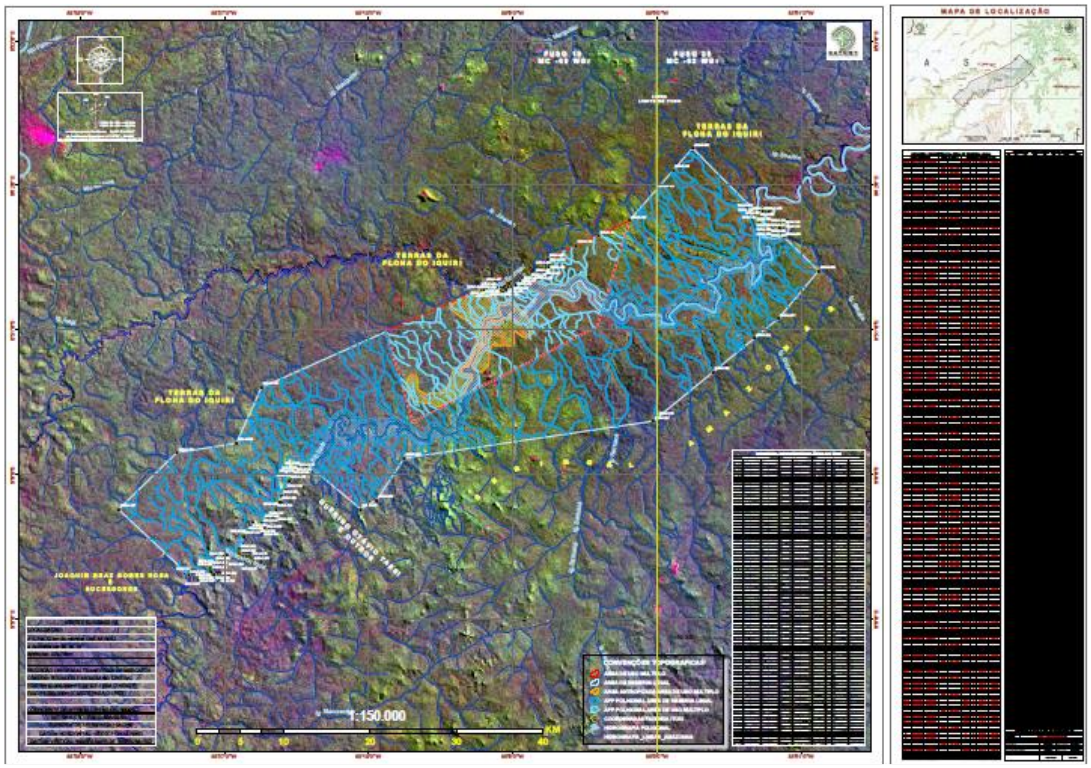


3) Geodetic coordinates of the project area boundary:

Country: Brazil

State: Amazonas

Municipality: Lábrea



The "*Nossa Senhora das Cachoeiras do Ituxi*" farm has its geodetic coordinates officially registered in notary office. The Project Area corresponds to the portion of the farm at the South of Ituxi River. The geodetic coordinates of the Project Area boundary are as follows:

FID	Shape *		X	Y
0	Point ZM	0	831302,623926	9021825,64363
1	Point ZM	0	833510,407888	9023373,87284
2	Point ZM	0	837317,012382	9023659,92579
3	Point ZM	0	839342,396499	9020416,9082
4	Point ZM	0	840974,471399	9019405,72682
5	Point ZM	0	838238,679199	9017029,56302
6	Point ZM	0	834027,605846	9013663,29523
7	Point ZM	0	829360,29816	9009885,15948
8	Point ZM	0	825253,695385	9009249,26298

9	Point ZM	0	820196,603919	9008465,61536
10	Point ZM	0	815668,787096	9008257,70544
11	Point ZM	0	815919,588537	9012436,65325
12	Point ZM	0	816059,310495	9017065,2545
13	Point ZM	0	815304,066281	9013578,98748
14	Point ZM	0	814283,701682	9009329,3662
15	Point ZM	0	811066,168985	9007049,1634
16	Point ZM	0	806028,772389	9006270,6451
17	Point ZM	0	801099,739656	9005330,86216
18	Point ZM	0	798615,199218	9002256,13912
19	Point ZM	0	795923,535014	9000094,50842
20	Point ZM	0	790733,34372	9004617,25589
21	Point ZM	0	792777,956601	9007942,04395
22	Point ZM	0	793420,247965	9008422,00412
23	Point ZM	0	795976,446522	9008196,66348
24	Point ZM	0	796274,358365	9009467,81548
25	Point ZM	0	799564,036172	9009644,37635
26	Point ZM	0	803097,761964	9007794,14897
27	Point ZM	0	806738,796557	9008602,14855
28	Point ZM	0	807807,486924	9012183,61616
29	Point ZM	0	807925,889725	9015775,20095
30	Point ZM	0	810156,310256	9018473,307
31	Point ZM	0	811257,299384	9021560,67751
32	Point ZM	0	812592,943299	9021994,83343
33	Point ZM	0	813138,20387	9021878,94055

34	Point ZM	0	816098,590023	9023236,96031
35	Point ZM	0	820158,982627	9024508,33929
36	Point ZM	0	821347,412599	9026205,63963
37	Point ZM	0	822946,229945	9024817,07656
38	Point ZM	0	825437,902183	9023736,80974
39	Point ZM	0	827272,251415	9023360,31219
40	Point ZM	0	811320,302436	9019297,80029
41	Point ZM	0	809618,645766	9017789,54282

4) Total size of the project area: 46,592 hectares

5) Details of ownership: Private land: Landowner: Ricardo Stoppe Junior

The entire Project Area is under the control of the project proponent at the time of validation.

a) According to the rural property documentation and project design, it is demonstrated that the project will not encroach uninvited on private property, community property, or government property. It is also demonstrated that project activities do not lead to involuntary removal or relocation of Property Rights Holders from their lands or territories, and does not force them to relocate activities important to their culture or livelihood.

b) No property rights are affected by this project activity.

c) No restitution or compensation is owned to any parties, given that no other lands have been or will be affected by this project in terms of land tenure and property rights.

1.8 Title and Reference of Methodology

Approved VCS Methodology VM0015 “Methodology for Avoided Unplanned Deforestation”, Version 1.1, 3 December 2012. At: http://www.v-c-s.org/methodologies/VM0015 (last visited in 20/05/2014)

VT0001 “Tool for the demonstration and assessment of additionality in VCS agriculture, forestry and other land use (AFOLU) project activities”, Version 3.0, 1 February 2012. At: http://www.v-c-s.org/methodologies/VT0001 (last visited in 20/05/2014)

AFOLU “Non-Permanence Risk Tool”, VCS Version 3, Procedural Document, 4 October 2012, v3.2. At: http://www.v-c-s.org/program-documents (last visited in 20/05/2014)

CDM – Executive Board “Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01)” EB 31. At: https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-04-v1.pdf (last visited in 25/08/2018)

1.9 Other Programs

Not applicable: the project is not engaged to other emissions trading program and the host country has not binding limits on GHG emissions.

The project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. The VCS Program has a central project database, which lists each approved project. The VCS Project Database is the central storehouse of information on all projects validated to VCS criteria and all Verified Carbon Units issued under the program. Every VCU can be tracked from issuance to retirement in the database, allowing buyers to ensure every credit is real, additional, permanent, independently verified, uniquely numbered and fully traceable online. This project has not been registered in any other credited activity, and no VCUs have been assigned to the project area so far. Thus, any possibility of double counting of credits is eliminated.

The project has not been registered, and it is not seeking registration under any other GHG programs.

This project has not been rejected under any other GHG program.

1.10 Sustainable Development

The FORTALEZA ITUXI REDD PROJECT complies with the logic of the environmental priorities defined by the Brazilian Federal Administration, which, in the course of COP 14 Conference held in Poznan, Poland, in December, 2008, declared a deforestation reduction goal of 70% up to year 2018. In order to attain this goal, it will be necessary to

join government initiatives with independent actions (such as that proposed under the FORTALEZA ITUXI REDD PROJECT).

The map below shows the strategic zone for "Containment of the expansion fronts with protected areas and alternative uses", which was established by the MacroZEE/AL (Macrozoneamento Ecológico-Econômico da Amazônia Legal; Ecological and Economic Macro-zoning of Amazon) of the Brazilian Ministry of Environment[1], involving de Project Area. The MacroZEE/AL aims to establish strategic indications of occupation and use of land on a sustainable basis to guide, at the regional scale, the development and spatial distribution of public development policies, territorial and environmental planning, as well as the decisions of private agents. Due to its shield function for the heart forest protection, this territorial unit deserves strengthening policies. In this context, the FORTALEZA ITUXI REDD PROJECT converges with the strategies set up by the MacroZEE/AL of the Brazilian Ministry of Environment.

Figure 1. Containment of the expansion fronts with protected areas and alternative uses (Source: Brazilian Ministry of Environment)

[1] http://www.mma.gov.br/component/k2/item/8200-figuras, last visited in 28/08/2015

Due to the increase in deforestation in the Legal Amazon, came into effect the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm; Plano de Ação para a Prevenção e Controle do Desmatamento na Amazônia Legal), starting mitigation and ongoing actions to reduce deforestation. The Deforestation Alert System (SAD) (Imazon, 2014), pointed out that the Lábrea municipality had the highest deforested area of the state, and was the fourth municipality in the Amazon with the largest deforested area (1,070.0 hectares), in October 2014, further demonstrating a common and usual practice of the municipality's dynamics. In this context, the Fortaleza Ituxi REDD Project is in line with main PPCDAm premises.

This project has therefore an enormous potential to assist the Federal Administration and state agencies to attain these goals and leverage pilot REDD projects on the municipal level, ensuring priority for the municipalities facing a critical deforestation process, as in the case of Lábrea and Porto Velho's districts of Nova Califórnia and Extrema.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The start of the implementation of Forest Management Plan is regarded as the first operation of this Project Activity. Equipments for Forest Management have been placed in the Project Area and first activities for preliminary studies on operations have been performed in 15/12/2013. The presence of workers in management activities is the first factor to inhibit the pressures of invasions inside the Project Area. Coupled with sustainable forest management, the project activity has increased surveillance to avoid further invasions in the Project Area.

The implemented forest management plan involved timber harvesting in 777.90 hectares in 2014 (no harvesting was done in 2015). As activities parallel to forest management, the project proponent has hired personnel and implemented the following training sessions to farm collaborators: i) fire brigade and first-aid training; ii) good practices in cattle ranching (evidences of training are available to auditors and any interested stakeholder). Complementarily, farm collaborators have been trained on the rationale of the REDD project and the importance of wood tracking documentation and monitoring techniques.

The project proponent has also made efforts to divulge the project activity to neighbouring landowners and their collaborators.

All along the monitoring period covered by this report, the farm staff has guaranteed surveillance of farm borders and supervised the work of harvesting/logging to be compatible with the Forest Management Plan. All the work resulted in the absence of deforestation inside the Project Area during this monitoring period.

Owing to project activities (i.e. patrimonial surveillance associated with forest management), the project proponent could avoid deforestation inside the Project Area during the verified period. Thus, the total GHG emission reductions generated in this monitoring period are estimated in 1,181,732 tCO_2, which corresponds to an annual average of 522,747 tCO_2.

2.2 Deviations

2.2.1 Methodology Deviations

In this project activity, the development of the first local biomass inventory has been conditioned to the first sales of carbon credits. The use of secondary biomass data for estimation of avoided emissions is permitted by the methodology VM0015. However, this methodology mentions the use of biomass inventory data obtained for less than 10 years. As a methodology deviation, the project proponent used biomass inventory data older than 10 years. This deviation might be justified by the fact that forest biomass in the Amazon Biome is increasing, as stated in scientific literature[2] [3], which implies more conservative data (i.e. lower biomass estimates) in older inventories, compared with newer inventories. The project proponent opted for using the scientific study made by Cummings et al. (2002), which was considered as a reliable source of information by the validation audit team, whose data have been derived from multiple inventory parcels, installed in the forest class similar to that observed in the Project Area. The proponent is adopting a methodological deviation to use these forest inventory data, justifying that authors have sampled areas very near the Project Area, inside the forest type that represents the vegetation inside the Project Area, which was published 11 years prior to the project start date. In this case, it can be assumed that the methodological deviation corresponds to 1 year, given that, according to VM0015, data should be published from 2003 (10 years before the project start date), to be eligible in conformity with the methodology without deviations. Thus, considering that 6 parcels were taken from inventory measurements made by Cummings et al. (2002) (which are the closest to the Project Area as shown by coordinates, in addition to represent the same type of vegetation), the proponent used the standard deviation among these parcels, for determining the 90% confidence interval, for uncertainty analysis.

2.2.2 Project Description Deviations

[2] Baker, T.R. et al. (2004). Increasing biomass in Amazonian forest plots. Phil. Trans. R. Soc. Lond. B (2004) 359, 353-365. DOI 10.1098/rstb.2003.1422

[3] Phillips, O.L. et al. (1998). Changes in the Carbon Balance of Tropical Forests: Evidence from Long-Term Plots. SCIENCE VOL 282 16, 439-442.

There is not any Project Description deviation applied during this monitoring period.

2.3 Grouped Project

This is not a grouped project.

2.4 Safeguards

2.4.1 No Net Harm

The project activities do not cause any potential negative offsite stakeholder impacts. The project does not result in net negative impacts on the wellbeing of other stakeholder groups. A communication channel will be established for stakeholders to express their concerns and to solve eventual conflicts and grievances that arise during project planning and implementation.

The project will involve several inclusion actions for the neighbouring communities – by means of a partnership to be established with Lábrea and Porto Velho (Nova Califórnia and Extrema districts) Municipal Administrations, in order to implement technical education programmes. These actions might be communicated by means of conventional media (i.e. telephone, internet, newspapers etc.).

Technical qualification, training in forest management, community development in the form of participative workshops may increase the collective understanding of climate change and the importance of the forest. This understanding is essential for each individual in the process of a collective transformation of cultural relations and of the lifestyle of the local community.

Among the proposed activities, the project proponent forecasts the organization of trainings focusing on sustainable cattle ranching, which intend to train workers to apply the knowledge for a sustainable meat production chain. Furthermore, fire brigade teams will be trained, a biomass inventory will be set up, and new income opportunities will be

created in the Municipalities of Lábrea and Porto Velho (both in terms of wood products and in terms of the sustainable exploitation of non-wood products, e.g. Brazil nuts).

The farm already supports a company for harvest of Brazil-nuts, which is called "Castanhal Fortaleza". The farm has established a kind of partnership with this company, by giving it free access to the forest for harvesting nuts. The families and communities involved in "Castanhal Fortaleza" business will receive additional benefits due to implementation of this Project Activity, as further described in this VCS-PD.

These activities will attenuate several work safety risks, in addition to improve well-being of local workers:

i) Complementary monitoring of labor conditions (monthly internal audits for health and security assessments, nutrition aspects, personal care and hygiene etc.). All situations and occupations that might arise through the implementation of the project and pose a substantial risk to worker safety will be comprehensively assessed.

ii) Monitoring the attendance of young in schools.

All relevant laws and regulations covering worker's rights will be periodically informed to workers, as part of community development sessions in the form of participative workshops. These workshops and training sessions will also cover subjects related to health and security, in a manner to reduce risks during the field activities.

2.4.2 Local Stakeholder Consultation

According to database surveys and the structure of activities foreseen in the project, the following list of stakeholders has been established:

- Lábrea City Hall

- Porto Velho City Hall (districts of Nova Califórnia and Extrema)

- Municipal Secretariat of Education of Lábrea

- Municipal Secretariat of Education of Porto Velho (districts of Nova Califórnia and Extrema)

- SEMA - AM (Amazonas State Secretariat of Environment)

- Extractive Reserve (RESEX) of "Ituxi"

- Extractive Reserve (RESEX) of "Médio Purus"

- National Forest (FLONA) of "Iquiri"

- National Park (PARNA) of “Mapinguari”

- Community leaders of Kaxarari Indigenous Land

- “Castanhal Fortaleza” company

- IFAM (Federal Institute of Science and Technology; Campus Lábrea)

The full project documentation has been made accessible to Communities and Other Stakeholders. The summary project documentation has been actively disseminated to Communities in Portuguese by mail and internet. A communication channel has been established with Communities and Other Stakeholders to better explain the project activities and to respond to stakeholders’ doubts and concerns related to the project.

The project proponent understands that stakeholders want and need to be involved in project design, implementation, monitoring and evaluation throughout the project lifetime. Therefore, a communication channel will be established for stakeholders to continually express their concerns and to solve eventual conflicts and grievances that arise during project planning, implementation and monitoring. It is expected that this communication channel will be a mechanism to ensure that the project proponent and all other entities involved in project design and implementation are not involved in or complicit in any form of discrimination or sexual harassment with respect to the project. All denouncements will be available to stakeholders and auditors. In case of conflicts, the project proponent and stakeholders will be free to propose and take any appropriate corrective action. This is the formalized grievance redress procedure that will be used throughout the project lifetime to address disputes with stakeholders, which may arise during project planning and implementation.

The process for receiving, hearing, responding to and attempting to resolve Grievances will be performed within a reasonable time period. It is expected that each grievance is responded in a delay of 7 days, proposing and/or taking corrective actions. This Feedback and Grievance Redress Procedure has three stages:

First: the Project Proponent shall attempt to amicably resolve all Grievances, and provide a written response to the Grievances in a manner that is culturally appropriate. (Action must be taken in 7 days)

Second: any Grievances that are not resolved by amicable negotiations shall be referred to mediation by a neutral third party. (Action must be taken in 30 days)

Third: any Grievances that are not resolved through mediation shall be referred either to a) arbitration, to the extent allowed by the laws of the relevant jurisdiction or b) competent courts in the relevant jurisdiction, without prejudice to a party’s ability to submit the Grievance to a competent supranational adjudicatory body, if any. (The time to accomplish this stage is dependent on local jurisdiction delays.)

Process of stakeholder identification and analysis used to identify Communities and Other Stakeholders

Traditional communities

Aiming at locating the traditional communities and also the social movements and conflicts occurring in the project region, the "Project New Social Cartography of the Amazon", series "Social Movements, Collective Identity and Conflicts" [4,5] has been consulted. These studies regard the "Extractive Communities of the Resex Ituxi" and the "Indigenous peoples of the municipality of Lábrea", as the main elements of the social scenario of the region. Based on this evaluation, it can be concluded that these social elements have potential for consideration as stakeholders.

"Quilombola" communities

The survey on "quilombola" (African) communities was performed for the State of Amazonas. According to SEPPIR (Secretariat of Policies for Promotion of Racial Equality; *Secretaria de Políticas de Promoção da Igualdade Racial*)[6] database, the State has six "quilombola" communities officially recognized. The studies have shown that none of these communities is located in a geographic position that could be directly affected by the project activities.

Indigenous lands

For mapping the indigenous lands that could be impacted by the project activities, the cartographic database from IBGE (indigenous maps)[7] has been consulted. As shown in the table below, considering the portions North and West from the Project Area, the indigenous village called "Vinhas" is the closest, located at 81 km in straight line from the closest point of the Project Area. Thus, it can be inferred that the project activities might have only discrete effects on these indigenous communities, considering that the Project Area is relatively distant from interactions with these communities.

[4] Nova Cartografia Social da Amazônia: Comunidade extrativista da Resex de Ituxi lutando por uma vida melhor- Lábrea, Amazonas / coordenador, Alfredo Wagner Berno de Almeida ; autores, Mason Mathews, Thereza Menezes . – Lábrea, AM / Projeto Nova Cartografia Social da Amazônia / UEA Edições, 2009. 12 p. : il. ; 25 cm. (Movimentos Sociais Identidade Coletiva e Conflitos ; 33). ISBN 978-85-7883-075-5. 1. Comunidade Extrativista – Lábrea (AM) I. Almeida, Alfredo Wagner Berno de. II. Mathews, Mason, III. Meneses Thereza. IV. Série. Available at: http://novacartografiasocial.com/ (visited in 19/02/2016)

[5] Nova Cartografia Social da Amazônia : Povos indígenas do município de Lábrea, AM : lutando por nossas terras / coordenação do projeto Alfredo Wagner Berno de Almeida ; coordenação de pesquisa Ana Carla Bruno, Thereza Cristina Cardoso Menezes. – Manaus : UEA Edições, 2013. 12 p.: il. color.; 25 cm.– Movimentos sociais, identidade coletiva e conflitos; 43. ISBN 978-85-7883-242-1. 1. Conflitos sociais. 2. Organizações sociais. 3. Índios – Lábrea (AM). 4. Movimentos sociais. 5. Cartografia. I. Almeida, Alfredo Wagner Berno de. II. Bruno, Ana Carla. III. Menezes, Thereza Cristina Cardoso. IV. Série. Available at: http://novacartografiasocial.com/ (visited in 19/02/2016)

[6] Available at: http://monitoramento.seppir.gov.br/ (visited in 19/02/2016)

[7] Available at: http://indigenas.ibge.gov.br/mapas-indigenas-2.html (visited in 19/02/2016)

Indigenous Village	Distance (km)
Vinhas	81
Alto Sapatine	84
Três Bocas	92
São Pedro	94
Kamicuã	108
Morada	109
Maeriene	117
Kanacuri	122

Straight-line distances between indigenous villages and the Project Area

However, the portion at the South is home to Indigenous Kaxarari, which has a regularized area of 145,889.98 hectares near the Project Area. According to the assessment made, it is considered that this indigenous land may be affected by the project activity. This indigenous land has been facing deforestation pressures, as recently reported by the media[8].

Other stakeholders

The project activities will require direct interaction with some public entities, as well as partnerships with research and teaching institutions. Thus, the process of stakeholder identification comprised all entities that will be associated directly or indirectly to the activities foreseen in this project.

As a complement, a survey was carried out to map the Conservation Units and rural settlements located nearby the Project Area.

Location Map of Communities

The following maps indicate the social movements currently active, as well as the location of communities and Conservation Units in the project region. According to “Project New Social Cartography of the Amazon”, series “Social Movements, Collective Identity and Conflicts”, the most relevant social movements in the project region are “Extractive Communities of the Resex Ituxi” (number 33 in the Brazilian map below) and the

[8] Available at: http://www.rondoniaovivo.com/interior/distrito-de-vista-alegre-do-abuna/noticia/exclusivo-madeireiros-retornam-para-t-i-kaxarari-apos-operacao-toruk/129839 (visited in 19/07/2017)

"Indigenous peoples of the municipality of Lábrea" (number 43 in the Brazilian map below).

Concerning the indigenous lands, eight indigenous villages were mapped in the project region (IBGE data), as indicated in the Google Earth map below. As previously stated, the direct impact of this project activity on regional indigenous lands is considered to be very feeble, given that the closest indigenous village is located at a distance of 81 km from the Project Area.

A land-use survey has also been carried out to the project region, mapping conservation units, settlements, indigenous lands and private lands. The closest conservation units to the Project Area are the Extractive Reserve (RESEX) of "Ituxi", the Extractive Reserve (RESEX) of "Médio Purus", the National Forest (FLONA) of "Iquiri" and the National Park (PARNA) of "Mapinguari". The management staffs of these conservation units are being contacted to publicize this project, and to exchange data on local fauna, flora and forest biomass stock.

Figure 2. "New Social Cartography of the Amazon", "Social Movements, Collective Identity and Conflicts": 33 - "Extractive Communities of the Resex Ituxi"; 43 - "Indigenous peoples of the municipality of Lábrea"

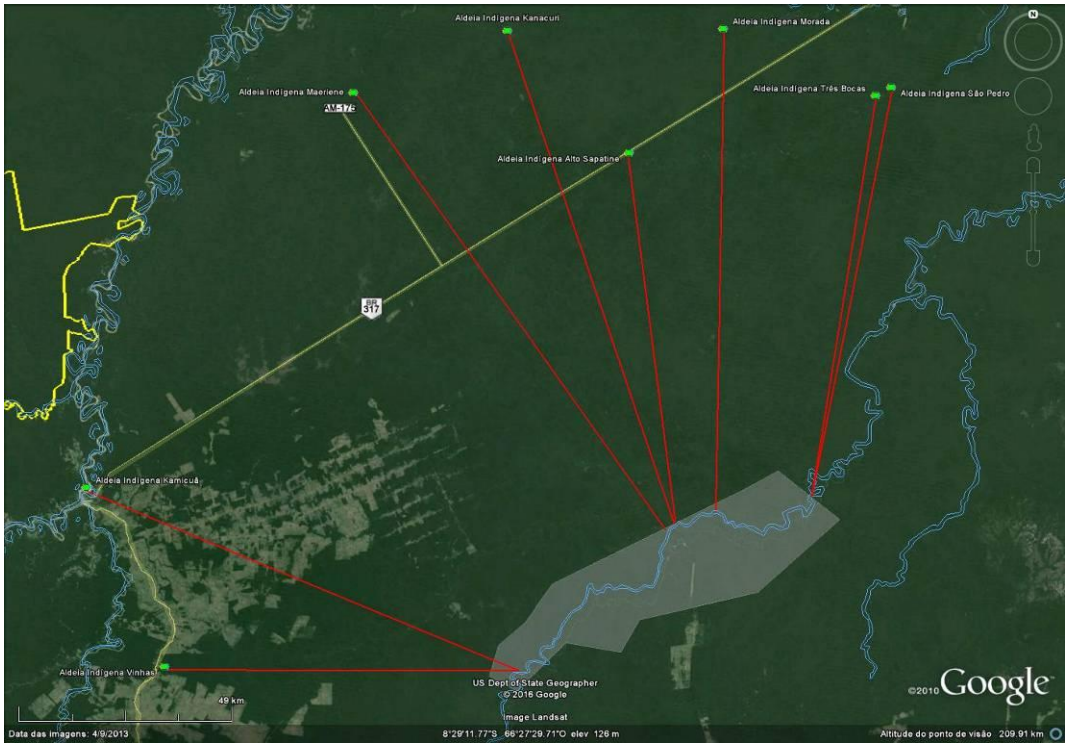


Figure 3. Location of indigenous villages in the project region

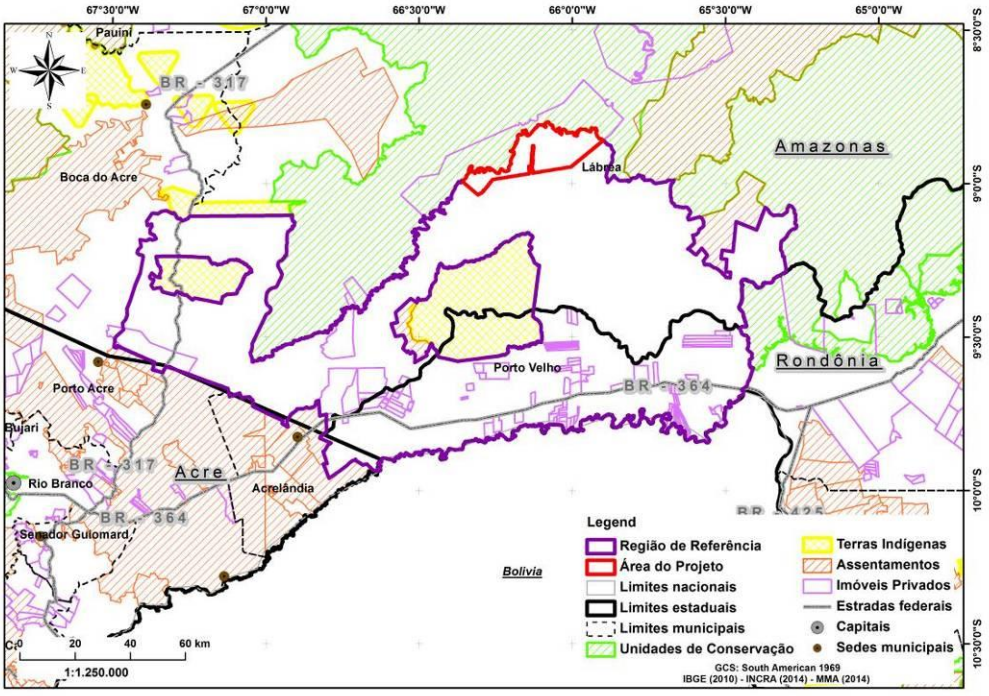


Figure 4. Land use map in the project region, indicating Conservation Units, settlements, indigenous lands (including Kaxarari land) and private lands

The “Nossa Senhora das Cachoeiras do Rio Ituxi” Farm has been submitted to the creation of a federal conservation unit (Floresta Nacional; National Forest) at the north of Iquiri River. The project proponent, landowner, started a judicial process to recover the rights of land use, having succeeded, according to documentation available for consultation. Nevertheless, the proponent has decided to keep this area out of the project scope, to avoid problems related to project non-permanence.

The ICMBio (Instituto Chico Mendes de Conservação da Biodiversidade) has manifested concerns about the location of the project activity, as the farm holds a portion of Iquiri National Forest (FLONA). The project proponent provided explanations on the project, as well as the full project for consultation. In the occasion, the project proponent elucidated that the Project Area has been located outside the FLONA area, and no negative impact is expected to occur in relation to the activities of this federal conservation unit.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	**CF**
Data unit	tC/tdm
Description	Default value of carbon fraction in biomass
Source of data	Values from the literature (e.g. IPCC 2003. Good practice guidance for land use, land-use change and forestry. Kanagawa: IGES, 2003. Available at: <http://www.ipccnggip. iges.or.jp/public/gpglulucf/gpglulucf.html>)
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	The default value was used for conservativeness purposes.
Purpose of the data	Calculation of baseline emissions
Comments	If new and more accurate carbon fraction data become available, these can be used to estimate the net anthropogenic GHG emission reduction of the subsequent fixed baseline period.

Data / Parameter	**44/12**
Data unit	Dimensionless
Description	Carbon mass to CO_2e mass conversion factor
Source of data	From scientific literature: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 AFOLU
Value applied	44/12
Justification of choice of data or description of measurement methods and procedures applied	Conversion from C to CO_2 based on molecular weights
Purpose of the data	Calculation of baseline emissions

Comments	IPCC standard value

Data / Parameter	**R**
Data unit	t root d.m.t^{-1} shoot d.m.
Description	Root to shoot ratio appropriate to species or forest type / biome; note that as defined here, root to shoot ratio is applied as belowground biomass per unit area: aboveground biomass per unit area (not on a per stem basis)
Source of data	Average of following references: 0.37 root-shoot ratio (R), according to "2006 IPCC Guidelines for National Greenhouse Gas Inventories", V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4; and 0.24 root-shoot ratio, according to VM0015, Appendix 3, Table 2. Root to shoot ratios
Value applied	0.31
Justification of choice of data or description of measurement methods and procedures applied	Local values are not known, and the IPCC and VM0015 factors are conservative values.
Purpose of the data	Calculation of baseline emissions
Comments	Peer-reviewed work performed in the region of the Project Area, with a similar vegetation typology. The statistical quality of model is in conformance with methodology requirements.

Data / Parameter	**BEF**
Data unit	dimensionless
Description	Biomass Expansion Factor
Source of data	According to "Brown, S., A. J. R. Gillespie, and A. E. Lugo, 1989. Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35:881-902". (Table 4; pg. 890; minimum value deducted from lowest limit.: 1.743 - 0.083 = 1.66)
Value applied	1.66
Justification of choice of data or description of measurement methods and procedures applied	BEF was applied for conversion of merchantable volume to total aboveground tree biomass.

Purpose of the data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	**Cab_{icl}**
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the aboveground biomass pool of initial forest class icl
Source of data	Average of public literature data from the project region. Further details are provided in "1.10 Conditions Prior to Project Initiation" of this VCS-PD.
Value applied	575
Justification of choice of data or description of measurement methods and procedures applied	0.31 root-shoot ratio (R) was applied (average of following references: 0.37 root-shoot ratio (R), according to "2006 IPCC Guidelines for National Greenhouse Gas Inventories", V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4; and 0.24 root-shoot ratio, according to VM0015, Appendix 3, Table 2. Root to shoot ratios) 1.66 Biomass Expansion Factor (BEF) was applied for conversion of merchantable volume to total aboveground tree biomass, according to "Brown, S., A. J. R. Gillespie, and A. E. Lugo, 1989. Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35:881-902". (Table 4; pg. 890; minimum value deducted from lowest limit.: 1.743 - 0.083 = 1.66) 0.589 t/m^3 wood density was applied, according to Nogueira (2008).
Purpose of the data	Calculation of baseline emissions
Comments	Literature studies used for this assessment, as well as respective calculations, are available for consultation by the audit team.

Data / Parameter	**Cbb_{icl}**
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the belowground biomass pool of initial forest class icl
Source of data	Average of public literature data from the project region. Further details are provided in "1.10 Conditions Prior to Project Initiation" of this VCS-PD.
Value applied	174
Justification of choice of	0.31 root-shoot ratio (R) was applied (average of following

data or description of measurement methods and procedures applied	references: 0.37 root-shoot ratio (R), according to "2006 IPCC Guidelines for National Greenhouse Gas Inventories", V. 4, Ch. 4, AFOLU, pg. 4.49, Table 4-4; and 0.24 root-shoot ratio, according to VM0015, Appendix 3, Table 2. Root to shoot ratios) 0.589 t/m^3 wood density was applied, according to Nogueira (2008).
Purpose of the data	Calculation of baseline emissions
Comments	Literature studies used for this assessment, as well as respective calculations, are available for consultation by the audit team.

Data / Parameter	**Cab_{fcl}**
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the aboveground biomass pool of post-deforestation class fcl
Source of data	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)
Value applied	61.1
Justification of choice of data or description of measurement methods and procedures applied	Conservative default value from IPCC, to estimate post-deforestation land use carbon stock.
Purpose of the data	Calculation of baseline emissions
Comments	Conservative average to be used in calculations, based on uncertainties in source values.

Data / Parameter	**Cbb_{fcl}**
Data unit	tCO_2/ha
Description	Average carbon stock per hectare in the belowground biomass pool of post-deforestation class fcl
Source of data	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)
Value applied	40.5
Justification of choice of data or description of measurement methods and procedures applied	Conservative default value from IPCC, to estimate post-deforestation land use carbon stock.
Purpose of the data	Calculation of baseline emissions
Comments	Conservative average to be used in calculations, based on uncertainties in source values.

Data / Parameter	**EI**
Data unit	N/A
Description	Ex ante estimated effectiveness index
Source of data	Local assessment
Value applied	0.9
Justification of choice of data or description of measurement methods and procedures applied	The project design team conservatively considers that surveillance activities are able to attain 90% of effectiveness in avoiding unplanned deforestation inside the Project Area.
Purpose of the data	Calculation of project emissions
Comments	This value is an ex ante estimate. Accurate and actual values will be monitored and reported in verification periods.

Data / Parameter	**DLF**
Data unit	N/A
Description	Displacement Leakage Factor
Source of data	Local assessment
Value applied	0.05
Justification of choice of data or description of measurement methods	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

and procedures applied	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. The project design team estimates that 100% of potential deforestation agents in the Reference Region will be given the opportunity to participate in leakage prevention activities. Thus, the "Displacement Leakage Factor" (DLF) is conservatively considered as 0.05.
Purpose of the data	Calculation of leakage
Comments	This value is an ex ante estimate. Accurate and actual values will be monitored and reported in verification periods.

Data / Parameter	**Deforestation**
Data unit	ha
Description	Maps of forest cover areas converted into non-forest areas
Source of data	Measured through data from PRODES/INPE project
Value applied	Yearly variable: deforestation values are presented for the Reference Region, Leakage Belt and Project Area (projections) in this VCS-PD
Justification of choice of data or description of measurement methods and procedures applied	The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (PRODES). The data generated by such program is used in this project. PRODES data are applicable for use in this project, according to the criteria listed below (Methodology VM0015): i) PRODES monitoring occurs in the entire project area and leakage belt. ii) PRODES monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period. iii) PRODES monitors conversion of forest land to non-forest land. iv) Monitoring occurred during the entire fixed baseline period.
Purpose of the data	Calculation of baseline emissions
Comments	N/A

3.2 Data and Parameters Monitored

Data / Parameter	**ACPAt**
Data unit	ha
Description	Annual area within the Project Area affected by catastrophic events at year t
Source of data	- Remote sensing data and GIS, - Supervisor reports
Description of measurement methods and procedures to be applied	The following sources were monitored: - INMET (INMET. Instituto Nacional de Meteorologia. http://www.inmet.gov.br /portal/index.php?r=home/page&page= rede_estacoes_conv_graf) - Periodic reports from area supervisor - INPE (INPE. Instituto Nacional de Pesquisas Espaciais. http://www.inpe.br/queimadas/abasFogo.php)
Frequency of monitoring/recording	At each time a catastrophic event occurs
Value monitored	0
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of project emissions
Calculation method	Remote sensing and GIS

Comments	N/A

Data / Parameter	**ABSLLKt**
Data unit	ha
Description	Annual area of deforestation within the leakage belt at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Deforestation in the leakage belt area was considered activity displacement leakage. Activity data for the leakage belt area will be determined using the same methods applied to monitoring deforestation activity data in the project area.
Frequency of monitoring/recording	Annually
Value monitored	2014: 4,531.9 ha. Actual leakage: 0 ha 2015: 10,430.7 ha. Actual leakage: 47.7 ha
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of leakage emissions
Calculation method	Analysis of satellite images and maps
Comments	Where strong evidence can be collected that deforestation in the leakage belt is attributable to deforestation agents that are not linked to the project area, the detected deforestation will not be attributed to the project activity, thus not considered leakage.

Data / Parameter	**ABSLPAt**
Data unit	ha
Description	Annual area of deforestation in the project area at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Forest cover change due to deforestation is monitored through periodic assessment of classified satellite imagery covering the project area.
Frequency of monitoring/recording	Annually
Value monitored	0
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of project emissions
Calculation method	Analysis of satellite images and maps
Comments	N/A

Data / Parameter	**ΔCADLKt**
Data unit	tCO_2e
Description	Total decrease in carbon stocks due to displaced deforestation at year t

Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	Deforestation in the leakage belt area was considered activity displacement leakage. Activity data for the leakage belt area was determined using the same methods applied to monitoring deforestation activity data in the project area.
Frequency of monitoring/recording	Annually
Value monitored	2014: 0 tCO_2e 2015: 28,248 tCO_2e
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of leakage emissions
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	**$\Delta CPAdPAt$**
Data unit	tCO_2e
Description	Total decrease in carbon stock due to all planned activities at year t in the project area
Source of data	Documents, remote sensing and GIS
Description of measurement methods and procedures to be	The planned activities in the project area that result in carbon stock decrease would be subject to monitoring, if

applied	significant.
Frequency of monitoring/recording	Annually
Value monitored	2014: 36,751 tCO_2e 2015: 0 tCO_2e
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of project emissions
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	**ΔCPSLKt**
Data unit	tCO_2e
Description	Total annual carbon stock change in leakage management areas in the project case
Source of data	- Activities report related to leakage prevention measures. - Field assessment. - Remote sensing and GIS.
Description of measurement methods and procedures to be applied	The planned activities in leakage management areas that result in carbon stock decrease would be subject to monitoring, if significant.

Frequency of monitoring/recording	Annually
Value monitored	0
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of leakage
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	**ΔCUDdPAt**
Data unit	tCO_2e
Description	Total actual carbon stock change due to unavoided unplanned deforestation at year t in the project area
Source of data	Remote sensing and GIS
Description of measurement methods and procedures to be applied	Forest cover change due to unplanned deforestation is monitored through periodic assessment of classified satellite imagery covering the project area.
Frequency of monitoring/recording	Annually
Value monitored	0
Monitoring equipment	Remote sensing and GIS

QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of project emissions
Calculation method	Emissions from deforestation are estimated by multiplying the detected area of forest loss by the average forest carbon stock per unit area.
Comments	N/A

Data / Parameter	**EBBPSPAt**
Data unit	tCO_2e
Description	Sum of (or total) actual non-CO_2 emissions from forest fire at year t in the project area
Source of data	- Remote sensing data and GIS, - Supervisor reports.
Description of measurement methods and procedures to be applied	If forest fires occur, these non-CO_2 emissions are subject to monitoring and accounting, when significant.
Frequency of monitoring/recording	Areas burnt are monitored every 5 years or if verification occurs on a frequency of less than every 5 years, examination will occur prior to any verification event.
Value monitored	0
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters.

	Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of project emissions
Calculation method	Analysis of satellite images and maps to determine the incidence of deforestation and multiplying it by the respective emission factors.
Comments	If forest fires occur, these non-CO_2 emissions will be subject to monitoring and accounting, when significant.

Data / Parameter	**EADLKt**
Data unit	tCO_2e
Description	Total ex ante increase in GHG emissions due to displaced forest fires at year t
Source of data	Remote sensing data and GIS
Description of measurement methods and procedures to be applied	When significant, GHG emissions due displaced forest fires are monitored.
Frequency of monitoring/recording	Annually
Value monitored	2014: 0 tCO_2e 2015: 1,190 tCO_2e
Monitoring equipment	Remote sensing and GIS
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of

	geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of leakage
Calculation method	Analysis of satellite images and maps to determine the incidence of deforestation and multiplying it by the respective emission factors.
Comments	Where strong evidence can be collected that forest fires in the leakage belt is attributable to deforestation agents that are not linked to the project area, the detected deforestation will not be attributed to the project activity, thus not considered leakage.

Data / Parameter	**RFt**
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	- VCS Non-Permanence Risk Report (v3.1), - Remote sensing data and GIS, - Supervisor report. - Literature data.
Description of measurement methods and procedures to be applied	All sources of data from the VCS Non-Permanence Risk Report were used to measure the various risk factors.
Frequency of monitoring/recording	Annually
Value monitored	21
Monitoring equipment	VCS-approved AFOLU Non-Permanence Risk Tool
QA/QC procedures to be applied	Literature data from reputed sources will be used and critically checked. When possible, the average of two or more sources will be used.
Purpose of the data	Calculation of buffer credits
Calculation method	All the risk factors described in the VCS Non-Permanence Risk Report were assessed.

Comments	N/A

Data / Parameter	**Deforestation in the project area and leakage belt**
Data unit	ha
Description	Forest cover areas converted into non-forest areas inside the Project Area and Leakage Belt
Source of data	Calculated through remote sensing images
Description of measurement methods and procedures to be applied	The monitoring of the forest cover in the Project Area and Leakage Belt was done through satellite image analysis. When data from the PRODES system are not available, the forest cover monitoring will be carried out by automatic classification and visual interpretation of images from other optical sensors or SAR data.
Frequency of monitoring/recording	Annually
Value monitored	Project Area: 2014: 0 ha 2015: 0 ha Leakage Belt: 2014: 4,531.9 ha 2015: 10,430.7 ha
Monitoring equipment	Remote sensing images digital processing program, geographic information systems
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.

Purpose of the data	Calculation of project emissions Calculation of leakage emissions
Calculation method	Analysis of satellite images and maps
Comments	N/A

Data / Parameter	**ΔCabBSLLKt**
Data unit	tCO_2e
Description	Total carbon stock changes in the leakage belt area
Source of data	Calculated
Description of measurement methods and procedures to be applied	• leakage prevention activities were listed; • a map showing areas of intervention and type of intervention were prepared; • areas where leakage prevention activities impact carbon stock were identified; • non-forest classes existing within these areas in the baseline case were identified; • conservative literature carbon stocks estimates were used; • carbon stock changes in the leakage management areas under the project scenario were reported using table 30b of the VM0015; • net carbon stock changes that the leakage prevention measures cause during the project crediting period were calculated; • results of the calculations are reported in table 30.c of the VM0015.
Frequency of monitoring/recording	To be determined depending on the activity
Value monitored	2014: 0 tCO_2e 2015: 29,438 tCO_2e
Monitoring equipment	Remote sensing images digital processing program, geographic information systems
QA/QC procedures to be applied	Best practices in remote sensing and GIS: 1) Land use and land cover mapping is assessed using images with spatial resolution superior to 30 meters. Image acquisition is performed during the period of low incidence of clouds and rainfall in the region, within July and September. 2) Images undergo geometric correction by means of

	geo-referencing, using topographic maps as reference or USG-NASA orthorectified images. 3) For analysis of areas with cloud cover, visual interpretation of radar image is performed. 4) Evaluation of classification accuracy is performed by analyzing the overall accuracy and kappa index obtained from a confusion matrix. The minimum accuracy of the classification mapping should be 80%.
Purpose of the data	Calculation of leakage
Calculation method	Analysis of satellite images and maps to determine deforestation in Leakage Belt and multiplying it by the carbon stocks previously set.
Comments	N/A

3.3 Monitoring Plan

This Monitoring Plan was developed according to Methodology VM0015 “Methodology for Avoided Unplanned Deforestation”, Version 1.1. The methodology encompasses three main monitoring tasks:

i) Monitoring of actual carbon stock changes and GHG emissions within the project area;

ii) Monitoring of leakage; and

iii) Ex post calculation of net anthropogenic GHG emission reduction.

This Monitoring Plan describes how these tasks are implemented. For each task, the monitoring plan includes the following aspects:

a) Technical description of the monitoring tasks.

b) Data to be collected.

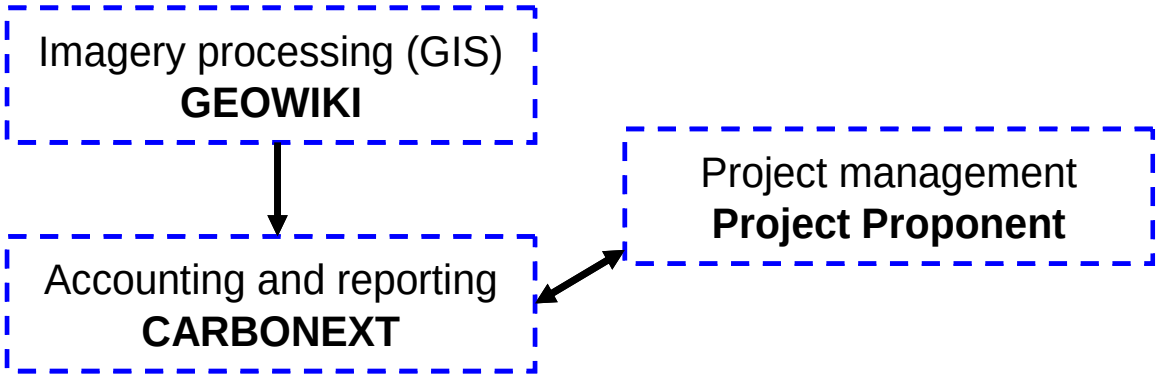
c) Overview of data collection procedures.

d) Quality control and quality assurance procedures.

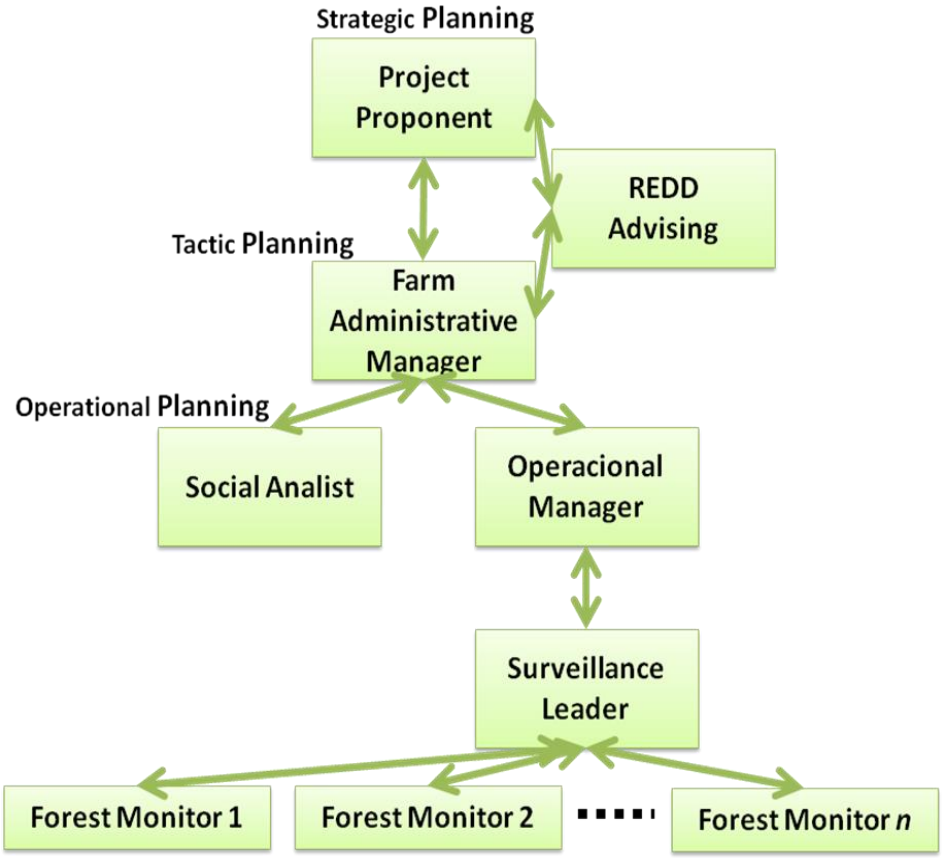
e) Data archiving.

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

General overview of parties involved in monitoring activities



General overview of staff in the Project Area



3.3.1 Monitoring of actual carbon stock changes and GHG emissions within the project area

Monitoring of project implementation

a) Technical description of the monitoring tasks.

Project activities implemented within the project area have been monitored to be consistent with the management plans of the project area and the PD.

b) Data to be collected.

Monitoring of deforestation-avoidance activities has been performed by means of evaluations of the surveillance rounds, and using satellite imagery to continuously inspect the forest condition within the Project Area. All images, maps and records generated during project implementation should be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

Monitoring of social and biodiversity parameters of project implementation has been based on data required in Tables 40 and 41, which attest that foreseen activities are being effectively implemented. A system has been implemented to record data on costs and investments, based on invoices, receipts and contracts related to activity implementation, as well as signed attendance lists.

c) Overview of data collection procedures.

All invoices, receipts and contracts related to activities implemented in this REDD project shall be conserved in printed version. Whenever possible, documentation should be kept in electronic format.

d) Quality control and quality assurance procedures.

The project proponent will train personnel to collect and keep all documentation in a sure place. All electronic documentation should also be sent to CARBONEXT to further security and checking.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification. Backup copies of files should be available in the project proponent facilities, as well as in CARBONEXT facilities.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

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

The project proponent is responsible to implement this monitoring item. CARBONEXT is co-responsible in archiving, and quality control and quality assurance procedures.

Monitoring of land-use and land-cover change within the project area

a) Technical description of the monitoring tasks.

Monitoring of land-use and land-cover change within the Project Area will be performed annually by analyzing satellite imagery of the Project Area.

Imagery analysis of land use will be based on secondary information from PRODES Digital (INPE, 2014), referring mainly to the classes "Forest Land" and "Non-Forest Land".

b) Data to be collected.

The categories of change that will be subject to MRV-A (monitoring, reporting, verification and accounting) are “Area of forest land converted to non-forest land”, “Area of forest land undergoing carbon stock decrease” and “Area of forest land undergoing carbon stock increase”. These categories are mandatory in AUD project activities having the same characteristics as this project (i.e. planned logging above the baseline and claiming carbon credits for carbon stock increase).

In this context, data to be collected consists of annual satellite imagery processed by PRODES, for the entire land coverage of Project Area.

The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

c) Overview of data collection procedures.

The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (PRODES). The data generated by such program is used in this project. PRODES data are applicable for use in this project, according to the criteria listed below (Methodology VM0015):

i) PRODES monitoring occurs in the entire project area and leakage belt.

ii) PRODES monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period.

iii) PRODES monitors conversion of forest land to non-forest land.

iv) Monitoring occurred during the entire fixed baseline period.

d) Quality control and quality assurance procedures.

The validation of land-use data used for modeling of land use will be performed by using the confusion matrix, in order to calculate the overall index of success by period and by class. Three specific classes will be used: forest, accumulated deforestation and other (hydrography, not forest, clouds, roads, residues, unclassified objects, and others).

The validation will be performed by using the land use mapping PRODES Digital (2014). The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

With the help of the "Create Random Points" tool in ArcGIS 10.0, 100 random points will be generated for each class / year as samples for evaluation, using satellite images as reference, making it possible to generate a confusion matrix for calculation of the accuracy indexes, and the Kappa index (indicators for validation of mapping accuracy).

Land use classes must have higher values than 90% accuracy for the accuracy and Kappa index, as required in VM00015 1.1 methodology.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

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

All satellite imagery assessments will be performed by GEOWIKI. CARBONEXT is responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits. The Project Proponent is co-responsible for data archiving.

Monitoring of carbon stock changes and non-CO2 emissions from forest fires

a) Technical description of the monitoring tasks.

Monitoring of carbon stocks is mandatory in the following cases:

Within the project area:

a) Areas subject to significant carbon stock decrease in the project scenario according to the ex ante assessment. These will be areas subject to controlled deforestation and planned harvest activities, such as logging, fuel wood collection and charcoal production. In these areas, carbon stock changes must be estimated at least once after each harvest event.

b) Areas subject to unplanned and significant carbon stock decrease, e.g. due to uncontrolled forest fires and other catastrophic events. In these areas, carbon stock losses must be estimated as soon as possible after the catastrophic event. See section 1.1.4 below for more detailed guidance.

Within leakage management areas:

a) Areas subject to planned and significant carbon stock decrease in the project scenario according to the ex ante assessment. In these areas, carbon stocks must be estimated at least once after the planned event that caused the carbon stock decrease.

b) Data to be collected.

The results of monitoring activity data and carbon stocks must be reported using the same formats and tables used for the ex ante assessment, according to Methodology VM0015 (the applicability of each table must be evaluated ex post, in the Monitoring Report):

Table 15 Ex post carbon stock per hectare of initial forest classes icl existing in the project area and leakage belt

Table 16 Ex post carbon stock per hectare of initial final classes fcl existing in the project area and leakage belt

Table 25.a Ex post carbon stock decrease due to planned and unplanned deforestation in the project area.

Table 25.b Ex post carbon stock decrease due to planned logging activities.

Table 25.c Ex post carbon stock decrease due to planned fuel-wood and charcoal activities.

Table 25.d Total ex post carbon stock decrease due to planned activities in the project area.

Table 25.e Ex post carbon stock decrease due to forest fires.

Table 25.f Ex post carbon stock decrease due to catastrophic events.

Table 25.g Total ex post carbon stock decrease due to forest fires and catastrophic events.

Table 26.a Ex post carbon stock increase due to growth without harvest.

Table 26.b Ex post carbon stock increase following planned logging activities.

Table 26.c Ex post carbon stock increase following planned fuel-wood and charcoal activities.

Table 26.d Total ex post carbon stock increase due to planned activities in the project area.

Table 26.e Ex post carbon stock increase on areas affected by forest fires.

Table 26.f Ex post carbon stock increase on areas affected by catastrophic events.

Table 26.g Ex post carbon stock increase on areas recovering after forest fires and catastrophic events.

Table 27 Ex post total net carbon stock change in the project area.

Non-CO_2 emissions from forest fires are subject to monitoring and accounting, when significant. In this case, under the project scenario it will be necessary to monitor the variables of table 23 within the project area and to report the results in table 24, according to VM0015.

Decreases in carbon stocks and increases in GHG emissions (e.g. in case of forest fires) due to natural disturbances (such as hurricanes, earthquakes, volcanic eruptions, tsunamis, flooding, drought47, fires, tornados or winter storms) or man-made events, including those over which the project proponent has no control (such as acts of terrorism or war), are subject to monitoring and must be accounted under the project scenario, when significant. Use tables 25.e, 25.f and 25.g to report carbon stock decreases and, optionally, tables 26.e, 26.f and 26.g to report carbon stock increases that may happen on the disturbed lands after the occurrence of an event. Use tables 23 and 24 to report emissions from forest fires.

If the area (or a sub-set of it) affected by natural disturbances or man-made events generated VCUs in past verifications, the total net change in carbon stocks and GHG emissions in the area(s) that generated VCUs must be estimated, and an equivalent amount of VCUs must be cancelled from the VCS buffer.

Summarize the results of all ex post estimations in the project area using the same table format used for the ex ante assessment:

Table 29: Total ex post estimated actual net changes in carbon stocks and emissions of GHG gases in the project area.

c) Overview of data collection procedures.

The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (PRODES). The data generated by such program is used in this project. PRODES data are applicable for use in this project, according to the criteria listed below (Methodology VM0015):

i) PRODES monitoring occurs in the entire project area and leakage belt.

ii) PRODES monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period.

iii) PRODES monitors conversion of forest land to non-forest land.

iv) Monitoring occurred during the entire fixed baseline period.

d) Quality control and quality assurance procedures.

The validation of land-use data used for modeling of land use will be performed by using the confusion matrix, in order to calculate the overall index of success by period and by class. Three specific classes will be used: forest, accumulated deforestation and other (hydrography, not forest, clouds, roads, residues, unclassified objects, and others).

The validation will be performed by using the land use mapping PRODES Digital (2014). The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

With the help of the "Create Random Points" tool in ArcGIS 10.0, 100 random points will be generated for each class / year as samples for evaluation, using satellite images as reference, making it possible to generate a confusion matrix for calculation of the accuracy indexes, and the Kappa index (indicators for validation of mapping accuracy).

Land use classes must have higher values than 90% accuracy for the accuracy and Kappa index, as required in VM00015 1.1 methodology.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

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

All satellite imagery assessments will be performed by GEOWIKI. CARBONEXT is responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits. The Project Proponent is co-responsible for data archiving.

4.3.2 Monitoring of leakage

a) Technical description of the monitoring tasks.

The sources of leakage identified as significant in the ex ante assessment are subject to monitoring. Two sources of leakage are potentially subject to monitoring:

- Decrease in carbon stocks and increase in GHG emissions associated with leakage prevention activities;

- Decrease in carbon stocks and increase in GHG emissions in due to activity displacement leakage.

This Project Activity does not involve decrease in carbon stocks and increase in GHG emissions associated with leakage prevention activities. In this project, leakage prevention activities do not involve any carbon stock reduction due to deforestation or additional emissions caused by increased grazing activities. In this case, only the decrease in carbon stocks and increase in GHG emissions in due to activity displacement leakage will be monitored.

b) Data to be collected.

Deforestation above the baseline in the leakage belt area will be considered activity displacement leakage.

The result of the ex post estimations of carbon stock changes must be reported using the same table formats used in the ex ante assessment of baseline carbon stock changes in the leakage belt.

Table 22.c.1. Ex post above-ground net carbon stock changes in the leakage belt.

Table 22.c.2. Ex post below-ground net carbon stock changes in the leakage belt.

Table 22.c.6. Ex post net carbon stock changes in the wood products in the leakage belt.

Where strong evidence can be collected that deforestation in the leakage belt is attributable to deforestation agents that are not linked to the Project Area, the detected deforestation will not be attributed to the Project Activity and considered leakage. The operational entity verifying the monitoring data shall determine whether the documentation provided by the project proponent represents sufficient evidence to consider the detected deforestation as not attributable to the Project Activity and therefore not leakage.

To estimate the increased GHG emissions due to forest fires in the leakage belt area the assumption is made that forest clearing is done by burning the forest. The parameter values used to estimate emissions shall be the same used for estimating forest fires in the baseline (table 23), except for the initial carbon stocks (Cab, Cdw) which shall be those of the initial forest classes burned in the leakage belt area.

Report the result of the estimations using the same table formats used in the ex ante assessment of baseline GHG emissions from forest fires in the project area:

Table 23: Parameters used to calculate emissions from forest fires in the leakage belt area

Table 24: Ex post estimated non-CO_2 emissions from forest fires in the leakage belt area

The results of all ex post estimations of leakage are summarized using the same table format used for the ex ante assessment:

Table 35. Total ex post estimated leakage.

c) Overview of data collection procedures.

The project area is located within a region that is subject to a monitoring program that is approved or sanctioned by the national government (PRODES). The data generated by such program is used in this project. PRODES data are applicable for use in this project, according to the criteria listed below (Methodology VM0015):

i) PRODES monitoring occurs in the entire project area and leakage belt.

ii) PRODES monitoring occurs in the entire reference region and covers the beginning, middle and end of the fixed baseline period.

iii) PRODES monitors conversion of forest land to non-forest land.

iv) Monitoring occurred during the entire fixed baseline period.

d) Quality control and quality assurance procedures.

The validation of land-use data used for modeling of land use will be performed by using the confusion matrix, in order to calculate the overall index of success by period and by class. Three specific classes will be used: forest, accumulated deforestation and other (hydrography, not forest, clouds, roads, residues, unclassified objects, and others).

The validation will be performed by using the land use mapping PRODES Digital (2014). The satellite images used will be four scenes of satellite Landsat 8 TM (orbits 001/65, 001/66, 233/65, and 233/66) to the total geographic scope of the Project Area and Reference Region.

With the help of the "Create Random Points" tool in ArcGIS 10.0, 100 random points will be generated for each class / year as samples for evaluation, using satellite images as reference, making it possible to generate a confusion matrix for calculation of the accuracy indexes, and the Kappa index (indicators for validation of mapping accuracy).

Land use classes must have higher values than 90% accuracy for the accuracy and Kappa index, as required in VM00015 1.1 methodology.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

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

All satellite imagery assessments will be performed by GEOWIKI. CARBONEXT is responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits. The Project Proponent is co-responsible for data archiving.

4.3.3 Ex post calculation of net anthropogenic GHG emission reduction

a) Technical description of the monitoring tasks.

The calculation of ex post net anthropogenic GHG emission reductions is similar to the ex ante calculation with the only difference that ex post estimated carbon stock changes and GHG emissions must be used in the case of the project scenario and leakage.

b) Data to be collected.

Report the ex post estimated net anthropogenic GHG emissions and calculation of Verified Carbon Units (VCUt, and VBCt) using the same table format used for the ex ante assessment:

Table 36: Ex post estimated net anthropogenic GHG emission reductions and VCUs.

c) Overview of data collection procedures.

Data collection procedures are the same as described in previous steps. This step involves compilation of data from previous procedures to calculate ex post net anthropogenic GHG emission reduction.

d) Quality control and quality assurance procedures.

A map showing Cumulative Areas Credited within the project area shall be updated and presented to VCS verifiers at each verification event. The cumulative area cannot generate additional VCUs in future periods.

e) Data archiving.

All maps and records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

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

All satellite imagery assessments will be performed by GEOWIKI. CARBONEXT is responsible for reporting and data archiving, according to VM0015, and for providing assistance during verification audits. The Project Proponent is co-responsible for data archiving.

4.3.4 Initial plan for selecting community and biodiversity variables to be monitored

Communities

a) Technical description of the monitoring tasks.

The farm already supports a company for harvest of Brazil-nuts, which is called "Castanhal Fortaleza". The farm has established a kind of partnership with this company, by giving it free access to the forest for harvesting nuts. The families and communities involved in "Castanhal Fortaleza" business will receive additional benefits due to implementation of this Project Activity.

Among the proposed activities, the project proponent forecasts the organization of trainings focusing on sustainable cattle ranching. Furthermore, fire brigade teams will be trained, a biomass inventory will be set up, and new income opportunities will be created in the Municipalities of Lábrea and Porto Velho (both in terms of wood products and in terms of the sustainable exploitation of non-wood products, e.g. Brazil nuts).

b) Data to be collected.

i) Complementary monitoring of labor conditions (monthly internal audits for health and security assessments, nutrition aspects, personal care and hygiene etc.);

ii) Monitoring the attendance of young in schools;

iii) Number of workers trained for sustainable cattle ranching techniques;

iv) Number of workers trained for fire brigades;

v) Number of attendees in training on forest management;

vi) Number of people reached in dissemination of forest conservation practices;

vii) Commercial activity data from "Castanhal Fortaleza" company.

Table 1. Social parameters to be monitored: activities, scope, indicators, units, monitoring frequencies, goals, corrective actions after critical analyses

Activities dependent on the completion of the Validation process

Activity	Scope	Indicator	Unit	Monitoring Frequency	Goal	Corrective Actions after Critical Analyses
Training of fire brigades	Project Area	Attendance	Attendees per Year	5 years	All employees and 15 neighbors	Enhance partnership with teaching institutions; Improve dissemination and communication means; Revise conditions of local and time of sessions
Training on forest management	Project Area	Attendance	Attendees per Year	3 years	All employees and 15 neighbors	Enhance partnership with teaching institutions; Improve dissemination and communication means; Revise conditions of local and time of sessions
Health internal audits	Project Area	Coverage	% of Employees per Month	monthly	100	Improve supervisor attendance in the field; Increase the number of supervisors in the field
Security internal audits	Project Area	Coverage	% of Employees per Month	monthly	100	Improve supervisor attendance in the field; Increase the number of supervisors in the field
Advice on nutritional aspects	Project Area	Attendance	% of Employees per Two Months	2 months	100	Improve dissemination and communication means; Consult employees about conditions of local and time of sessions
Advice on personal care and hygiene	Project Area	Attendance	% of Employees per Two Months	2 months	100	Improve dissemination and communication means; Consult employees about conditions of local and time of sessions
Monitoring the attendance in schools	Project Area	Attendance	% of School Attendance by Employees' Sons	2 months	90	Strengthen orientation of parents (employees); Improve relationship with schools to incentive students; Provide additional incentive to students

Activities dependent on carbon credits sales

Activity	Scope	Indicator	Unit	Monitoring Frequency	Goal	Corrective Actions after Critical Analyses
Training on sustainable cattle raising	Regional	Attendance	Attendees per Year	yearly	15	Enhance partnership with teaching institutions; Improve dissemination and communication means; Revise conditions of local and time of sessions
Training on forest management	Regional	Attendance	Attendees per Year	yearly	15	Enhance partnership with teaching institutions; Improve dissemination and communication means; Revise conditions of local and time of sessions

c) Overview of data collection procedures.

Data collection procedures will consist of monthly internal audits involving field visits in operation sites, as well as interviews with workers and their families.

d) Quality control and quality assurance procedures.

All communication with workers and families will be registered in minutes of meeting, which might be signed by all parties involved.

Attestation of health plans and attendance in school should also be collected every 6 months.

Reports of internal audits should be produced monthly. These reports should clearly inform the results of variables involved in monitoring, by means of photos, interviews, and documents.

e) Data archiving.

All records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

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

The Project Proponent is responsible for the social aspects and labor conditions inside the Project Area.

Biodiversity

a) Technical description of the monitoring tasks.

The monitoring tasks aim to assess the effectiveness of measures used to maintain High Conservation Values to community well-being present in the project zone.

b) Data to be collected.

A survey on the occurrence of High Conservation Values in the Project Area will be carried out after the first verification period. This assessment will be monitored and reported every 5 years.

The studies will involve fauna and flora aspects in the Project Area, as well as evaluations of the relationship between High Conservation Values in the Project Area and local communities.

The biodiversity monitoring results will be inserted in the Sustainable Forest Management Plan for publication and dissemination to the communities and other stakeholders.

Table 2. Biodiversity parameters to be monitored: activities, scope, indicators, units, monitoring frequencies, goals, corrective actions after critical analyses

Activities dependent on the completion of the Validation process

Activity	Scope	Indicator	Unit	Monitoring Frequency	Goal	Corrective Actions after Critical Analyses
Training of fire brigades	Project Area	Attendance	Attendees per Year	5 years	All employees and 15 neighbors	Enhance partnership with teaching institutions; Improve dissemination and communication means; Revise conditions of local and time of sessions
Dissemination of forest conservation practices	Project Area	Attendance	% of Employees per Two Months	2 months	100	Improve supervisor attendance in the field; Increase the number of supervisors in the field

Activities dependent on carbon credits sales

Activity	Scope	Indicator	Unit	Monitoring Frequency	Goal	Corrective Actions after Critical Analyses
Biomass, fauna and flora inventory	Project Area	Carbon Stock	tCO_2 per hectare	5 years	Maintenance of carbon stocks	Increase in surveillance mechanisms; Develop conservation practices; Consult specialists; Revise exploitation procedures; Revise contingency procedures; Consider enrichment practices to improve biodiversity
		Endangered fauna species	Number of Endangered Species		Maintenance of number of fauna endangered species	
		Total fauna species	Number of Species		Maintenance of total number of fauna species	
		Endangered plant species	Number of Endangered Species		Maintenance of number of plant endangered species	
		Total plant species	Number of Species		Maintenance of total number of plant species	
Survey on High Conservation Value areas	Project Area	Attributes to be defined by Survey	% of Protection of High Conservation Value Attributes	5 years	100	Increase in surveillance mechanisms; Development of conservation practices; Consultation of specialists
Dissemination of forest conservation practices	Regional	Attendance	Attendees per Year	yearly	15	Enhance partnership with teaching institutions; Improve dissemination and communication means; Revise conditions of local and time of sessions

c) Overview of data collection procedures.

Data collection will be carried out by means of local studies on fauna, flora and High Conservation Value aspects. These studies will be planned and performed by a specialized outsourced company. Data collection procedures will be described in depth in the first biodiversity monitoring report to be issued after the first verification period.

d) Quality control and quality assurance procedures.

The quality control and quality assurance procedures will be determined by a specialized outsourced company. Quality control and quality assurance procedures will be described in depth in the first biodiversity monitoring report to be issued after the first verification period.

e) Data archiving.

All records generated during project implementation will be conserved and made available to VCS verifiers at verification for inspection to demonstrate that the AUD project activity has actually been implemented.

All documents and records will be kept in a secure retrievable manner for at least two years after the end of the project crediting period.

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

The Project Proponent is responsible for the biodiversity assessments in this Project Activity. Fauna and flora assessments will be performed by a specialized outsourced company (to be defined).

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The accumulated baseline deforestation projected to occur within the Project Area was estimated as 5,391.6 hectares over the 30-years project lifetime. The estimated average annual rate of deforestation is 179.7 hectares for the Project Area.

Table 3. Annual areas of baseline deforestation in the project area (Table 9.b of VM0015)

Year	Project year	Total - PA	
		annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2013	0	-	0.0
2014	1	1,748.25	1,748.3
2015	2	244.00	1,992.3
2016	3	-	1,992.3
2017	4	242.31	2,234.6
2018	5	-	2,234.6
2019	6	241.87	2,476.4
2020	7	-	2,476.4
2021	8	246.66	2,723.1
2022	9	-	2,723.1
2023	10	238.68	2,961.8
2024	11	-	2,961.8
2025	12	237.54	3,199.3
2026	13	-	3,199.3
2027	14	238.86	3,438.2
2028	15	-	3,438.2
2029	16	225.66	3,663.8
2030	17	-	3,663.8
2031	18	224.42	3,888.3
2032	19	-	3,888.3
2033	20	219.81	4,108.1
2034	21	-	4,108.1
2035	22	217.42	4,325.5
2036	23	-	4,325.5
2037	24	220.70	4,546.2
2038	25	-	4,546.2
2039	26	212.02	4,758.2
2040	27	-	4,758.2
2041	28	213.97	4,972.2
2042	29	-	4,972.2
2043	30	419.42	5,391.6
TOTAL		**5,391.6**	

Table 4. Annual areas of baseline deforestation in the leakage belt (Table 9.c of VM0015)

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0
2014	1	9,824.5	9,824.5
2015	2	9,550.7	19,375.2
2016	3	10,816.8	30,192.0
2017	4	8,854.7	39,046.7
2018	5	10,414.4	49,461.1
2019	6	8,464.0	57,925.1
2020	7	10,012.1	67,937.2
2021	8	8,358.8	76,296.0
2022	9	11,309.6	87,605.6
2023	10	7,678.3	95,283.8
2024	11	8,632.8	103,916.6
2025	12	7,620.2	111,536.8
2026	13	8,142.8	119,679.6
2027	14	7,435.6	127,115.2
2028	15	7,759.2	134,874.4
2029	16	7,194.7	142,069.1
2030	17	9,005.5	151,074.6
2031	18	6,466.6	157,541.3
2032	19	6,958.6	164,499.9
2033	20	6,291.9	170,791.8
2034	21	6,668.8	177,460.6
2035	22	6,039.0	183,499.6
2036	23	6,427.9	189,927.5
2037	24	5,778.2	195,705.7
2038	25	7,492.6	203,198.3
2039	26	5,144.3	208,342.7
2040	27	5,857.8	214,200.5
2041	28	8,801.2	223,001.7
2042	29	1,792.8	224,794.4
2043	30	4,774.6	229,569.0
TOTAL		**229,569.0**	

According to MMA data, the Project Area has 100% of its forest cover corresponding to Open Ombrophylous Forest (Submontane open ombrophylous forest – As). The following table shows the annual estimates of deforestation within the Project Area, obtained by means of modelling.

Table 5. Annual areas deforested per forest class icl within the project area in the baseline case (baseline activity data per forest class) (Table 11.b of VM0015)

Year	ID_{icl} >	1	Total baseline deforestation in the project area	
	Name >	Submontane open ombrophilous forest (As)		
	Project year *t*	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2013	0	0.0	0.0	0.0
2014	1	1,748.3	1,748.3	1,748.3
2015	2	244.0	244.0	1,992.3
2016	3	0.0	0.0	1,992.3
2017	4	242.3	242.3	2,234.6
2018	5	0.0	0.0	2,234.6
2019	6	241.9	241.9	2,476.4
2020	7	0.0	0.0	2,476.4
2021	8	246.7	246.7	2,723.1
2022	9	0.0	0.0	2,723.1
2023	10	238.7	238.7	2,961.8
2024	11	0.0	0.0	2,961.8
2025	12	237.5	237.5	3,199.3
2026	13	0.0	0.0	3,199.3
2027	14	238.9	238.9	3,438.2
2028	15	0.0	0.0	3,438.2
2029	16	225.7	225.7	3,663.8
2030	17	0.0	0.0	3,663.8
2031	18	224.4	224.4	3,888.3
2032	19	0.0	0.0	3,888.3
2033	20	219.8	219.8	4,108.1
2034	21	0.0	0.0	4,108.1
2035	22	217.4	217.4	4,325.5
2036	23	0.0	0.0	4,325.5
2037	24	220.7	220.7	4,546.2
2038	25	0.0	0.0	4,546.2
2039	26	212.0	212.0	4,758.2
2040	27	0.0	0.0	4,758.2
2041	28	214.0	214.0	4,972.2
2042	29	0.0	0.0	4,972.2
2043	30	419.4	419.4	5,391.6
TOTAL			**5,391.6**	

The following table shows the annual estimates of deforestation within the Leakage Belt, obtained by means of modelling.

Table 6. Annual areas deforested per forest class icl within the leakage belt area in the baseline case (baseline activity data per forest class) (Table 11.c of VM0015)

Year	ID_{icl} >	1	Total baseline deforestation in the leakage belt	
	Name >	Submontane open ombrophilous forest (As)		
	Project year *t*	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0	0.0
2014	1	9,824.5	9,824.5	9,824.5
2015	2	9,550.7	9,550.7	19,375.2
2016	3	10,816.8	10,816.8	30,192.0
2017	4	8,854.7	8,854.7	39,046.7
2018	5	10,414.4	10,414.4	49,461.1
2019	6	8,464.0	8,464.0	57,925.1
2020	7	10,012.1	10,012.1	67,937.2
2021	8	8,358.8	8,358.8	76,296.0
2022	9	11,309.6	11,309.6	87,605.6
2023	10	7,678.3	7,678.3	95,283.8
2024	11	8,632.8	8,632.8	103,916.6
2025	12	7,620.2	7,620.2	111,536.8
2026	13	8,142.8	8,142.8	119,679.6
2027	14	7,435.6	7,435.6	127,115.2
2028	15	7,759.2	7,759.2	134,874.4
2029	16	7,194.7	7,194.7	142,069.1
2030	17	9,005.5	9,005.5	151,074.6
2031	18	6,466.6	6,466.6	157,541.3
2032	19	6,958.6	6,958.6	164,499.9
2033	20	6,291.9	6,291.9	170,791.8
2034	21	6,668.8	6,668.8	177,460.6
2035	22	6,039.0	6,039.0	183,499.6
2036	23	6,427.9	6,427.9	189,927.5
2037	24	5,778.2	5,778.2	195,705.7
2038	25	7,492.6	7,492.6	203,198.3
2039	26	5,144.3	5,144.3	208,342.7
2040	27	5,857.8	5,857.8	214,200.5
2041	28	8,801.2	8,801.2	223,001.7
2042	29	1,792.8	1,792.8	224,794.4
2043	30	4,774.6	4,774.6	229,569.0
TOTAL			**229,569.0**	

To project the LU/LC classes that will replace forests in the baseline case, Method 1 “Historical LU/LC-change” has been chosen, since historical LU/LC-changes are assumed to be

representative for future trends. Hence, post-deforestation land-uses are allocated to the projected areas of annual deforestation in same proportions as those observed on lands deforested during the historical reference period in the Reference Region.

As previously mentioned in “1.10 Conditions Prior to Project Initiation” of the VCS-PD, pasture accounts for virtually all the deforested land occupation in the project region. Thus, the post-deforestation class is considered as “pasture”.

The following table shows the annual estimates of deforestation within the Project Area, obtained by means of modelling.

Table 7. Annual areas deforested in each zone within the project area in the baseline case (baseline activity data zone) (Table 13.b of VM0015)

Year	ID_z >	1	Total baseline deforestation in the project area	
	Name >	Pasture		
	Project year *t*	ha	annual $ABSLPA_t$ ha	cummulative ABSLPA ha
2013	0	0.0	0.0	0.0
2014	1	1,748.3	1,748.3	1,748.3
2015	2	244.0	244.0	1,992.3
2016	3	0.0	0.0	1,992.3
2017	4	242.3	242.3	2,234.6
2018	5	0.0	0.0	2,234.6
2019	6	241.9	241.9	2,476.4
2020	7	0.0	0.0	2,476.4
2021	8	246.7	246.7	2,723.1
2022	9	0.0	0.0	2,723.1
2023	10	238.7	238.7	2,961.8
2024	11	0.0	0.0	2,961.8
2025	12	237.5	237.5	3,199.3
2026	13	0.0	0.0	3,199.3
2027	14	238.9	238.9	3,438.2
2028	15	0.0	0.0	3,438.2
2029	16	225.7	225.7	3,663.8
2030	17	0.0	0.0	3,663.8
2031	18	224.4	224.4	3,888.3
2032	19	0.0	0.0	3,888.3
2033	20	219.8	219.8	4,108.1
2034	21	0.0	0.0	4,108.1
2035	22	217.4	217.4	4,325.5
2036	23	0.0	0.0	4,325.5
2037	24	220.7	220.7	4,546.2
2038	25	0.0	0.0	4,546.2
2039	26	212.0	212.0	4,758.2
2040	27	0.0	0.0	4,758.2
2041	28	214.0	214.0	4,972.2
2042	29	0.0	0.0	4,972.2
2043	30	419.4	419.4	5,391.6
TOTAL			**5,391.6**	

The following table shows the annual estimates of deforestation within the Leakage Belt, obtained by means of modelling.

Table 8. Annual areas deforested in each zone within the leakage belt in the baseline case (baseline activity data per zone) (Table 13.c of VM0015)

Year	ID_z >	1	Total baseline deforestation in the leakage belt	
	Name >	Pasture		
	Project year *t*	ha	annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0	0.0
2014	1	9,824.5	9,824.5	9,824.5
2015	2	9,550.7	9,550.7	19,375.2
2016	3	10,816.8	10,816.8	30,192.0
2017	4	8,854.7	8,854.7	39,046.7
2018	5	10,414.4	10,414.4	49,461.1
2019	6	8,464.0	8,464.0	57,925.1
2020	7	10,012.1	10,012.1	67,937.2
2021	8	8,358.8	8,358.8	76,296.0
2022	9	11,309.6	11,309.6	87,605.6
2023	10	7,678.3	7,678.3	95,283.8
2024	11	8,632.8	8,632.8	103,916.6
2025	12	7,620.2	7,620.2	111,536.8
2026	13	8,142.8	8,142.8	119,679.6
2027	14	7,435.6	7,435.6	127,115.2
2028	15	7,759.2	7,759.2	134,874.4
2029	16	7,194.7	7,194.7	142,069.1
2030	17	9,005.5	9,005.5	151,074.6
2031	18	6,466.6	6,466.6	157,541.3
2032	19	6,958.6	6,958.6	164,499.9
2033	20	6,291.9	6,291.9	170,791.8
2034	21	6,668.8	6,668.8	177,460.6
2035	22	6,039.0	6,039.0	183,499.6
2036	23	6,427.9	6,427.9	189,927.5
2037	24	5,778.2	5,778.2	195,705.7
2038	25	7,492.6	7,492.6	203,198.3
2039	26	5,144.3	5,144.3	208,342.7
2040	27	5,857.8	5,857.8	214,200.5
2041	28	8,801.2	8,801.2	223,001.7
2042	29	1,792.8	1,792.8	224,794.4
2043	30	4,774.6	4,774.6	229,569.0
TOTAL			**229,569.0**	

The carbon stock change factors shown below have been calculated based on VM0015 premises and using Method 2, as activity data are available for categories.

Table 9. Carbon stock change factors for land-use change categories (ct or ctz) (Method 2) (Table 20.c of VM0015)

Year after deforestation		$\Delta Cab_{ctz,t}$	$\Delta Cbb_{ctz,t}$	$\Delta Cwp_{ctz,t}$ long-lived
0	2013	-575	-17.37	0
1	2014	6.11	-13.32	0
2	2015	6.11	-13.32	0
3	2016	6.11	-13.32	0
4	2017	6.11	-13.32	0
5	2018	6.11	-13.32	0
6	2019	6.11	-13.32	0
7	2020	6.11	-13.32	0
8	2021	6.11	-13.32	0
9	2022	6.11	-13.32	0
10	2023	6.11	4.05	0
11	2024	0	0.00	0
12	2025	0	0.00	0
13	2026	0	0.00	0
14	2027	0	0.00	0
15	2028	0	0.00	0
16	2029	0	0.00	0
17	2030	0	0.00	0
18	2031	0	0.00	0
19	2032	0	0.00	0
20	2033	0	0.00	0
21	2034	0	0.00	0
22	2035	0	0.00	0
23	2036	0	0.00	0
24	2037	0	0.00	0
25	2038	0	0.00	0
26	2039	0	0.00	0
27	2040	0	0.00	0
28	2041	0	0.00	0
29	2042	0	0.00	0
30	2043	0	0.00	0

The following tables show the calculation of baseline carbon stock changes in above-ground biomass, below-ground biomass and wood products in the Project Area, using the carbon stock change factors presented in Table 9.

Table 10. Baseline carbon stock change in the above-ground biomass in the project area (Table 22.b.1 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		$ABSLPA_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLPA_t$	$\Delta CabBSLPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0	0	0
2014	1	1,748.3	-575	-1,005,875	-1,005,875
2015	2	244.0	-65	-129,709	-1,135,584
2016	3	0.0	6	12,170	-1,123,415
2017	4	242.3	-57	-127,246	-1,250,661
2018	5	0.0	6	13,650	-1,237,011
2019	6	241.9	-51	-125,513	-1,362,524
2020	7	0.0	6	15,127	-1,347,397
2021	8	246.7	-47	-126,791	-1,474,188
2022	9	0.0	6	16,634	-1,457,554
2023	10	238.7	-41	-120,693	-1,578,248
2024	11	0.0	15	18,092	-1,560,156
2025	12	237.5	-107	-129,259	-1,689,414
2026	13	0.0	6	7,373	-1,682,041
2027	14	238.9	-108	-130,057	-1,812,099
2028	15	0.0	6	7,352	-1,804,747
2029	16	225.7	-103	-122,484	-1,927,230
2030	17	0.0	6	7,253	-1,919,977
2031	18	224.4	-105	-121,869	-2,041,846
2032	19	0.0	6	7,117	-2,034,729
2033	20	219.8	-104	-119,353	-2,154,082
2034	21	0.0	6	7,002	-2,147,080
2035	22	217.4	-105	-118,093	-2,265,173
2036	23	0.0	6	6,879	-2,258,294
2037	24	220.7	-108	-120,103	-2,378,397
2038	25	0.0	6	6,768	-2,371,628
2039	26	212.0	-105	-115,220	-2,486,848
2040	27	0.0	6	6,685	-2,480,163
2041	28	214.0	-107	-116,425	-2,596,589
2042	29	0.0	6	6,621	-2,589,967
2043	30	419.4	-183	-234,697	-2,824,664

Table 11. Baseline carbon stock change in the below-ground biomass in the project area (Table 22.b.2 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		$BBSLPA_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLPA_t$	$\Delta CbbBSLPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.00	0	0
2014	1	1,748.3	-17.37	-30,368	-30,368
2015	2	244.0	-13.82	-27,523	-57,891
2016	3	0.0	-13.32	-26,535	-84,426
2017	4	242.3	-13.76	-30,744	-115,170
2018	5	0.0	-13.32	-29,762	-144,932
2019	6	241.9	-13.71	-33,963	-178,895
2020	7	0.0	-13.32	-32,984	-211,879
2021	8	246.7	-13.69	-37,268	-249,147
2022	9	0.0	-13.32	-36,269	-285,416
2023	10	238.7	-13.65	-40,415	-325,830
2024	11	0.0	-32.51	-39,448	-365,278
2025	12	237.5	-16.81	-20,289	-385,567
2026	13	0.0	-13.32	-16,077	-401,644
2027	14	238.9	-16.80	-20,226	-421,870
2028	15	0.0	-13.32	-16,031	-437,901
2029	16	225.7	-16.80	-19,951	-457,851
2030	17	0.0	-13.32	-15,815	-473,666
2031	18	224.4	-16.92	-19,713	-493,380
2032	19	0.0	-13.32	-15,519	-508,898
2033	20	219.8	-16.87	-19,337	-528,235
2034	21	0.0	-13.32	-15,267	-543,503
2035	22	217.4	-16.91	-19,044	-562,547
2036	23	0.0	-13.32	-14,999	-577,546
2037	24	220.7	-17.00	-18,833	-596,379
2038	25	0.0	-13.32	-14,758	-611,137
2039	26	212.0	-16.85	-18,440	-629,577
2040	27	0.0	-13.32	-14,576	-644,153
2041	28	214.0	-16.88	-18,293	-662,446
2042	29	0.0	-13.32	-14,437	-676,883
2043	30	419.4	-16.92	-21,722	-698,605

Table 12. Baseline carbon stock change in the wood products in the project area (Table 22.b.6 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the project area		Total baseline carbon stock change in the project area	
		Forest / Pasture		annual	cumulative
		$WPSLPA_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLPA_t$	$\Delta CwpBSLPA$
		ha	$tCO_2\text{-}e\ ha^{-1}$	$tCO_2\text{-}e$	$tCO_2\text{-}e$
2013	0	0.0	0.00	0	0
2014	1	1,748.3	0.00	0	0
2015	2	244.0	0.00	0	0
2016	3	0.0	0.00	0	0
2017	4	242.3	0.00	0	0
2018	5	0.0	0.00	0	0
2019	6	241.9	0.00	0	0
2020	7	0.0	0.00	0	0
2021	8	246.7	0.00	0	0
2022	9	0.0	0.00	0	0
2023	10	238.7	0.00	0	0
2024	11	0.0	0.00	0	0
2025	12	237.5	0.00	0	0
2026	13	0.0	0.00	0	0
2027	14	238.9	0.00	0	0
2028	15	0.0	0.00	0	0
2029	16	225.7	0.00	0	0
2030	17	0.0	0.00	0	0
2031	18	224.4	0.00	0	0
2032	19	0.0	0.00	0	0
2033	20	219.8	0.00	0	0
2034	21	0.0	0.00	0	0
2035	22	217.4	0.00	0	0
2036	23	0.0	0.00	0	0
2037	24	220.7	0.00	0	0
2038	25	0.0	0.00	0	0
2039	26	212.0	0.00	0	0
2040	27	0.0	0.00	0	0
2041	28	214.0	0.00	0	0
2042	29	0.0	0.00	0	0
2043	30	419.4	0.00	0	0

The following tables show the calculation of baseline carbon stock changes in above-ground biomass, below-ground biomass and wood products in the Leakage Belt, using the carbon stock change factors presented in Table 9.

Table 13. Baseline carbon stock change in the above-ground biomass in the leakage belt area (Table 22.c.1 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$ABSLLK_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLLK_t$	$\Delta CabBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0	0	0	0
2014	1	9,825	-575	-5,652,658	-5,652,658
2015	2	9,551	-281	-5,435,089	-11,087,747
2016	3	10,817	-202	-6,105,208	-17,192,954
2017	4	8,855	-126	-4,910,223	-22,103,178
2018	5	10,414	-116	-5,753,531	-27,856,709
2019	6	8,464	-79	-4,567,720	-32,424,429
2020	7	10,012	-80	-5,406,723	-37,831,151
2021	8	8,359	-58	-4,394,308	-42,225,460
2022	9	11,310	-69	-6,041,054	-48,266,513
2023	10	7,678	-41	-3,882,638	-52,149,151
2024	11	8,633	-47	-4,384,941	-56,534,091
2025	12	7,620	-41	-3,809,598	-60,343,689
2026	13	8,143	-46	-4,122,080	-64,465,769
2027	14	7,436	-42	-3,731,547	-68,197,317
2028	15	7,759	-46	-3,926,368	-72,123,685
2029	16	7,195	-43	-3,617,796	-75,741,481
2030	17	9,006	-56	-4,667,448	-80,408,929
2031	18	6,467	-40	-3,212,818	-83,621,747
2032	19	6,959	-46	-3,507,419	-87,129,165
2033	20	6,292	-42	-3,150,421	-90,279,586
2034	21	6,669	-46	-3,375,714	-93,655,300
2035	22	6,039	-42	-3,025,377	-96,680,677
2036	23	6,428	-46	-3,258,811	-99,939,488
2037	24	5,778	-42	-2,895,451	-102,834,939
2038	25	7,493	-57	-3,891,957	-106,726,896
2039	26	5,144	-38	-2,542,500	-109,269,396
2040	27	5,858	-47	-2,965,544	-112,234,940
2041	28	8,801	-71	-4,678,249	-116,913,190
2042	29	1,793	-10	-631,623	-117,544,812
2043	30	4,775	-40	-2,378,807	-119,923,619

Table 14. Baseline carbon stock change in the below-ground biomass in the leakage belt area (Table 22.c.2 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$BBSLLK_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLLK_t$	$\Delta CbbBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0	0.00	0	0
2014	1	9,825	-17.37	-170,657	-170,657
2015	2	9,551	-15.32	-296,753	-467,411
2016	3	10,817	-14.77	-445,951	-913,362
2017	4	8,855	-14.24	-555,937	-1,469,300
2018	5	10,414	-14.17	-700,966	-2,170,265
2019	6	8,464	-13.91	-805,795	-2,976,061
2020	7	10,012	-13.92	-945,418	-3,921,479
2021	8	8,359	-13.76	-1,050,049	-4,971,528
2022	9	11,310	-13.84	-1,212,637	-6,184,165
2023	10	7,678	-13.65	-1,300,191	-7,484,356
2024	11	8,633	-15.08	-1,419,038	-8,903,395
2025	12	7,620	-15.03	-1,385,576	-10,288,971
2026	13	8,143	-15.30	-1,368,941	-11,657,912
2027	14	7,436	-15.00	-1,321,043	-12,978,955
2028	15	7,759	-15.31	-1,307,763	-14,286,718
2029	16	7,195	-15.01	-1,262,592	-15,549,310
2030	17	9,006	-15.36	-1,277,142	-16,826,451
2031	18	6,467	-15.01	-1,219,634	-18,046,085
2032	19	6,959	-15.64	-1,202,978	-19,249,064
2033	20	6,292	-15.01	-1,133,447	-20,382,511
2034	21	6,669	-15.25	-1,121,528	-21,504,039
2035	22	6,039	-15.07	-1,084,430	-22,588,470
2036	23	6,428	-15.23	-1,070,127	-23,658,596
2037	24	5,778	-15.10	-1,036,001	-24,694,597
2038	25	7,493	-15.28	-1,043,705	-25,738,302
2039	26	5,144	-15.08	-999,364	-26,737,666
2040	27	5,858	-15.60	-984,449	-27,722,116
2041	28	8,801	-15.18	-993,652	-28,715,768
2042	29	1,793	-14.98	-903,006	-29,618,774
2043	30	4,775	-15.07	-885,999	-30,504,773

Table 15. Baseline carbon stock change in the wood products in the leakage belt area (Table 22.c.6 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the leakage belt area		Total baseline carbon stock change in the leakage belt area	
		Forest / Pasture		annual	cumulative
		$WPSLLK_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLLK_t$	$\Delta CwpBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.00	0	0
2014	1	9,824.5	0.00	0	0
2015	2	9,550.7	0.00	0	0
2016	3	10,816.8	0.00	0	0
2017	4	8,854.7	0.00	0	0
2018	5	10,414.4	0.00	0	0
2019	6	8,464.0	0.00	0	0
2020	7	10,012.1	0.00	0	0
2021	8	8,358.8	0.00	0	0
2022	9	11,309.6	0.00	0	0
2023	10	7,678.3	0.00	0	0
2024	11	8,632.8	0.00	0	0
2025	12	7,620.2	0.00	0	0
2026	13	8,142.8	0.00	0	0
2027	14	7,435.6	0.00	0	0
2028	15	7,759.2	0.00	0	0
2029	16	7,194.7	0.00	0	0
2030	17	9,005.5	0.00	0	0
2031	18	6,466.6	0.00	0	0
2032	19	6,958.6	0.00	0	0
2033	20	6,291.9	0.00	0	0
2034	21	6,668.8	0.00	0	0
2035	22	6,039.0	0.00	0	0
2036	23	6,427.9	0.00	0	0
2037	24	5,778.2	0.00	0	0
2038	25	7,492.6	0.00	0	0
2039	26	5,144.3	0.00	0	0
2040	27	5,857.8	0.00	0	0
2041	28	8,801.2	0.00	0	0
2042	29	1,792.8	0.00	0	0
2043	30	4,774.6	0.00	0	0

Conversion of forest to non-forest involving fires is a source of emissions of non-CO_2 gases (CH_4 and N_2O). Sufficient data on such forest fires are available from the historical reference period and the project proponent considers that these emissions are an important component of the baseline. Thus, CH_4 emissions from biomass burning were estimated.

The effect of fire on carbon emissions is counted in the estimation of carbon stock changes; therefore CO_2 emissions from forest fires were ignored to avoid double counting.

To estimate non-CO_2 emissions from forest fires, the average percentage of the deforested area in which fire was used, the average proportion of mass burnt in each carbon pool (Pburnt,p), and the average combustion efficiency of each pool (CE_p) were estimated. These average percentage values were estimated for each forest class (*icl*) and are assumed to remain the same in the future.

Based on revised IPCC 1996 GL LULUCF, GHG emissions from biomass burning were estimated as follows.

$$EBBtot_{icl,t} = EBBN2O_{id,t} + EBBCH4_{id,t}$$

Where:

$EBBtot_{icl,t}$	Total GHG emission from biomass burning in forest class *icl* at year *t*; tCO_2-e ha^{-1}
$EBBN2O_{icl,t}$	N_2O emission from biomass burning in forest class *icl* at year *t*; tCO_2-e ha^{-1}
$EBBCH4_{icl,t}$	CH_4 emission from biomass burning in forest class *icl* at year *t*; tCO_2-e ha^{-1}

$$EBBN2O_{icl,t} = EBBCO2_{icl,t} * 12/44 * NCR*ER_{N2O}*44/28*GWP_{N2O}$$

$$EBBCH4_{icl,t} = EBBCO2_{icl,t} * 12/44 * ER_{CH4}*16/12*GWP_{CH4}$$

Where:

$EBBCO2_{icl,t}$	Per hectare CO_2 emission from biomass burning in slash and burn in forest class *icl* at year *t*; tCO_2-e ha^{-1}
$EBBN2O_{icl,t}$	Per hectare N_2O emission from biomass burning in slash and burn in forest class *icl* at year *t*; tCO_2-e ha^{-1}
$EBBCH4_{icl,t}$	Per hectare CH_4 emission from biomass burning in slash and burn in forest class *icl* at year *t*; tCO_2-e ha^{-1}
NCR	Nitrogen to Carbon Ratio (IPCC default value = 0.01); dimensionless
ER_{N2O}	Emission ratio for N_2O (IPCC default value = 0.007)
ER_{CH4}	Emission ratio for CH_4 (IPCC default value = 0.012)

GWP_{N2O}	Global Warming Potential for N_2O (IPCC default value = 310 for the first commitment period)
GWP_{CH4}	Global Warming Potential for CH_4 (IPCC default value = 21 for the first commitment period)

$$EBBCO2_{icl,t} = Fburnt_{icl} * \sum_{p=1}^{P} (C_{p,icl,t} * Pburnt_{p.icl} * CE_{p,icl})$$

Where:

$EBBCO2_{icl,t}$	Per hectare CO_2 emission from biomass burning in the forest class *icl* at year *t*; tCO_2-e ha^{-1}
$Fburnt_{icl}$	Proportion of forest area burned during the historical reference period in the forest class *icl*; %
$C_{p,icl,t}$	Average carbon stock per hectare in the carbon pool *p* burnt in the forest class *icl* at year *t*; tCO_2-e ha^{-1}
$Pburnt_{p,icl}$	Average proportion of mass burnt in the carbon pool *p* in the forest class *icl*; %
$CE_{p,icl}$	Average combustion efficiency of the carbon pool *p* in the forest class *icl*; dimensionless
p	Carbon pool that could burn (above-ground biomass, dead wood, litter)
icl	1, 2, 3, …*icl* (pre-deforestation) forest classes
t	1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

The IPCC default combustion efficiency of 0.5 was used. The Nitrogen to Carbon Ratio (NCR) of 0.01 was used.

Table 16. Parameters used to calculate non-CO_2 emissions from forest fires (Table 23 of VM0015)

Initial Forest Class		Parameters								
IDcl	Name	N/A *Fburnt$_{icl}$*	$tCO_2e\ ha^{-1}$ *Cab*	N/A *Pburnt$_{ab,icl}$*	N/A *CEab,icl*	$tCO_2e\ ha^{-1}$ *ECO2-ab*	$tCO_2e\ ha^{-1}$ *EBBCO2-tot*	$tCO_2e\ ha^{-1}$ *EBBN2O$_{icl}$*	$tCO_2e\ ha^{-1}$ *EBBCH4$_{icl}$*	$tCO_2e\ ha^{-1}$ *EBBtot$_{icl}$*
1	Submontane open ombrophilous forest (As)	1.0	575	0.86	0.5	247	247	2.30	22.7	25.0

Table 17. Baseline non-CO_2 emissions from forest fires in the project area (Table 24 of VM0015)

Year	Project year t	Emissions of non-CO2 gasses from baseline forest fires		Total baseline non-CO2 emissions from forest fires in the project area	
		IDicl = 1		annual	cumulative
		$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$EBBBSLPA_t$	EBBBSLPA
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	24.97	0	0
2014	1	1,748.3	24.97	43,648	43,648
2015	2	244.0	24.97	6,092	49,740
2016	3	0.0	24.97	0	49,740
2017	4	242.3	24.97	6,050	55,789
2018	5	0.0	24.97	0	55,789
2019	6	241.9	24.97	6,039	61,828
2020	7	0.0	24.97	0	61,828
2021	8	246.7	24.97	6,158	67,986
2022	9	0.0	24.97	0	67,986
2023	10	238.7	24.97	5,959	73,945
2024	11	0.0	24.97	0	73,945
2025	12	237.5	24.97	5,931	79,876
2026	13	0.0	24.97	0	79,876
2027	14	238.9	24.97	5,964	85,839
2028	15	0.0	24.97	0	85,839
2029	16	225.7	24.97	5,634	91,473
2030	17	0.0	24.97	0	91,473
2031	18	224.4	24.97	5,603	97,076
2032	19	0.0	24.97	0	97,076
2033	20	219.8	24.97	5,488	102,564
2034	21	0.0	24.97	0	102,564
2035	22	217.4	24.97	5,428	107,992
2036	23	0.0	24.97	0	107,992
2037	24	220.7	24.97	5,510	113,502
2038	25	0.0	24.97	0	113,502
2039	26	212.0	24.97	5,293	118,796
2040	27	0.0	24.97	0	118,796
2041	28	214.0	24.97	5,342	124,138
2042	29	0.0	24.97	0	124,138
2043	30	419.4	24.97	10,471	134,609

Ex ante estimation of actual carbon stock changes

These carbon stock changes are due to the following:

- Planned activities within the project area.

- Unplanned deforestation that cannot be avoided.

Carbon stock changes due to possible future catastrophic events cannot be predicted and were therefore excluded from the ex ante assessment.

Certain discrete areas of forest within the project area will be subject to project activities that will change the carbon stocks of these areas compared to the baseline. In this Project Activity, such activities are related to planned timber logging.

According to the Sustainable Forest Management Plan, the annual area of wood controlled logging is 1,831.74 hectares. Considering that the total management area is 24,295.89 hectares, it has been assumed ex ante that logging activities would be carried out during 13 years, followed by 14 years of fallow. The table below shows the yearly ex ante estimates of carbon stock decrease due to planned logging activities in the Project Area.

The increase following planned logging activities in the Project Area has also been estimated ex ante, using secondary data by WEST et al. (2014)[9], which points to an annual increase of 3.03 tCO_2 per hectare per year due to post-logging regeneration of vegetation.

[9] West et al. 2014. Forest Ecology and Management 314 (2014) 59–63.

Table 18. Ex ante estimated actual carbon stock decrease due to planned logging activities in the project area (Table 25.b of VM0015)

Year	Project year t	Areas of planned logging activities x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLdPA_t$	$\Delta CPLdPA$
		ha	$tCO_2\text{-}e\ ha^{-1}$	$tCO_2\text{-}e$	$tCO_2\text{-}e$
2013	0	0,0	47,24	0	0
2014	1	1.831,7	47,24	86.538	86.538
2015	2	1.831,7	47,24	86.538	173.075
2016	3	1.831,7	47,24	86.538	259.613
2017	4	1.831,7	47,24	86.538	346.150
2018	5	1.831,7	47,24	86.538	432.688
2019	6	1.831,7	47,24	86.538	519.225
2020	7	1.831,7	47,24	86.538	605.763
2021	8	1.831,7	47,24	86.538	692.300
2022	9	1.831,7	47,24	86.538	778.838
2023	10	1.831,7	47,24	86.538	865.375
2024	11	1.831,7	47,24	86.538	951.913
2025	12	1.831,7	47,24	86.538	1.038.450
2026	13	1.831,7	47,24	86.538	1.124.988
2027	14	0,0	47,24	0	1.124.988
2028	15	0,0	47,24	0	1.124.988
2029	16	0,0	47,24	0	1.124.988
2030	17	0,0	47,24	0	1.124.988
2031	18	0,0	47,24	0	1.124.988
2032	19	0,0	47,24	0	1.124.988
2033	20	0,0	47,24	0	1.124.988
2034	21	0,0	47,24	0	1.124.988
2035	22	0,0	47,24	0	1.124.988
2036	23	0,0	47,24	0	1.124.988
2037	24	0,0	47,24	0	1.124.988
2038	25	0,0	47,24	0	1.124.988
2039	26	0,0	47,24	0	1.124.988
2040	27	0,0	47,24	0	1.124.988
2041	28	1.831,7	47,24	86.538	1.211.525
2042	29	1.831,7	47,24	86.538	1.298.063
2043	30	1.831,7	47,24	86.538	1.384.600

Table 19. Ex ante estimated carbon stock increase following planned logging activities in the project area (Table 26.b of VM0015)

Year	Project year t	Areas of planned logging activities x Carbon stock change (increase up to maximum long-term average)		Total carbon stock increase due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLiPA_t$	$\Delta CPLiPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.00	0	0
2014	1	1,831.7	3.03	5,541	5,541
2015	2	1,831.7	6.05	11,082	16,623
2016	3	1,831.7	9.08	16,623	33,246
2017	4	1,831.7	12.10	22,164	55,410
2018	5	1,831.7	15.13	27,705	83,115
2019	6	1,831.7	18.15	33,246	116,361
2020	7	1,831.7	21.18	38,787	155,148
2021	8	1,831.7	24.20	44,328	199,476
2022	9	1,831.7	27.23	49,869	249,345
2023	10	1,831.7	30.25	55,410	304,755
2024	11	1,831.7	33.28	60,951	365,707
2025	12	1,831.7	36.30	66,492	432,199
2026	13	1,831.7	39.33	72,033	504,232
2027	14	1,831.7	42.35	77,574	581,806
2028	15	1,831.7	45.38	83,115	664,921
2029	16	1,831.7	48.40	88,656	753,577
2030	17	1,831.7	51.43	94,197	847,774
2031	18	1,831.7	54.45	99,738	947,512
2032	19	1,831.7	57.48	105,279	1,052,792
2033	20	1,831.7	60.50	110,820	1,163,612
2034	21	1,831.7	63.53	116,361	1,279,973
2035	22	1,831.7	66.55	121,902	1,401,875
2036	23	1,831.7	69.58	127,443	1,529,318
2037	24	1,831.7	72.60	132,984	1,662,302
2038	25	1,831.7	75.63	138,525	1,800,828
2039	26	1,831.7	78.65	144,066	1,944,894
2040	27	1,831.7	81.68	149,607	2,094,501
2041	28	1,831.7	81.68	149,607	2,244,108
2042	29	1,831.7	81.68	149,607	2,393,715
2043	30	1,831.7	81.68	149,607	2,543,323

Some unplanned deforestation may happen in the project area despite the AUD project activity. The level at which deforestation will actually be reduced in the project case depends on the effectiveness of the proposed activities, which cannot be measured ex ante.

To allow ex ante projections to be made, the project proponent conservatively estimated an Effectiveness Index (*EI*) of 0.90.

$$\Delta CUDdPA_t = \Delta CBSL_t * (1 - EI)|$$

Where:

$\Delta CUDdPA_t$	Total ex ante actual carbon stock change due to unavoided unplanned deforestation at year *t* in the project area; tCO_2-e
$\Delta CBSL_t$	Total baseline carbon stock change at year t in the project area; tCO_2-e
EI	Ex ante estimated Effectiveness Index; %
t dimensionless	1, 2, 3 … T, a year of the proposed project crediting period;

Table 20. Ex ante estimated net carbon stock change in the project area under the project scenario (Table 27 of VM0015)

Year	Project year t	Total carbon stock decrease due to planned logging activities		Total carbon stock increase due to planned logging activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CPLdPA_t$	$\Delta CPLdPA$	$\Delta CPLiPA_t$	$\Delta CPLiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2013	0	0	0	0	0	0	0	0	0
2014	1	86,538	86,538	5,541	5,541	-103,624	-103,624	-184,621	-184,621
2015	2	86,538	173,075	11,082	16,623	-15,723	-119,348	-91,179	-275,800
2016	3	86,538	259,613	16,623	33,246	-1,437	-120,784	-71,351	-347,151
2017	4	86,538	346,150	22,164	55,410	-15,799	-136,583	-80,172	-427,323
2018	5	86,538	432,688	27,705	83,115	-1,611	-138,194	-60,444	-487,767
2019	6	86,538	519,225	33,246	116,361	-15,948	-154,142	-69,239	-557,006
2020	7	86,538	605,763	38,787	155,148	-1,786	-155,928	-49,536	-606,542
2021	8	86,538	692,300	44,328	199,476	-16,406	-172,334	-58,615	-665,157
2022	9	86,538	778,838	49,869	249,345	-1,963	-174,297	-38,632	-703,789
2023	10	86,538	865,375	55,410	304,755	-16,111	-190,408	-47,238	-751,028
2024	11	86,538	951,913	60,951	365,707	-2,136	-192,543	-27,722	-778,750
2025	12	86,538	1,038,450	66,492	432,199	-14,955	-207,498	-35,000	-813,750
2026	13	86,538	1,124,988	72,033	504,232	-870	-208,369	-15,375	-829,125
2027	14	0	1,124,988	77,574	581,806	-15,028	-223,397	62,546	-766,579
2028	15	0	1,124,988	83,115	664,921	-868	-224,265	82,247	-684,331
2029	16	0	1,124,988	88,656	753,577	-14,243	-238,508	74,413	-609,919
2030	17	0	1,124,988	94,197	847,774	-856	-239,364	93,341	-516,578
2031	18	0	1,124,988	99,738	947,512	-14,158	-253,523	85,580	-430,998
2032	19	0	1,124,988	105,279	1,052,792	-840	-254,363	104,439	-326,559
2033	20	0	1,124,988	110,820	1,163,612	-13,869	-268,232	96,951	-229,608
2034	21	0	1,124,988	116,361	1,279,973	-827	-269,058	115,535	-114,073
2035	22	0	1,124,988	121,902	1,401,875	-13,714	-282,772	108,188	-5,885
2036	23	0	1,124,988	127,443	1,529,318	-812	-283,584	126,631	120,746
2037	24	0	1,124,988	132,984	1,662,302	-13,894	-297,478	119,091	239,837
2038	25	0	1,124,988	138,525	1,800,828	-799	-298,277	137,726	377,563
2039	26	0	1,124,988	144,066	1,944,894	-13,366	-311,643	130,700	508,263
2040	27	0	1,124,988	149,607	2,094,501	-789	-312,432	148,818	657,082
2041	28	86,538	1,211,525	149,607	2,244,108	-13,472	-325,903	49,598	706,680
2042	29	86,538	1,298,063	149,607	2,393,715	-782	-326,685	62,288	768,968
2043	30	86,538	1,384,600	149,607	2,543,323	-25,642	-352,327	37,428	806,395

Ex ante estimation of actual non-CO_2 emissions from forest fires

Where forest fires have been included in the baseline scenario, non-CO_2 emissions from biomass burning must be included in the project scenario. This is done by multiplying the baseline emissions by the factor (1 – *EI*).

$$EBBPSPA_t = EBBBSPA_t^* (1 - EI)$$

Where:

$EBBPSPA_t$	Total ex ante actual non-CO_2 emissions from forest fire due to unavoided unplanned deforestation at year *t* in the project area; tCO_2-e
$EBBBSPA_t$ tCO_2-e	Total non-CO_2 emissions from forest fire at year *t* in the project area;
EI	Ex ante estimated Effectiveness Index; %

t 1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

Table 21. Total ex ante estimated actual emissions of non-CO_2 gases due to forest fires in the project area (Table 28 of VM0015)

Year	Project year t	Total ex ante estimated actual non-CO2 emissions from forest fires in the Project area	
		annual	cumulative
		$EBBPSPA_t$	EBBPSPA
		tCO_2-e	tCO_2-e
2013	0	0	0
2014	1	4,365	4,365
2015	2	609	4,974
2016	3	0	4,974
2017	4	605	5,579
2018	5	0	5,579
2019	6	604	6,183
2020	7	0	6,183
2021	8	616	6,799
2022	9	0	6,799
2023	10	596	7,395
2024	11	0	7,395
2025	12	593	7,988
2026	13	0	7,988
2027	14	596	8,584
2028	15	0	8,584
2029	16	563	9,147
2030	17	0	9,147
2031	18	560	9,708
2032	19	0	9,708
2033	20	549	10,256
2034	21	0	10,256
2035	22	543	10,799
2036	23	0	10,799
2037	24	551	11,350
2038	25	0	11,350
2039	26	529	11,880
2040	27	0	11,880
2041	28	534	12,414
2042	29	0	12,414
2043	30	1,047	13,461

Total ex ante estimations for the project area

Table 22. Total ex ante estimated actual net carbon stock changes and emissions of non-CO_2 gases in the project area (Table 29 of VM0015)

Year	Project year t	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
		annual $\Delta CPAdPA_t$ tCO_2-e	cumulative $\Delta CPAdPA$ tCO_2-e	annual $\Delta CPAiPA_t$ tCO_2-e	cumulative $\Delta CPAiPA$ tCO_2-e	annual $\Delta CUDdPA_t$ tCO_2-e	cumulative $\Delta CUDdPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e	annual $EBBPSPA_t$ tCO_2-e	cumulative $EBBPSPA$ tCO_2-e
2013	0	0	0	0	0	0	0	0	0	0	0
2014	1	86,538	86,538	5,541	5,541	-103,624	-103,624	-184,621	-184,621	4,365	4,365
2015	2	86,538	173,075	11,082	16,623	-15,723	-119,348	-91,179	-275,800	609	4,974
2016	3	86,538	259,613	16,623	33,246	-1,437	-120,784	-71,351	-347,151	0	4,974
2017	4	86,538	346,150	22,164	55,410	-15,799	-136,583	-80,172	-427,323	605	5,579
2018	5	86,538	432,688	27,705	83,115	-1,611	-138,194	-60,444	-487,767	0	5,579
2019	6	86,538	519,225	33,246	116,361	-15,948	-154,142	-69,239	-557,006	604	6,183
2020	7	86,538	605,763	38,787	155,148	-1,786	-155,928	-49,536	-606,542	0	6,183
2021	8	86,538	692,300	44,328	199,476	-16,406	-172,334	-58,615	-665,157	616	6,799
2022	9	86,538	778,838	49,869	249,345	-1,963	-174,297	-38,632	-703,789	0	6,799
2023	10	86,538	865,375	55,410	304,755	-16,111	-190,408	-47,238	-751,028	596	7,395
2024	11	86,538	951,913	60,951	365,707	-2,136	-192,543	-27,722	-778,750	0	7,395
2025	12	86,538	1,038,450	66,492	432,199	-14,955	-207,498	-35,000	-813,750	593	7,988
2026	13	86,538	1,124,988	72,033	504,232	-870	-208,369	-15,375	-829,125	0	7,988
2027	14	0	1,124,988	77,574	581,806	-15,028	-223,397	62,546	-766,579	596	8,584
2028	15	0	1,124,988	83,115	664,921	-868	-224,265	82,247	-684,331	0	8,584
2029	16	0	1,124,988	88,656	753,577	-14,243	-238,508	74,413	-609,919	563	9,147
2030	17	0	1,124,988	94,197	847,774	-856	-239,364	93,341	-516,578	0	9,147
2031	18	0	1,124,988	99,738	947,512	-14,158	-253,523	85,580	-430,998	560	9,708
2032	19	0	1,124,988	105,279	1,052,792	-840	-254,363	104,439	-326,559	0	9,708
2033	20	0	1,124,988	110,820	1,163,612	-13,869	-268,232	96,951	-229,608	549	10,256
2034	21	0	1,124,988	116,361	1,279,973	-827	-269,058	115,535	-114,073	0	10,256
2035	22	0	1,124,988	121,902	1,401,875	-13,714	-282,772	108,188	-5,885	543	10,799
2036	23	0	1,124,988	127,443	1,529,318	-812	-283,584	126,631	120,746	0	10,799
2037	24	0	1,124,988	132,984	1,662,302	-13,894	-297,478	119,091	239,837	551	11,350
2038	25	0	1,124,988	138,525	1,800,828	-799	-298,277	137,726	377,563	0	11,350
2039	26	0	1,124,988	144,066	1,944,894	-13,366	-311,643	130,700	508,263	529	11,880
2040	27	0	1,124,988	149,607	2,094,501	-789	-312,432	148,818	657,082	0	11,880
2041	28	86,538	1,211,525	149,607	2,244,108	-13,472	-325,903	49,598	706,680	534	12,414
2042	29	86,538	1,298,063	149,607	2,393,715	-782	-326,685	62,288	768,968	0	12,414
2043	30	86,538	1,384,600	149,607	2,543,323	-25,642	-352,327	37,428	806,395	1,047	13,461

Leakage

Activities that will cause deforestation within the project area in the baseline case could be displaced outside the project boundary due to the implementation of the AUD project activity. If carbon stocks in the leakage belt area will decrease more during project implementation than projected in the baseline case, this will be an indication that leakage due to displacement of baseline activities has occurred. Leakage due to activity displacement can thus be estimated by ex post monitoring of deforestation in the leakage belt and comparing ex post observed deforestation with ex ante projected baseline deforestation.

Ex ante activity displacement leakage can only be guessed based on the anticipated combined effectiveness of the proposed leakage prevention measures and project activities. This shall be done by multiplying the estimated baseline carbon stock changes for the project area by a "Displacement Leakage Factor" (DLF) representing the percent of deforestation expected to be displaced outside the project boundary.

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.

It is expected that 100% of potential deforestation agents in the Reference Region will be given the opportunity to participate in leakage prevention activities. Thus, the "Displacement Leakage Factor" (DLF) is conservatively considered as 0.05.

If emissions from forest fires have been included in the baseline, the ex ante emissions from forest fires due to activity displacement leakage will be calculated by multiplying baseline forest fire emissions in the project area by the same DLF used to estimate the decrease in carbon stocks.

Table 23. Ex ante estimated leakage due to activity displacement (Table 34 of VM0015)

Year	Project year t	Total ex ante estimated decrease in carbon stocks due to displaced deforestation		Total ex ante estimated increase in GHG emissions due to displaced forest fires	
		annual $\Delta CADLK_t$ tCO_2-e	cumulative $\Delta CADLK$ tCO_2-e	annual $EADLK_t$ tCO_2-e	cumulative $EADLK$ tCO_2-e
2013	0	0	0	0	0
2014	1	-51,812	-51,812	2,182	2,182
2015	2	-7,862	-59,674	305	2,487
2016	3	-718	-60,392	0	2,487
2017	4	-7,899	-68,292	302	2,789
2018	5	-806	-69,097	0	2,789
2019	6	-7,974	-77,071	302	3,091
2020	7	-893	-77,964	0	3,091
2021	8	-8,203	-86,167	308	3,399
2022	9	-982	-87,149	0	3,399
2023	10	-8,055	-95,204	298	3,697
2024	11	-1,068	-96,272	0	3,697
2025	12	-7,477	-103,749	297	3,994
2026	13	-435	-104,184	0	3,994
2027	14	-7,514	-111,698	298	4,292
2028	15	-434	-112,132	0	4,292
2029	16	-7,122	-119,254	282	4,574
2030	17	-428	-119,682	0	4,574
2031	18	-7,079	-126,761	280	4,854
2032	19	-420	-127,181	0	4,854
2033	20	-6,934	-134,116	274	5,128
2034	21	-413	-134,529	0	5,128
2035	22	-6,857	-141,386	271	5,400
2036	23	-406	-141,792	0	5,400
2037	24	-6,947	-148,739	276	5,675
2038	25	-399	-149,138	0	5,675
2039	26	-6,683	-155,821	265	5,940
2040	27	-395	-156,216	0	5,940
2041	28	-6,736	-162,952	267	6,207
2042	29	-391	-163,343	0	6,207
2043	30	-12,821	-176,163	524	6,730

Table 24. Ex ante estimated total leakage (Table 35 of VM0015)

Year	Project year t	Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
		annual $EADLK_t$ tCO_2-e	cumulative EADLK tCO_2-e	annual $\Delta CADLK_t$ tCO_2-e	cumulative $\Delta CADLK$ tCO_2-e	annual ΔCLK_t tCO_2-e	cumulative ΔCLK tCO_2-e	annual ELK_t tCO_2-e	cumulative ELK tCO_2-e
2013	0	0	0	0	0	0	0	0	0
2014	1	2,182	2,182	-51,812	-51,812	-51,812	-51,812	2,182	2,182
2015	2	305	2,487	-7,862	-59,674	-7,862	-59,674	305	2,487
2016	3	0	2,487	-718	-60,392	-718	-60,392	0	2,487
2017	4	302	2,789	-7,899	-68,292	-7,899	-68,292	302	2,789
2018	5	0	2,789	-806	-69,097	-806	-69,097	0	2,789
2019	6	302	3,091	-7,974	-77,071	-7,974	-77,071	302	3,091
2020	7	0	3,091	-893	-77,964	-893	-77,964	0	3,091
2021	8	308	3,399	-8,203	-86,167	-8,203	-86,167	308	3,399
2022	9	0	3,399	-982	-87,149	-982	-87,149	0	3,399
2023	10	298	3,697	-8,055	-95,204	-8,055	-95,204	298	3,697
2024	11	0	3,697	-1,068	-96,272	-1,068	-96,272	0	3,697
2025	12	297	3,994	-7,477	-103,749	-7,477	-103,749	297	3,994
2026	13	0	3,994	-435	-104,184	-435	-104,184	0	3,994
2027	14	298	4,292	-7,514	-111,698	-7,514	-111,698	298	4,292
2028	15	0	4,292	-434	-112,132	-434	-112,132	0	4,292
2029	16	282	4,574	-7,122	-119,254	-7,122	-119,254	282	4,574
2030	17	0	4,574	-428	-119,682	-428	-119,682	0	4,574
2031	18	280	4,854	-7,079	-126,761	-7,079	-126,761	280	4,854
2032	19	0	4,854	-420	-127,181	-420	-127,181	0	4,854
2033	20	274	5,128	-6,934	-134,116	-6,934	-134,116	274	5,128
2034	21	0	5,128	-413	-134,529	-413	-134,529	0	5,128
2035	22	271	5,400	-6,857	-141,386	-6,857	-141,386	271	5,400
2036	23	0	5,400	-406	-141,792	-406	-141,792	0	5,400
2037	24	276	5,675	-6,947	-148,739	-6,947	-148,739	276	5,675
2038	25	0	5,675	-399	-149,138	-399	-149,138	0	5,675
2039	26	265	5,940	-6,683	-155,821	-6,683	-155,821	265	5,940
2040	27	0	5,940	-395	-156,216	-395	-156,216	0	5,940
2041	28	267	6,207	-6,736	-162,952	-6,736	-162,952	267	6,207
2042	29	0	6,207	-391	-163,343	-391	-163,343	0	6,207
2043	30	524	6,730	-12,821	-176,163	-12,821	-176,163	524	6,730

Net GHG Emission Reductions and Removals

The determination of which GHG emissions by sources, decreases in carbon pools, and leakage emissions are significant for this Project Activity has been carried out using the "Tool for testing significance of GHG emissions in A/R CDM project activities (Version 01)". According to the tool, the GHG emissions by sources, decreases in carbon pools and leakage emissions are all considered significant, as their sums represent more than 5% of net emission reductions.

Calculation of ex-ante estimation of total net GHG emissions reductions

The net anthropogenic GHG emission reduction of the proposed AUD project activity is calculated as follows:

$$REDD_t = (CBSLPA_t + EBBBSLPA_t) - (CPSPA_t + EBBPSPA_t) - (CLK_t + ELK_t)$$

Where:

$REDD_t$ Ex ante estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t; tCO_2e

$CBSLPA_t$ Sum of baseline carbon stock changes in the project area at year t; tCO_2e

Note: The absolute values of $CBSLPA_t$ shall be used in equation above.

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

$CPSPA_t$ Sum of ex ante estimated actual carbon stock changes in the project area at year *t*; tCO_2e

Note: If $CPSPA_t$ represents a net increase in carbon stocks, a negative sign before the absolute value of $CPSPA_t$ shall be used. If $CPSPA_t$ represents a net decrease, the positive sign shall be used.

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

CLK_t Sum of ex ante estimated leakage net carbon stock changes at year *t*; tCO_2e

Note: If the cumulative sum of CLK_t within a fixed baseline period is > 0, CLK_t shall be set to zero.

ELK_t Sum of ex ante estimated leakage emissions at year *t*; tCO_2e

t 1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

Calculation of ex-ante Verified Carbon Units (VCUs)

The number of Verified Carbon Units (VCUs) to be generated through the proposed AUD project activity at year t is calculated as follows:

$VCU_t = REDD_t – VBC_t$

$VBC_t = (CBSLPA_t - CPSPA_t) * RF_t$

Where:

VCU_t	Number of Verified Carbon Units that can be traded at time t; t CO2-e
$REDD_t$	Ex ante estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year *t*; tCO_2-e ha^{-1}
VBC_t	Number of Buffer Credits deposited in the VCS Buffer at time *t*; t CO_2-e
$CBSLPA_t$	Sum of baseline carbon stock changes in the project area at year *t*; tCO_2e
$CPSPA_t$	Sum of ex ante estimated actual carbon stock changes in the project area at year *t*; tCO_2-e ha^{-1}
RF_t	Risk factor used to calculate VCS buffer credits; %

Note: RF_t is a risk factor to be determined using the latest version of the VCS-approved AFOLU Non-Permanence Risk Tool.

t	1, 2, 3 … T, a year of the proposed project crediting period; dimensionless

Table 25. Ex ante estimated net anthropogenic GHG emission reductions (ΔREDDt) and Verified Carbon Units (VCUt)

Years	Estimated baseline emissions (tCO2e)	Estimated project emissions (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions (tCO2e)
2013	0	0	0	0
2014	1,079,891	188,986	53,995	836,911
2015	163,324	91,788	8,166	63,370
2016	14,365	71,351	718	-57,704
2017	164,040	80,777	8,202	75,060
2018	16,112	60,444	806	-45,137
2019	165,515	69,843	8,276	87,396
2020	17,856	49,536	893	-32,573
2021	170,218	59,231	8,511	102,476
2022	19,635	38,632	982	-19,979
2023	167,067	47,834	8,353	110,880
2024	21,356	27,722	1,068	-7,434
2025	155,478	35,593	7,774	112,111
2026	8,704	15,375	435	-7,106
2027	156,247	-61,949	7,812	210,384
2028	8,679	-82,247	434	90,492
2029	148,068	-73,849	7,403	214,514
2030	8,562	-93,341	428	101,475
2031	147,186	-85,020	7,359	224,846
2032	8,401	-104,439	420	112,420

2033	144,178	-96,402	7,209	233,371
2034	8,265	-115,535	413	123,387
2035	142,565	-107,646	7,128	243,083
2036	8,120	-126,631	406	134,345
2037	144,446	-118,540	7,222	255,764
2038	7,989	-137,726	399	145,316
2039	138,954	-130,171	6,948	262,177
2040	7,891	-148,818	395	156,315
2041	140,060	-49,064	7,003	182,121
2042	7,816	-62,288	391	69,713
2043	266,891	-36,381	13,345	289,927
Total	3,657,879	-792,935	182,894	4,267,919

4.2 Project Emissions

The use of carbon stock estimates in similar ecosystems derived from local studies, literature and IPCC defaults is permitted, provided the accuracy and conservativeness of the estimates are demonstrated.

According to "1.10 Conditions Prior to Project Initiation" of the VCS-PD, biomass data have been taken from 6 parcels of Cummings et al. (2002) work. Data presented in the next table have been calculated from this scientific publication, as well as superior and inferior limits of the 90% Confidence Intervals.

Table 26. Ex post carbon stock per hectare of initial forest classes icl existing in the project area and leakage belt (Table 15a of VM0015)

Year	Project year t	Initial forest class *icl* Name: Submontane open ombrophilous forest (As) ID $_{icl}$ 1 Average carbon stock per hectare ± 90% CI											
		Cab $_{icl}$		Cbb $_{icl}$		Cwp $_{icl}$						Ctot $_{icl}$	
						short lived		*medium lived*		*long lived*			
		C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI	C *stock*	± 90% CI
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2013	0												
2014	1		555		168		0		0		25		698
2015	2	575		174		0		0		30		719	
…	…		595		180		0		0		35		740
2043	30												

The 90% Confidence Intervals have been used to define if the most suitable choice would be the average or the inferior limit of intervals, to mitigate uncertainties in estimates, as shown in table below. In the present case, the averages of above and below-ground biomass have been taken for calculation; while the superior limit of the interval has been taken for the calculations related to the wood products carbon pool, for conservativeness purposes and mitigation of uncertainties.

Table 27. Ex post carbon stock per hectare of initial forest classes icl existing in the project area and leakage belt (the selection of carbon pools is subject to the latest VCS requirements) (Table 15b of VM0015)

Year	Project year t	Initial forest class *icl* Name: Submontane open ombrophilous forest (As) ID $_{icl}$ 1 Average carbon stock per hectare ± 90% CI											
		Cab $_{icl}$		Cbb $_{icl}$		Cwp $_{icl}$						Ctot $_{icl}$	
						short lived		*medium lived*		*long lived*			
		C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*	C *stock*	C *stock change*
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2013	0	575	0	174	0	0	0	0	0	35	5	714	-5
2014	1												
2015	2												
…	…												
2043	30												

The same reasoning is applicable to post-deforestation classes, for which the superior limit of the interval has been taken in the case of above-ground biomass, while the superior limit has been chosen for below-ground biomass, for conservativeness purposes and mitigation of uncertainties.

Table 28. Ex post carbon stock per hectare of final classes fcl existing in the project area and leakage belt (Table 16 of VM0015)

Year	Project year t	Post deforestation class *fcl* Name: Pasture ID $_{fcl}$ 1 Average carbon stock per hectare ± 90% CI											
		Cab $_{fcl}$		Cbb $_{fcl}$		Cwp $_{fcl}$						Ctot $_{fcl}$	
						short lived		*medium lived*		*long lived*			
		average stock	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI
		t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
2013	0	39.32	17.6	26.08	11.6	0	0	0	0	0	0	65.40	29.2
2014	1												
2015	2		61.1		40.5		0		0		0		101.6
…	…												
2043	30												
Average		39.32		26.08		0		0		0		65.40	
Average to be used in calculations		61.1		40.5		0		0		0		101.6	

Certain discrete areas of forest within the project area will have been subject to project activities that changed the carbon stocks of these areas compared to the baseline. In this Project Activity, such activities are related to planned timber logging.

According to documents provided by the project proponent (!relatorio 2014.pdf; RESUMO_DOCS_EXPLORACAO.xls), the area of wood controlled logging was 777.9 hectares, and management activities only extracted wood in 2014. The table below shows the yearly estimates of carbon stock decrease due to planned logging activities in the Project Area.

The increase following planned logging activities in the Project Area has also been estimated, using secondary data by WEST et al. (2014)[10], which points to an annual increase of 3.03 tCO_2 per hectare per year due to post-logging regeneration of vegetation.

Table 29. Ex post carbon stock decrease due to planned logging activities (Table 25b of VM0015)

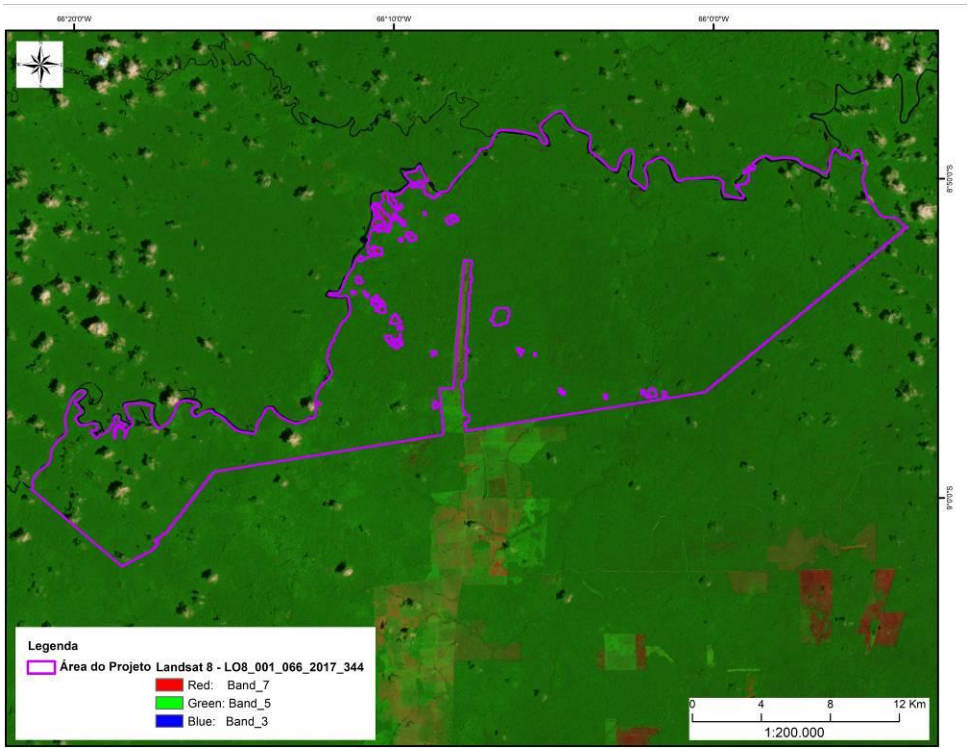
Year	Project year t	Areas of planned logging activities x Carbon stock change (decrease) in the project area		Total carbon stock decrease due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLdPA_t$	$\Delta CPLdPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	47.24	0	0
2014	1	777.9	47.24	36,751	36,751
2015	2	0.0	47.24	0	36,751

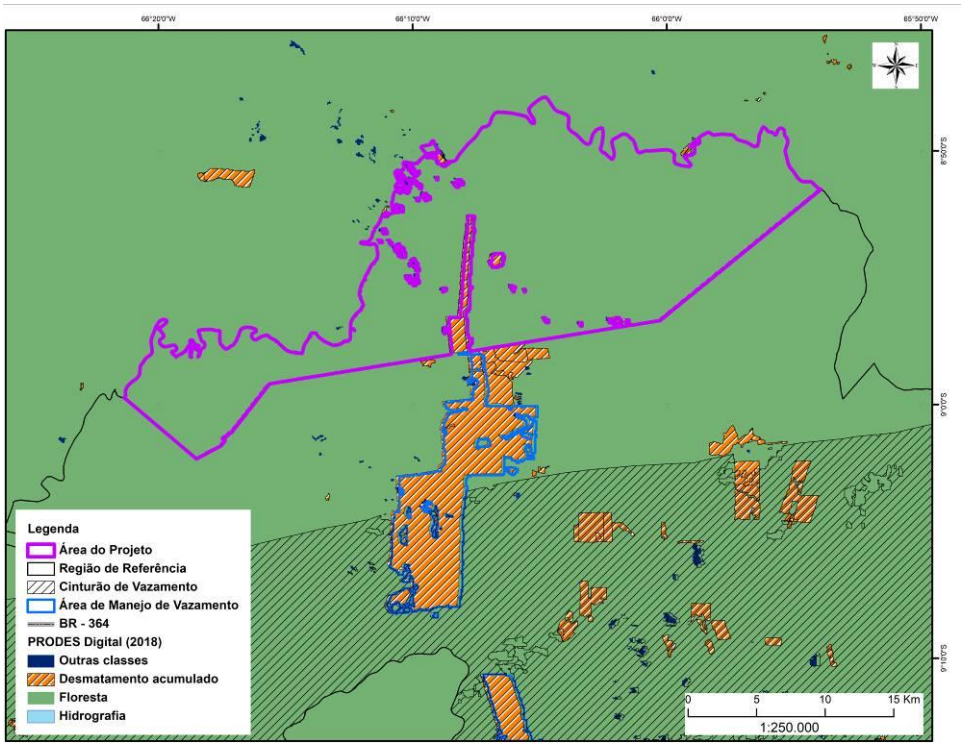
Table 30. Ex post carbon stock increase following planned logging activities (Table 26b of VM0015)

Year	Project year t	Areas of planned logging activities x Carbon stock change (increase up to maximum long-term average)		Total carbon stock increase due to planned logging activities	
		IDcl = 1		annual	cumulative
		$APLPA_{icl,t}$	$\Delta Ctot_{icl,t}$	$\Delta CPLiPA_t$	$\Delta CPLiPA$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.00	0	0
2014	1	777.9	3.03	2,353	2,353
2015	2	0.0	3.03	2,353	4,706

[10] West et al. 2014. Forest Ecology and Management 314 (2014) 59–63.

There was no unavoided unplanned deforestation within the Project Area during the monitoring period, as demonstrated in the following image.





Thus, the ex post total net carbon stock change within the Project Area is expressed in table below.

Table 31. Ex post total net carbon stock change in the project area (Table 27 of VM0015)

Year	Project year t	Total carbon stock decrease due to planned logging activities		Total carbon stock increase due to planned logging activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
		annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
		$\Delta CPLdPA_t$	$\Delta CPLdPA$	$\Delta CPLiPA_t$	$\Delta CPLiPA$	$\Delta CUDdPA_t$	$\Delta CUDdPA$	$\Delta CPSPA_t$	$\Delta CPSPA$
		tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2013	0	0	0	0	0	0	0	0	0
2014	1	36,751	36,751	2,353	2,353	0	0	-34,398	-34,398
2015	2	0	36,751	2,353	4,706	0	0	2,353	-32,045

As demonstrated in the abovementioned image, there has been no fire within the Project Area during the monitoring period. Thus, the ex post actual net changes in carbon stocks and emissions in the Project Area are expressed in table below.

Table 32. Total ex post estimated actual net changes in carbon stocks and emissions of GHG gases in the project area (Table 29 of VM0015)

Year	Project year t	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total ex ante estimated actual non-CO2 emissions from forest fires in the project area	
		annual $\Delta CPAdPA_t$ tCO_2-e	cumulative $\Delta CPAdPA$ tCO_2-e	annual $\Delta CPAiPA_t$ tCO_2-e	cumulative $\Delta CPAiPA$ tCO_2-e	annual $\Delta CUDdPA_t$ tCO_2-e	cumulative $\Delta CUDdPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e	annual $EBBPSPA_t$ tCO_2-e	cumulative EBBPSPA tCO_2-e
2013	0	0	0	0	0	0	0	0	0	0	0
2014	1	36,751	36,751	2,353	2,353	0	0	-34,398	-34,398	0	0
2015	2	0	36,751	2,353	4,706	0	0	2,353	-32,045	0	0

4.3 Leakage

The results of all ex post estimations of leakage are summarized using the same table format used for the ex ante assessment:

Table 33. Annual ex post areas of deforestation in the leakage belt (Table 9.c of VM0015)

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0
2014	1	4,531.9	4,531.9
2015	2	10,430.7	14,962.6
TOTAL		**14,962.6**	

Considering that ex post deforestation in 2014 was lower than that estimated ex ante, there is no leakage displacement for that year. Otherwise, ex post deforestation in 2015 has been 880 hectares higher than that estimated ex ante, which represents leakage. Given that the Leakage Belt area is 860,312 hectares and Project Area is 46,592 hectares, the proportional value used for leakage displacement calculation was 47.7 hectares ((46,592 / 860,312)*880). Thus, for calculation purposes the following proportional values were taken:

Table 34. Proportional annual ex post deforestation in the leakage belt

Year	Project year	Total - LK	
		annual $ABSLLK_t$ ha	cummulative ABSLLK ha
2013	0	0.0	0.0
2014	1	0.0	0.0
2015	2	47.7	47.7
TOTAL		**47.7**	

Table 35. Ex post above-ground net carbon stock changes in the leakage belt (Table 22.c.1 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for above-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$ABSLLK_{ct,t}$	$\Delta Cab_{ct,t}$	$\Delta CabBSLLK_t$	$\Delta CabBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0	0	0	0
2014	1	0	0	0	0
2015	2	47.7	-575	-27,421	-27,421

Table 36. Ex post below-ground net carbon stock changes in the leakage belt (Table 22.c.2 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for below-ground biomass in the leakage belt		Total baseline carbon stock change in the leakage belt	
		Forest / Pasture		annual	cumulative
		$BBSLLK_{ct,t}$	$\Delta Cbb_{ct,t}$	$\Delta CbbBSLLK_t$	$\Delta CbbBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0	0.00	0	0
2014	1	0	0.00	0	0
2015	2	47.7	-17.37	-828	-828

Table 37. Ex post net carbon stock changes in the wood products in the leakage belt (Table 22.c.6 of VM0015)

Year	Project year t	Activity data per category x Carbon stock change factor for wood products biomass in the leakage belt area		Total baseline carbon stock change in the leakage belt area	
		Forest / Pasture		annual	cumulative
		$WPSLLK_{ct,t}$	$\Delta Cwp_{ct,t}$	$\Delta CwpBSLLK_t$	$\Delta CwpBSLLK$
		ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
2013	0	0.0	0.00	0	0
2014	1	0.0	0.00	0	0
2015	2	47.7	0.00	0	0

Table 38. Parameters used to calculate emissions from forest fires in the leakage belt area (Table 23 in VM0015)

Initial Forest Class		Parameters								
IDcl	Name	$Fburnt_{icl}$ N/A	Cab $tCO_2e\ ha^{-1}$	$Pburnt_{ab,icl}$ N/A	$CEab,icl$ N/A	$ECO2\text{-}ab$ $tCO_2e\ ha^{-1}$	$EBBCO2\text{-}tot$ $tCO_2e\ ha^{-1}$	$EBBN2O_{icl}$ $tCO_2e\ ha^{-1}$	$EBBCH4_{icl}$ $tCO_2e\ ha^{-1}$	$EBBtot_{icl}$ $tCO_2e\ ha^{-1}$
1	Submontane open ombrophilous forest (As)	1.0	575	0.86	0.5	247	247	2.30	22.7	25.0

Table 39. Ex post estimated non-CO2 emissions from forest fires in the leakage belt area

Year	Project year t	Total ex post estimated increase in GHG emissions due to displaced forest fires	
		annual $EADLK_t$ tCO_2-e	cumulative EADLK tCO_2-e
2013	0	0	0
2014	1	0	0
2015	2	1,190	1,190

Table 40. Ex post estimated leakage due to activity displacement (Table 34 of VM0015)

Year	Project year t	Total ex post estimated decrease in carbon stocks due to displaced deforestation		Total ex post estimated increase in GHG emissions due to displaced forest fires	
		annual $\Delta CADLK_t$ tCO_2-e	cumulative $\Delta CADLK$ tCO_2-e	annual $EADLK_t$ tCO_2-e	cumulative EADLK tCO_2-e
2013	0	0	0	0	0
2014	1	0	0	0	0
2015	2	-28,248	-28,248	1,190	1,190

Table 41. Total ex post estimated leakage (Table 35 of VM0015)

Year	Project year t	Total ex ante increase in GHG emissions due to displaced forest fires		Total ex ante decrease in carbon stocks due to displaced deforestation		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
		annual $EADLK_t$ tCO_2-e	cumulative EADLK tCO_2-e	annual $\Delta CADLK_t$ tCO_2-e	cumulative $\Delta CADLK$ tCO_2-e	annual ΔCLK_t tCO_2-e	cumulative ΔCLK tCO_2-e	annual ELK_t tCO_2-e	cumulative ELK tCO_2-e
2013	0	0	0	0	0	0	0	0	0
2014	1	0	0	0	0	0	0	0	0
2015	2	1,190	1,190	-28,248	-28,248	-28,248	-28,248	1,190	1,190

4.4 Net GHG Emission Reductions and Removals

The table below expresses the quantification of the net change in carbon stocks. As determined in the AFOLU non-permanence risk report (available in the VCS-PD), this project activity has 21% non-permanence risk rating.

Table 42. Ex post estimated net anthropogenic GHG emission reductions and VCUs (Table 36 of VM0015)

		Baseline carbon stock changes		Baseline GHG emissions		Ex ante project carbon stock changes		Ex ante project GHG emissions		Ex ante leakage carbon stock changes		Ex ante leakage GHG emissions		Ex ante net anthropogenic GHG emission reductions		Ex ante VCUs tradable		Ex ante buffer credits	
Year	Project year t	annual $\Delta CBSLPA_t$ tCO_2-e	cumulative $\Delta CBSLPA$ tCO_2-e	annual $EBBBSLPA_t$ tCO_2-e	cumulative EBBBSLPA tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e	annual EBBPSPAt tCO_2-e	cumulative EBBPSPA tCO_2-e	annual ΔCLK_t tCO_2-e	cumulative ΔCLK tCO_2-e	annual ELKt tCO_2-e	cumulative ELK tCO_2-e	annual $\Delta REDD_t$ tCO_2-e	cumulative $\Delta REDD$ tCO_2-e	annual VCU_t tCO_2-e	cumulative VCU tCO_2-e	annual VBC_t tCO_2-e	cumulative VBC tCO_2-e
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	1	1,036,243	1,036,243	43,648	43,648	34,398	34,398	0	0	0	0	0	0	1,045,493	1,045,493	835,106	835,106	210,388	210,388
2015	2	157,232	1,193,476	6,092	49,740	-2,353	32,045	0	0	28,248	28,248	1,190	1,190	136,239	1,181,732	102,726	937,832	33,513	243,900

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2013	0	0	0	0
2014	1,079,891	34,398	0	1,045,493
2015	163,324	-2,353	29,438	136,239
Total	**1,243,215**	**32,045**	**29,438**	**1,181,732**