CIKEL BRAZILIAN AMAZON REDD APD PROJECT

GHG EMISSION REDUCTIONS FROM AVOIDING PLANNED DEFORESTATION

Document Prepared By

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The objective of the project, referred to as the CIKEL Brazilian Amazon REDD APD Project, is avoid emissions from planned deforestation on a property in Para state, Brazil. The project proponent is CKBV Florestal Ltda (CKBV or "the company"), a Brazilian private and family company whose main business is the management and commercialization of native wood. CKBV is part of CIKEL group, which has been working in forest management in the Brazilian Amazon since 1977.

Due to difficulties in its commercial wood business in 2005 and 2006, which had a negative financial impact on the company, in 2006 CKBV decided to diversify its business beyond wood products. The diversification alternative chosen was livestock, and to pursue this new business activity CKBV had initiated plans to legally convert (suppress) 20% of its forest property in the Rio Capim Complex to pasture.

The main activity of the CIKEL Brazilian Amazon REDD APD Project is the cancelation of the planned deforestation activities and decision to instead conserve the forest area and continue limited forest management activities in the area under Forest Stewardship Council® Certification (FSC®) with Low Impact Logging (SFMLIL) practices. Also, the company is intensifying and improving its practices to support the sustainable social development, maintaining and improving the biodiversity monitoring at the RCC in the framework of FCS certification and REDD activities.

The financial incentives from the sale of VCUs permit the project activity to be competitive with alternative business scenarios like livestock and allow CKBV to cancel its legal forest conversion plans and maintain its forest management activities.

The project is located at the Rio Capim Complex (RCC), Paragominas municipality, in Para State, in the Eastern Amazon. The RCC property includes five forest areas: Rio Capim, Poty, Cauaxi, Sumal and Caculé, totaling 209,130.54 ha. The project area is a subset of the RCC property and covers an area of 27,434.9 ha of native forest.

From the implementation of this REDD Project, it is estimated that 9,432,299 tonnes of carbon dioxide emissions will be avoided which would have been emitted into the atmosphere in a period of 10 years in the absence of the project, not including the project's non-permanence risk buffer contribution.

1.2 Sectoral Scope and Project Type

Project Scope 14: Agriculture, Forest and other Land Use (AFOLU)

Project Category: Reduction Emission from Deforestation and Degradation (REDD)

Type of Activity: Avoided Planned Deforestation (APD)

1.3 Project Proponent

CKVB Florestal Ltda.

Owner and project proponent.

Responsible person: Aparecida Calixto Pereira Denadai

Role in the company: Shareholder and Social and Environmental Director

Role in this project: General Director

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1.4 Other Entities Involved in the Project

Entity	**33 Forest Capital**
Role	Financial and Technical partner for the next 10-year
Responsible	Ivana Cepon
Address	Burgemeester van Karnebeeklaan 17 2585 BA The Hague, The Netherlands
Contact	Phone +31 70 3461734 icepon@33assetmngt.com

Entity	**TerraCarbon LLC**
Role	Technical lead on development of VCS PD
Responsible	David Shoch
Address	5901 N. Sheridan Road, Peoria, Illinois 61614 USA
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1.5 Project Start Date

The project start date is July 19, 2007, which is the date of issuance of the Authorization of Forest Exploitation (AUTFE) in the project area.

CKBV initiated the process to obtain authorization to legally deforest 20% of the RCC property in July 2006, in response to difficulties faced by its core commercial wood business, and a consequent need to diversify into other revenue generating activities.

During the years 2005 and 2006, CKBV suffered a substantial negative financial impact, demonstrated in Figure 1.1 below.

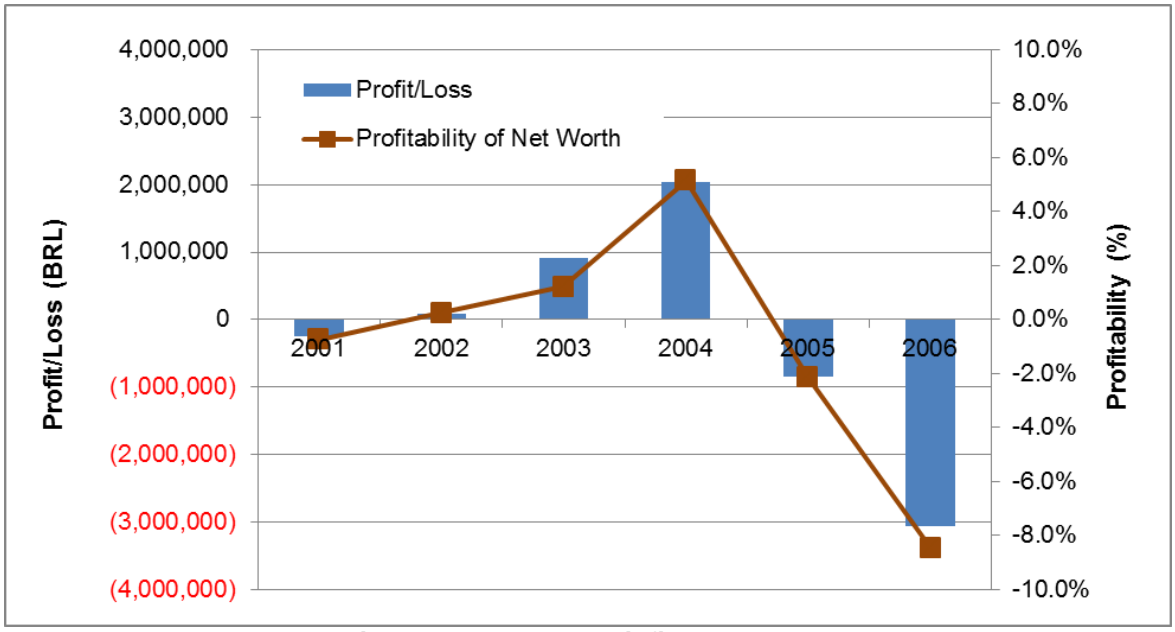


Figure 1.1 - CKBV Cash flow 2001 to 2006
(Source: CKBV's Financial Statements)

The negative impact was generated by various factors as described below:

- **Delay in the authorization from the regulatory agency to harvest timber, leading to a huge decrease in the exploited wood volume in 2005 and 2006.**

  The timber harvest activities carried out by CKBV depend on authorization from the competent regulatory agency (Brazilian Institute of Environment and Renewable Resources – IBAMA until 2005, Para State Secretary of Environment – SEMA as of 2006).

  In order to receive the AUTFE authorization, which covers both the extraction of timber and wood residues, for each Annual Production Unit (APU), an Annual Operation Plan (AOP) must be submitted for the agency's approval. The approval process generally involves significant delays that are beyond the company's control.

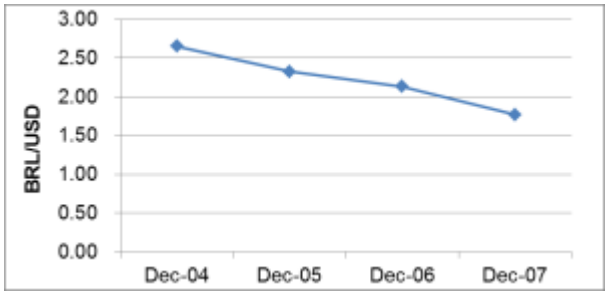
  In 2005, the delay in receiving authorization was especially long, in part due to the transition of the agency responsible for the authorization, which reduced wood operation/extraction in the Rio Capim complex significantly during the whole year. In fact, the extraction made was for the remaining wood volume authorized in the year before. As a consequence, there was a large decrease in profits from wood that year and CKBV requested the cancellation of the protocol "2005 AOP" in December of that year in order to give entrance to the protocol of "2006 AOP".

- **Land invasion in 2005 in Jutaituba forest area, belonging to the Martins Group, Portel municipality, Pará State, rented and managed by CKBV, making wood exploitation not viable in that area for more than one year due to security concerns.**

- **Adverse USD-BRL exchange rate for export (Table 1.1). Exchange rate is particularly influential to CKBV's business because its commercial timber business at the time was directed solely to the export market.**

Table 1.1 – USD/BRL exchange rate (2004-2007) (Source: Brazilian Central Bank)

Date	Rate
31 dec2004	2.65
31 dec 2005	2.34
31 dec 2006	2.13
31 dec 2007	1.77



Since 2002, CKBV has looked to diversify its productive activities to increase revenue and reduce its dependence on wood production. However, in response to the severe financial difficulties in 2005 and 2006, there was greater urgency and CKBV sought to take action on diversifying its business. The chosen alternative was to suppress (clearcut) the legally permitted 20% of the RCC area, and once cleared, convert the area to pasture for livestock. On July 7 2006 a protocol was submitted to IBAMA # 02018.006149/06-99 which requested the exclusion of the areas which were planned to be suppressed, from the Forest Management Plan approved in 2000, allowing them to no longer be considered as part of the dedicated forest management area at RCC. This is the first stage to initiate the legal process for legal authorization of suppression of forest areas.

In early 2007, CKVB continued efforts to obtain authorization of the exclusion of areas of the Forest Management Plan in 2000, and move forward with the forest suppression plan, however at the same time began first exploring the possibility of generating revenues from the sale of carbon credits from avoiding deforestation and the continued sale of wood products as an alternate business strategy. After internal deliberations, CKBV decided to abandon the business plan of forest suppression and livestock activities and instead established the generation of carbon credits and continued sale of wood products as a business priority in the Goals Plan for the second half of 2007. Therefore, on June 29, 2007 an amendment was attached to the "2007 AOP" requesting the inclusion of part of the forest area reserved for the suppression, effectively cancelling the previous request of exclusion of the forest area originally submitted in July 2006 to IBAMA. The new AUTFE, with official approval of the amendment, and thus stopping the exclusion authorization process, was issued on July 19, 2007, which serves as the start date of avoided planned deforestation project. The chronology of decision making and actions toward authorization are summarized in Table 1.2.

Table 1.2. Chronology of decision making and actions toward authorization of planned deforestation activities in the project area by CKBV

Date	Action
2006	Suppression/Cattle business plan developed CKBV submitted request for exclusion of the areas from Forest Management Plan on 7/7/2006
29/6/2007	CKBV submitted amendment to 2007 AOP.
19/7/2007 (project start date)	AUTFE issued
From 20/7/2007	Carbon prioritized in the Business Goals Plan

Note that the project start date is marked by the issuance of the first AUTFE, and that the suppression plan would be authorized and implemented incrementally. While this first area of the suppression plan, Poty, is not included in the VCS project area (because it does not meet the applicability conditions of module M-MON), the issuance for this area is relevant for setting the project start date, because it marks the initiation of the overall suppression plan that was always considered as a single business activity from the standpoint of CKBV.

1.6 Project Crediting Period

The project has a crediting period of 20 years. The start date of the crediting period is July 19 2007 and the end date of the crediting period is July 18 2027.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

As per VCS guidance on REDD projects (VCS AFOLU v3 3.1.9), ex ante estimates to determine project scale are provided for only the first 10-year baseline period, through July 2017 (Table 1.3). The project is beneath the threshold of mega projects, with less than 1,000,000 tCO_2e per year in anticipated emissions reductions generated.

Table 1.3. Ex ante estimates of net emission reductions (including non-permanence risk buffer deduction) from the CIKEL Brazilian Amazon REDD APD Project.

Years	Estimated GHG emission Reductions or removals (tCO_{2e})
2008	1,179,688
2009	1,083,663
2010	976,863
2011	335,621
2012	407,306
2013	370,369
2014	960,160
2015	397,492
2016	996,944
2017	746,031
Total estimated ERs	7,454,138
Total number of crediting years	20
Average annual ERs	372,707

* hereafter, the year refers to the year at the end of the annual interval, hence 2008 represents the year between July 19 2007 to July 18 2008.

Project (Less than or equal to 1,000,000 tCO_2e per year)	X
Mega-project	

1.8 Description of the Project Activity

The main objective of the CIKEL Brazilian Amazon REDD APD Project is the conservation of the forest area at Rio Capim Complex (RCC). The main activity of the CIKEL Brazilian Amazon REDD APD Project is the cancelation of the planned deforestation activities and continued limited forest management activities in the area under limited FSC certified Low Impact Logging practices. Also, the company will intensify and improve its practices to support the sustainable social development, maintenance and improvement of biodiversity for the RCC.

The forest logging schedule of the project area is shown in Table 1.4.

Table 1.4: Forest exploitation schedule by year

Year	Harvest Area (ha)	Volume of timber extracted (m^3)	Volume of residues extracted (m^3)
2008	0	0	0
2009	0	0	0
2010	1,122.3	18,417	0
2011	2,766.9	50,744	187,220
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0

Forest management practices in the project area are summarized below.

Sustainable Forest Management with Low Impact Logging (SFMLIL)

The objective of SFMLIL is to harvest wood sustainably, in accordance with current law, Forest Stewardship Council (FSC) principles and sustainable principles of forest management. The main characteristics of SFMLIL are described below:

1) 35-year forest cutting cycle and intensity of cut up to 30m^3/ha
SILVA (1989) and SILVA & WHITMORE (1990) proposed using a cutting cycle of 25 to 30 years with a logging intensity of 30 to 40 m^3/ha. BODEGOM & GRAAF (1994) and GRAAF (2000) suggested using a cutting cycle of 20 to 25 years with intensity higher than 30 m^3/ha. By choosing a cutting cycle of 35 years, near the upper limit of the recommended rates, CKBV develops SFMLIL in accordance with the legal requirements and interpreting the recommendations of the main researchers in the Amazon in a conservative manner, allowing a longer recovery interval between harvests.

2) Criteria for the selection of harvest trees
Tree species selected for harvest are limited to those with a guaranteed commercial market at the time of harvest. Nevertheless, a wide range of species, 58 species as of the most recent management plan for the Rio Capim Complex, are harvested, which allows for more holistic management goals, with reduced intensity of extraction on any one species.
CKBV has established the following criteria for the selection of trees:
   - Compliance national and state legislation;
   - The diameter of the trees must be equal to or bigger than 50 cm;
   - Trees that have bird nests identified during the inventory are excluded from the cutting selection;
   - In the case of rare trees species, 5 trees per every 100 ha will have to be left;

3) Principles of CKBV's production system and operational practices

- Long-term planning in the total area, with delimitation at the stand or annual production unit (APU) level.
- 100% mapped inventory of the APU for stock trees, with designated leave trees and harvest trees.
- Definition of silvicultural activities, including the intensity of harvest in accordance with forest legislation.
- Planning of the harvesting including the direction in which the trees will fall, planning of the harvest and location of roads and wood yards.
- Training of operators.
- Long-term monitoring.
- Fulfillment of the Instructions of Operational Health, Safety and Environment (IOSWE)[1] in the Sustainable Forest Management activities.

4) Forest protection

The areas considered for permanent environmental protection (rivers, wetlands, small rivers and others identified in the micro zoning) will be excluded from harvest planning and constantly monitored due to their importance for the maintenance of the ecosystem balance in these places. The following actions are carried out:

(a) Hillsides, hills, hydrological grid and places of steep topography will be preserved.

(b) Actions to fight fire (see Annex 1 for more details):

- CKBV has fire brigade and annually training are taking place
- Indicative signs will be placed along the roads, especially for third parties who use the main roads within RCC
- During the integration process and Weekly Security Speeches, the direct employees and third parties will be warned about the dangers of throwing cigarettes butts, or lighting fires in the forest or around it and fueling up machines without observing security rules.

(c) Property security:

RCC has a Property Security Plan executed by CKBV employees together with an outsourced company.

Principle and criteria of FSC Certification

Since 1999, CKVB adapted their practices and techniques according to the principles set out in the FSC® Certification: Compliance with all applicable laws and international treaties; Demonstrated and uncontested, clearly defined, long–term land tenure and use rights; Recognition and respect of indigenous peoples' rights; Maintenance or enhancement of long-term social and economic well-being of forest workers and local communities and respect of worker's rights in compliance with International Labour Organisation (ILO) conventions; Equitable use and sharing of benefits derived from the forest; reduction of environmental impact of logging activities and maintenance of the ecological functions and integrity of the forest; Appropriate and continuously updated management plan; Appropriate monitoring and assessment activities to assess the condition of the forest, management activities and their social and environmental impacts; Maintenance of High Conservation Value Forests (HCVFs) defined as environmental and social values that are considered to be of outstanding significance or critical importance.

[1] The IOSWE are internal instructions revised and adapted in 2009 from procedures proposed in the PMFS 2000. Said instructions will be patterns of internal auditing, annually revised.

In 2000, the RCC Sustainable Forest Management Plan was approved by IBAMA and Low Impact Logging was instituted. On November 20, 2000, the first AUTFE was issued for the Rio Capim forest area, and thus the logging initiated on November 21st in that same year. Since then, the logging in RCC has been with Low Impact Logging. In that same year, September 2001, the farm Rio Capim forest area was certified by FSC®.

Summary of the FSC certification data:

Period	Scope	Nº Certificate	Issue date	Expiration date	On-site visit date	Report date
2001	Rio Capim Forest Area	SCS-FM/COC-00031N	01/09/2001	31/08/2006	July 30 and 31 and August 1 of 2001	September, 2001
2001	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2001	31/08/2006	November 29, 30 and 31 of 2001	April, 2002
2002	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2001	31/08/2006	August 05 and 06 of 2002	October, 2002
2003	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2001	31/08/2006	August 04 to 06 of 2003	September, 2003
2004	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2001	31/08/2006	July 12 to 15 of 2004	August, 2004
2005	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2001	31/08/2006	October 17 to 20 of 2005	January, 2006
2006	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2006	01/09/2011	July 23 to 27 of 2006	August 30 of 2006
2007	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2006	01/09/2011		October, 2007
2008	Rio Capim (140,.658 ha)	SCS-FM/COC-00031N	01/09/2006	01/09/2011		October, 2008
2009	Rio Capim (140,658 ha)	SCS-FM/COC-00031N	01/09/2006	01/09/2011		September, 2009
2010 (1st)	Rio Capim (140,936.57 ha)	SW-FM/COC-005147	01/09/2006	31/08/2011	October 19 to 23 of 2010	February 07 of 2011
2010 (2nd)	Rio Capim, Sumal, Poty, Caculé, Cauaxi (199,168.26 ha)	SW-FM/COC-005147	01/09/2006	31/08/2011	November 29 to December 03 of 2010	February 07 of 2011
2011	Rio Capim, Sumal, Poty, Caculé, Cauaxi (199,168.83 ha)	SW-FM/COC-005147	01/07/2009	30/06/2014	July 04 to 08 of 2011	February 2012

At the time of the validation of this PD (2012) the entire project area has FSC® certification (see Annex 2 for more details). All of the RCC property undergoes periodic certification which takes place every five years.

Life time of the project activity

CKBV's intention is to conserve forests in the project area in perpetuity, and a 100 year commitment to continuing sustainable forest management was formalized to SEMA in February 2012.

1.9 Project Location

The project is located in the Rio Capim Complex (RCC), Paragominas municipality, Pará State, Eastern Amazon, Brazil. The RCC has five forest areas, all of them administered by CKBV: Rio Capim, Poty, Cauaxi, Sumal and Caculé, as shown in Figure 1.2. The Rio Capim Complex property altogether covers 209,130.54 ha.

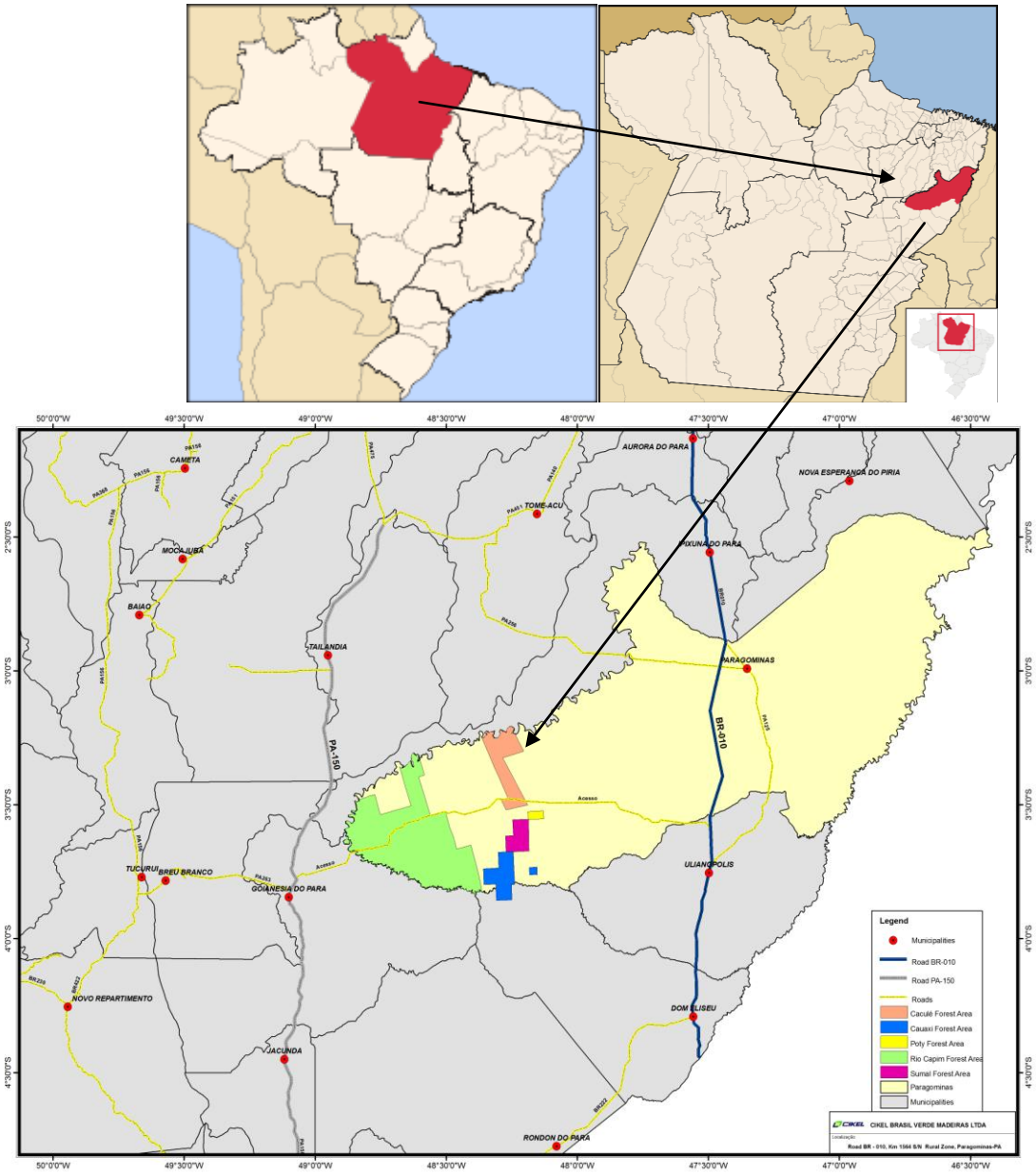


Figure 1.2: Location of the five forest areas comprising Rio Capim Complex are shown in a map of the municipal district of Paragominas: Rio Capim (light green), Caculé (orange brown), Cauaxi 1 and 2 (blue), Poty (yellow) and Sumal (purple).

The specific location of the project area within the Rio Capim complex is shown in Figure 2.1 below.

(a) General characteristics of project area

The forests in the project area are principally characterized as mature “floresta ombrofila densa”, with smaller areas of secondary forests and riparian forest in narrow floodplains along water course. Soils throughout the area are characterized as yellow latisol clay soils, "Latossolo Amarelo."

The project area covers 27,434.9 ha, which is the area within the authorized suppression area of 27,934 ha that meets the VCS REDD eligibility requirement of being 100% forested at the project start date (2007) and for the period at least 10 years prior to the start date (1997), demonstrated in Figures 1.4 and 1.5 in Section 1.10 below. Hence, from the authorized suppression area, which already excluded designated areas of permanent protection (along steep slopes and riparian areas), were excluded roads, water bodies and any other areas not qualifying as forest, as well as the Poty area, which does not meet the applicability conditions of VM0007 module M-MON (harvest took place prior to securing FSC certification).

Geophysical setting of the project area:

- Soil

According to Rodrigues et al. (2000), the main soils mapped within the region of the Municipal District of Paragominas were: Yellow Latisols, Yellow Argisols, Plithosols, Gleysols and Neosols. These soils were classified according to criteria and differential characteristics to frame them within the Brazilian System of Soil Classification (EMBRAPA, 1988). As it can be seen in Figure 12, project area soils are Yellow Latisols. According to Viera (1988), they are soils where clay contents in B horizon vary from 15% to more than 60%. It is possible to define a soil classification of intermediate texture (15% to 35% clay), clay-like texture (35% to 60% clay) and of very clay-like texture (more than 60% clay). With reference to use possibilities, Rodrigues *et Al.* (2003) state that Latisols, due to their unfavorable chemical characteristics for agricultural activities, require correction, mainly in relation to high acidity and high aluminum content. These limiting characteristics are easily corrected by means of correctives and chemical and organic fertilizer application with the aim of increasing concentration and retention capacity of nutrients in the soil. As regards physical properties, Rodrigues *et al.* (2003) suggest adopting soil and handling conservation practices for Yellow Latisols, although they do not have restrictions for intensive agricultural use, considering soil and nutrient losses due to water erosion resulting from rainfall indices present in the most rainy season.

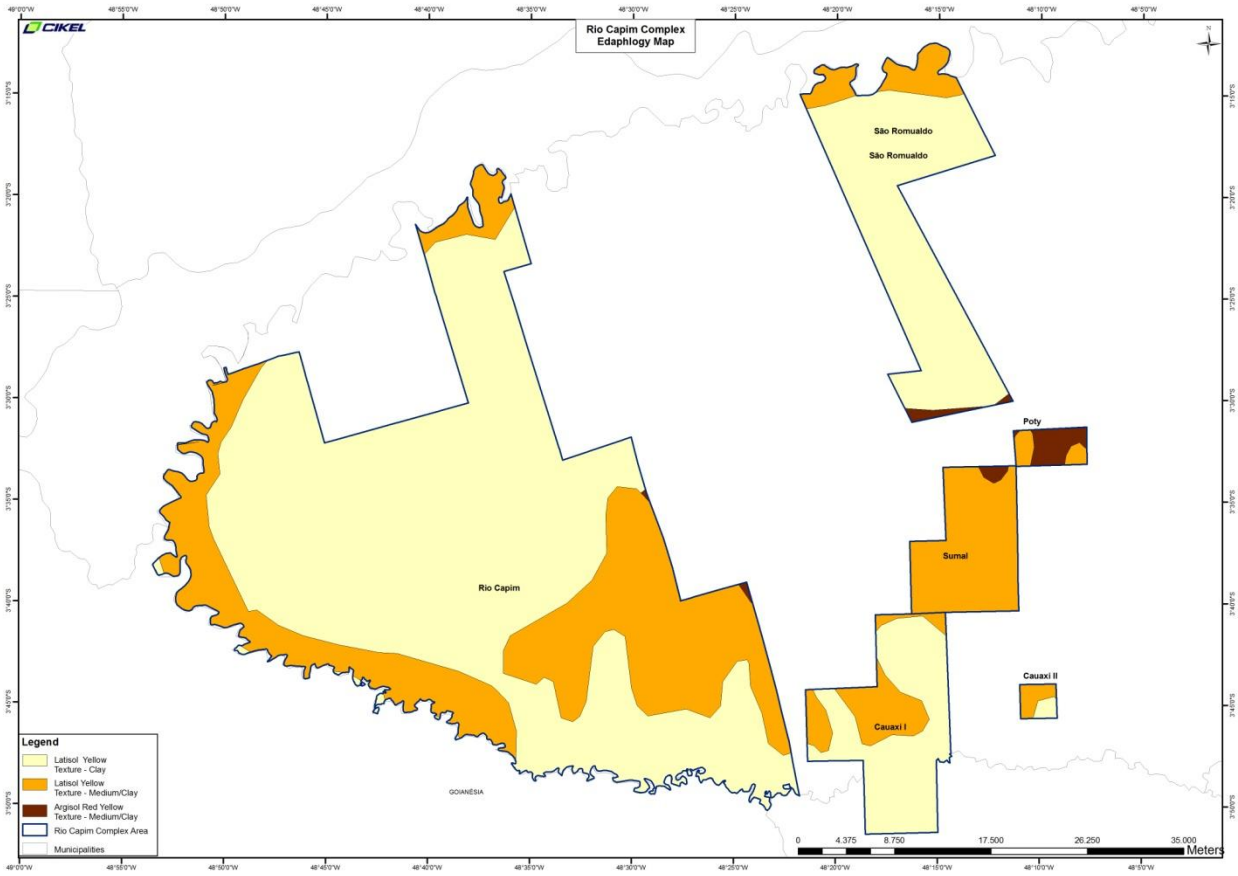


Figure 1.3: Soil classification map of the Rio Capim Complex

- **Climate**

The climate of the region can be characterized as hot and humid, with quite high temperature, relative humidity and volumetric rainfall, perfectly framed in the AW type of the Koppen classification (tropical humid, with monsoon rains, dry winter, with precipitation in the driest month below 60 mm). The annual rainfall is around 1,800 mm (Table 1.5).

Table 1.5: Monthly average rainfall distribution in Paragominas Municipality from 1982 to 2005 (mm)

Paragominas	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
1982 – 2005	223.5	275.4	363.8	344.8	192.9	64.2	27.9	25.9	24.7	31.6	48.1	128.6

Rainfall is not evenly distributed throughout the year, showing a clear dry season between the months of July-November and a rainy season starting in November-December and lasting until April. The monthly average temperature, according to the Koppen classification, ranges between 25.6ºC and 27.1ºC (IBGE, 1996a). The relative humidity is high, with values between 80 and 85%.

- **Hydrography**

The unit has a water network constituted by the Capim river and its tributaries, which occupy a part of the project area, forming a network of small tributaries of a perennial nature, igarapés and streams,

and headwatering in the area. There are also numerous small rivers, such as Cauaxí, Candiru–Açu, Potiritá, Água Boa, Camaoi, Timbó Açu and Matamatá, an affluent of Capim river and Piriá and Uraim rivers, affluents of Gurupí river.

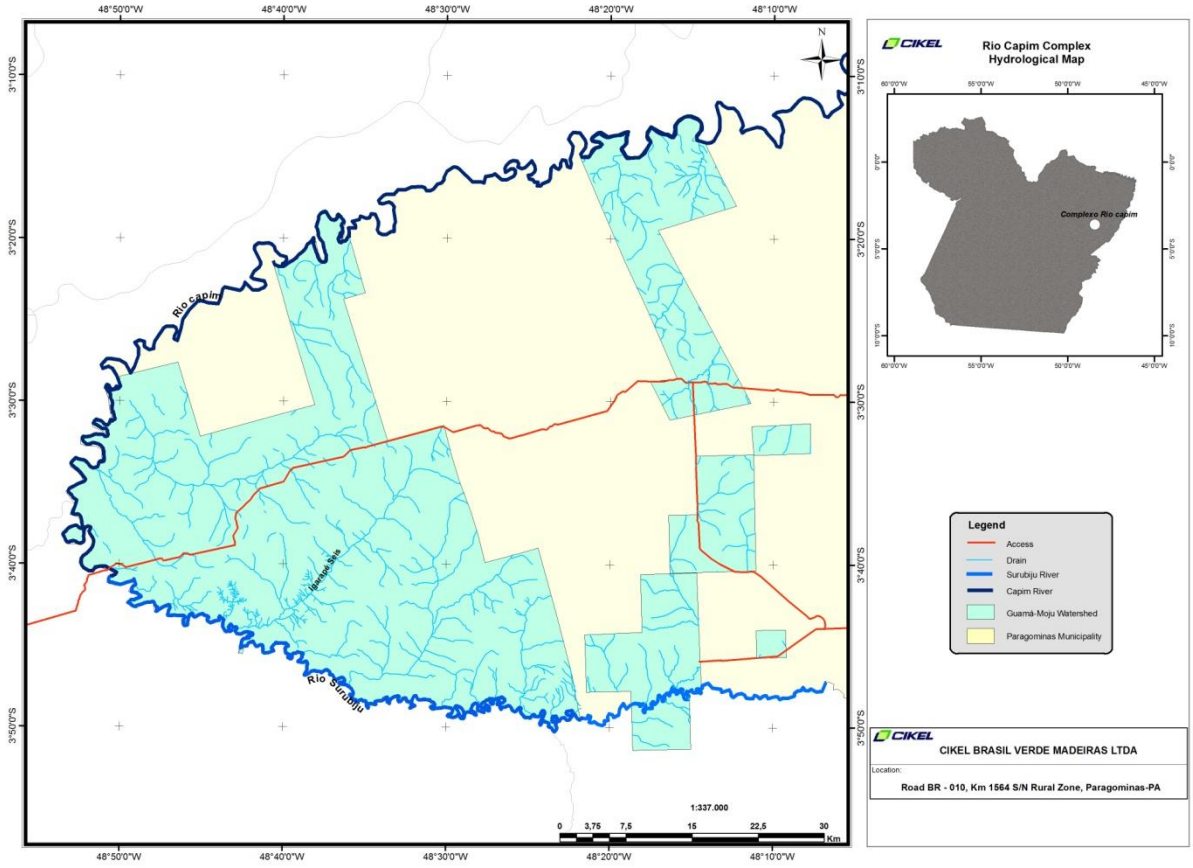


Figure 1.4: Map of the hydrology of Rio Capim Complex

- **Topography and relief**

The area has a topography ranging from flat to gently undulated, with an average altitude of 20 m relative to sea level. It is located in the Morphostructural Domain of Planaltos in Non-bent Sedimentary Sequences (IBGE, 1996a), characterized by flat structural surfaces in the form of extensive plateaus, with average altitudes around 200 m, bounded by dissected plateaus in the form of ridges, tabular watersheds developed in sedimentary rocks constituted by argillite, of the Ipixuna Formation, of the Upper Cretaceous period, belonging to the Grajaú Basin (Góes, 1995) and by floodplains.

- **Geology**

The geological terrains of the Paragominas region belong to the Maranhao Basin, according to the definition by Mesner & Wooldridge (1964). However, more recently, Góes (1995) admitted to this extensive Sedimentary Province a polycyclic evolution, enabling its partitioning in the following different basins: Parnaíba, Apercatas, Grajaú and Espigao-Mestre. Taking into account this new conceptualization, the region is situated in the Grajaú Basin, in whose stratigraphy can be identified, from the bottom to the top, the following geological units: Ipixuna Formation, Itapecuru Formation, Detritus-Lateritic Paleogene Coverage, Pleistocene Sedimentary Coverage and Alluvial Deposits.

The Geological ages is shown in Table 1.6.

Table 1.6: Geological ages

AGE			Stratigraphy
Era	**Epoca**	**Period**	
Cenozoic	Neogene	Holocene	Recentalluvium
		Pleistocene	Post barrier sediments
		Pliocene	
		Miocene	Barrier Formation
	Paleogene	Oligocene	Detritus-Lateritic Paleogene Coverage
		Eocene	
Mesozoic	Cretaceous		Ipixuna Formation
			Itapecuru Formation
Proterozoic			Gurupi Group
			Aurizona Group
Arqueizoic			Maracacumé Complex

Source: Atlas socioambiental, Federal University of Para, Page 77.

The Rio Capim Complex project area has the following stratigraphies:

Cenozoic: Recent alluvium, Post barrier sediments an Detritus-Lateritic Paleogene Coverage.

Alluvial Deposits: these Holocene Quaternary Alluvial Deposits are well illustrated in the Capim and Gurupi river valleys, that even present, in some parts, terraces of probable Pleistocene age (IBGE, 1996b). These deposits are directly related to the Rio Capim and Rio Gurupi Plains geomorphological units.

Post barrier sediments: they are clay-sand, unconsolidated sediments; normally, they are yellow and with predominantly fine granulometry. Granules and small quartz pebbles can also be found forming concreionarios horizons. These concreionarios horizons constitute stone lines which are real time lines, marking the change of a more humid climate to a dryer, more arid or semi arid period (Rossetti, Truckenbrodt, Goés 1989). In the study area, stone lines have a wide distribution, appearing in the toioe of the sequence in different profiles for roads, exposed soils, mines and urban area cuts. The lower unit can be both Barrier Formation and older Ipixuna or Itapecur Formation; the upper unit is composed of Post Barrier Sediments, lying over in a dry climate environment (Rossetti, Truckenbrodt, Goés 2001). According to Rossetti, Truckenbrodt and Goés (1989) Post barrier sediments normally present as non structured, and in relation to the ead /age these sediments were interpreted as plio-pleistocene to holocenic. In the Capim basin these plio-pleistocenic covers mark a flattening level called Plano de Ulianópolis (Ulianópolis plain).

Detritus-Lateritic Paleogene Coverage: This unit is presented as plateaus on cretaceous sediments and in regional terms, it is more frequent in the areas of Medium and Lower Amazon and in the stretch between Paragominas and Acailancia. This unit is characterized by displaying a complete laterite profile, according to those described by Costa et al. (1985), occurring, from the bottom to the top, mottled clay horizons, finishing with a thick lateritic alumina crust, which are the main sources of

kaolin and bauxite within the Brazilian territory. At the top, there is a clay level, known in geological literature as “Belterra Clay”, which for some authors is an on-site formation, while for others would be form the Lower to Middle Tertiary Period. These coverages are directly related to the Tabular Surfaces of Tiracambu Mountain Range geomorpholical unit.

Mesozoic: Itapecuru Formation

Itapecuru Formation is from the Cretaceous Period. Cunha and Del´Arco (1988) subdivide these units, studying north-central region of the state of Maranhao, “las facies” clay-sand and sand-clay. Las facies clay-sand is composed of sandstone, siltstone, argillites, pinkish, gray whitish and reddish, “mosqueado” or with whitish spots. When modified, sandstone presents very fine and siltic granulometry, basically composed of quartz, clay and feldspar. The sand-clay facies are composed of friable, violet and pinkish feldspar sandstone, with siltstones and conglomerates collations and lenses, predominantly fine to medium granulometry, with subordinate micro conglomerate and gross sheets. Itapecuru Formation has a broad distribution, covering most of the eastern area of Río Capim basin and south of Ipixuna Municipality of Para, and practically all paraense area of Rio Gurupi basin. This formation is related to dry lands and valleys, and does not have significant mineral resources.

(b) Geographical coordinates

The geographical coordinates of the project area within the RCC are shown in the Figure 1.5, 1.6 and Table 1.7 and 1.8 below:

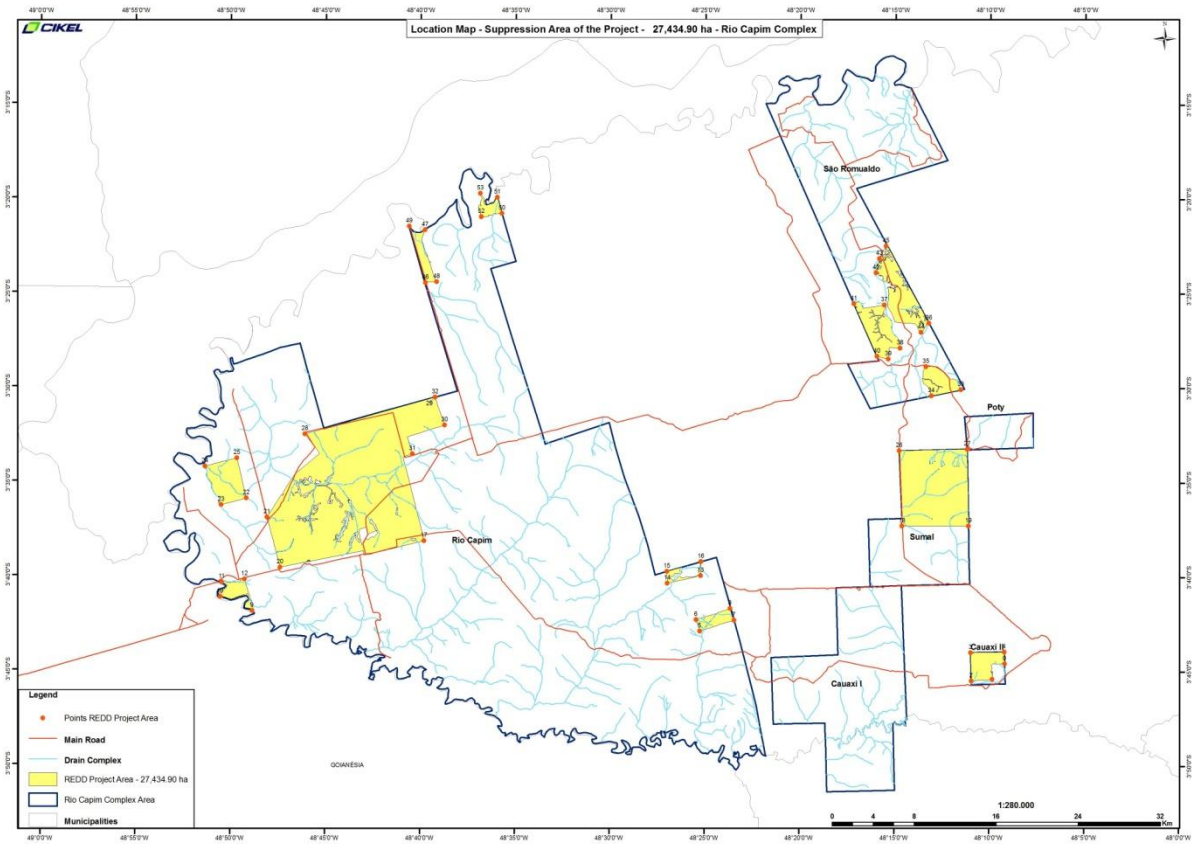


Figure 1.5: Map of the geographical coordinates of the project area

Table 1.7: The GPS coordinates of the project area

Points	Areas	Latitude	Longitude
0	Cauaxi	3° 44' 35,72" S	48° 9' 11,05" W
1	Cauaxi	3° 45' 24,89" S	48° 9' 50,01" W
2	Cauaxi	3° 45' 30,20" S	48° 10' 56,72" W
3	Cauaxi	3° 44' 0,68" S	48° 10' 58,95" W
4	Cauaxi	3° 43' 58,36" S	48° 9' 12,26" W
5	Rio Capim	3° 42' 55,01" S	48° 25' 15,40" W
6	Rio Capim	3° 42' 17,86" S	48° 25' 26,58" W
7	Rio Capim	3° 42' 19,94" S	48° 23' 26,81" W
8	Rio Capim	3° 41' 42,38" S	48° 23' 40,02" W
9	Rio Capim	3° 41' 52,61" S	48° 48' 51,08" W
10	Rio Capim	3° 41' 7,67" S	48° 50' 31,34" W
11	Rio Capim	3° 40' 21,65" S	48° 50' 26,99" W
12	Rio Capim	3° 40' 12,46" S	48° 49' 15,31" W
13	Rio Capim	3° 39' 58,41" S	48° 25' 12,76" W
14	Rio Capim	3° 40' 23,10" S	48° 26' 58,96" W
15	Rio Capim	3° 39' 45,25" S	48° 26' 59,55" W
16	Rio Capim	3° 39' 14,28" S	48° 25' 12,49" W
17	Rio Capim	3° 38' 9,88" S	48° 39' 47,58" W
18	Sumal	3° 37' 18,85" S	48° 14' 36,88" W
19	Sumal	3° 37' 18,20" S	48° 11' 6,60" W
20	Rio Capim	3° 39' 35,02" S	48° 47' 22,64" W
21	Rio Capim	3° 36' 55,69" S	48° 48' 4,78" W
22	Rio Capim	3° 35' 55,53" S	48° 49' 10,44" W
23	Rio Capim	3° 36' 16,87" S	48° 50' 29,76" W
24	Rio Capim	3° 34' 14,36" S	48° 51' 20,64" W
25	Rio Capim	3° 33' 47,99" S	48° 49' 40,20" W
26	Sumal	3° 33' 19,69" S	48° 14' 46,86" W
27	Sumal	3° 33' 14,41" S	48° 11' 11,41" W
28	Rio Capim	3° 32' 31,19" S	48° 46' 5,08" W
29	Rio Capim	3° 30' 33,59" S	48° 39' 13,78" W
30	Rio Capim	3° 32' 2,28" S	48° 38' 43,78" W
31	Rio Capim	3° 33' 33,94" S	48° 40' 25,10" W
32	Rio Capim	3° 30' 33,59" S	48° 39' 13,78" W
33	São Romualdo/Caculé	3° 30' 6,05" S	48° 11' 32,46" W
34	São Romualdo/Caculé	3° 30' 25,59" S	48° 13' 4,75" W
35	São Romualdo/Caculé	3° 28' 52,96" S	48° 13' 23,19" W
36	São Romualdo/Caculé	3° 26' 35,03" S	48° 13' 13,39" W
37	São Romualdo/Caculé	3° 25' 37,45" S	48° 15' 34,96" W
38	São Romualdo/Caculé	3° 27' 53,91" S	48° 14' 44,08" W
39	São Romualdo/Caculé	3° 28' 28,56" S	48° 15' 21,96" W
40	São Romualdo/Caculé	3° 28' 20,77" S	48° 15' 57,53" W

Points	Areas	Latitude	Longitude
41	São Romualdo/Caculé	3° 25' 33,99" S	48° 17' 10,75" W
42	São Romualdo/Caculé	3° 23' 54,74" S	48° 16' 1,06" W
43	São Romualdo/Caculé	3° 23' 9,48" S	48° 15' 50,70" W
44	São Romualdo/Caculé	3° 27' 4,07" S	48° 13' 38,31" W
45	São Romualdo/Caculé	3° 22' 30,36" S	48° 15' 29,26" W
46	Rio Capim	3° 24' 30,04" S	48° 39' 45,56" W
47	Rio Capim	3° 21' 42,40" S	48° 39' 46,69" W
48	Rio Capim	3° 24' 27,25" S	48° 39' 10,00" W
49	Rio Capim	3° 21' 30,69" S	48° 40' 36,54" W
50	Rio Capim	3° 20' 49,29" S	48° 35' 43,51" W
51	Rio Capim	3° 19' 58,15" S	48° 35' 58,41" W
52	Rio Capim	3° 21' 0,43" S	48° 36' 48,80" W
53	Rio Capim	3° 19' 45,42" S	48° 36' 52,02" W

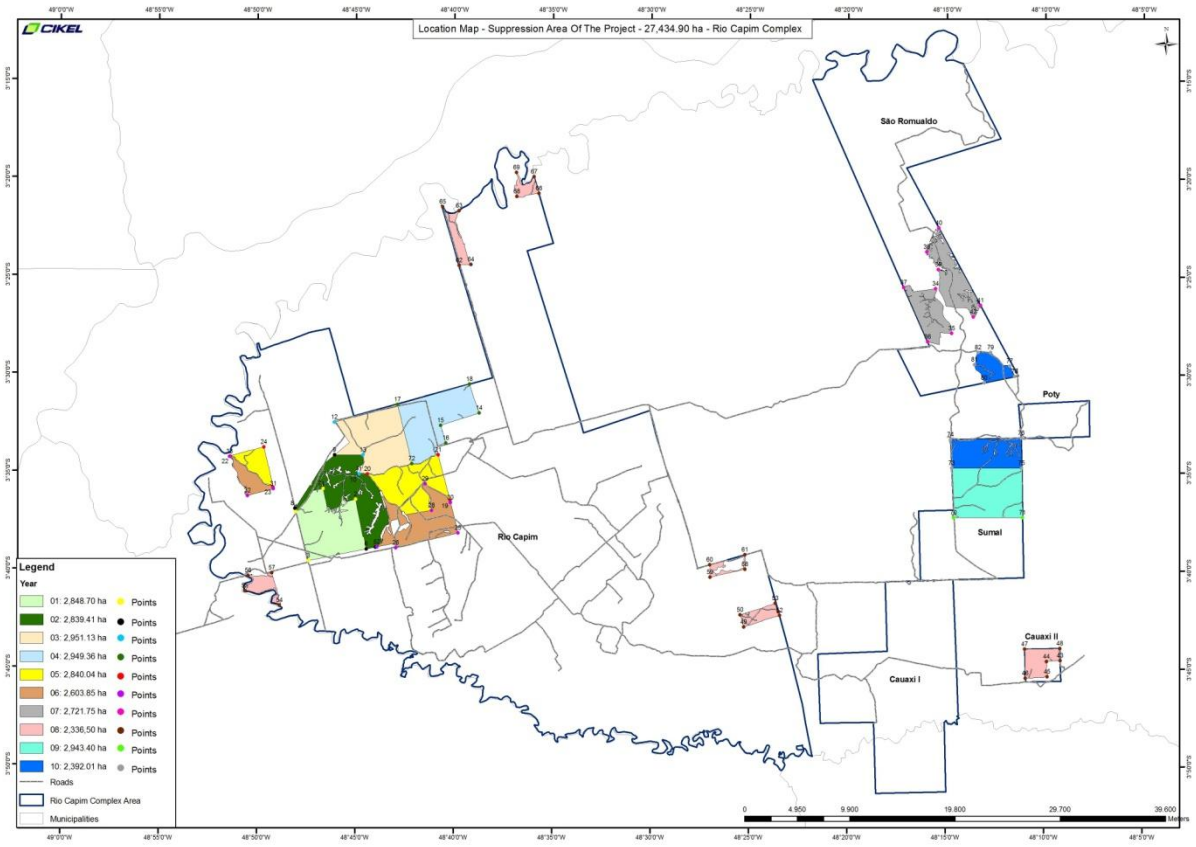


Figure 1.6: Map of the polygons of the project area

Table 1.8: The GPS coordinates of the polygons of the project area

Points	Areas	Year	Latitude	Longitude
1	Rio Capim	1	3° 35' 55,07" S	48° 46' 39,16" W
2	Rio Capim	1	3° 36' 26,81" S	48° 44' 59,92" W
3	Rio Capim	1	3° 39' 35,02" S	48° 47' 22,64" W
4	Rio Capim	1	3° 37' 5,27" S	48° 48' 2,13" W
5	Rio Capim	2	3° 38' 53,93" S	48° 43' 59,73" W
6	Rio Capim	2	3° 38' 59,43" S	48° 44' 26,89" W
7	Rio Capim	2	3° 35' 55,07" S	48° 46' 39,16" W
8	Rio Capim	2	3° 36' 55,69" S	48° 48' 4,78" W
9	Rio Capim	2	3° 34' 11,30" S	48° 46' 3,94" W
10	Rio Capim	2	3° 35' 10,98" S	48° 44' 51,32" W
11	Rio Capim	3	3° 35' 9,90" S	48° 44' 49,52" W
12	Rio Capim	3	3° 32' 31,19" S	48° 46' 5,08" W
13	Rio Capim	3	3° 34' 11,09" S	48° 44' 37,94" W
14	Rio Capim	4	3° 32' 2,28" S	48° 38' 43,78" W
15	Rio Capim	4	3° 32' 39,93" S	48° 40' 41,12" W
16	Rio Capim	4	3° 33' 33,94" S	48° 40' 25,10" W
17	Rio Capim	4	3° 31' 36,50" S	48° 42' 53,01" W
18	Rio Capim	4	3° 30' 33,59" S	48° 39' 13,78" W
72	Rio Capim	4	3° 34' 37,66" S	48° 42' 8,53" W
19	Rio Capim	5	3° 36' 30,49" S	48° 40' 12,27" W
20	Rio Capim	5	3° 35' 10,23" S	48° 44' 24,15" W
21	Rio Capim	5	3° 34' 10,22" S	48° 40' 48,33" W
22	Rio Capim	5	3° 34' 15,48" S	48° 51' 22,72" W
23	Rio Capim	5	3° 35' 50,50" S	48° 49' 11,38" W
24	Rio Capim	5	3° 33' 47,99" S	48° 49' 40,20" W
25	Rio Capim	6	3° 38' 9,88" S	48° 39' 47,58" W
26	Rio Capim	6	3° 38' 55,96" S	48° 42' 57,40" W
27	Rio Capim	6	3° 38' 52,99" S	48° 43' 55,10" W
28	Rio Capim	6	3° 37' 0,78" S	48° 41' 8,02" W
29	Rio Capim	6	3° 35' 38,85" S	48° 41' 28,32" W
30	Rio Capim	6	3° 36' 36,26" S	48° 40' 10,93" W
31	Rio Capim	6	3° 35' 55,53" S	48° 49' 10,44" W
32	Rio Capim	6	3° 36' 16,87" S	48° 50' 29,76" W
33	Rio Capim	6	3° 34' 16,91" S	48° 51' 24,12" W
34	São Romualdo/Caculé	7	3° 25' 37,99" S	48° 15' 33,64" W
35	São Romualdo/Caculé	7	3° 27' 53,91" S	48° 14' 44,08" W
36	São Romualdo/Caculé	7	3° 28' 20,77" S	48° 15' 57,53" W
37	São Romualdo/Caculé	7	3° 25' 33,99" S	48° 17' 10,75" W
38	São Romualdo/Caculé	7	3° 24' 39,40" S	48° 15' 25,80" W
39	São Romualdo/Caculé	7	3° 23' 45,34" S	48° 16' 0,99" W

Points	Areas	Year	Latitude	Longitude
40	São Romualdo/Caculé	7	3° 22' 31,98" S	48° 15' 24,13" W
41	São Romualdo/Caculé	7	3° 26' 28,39" S	48° 13' 16,97" W
42	São Romualdo/Caculé	7	3° 27' 4,07" S	48° 13' 38,31" W
43	Cauaxi	8	3° 44' 35,72" S	48° 9' 11,05" W
44	Cauaxi	8	3° 44' 38,99" S	48° 9' 52,27" W
45	Cauaxi	8	3° 45' 24,89" S	48° 9' 50,01" W
46	Cauaxi	8	3° 45' 30,20" S	48° 10' 56,72" W
47	Cauaxi	8	3° 44' 0,68" S	48° 10' 58,95" W
48	Cauaxi	8	3° 43' 58,36" S	48° 9' 12,26" W
49	Rio Capim	8	3° 42' 55,01" S	48° 25' 15,40" W
50	Rio Capim	8	3° 42' 17,86" S	48° 25' 26,58" W
51	Rio Capim	8	3° 42' 8,75" S	48° 23' 29,82" W
52	Rio Capim	8	3° 42' 19,94" S	48° 23' 26,81" W
53	Rio Capim	8	3° 41' 42,38" S	48° 23' 40,02" W
54	Rio Capim	8	3° 41' 52,61" S	48° 48' 51,08" W
55	Rio Capim	8	3° 41' 7,63" S	48° 50' 37,63" W
56	Rio Capim	8	3° 40' 21,65" S	48° 50' 26,99" W
57	Rio Capim	8	3° 40' 12,46" S	48° 49' 15,31" W
58	Rio Capim	8	3° 39' 58,41" S	48° 25' 12,76" W
59	Rio Capim	8	3° 40' 23,10" S	48° 26' 58,96" W
60	Rio Capim	8	3° 39' 45,25" S	48° 26' 59,55" W
61	Rio Capim	8	3° 39' 14,28" S	48° 25' 12,49" W
62	Rio Capim	8	3° 24' 30,04" S	48° 39' 45,56" W
63	Rio Capim	8	3° 21' 42,40" S	48° 39' 46,69" W
64	Rio Capim	8	3° 24' 27,25" S	48° 39' 10,00" W
65	Rio Capim	8	3° 21' 30,69" S	48° 40' 36,54" W
66	Rio Capim	8	3° 20' 49,29" S	48° 35' 43,51" W
67	Rio Capim	8	3° 19' 58,15" S	48° 35' 58,41" W
68	Rio Capim	8	3° 20' 58,45" S	48° 36' 50,54" W
69	Rio Capim	8	3° 19' 45,42" S	48° 36' 52,02" W
70	Sumal	9	3° 37' 18,85" S	48° 14' 36,88" W
71	Sumal	9	3° 37' 18,20" S	48° 11' 6,60" W
73	Sumal	10	3° 34' 47,20" S	48° 14' 42,85" W
74	Sumal	10	3° 33' 19,69" S	48° 14' 46,86" W
75	Sumal	10	3° 34' 46,55" S	48° 11' 9,75" W
76	Sumal	10	3° 33' 14,41" S	48° 11' 11,43" W
77	São Romualdo/Caculé	10	3° 29' 34,33" S	48° 11' 47,23" W
78	São Romualdo/Caculé	10	3° 30' 6,05" S	48° 11' 32,46" W
79	São Romualdo/Caculé	10	3° 28' 52,56" S	48° 12' 45,34" W
80	São Romualdo/Caculé	10	3° 30' 25,59" S	48° 13' 4,75" W
81	São Romualdo/Caculé	10	3° 29' 29,74" S	48° 13' 34,30" W
82	São Romualdo/Caculé	10	3° 28' 52,96" S	48° 13' 23,19" W

1.10 Conditions Prior to Project Initiation

Cikel group acquired the Cauaxi and Sumal properties in 1991, Rio Capim in 1992 and Caculé in 1999. Ten years prior to the project start date, in 1997, the entire project area was forest (Figure 1.7).

Forests in the area had been historically exploited, prior to administration by CKBV. In 2000, the RCC Sustainable Forest Management Plan was approved by IBAMA and Low Impact Logging was instituted. On November 20, 2000, the first AUTFE was issued for the RCC forest areas, and thus the logging initiated on November 21st in that same year. Since then, the logging in RCC has been with Low Impact Logging. In that same year, the farm Rio Capim forest area was certified by FSC®, and in 2010 other RCC forest areas were included in the scope of the FSC certification, including the entire project area.

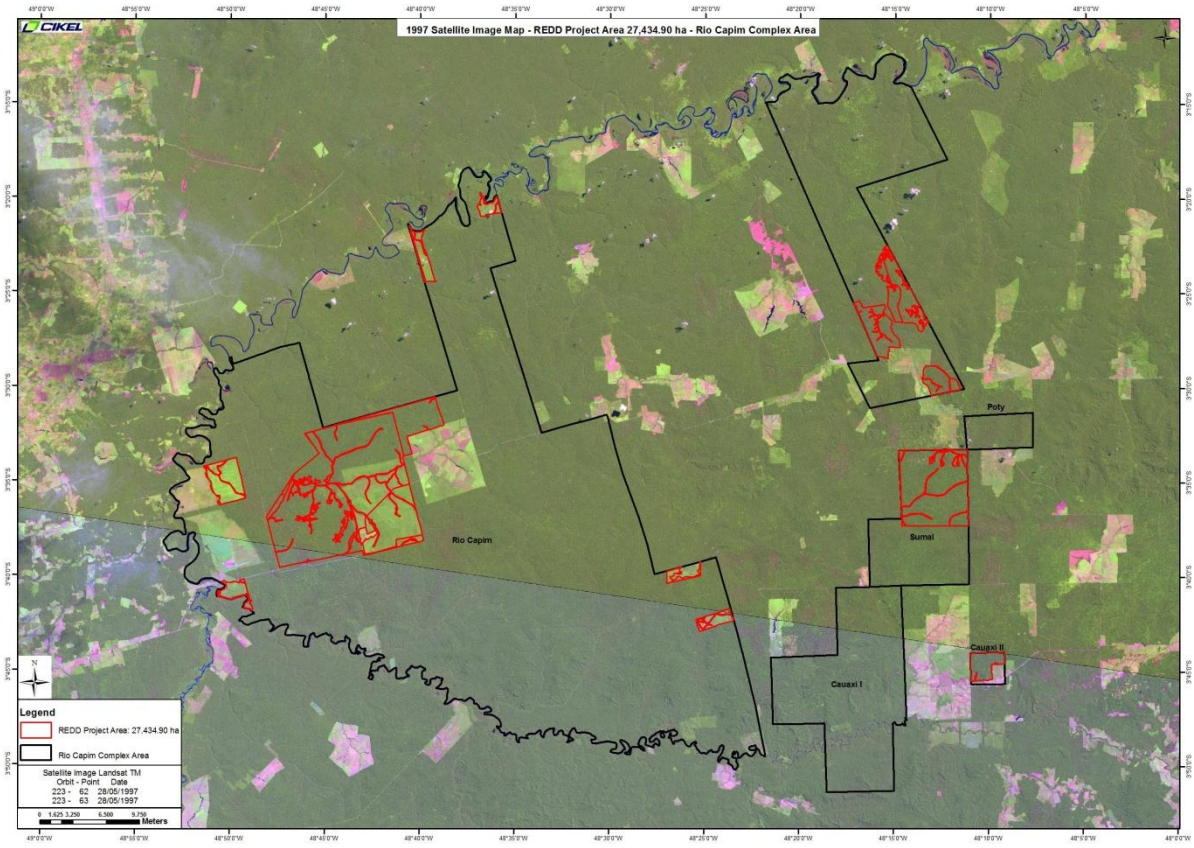


Figure 1.7– Landast image of 1997 of RCC property area (black) and project area (red)

Figure 1.8 is the satellite image of 2007, showing that all the project area was entirely forest at the project start date.

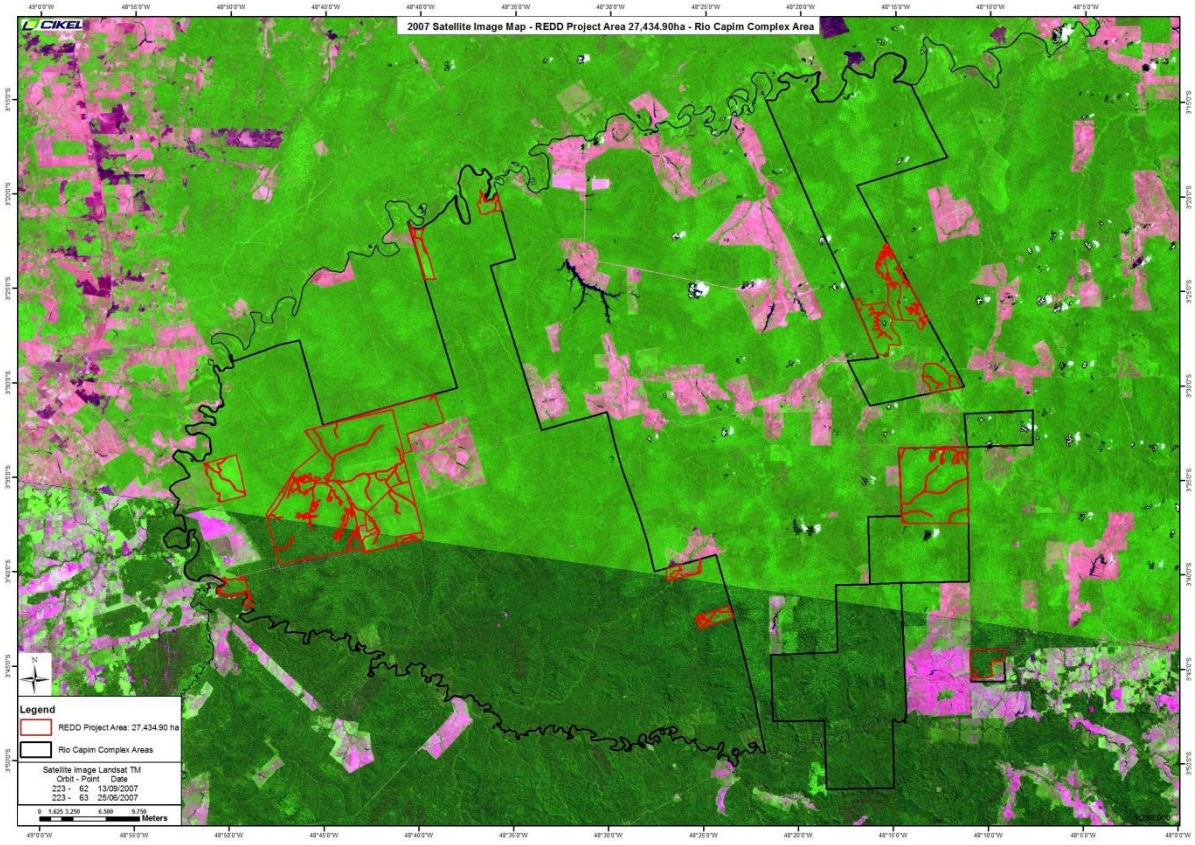


Figure 1.8– Landast image of 2007 of RCC property area (black) and project area (red)

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activities, including continued forest management and sale of wood products, are all undertaken in compliance with applicable laws. According to the FSC® Certificate, the SFMLIL implemented by CKBV at RCC must follow national and state regulations and laws related to forest management. In relation to the evaluation of CKBV's compliance with laws and FSC principles, the FSC Certificate states that: laws pertaining to the activity are fulfilled; the company's operating records are duly legalized and the management plan is properly registered with SEMA. In the following table is the summary the main regulations applied to the activities of Sustainable Forest Management:

Table 1.8 below reviews all relevant laws and explains means of compliance.

Table 1.9. Applicable laws and demonstration of compliance.

Title and number of the law	Context/Relevance	Compliance demonstrated by
Law No 4.771, September 15, 1965 - (D.O.U. of 16/09/65).	Brazilian Forest Code of 1965 - Brazilian Forest Code - has, for example: II - a permanent preservation area: protected area in terms of arts. 2 and 3 of this Law, covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, biodiversity, gene flow of plants and animals, protect the soil and ensure the well-being of human populations ; III - Legal Reserve: an area located within a rural property or possession, except for the permanent preservation, necessary for the sustainable use of natural resources, conservation and rehabilitation of ecological processes, biodiversity conservation and shelter, and protection of native flora and fauna; Article 150 - it is forbidden to exploit empirical form of the primitive forests of the Amazon basin, which can only be used in compliance with the technical plans and management conduct to be established by act of government, to be downloaded within a year.	Legal reserve area well defined. APPs well defined, planned and respected and operations regulated by PMFS approved.
Regulatory Instruction No 5, December 11, 2006	It provides for technical procedures for the preparation, presentation, execution and evaluation technique for Sustainable Forest Management Plans - PMFSs in primitive forests and its forms of succession in the Amazon, and other policies.	Management Plan and AOP approved by Environment Entity.
Resolution No 406, February 2, 2009 - Ministry of Environment - National Environment Council	It establishes technical parameters to be adopted in the preparation, presentation, technical evaluation and implementation of Sustainable Forest Management Plan - PMFS timber purposes, for native forests and their forms of succession in the Amazon. Article 1 sets forth technical parameters for the preparation, presentation, implementation and technical evaluation of Sustainable Forest Management Plans - PMFS purposes native forests for timber and its forms of succession in the Amazon Biome, which should be applied at any level of competence by agencies comprising the National Environmental System - SISNAMA observing the provisions of this Resolution.	Management Plan and AOP approved by Environment Entity.
Resolution No 411, May 6, 2009 - National Environment Council	It provides for procedures for inspection of consumer industries or processing of timber forest products and byproducts of native origin, and their naming patterns and volumetric coefficients of income, including charcoal and sawmill waste. This article 1 resolution aims at defining procedures for inspection of consumer industries or processing of timber forest products and by products of native origin,	Separation of logs by species, with lot properly labeled

Title and number of the law	Context/Relevance	Compliance demonstrated by
	and their naming patterns and volumetric coefficients of income, including charcoal and sawmill waste.	
Regulatory Instruction No 2, June 27, 2007-MMA	Changes in provisions of Regulatory Instruction No. 5 of December 11, 2006, and other policies. The first Art arts. 8, 28 and 43 of Instruction No 5 in 2006, published in the Official Gazette of December 13, 2006, Section 1, pages 155-159 shall henceforth read as follows: I - maintaining at least 10 % of number of trees by species in the area of effective exploitation of the UPA, that meet the selection criteria listed in PMFS cutting, subject to the minimum maintenance of three trees per species per 100 ha in each UT, and II - maintenance of all trees of species whose abundance of individuals with PAD superior to DMC is equal to or less than 3 trees per 100 hectares of effective exploitation of the UPA, every UT.	Selection criteria are described in the AOP approved by the Environment Entity.
Regulatory Instruction No 003- May 23, 2007 - Science, Technology and Environment Executive Office – SECTAM (in its Portuguese acronym).	The discipline regulating the Rural Environmental Registry - CAR (in Portuguese Cadastro Ambiental Rural) in Para and other measures. Article 1 - Establish criteria and procedures for effecting the Rural Environmental Registry -. CAR-PA, as a tool for identification of rural property in the state of Pará, to be issued by SECTAM-PA under this Instruction. Article 2 - Registration is required for the CAR-PA for every rural property in the state of Pará even for those who do not engage in any economically productive rural activities. Article 3 - The issue of CAR-PA will be given only once for each rural property and will be subject to registration number in sequential order, which will appear on all licenses, permits and other documents issued for the environmental regularization of rural property. This registration number will be linked to rural property, regardless of transfer of ownership, possession and control. Sole Paragraph. - It will not be granted license of any kind to the rural property that is not registered with the Rural Environmental Registry - CAR-PA. Article 4 - In CAR-PA there is essential data of the rural property, the Total Area - AT, the Permanent Preservation Area - APP, the Area Legal Reserve - ARL and Area Land Use Alternative - Auas, in addition to names and qualifications of the owners of rural property, possession or area, geographic coordinates and other data required by supplementary legislation.	Preparation of CAR for every property.

Title and number of the law	Context/Relevance	Compliance demonstrated by
Regulatory Instruction No 012, November 30, 2006 - SECTAM (in its Portuguese acronym)	It establishes standards and procedures to regulate the use of Forest Guide - GFPA for the transportation of goods and / or by-products of forest in Pará State, and other measures. Article 1 - To regulate the use of Forest Guide - GF-PA for the transport of goods and / or by-products of forest in Pará State, under Art. 6 Paragraph V of the State Decree No. 2592 of November 27, 2006, and other measures. Article 2 - The Forest Guide - GF-PA will be issued in the following models for the various types defined in this Normative Instruction: I. GF Model 1 - GF1-PA II. Model 2 GF - GF2-PA III. GF Model 3 - GF3-PA, and IV. GF Model 4 - GF4-PA	In all forest operations CIKEL uses GF in accordance with the IN.
Regulatory Instruction No 014, November 30, 2006 - SECTAM (in its Portuguese acronym)	It defines the requirements for the registration for the Defense Technical Activity - CTDAM and other measures. Whereas there is a need to regulate the paragraph I of art. 1 of Decree No. 5741 of December 19, 2002, which established the Technical Registration Activity Environmental Defense; Whereas it is necessary to provide the general public regarding natural persons and legal entities authorized to develop environmental projects within the State of Para RESOLVED: Article 1 defines the documents necessary for registration in the Register annual Technical Environmental Defense Activity - CTDAM.	The company's technicians are engaged in technical function CTDAM.

Title and number of the law	Context/Relevance	Compliance demonstrated by
Regulatory Instruction No 15, December 7, 2006 – SECTAM.	Whereas the Technical Cooperation Agreement in Section II deals with the competence of SECTAM and the letter "a)" that establishes the need for standardization in Pará State, related to forestry; Whereas the need to regulate the use of forest residues from managed forestry and forest areas to alternative use of land; Whereas the importance of establishing criteria for approval of use of forest residues for firewood or charcoal, decides: Article 1o may only request the first use of forest waste holders management plans (FMP) and applicants for removal of vegetation for alternative use of land licensed by the SECT. Sole Paragraph. The granting of the use of waste must be on leave from rural activities - LAR. Art. 2o The extraction of logging residues provided in Forest Management Plans and Annual Operational Plans (AOPs) and removal of vegetation filed and approved, shall be held within two years after the start of operation or one year after the removal of vegetation the area. Article 3o- as an exception, SECTAM may consider the extraction of waste related to AOP filed until 2004, of a size equal to the volume of logs in the permit allowed Forestry - AUTFE or according volumetric study of waste led UPA. Sole paragraph. In the case study of volume, it should be submitted to the Technical Board of Forestry SECTAM. Art 4o of the year 2007, the volume of waste will be released on the following criteria: a) for holders that do not have volumetric study of waste, SECTAM will authorize a m^3 of waste per 1 m^3 of logs extracted, or b) for holders who submit technical content of volumetric waste, this index will be considered after evaluation and approval by the Technical Chamber of Forestry SECTAM, or c) for holders who carry waste inventory SECTAM release the volume corresponding to the lower limit confidence interval obtained to estimate the average volume of waste per hectare.	Logging residue indexes are approved by the Environment Entity.
Regulatory Instruction No 8/2007, December 7, 2007-SEMA	Provisions on control and environmental monitoring of the production industries of pig iron and charcoal in the State of Pará. Art. 1º All the industries of pig iron production which use charcoal as raw material and have Operating License issued by the SEMA, or with licensing process in course, will have their activities monitored by the Intensive Environmental Monitoring Program, getting such license limited to the early confirmation of availability of legal or mineral charcoal. § 1º - The proof of the raw material for charcoal, which is the head of this article, will be carried out by means of this agreement or preliminary	Obtaining all permits required by the environment entity for the production of charcoal.

Title and number of the law	Context/Relevance	Compliance demonstrated by
	agreement, signed between the suppliers of charcoal and the consumers of vegetal raw material described in PSA- Annual Procurement Plan- and proven in SISFLORA (Forest Product Transportation and Commercialization System). § 2º - The duly licensed Charcoal Companies signing such agreement and preliminary agreement, cannot exceed the amount established in its license.	
Regulatory Instruction No 7/2006, September 27,2006-SEMA. In relation to Sustainable Forestry Management Plan (PMFS, in its Portuguese acronym).	Art. 1 o The Sustainable Forest Management Plan (PMFS) must abide: I – The intensity of logging not exceeding 30m³/ha if machines for the extraction of timber are used. In this case, the initial cutting cycle will be of 35 years; II – The intensity of logging not exceeding 10m³/ha if the use of machinery for the extraction of wood is not used. In this case, the initial cutting cycle is of 10 years. § 1o It is understood by Intensity Cut: trade volume of cut trees, estimated by volumetric equations under the PMFS and based on inventory data to 100%, expressed in cubic meters per unit area (m³/ha) of effective forest exploitation, calculated for each unit of work (UT). Art. 2 o The PMFS must meet the following criteria for the selection of trees: § 1o It cannot be exploited species: I - with diameters (DBH) of less than 50cm, except in cases where technical justifications are presented based on data from forest inventories; II - prohibited for exploration in accordance with the current legislation; III – therefore, in the forest inventory at 100%, a density smaller or equal to three individuals per 100 hectares;	The company has a management plan approved by the AOP and the environment entity that complies with the legislation. Forestry operations are governed by the Operating Work Instructions, Safety and Environment provisions of law and voluntary certifications.
Federal Decree No 5.975 / 2006	Art. 10. The exploitation of forest and succeeding formations involving the removal of the arboreal natural vegetation close cutting will be permitted only upon authorization of removal for the alternative use of land issued by the competent organ SISNAMA (Environmental National System). § 1o It is understood by alternative use of land, the replacement of forest and other successor formations by other soil coverage, such as settlement projects for land, farming, industrial, power generation and transmission of energy, for mining and transport reform.	

1.12 Ownership and Other Programs

1.12.1 Proof of Title

The project area is entirely contained within the RCC. The five properties making up the RCC are owned by companies belonging to the CIKEL group. The legal title of each property is detailed in table 1.10 below. CKBV has the legal right to practice forest management at the RCC since May 2000 and corresponding title of the carbon credits generating from the project activity. These agreements and property legal titles are available for the auditors during validation process.

Table 1.10 Demonstration of ownership of project area by CIKEL group companies.

Farm	Forest Area	Legal Area (ha)	Project Area	Owner until 03 April 2011	Owner from 04 April 2011	Number and location of the legal registry
Rio Capim	Rio Capim I	36,297.0000		Rondon Imóveis Ltda.		8823 page, 290 book 2-A.E (Paragominas)
	Rio Capim IV and VII	65,114.5804	Yes	Madereira Matinha S/A		4828 page 168, book 2-P (Paragominas)
	Rio Capim VI	5,262.7443	Yes	Madereira Matinha S/A		4594 page 234, book 2-O (Paragominas)
	Pindobal	13,364.2238		Madereira Matinha S/A		4595 page. 235, book 2-O (Paragominas)
	CIKEL V	13,068.0000		CKBV		8708 page 175, book 2-A.E (Paragominas)
	CIKEL IX	9,550.0000	Yes	CKBV		8709 page 176, book 2-A.E (Paragominas)
	Igaci	6,534.0000		Rondon Imóveis Ltda		8988 page 156 book 2-A.F (Paragominas)
	Total area Rio Capim	149,190.5485				
Sumal		10,890.0000	Yes	Sumal Surubiju Madereira Ltda.	Rondon Imóveis Ltda	2501 page 101, livro 2-I (Paragominas)
Caculé		28,277.0000	Yes	Rondon Imóveis Ltda.		8824 page 291 book 2-A.E (Paragominas)
Cauaxi I		17,424.0000		CKBV		8706 page 173 book 2-A.E (Paragominas)
Cauaxi II		1,171.0000	Yes	Rondon Imóveis Ltda. (since November 1 2011 before that was CKVB)		8707 page 174 book 2-A.E (Paragominas)
Total AREA		209,130.5485				

CKBV: CKBV Florestal Ltda. Former names: Cikel Brasil Verde S.A. e Cikel Brasil Verde Madeiras Ltda.;
Rondon Imóveis Ltda.. Former name: Rondon do Pará Painéis Ltda.;
Madeireira Matinha S.A. Former name: Cikel Comércio e Indústria Keila S.A.;

1.12.2 Emissions Trading Programs and Other Binding Limits

Brazil is a non-Annex I country under Kyoto Protocol and does not have any GHG reduction commitments under the Convention. Moreover, CKBV does not have any project related to carbon credit generation under the CDM or other regulatory scheme within the project area.

1.12.3 Participation under Other GHG Programs

The CIKEL REDD Project is not registered or seeking registration in any other GHG programs.

1.12.4 Other Forms of Environmental Credit

The project does not intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under this VCS project.

1.12.5 Projects Rejected by Other GHG Programs

CKBV is not requesting registration of this project in any other GHG Programs nor has the project been rejected by any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project is not a grouped project.

Leakage Management

In this avoiding planned deforestation project, the baseline agent of deforestation is the same as the project proponent. Generally, leakage mitigation activities are directed to the baseline agents to minimize risk of displacement of activities. Risk of displacement of CKBV's planned deforestation activities is reduced through the realization of new revenues from the sale of carbon credits, which serve to replace the revenues foregone by cancelling the planned deforestation and new livestock activity.

Commercially Sensitive Information

The following information was available for the validation process: Wood exportation 2002-2006, Suppression Plan and Livestock business plan; CKBV Business Goals Plan CKBV's Financial Statements and Historical operation cost and production information from 2001-2006.

Further information

The following information was available during validation process: IBAMA Protocol (Protocol nº. 02018.006149/06-99); 29/6/2007 amendment to 2007 AOP; AUTFE Poty, from 2007; ; Results of geo-referencing in 2008 and Property Legal Titles; Legal Right Forest Management Agreement; Legal Right of Carbon Credits Agreement; Correspondence between CKBV and IMAZON and Imazon commercial proposal of February 2008; UFRA residue study; 2000 and 2011 Forest Management Plans; IOSWE 22 and 2; Official Letter to SEMA with 100-year longevity commitment; KML maps of the project area.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

REDD Methodology framework:

VM0007 REDD Methodology Module, REDD Methodology Framework (REDD-MF), version 1.0

This project uses the following modules and tools:

REDD-MF REDD Methodology framework module

Carbon pool modules:

CP-AB "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools", version 1.0

CP-W "VMD0005 Estimation of carbon stocks in the long-term wood products pool", version 1.0

Baseline module:

BL-PL "VMD0006 Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation", version 1.0

Leakage modules:

LK-ASP "VMD0009 Estimation of emissions from activity shifting for avoided planned deforestation", version 1.0

LK-ME "VMD0011 Estimation of emissions from market-effects", version 1.0. Mandatory where the process of deforestation involves timber harvesting for commercial markets

Monitoring module:

M-MON "VMD0015 Methods for monitoring of greenhouse gas emissions and removals", version 2, November 23, 2011

Other modules:

X -STR "VMD0016 Methods for stratification of the project area", version 1.0.

X-UNC "VMD0017 Estimation of uncertainty for REDD project activities", version 1.0.

Tools:

T-ADD "VT0001 Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities", version 3.0.

"AFOLU Non-permanence Risk Tool", version 3.1

No deviations to the methodology were applied.

2.2 Applicability of Methodology

In Table 2.1 below is presented the applicability conditions of the methodology and for each its correspondent justification.

Table 2.1: REDD Methodology applicability

Conditions of applicability of Methodology	Justification
General Conditions	
Land in the project area has qualified as forest at least 10 years before the project start date.	The project area complies with this condition as mentioned in sections 1.9 and 1.10, with complete forest cover demonstrated for the years 2007 and 1997 (Figures 1.7 and 1.8).
The project area can include forested wetlands (such as bottomland forests, floodplain forests, mangrove forests) as long as they do not grow on peat. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm^3. If the project area includes a forested wetlands growing on peat (e.g. peat swamp forests), this methodology is not applicable.	The project area is “terra firme” rainforest with limited areas of riparian/floodplain forest. None of these areas have a peat substrate, instead all growing on yellow latisol clay soils, "Latossolo Amarelo (Yellow Latossolo)."
Project proponents must be able to show control over the project area and ownership of carbon rights for the project area at the time of verification.	As shown in section 1.12, CKBV has the control of the project area and the ownership of the carbon credits.
Baseline deforestation and baseline forest degradation in the project area fall within one or more of the following categories: • Unplanned deforestation (VCS category AUDD); • Planned deforestation (VCS category APD); • Degradation through extraction of wood for fuel (fuelwood and charcoal production) (VCS category AUDD).	The project falls within the Planned Deforestation category, as it is legally allow according to the Brazilian Forest Law/Legislation, n^o 4771 of 1997, in its article 16, allows the owner to suppress up to 20% of the total area for its economic use such as livestock or agricultural activities. All the documents are available for validation process.
Baselines shall be renewed every 10 years after the start of the project except where triggers lead to a more frequent renewal.	Baseline will be renewed in July 2017.
All land areas registered under the CDM or under any other carbon trading scheme (both voluntary and compliance-orientated) must be transparently reported and excluded from the project area. The exclusion of land in the project area from any other carbon trading scheme shall be monitored over time and reported in the monitoring reports.	CIKEL REDD APD project is not registered in any carbon trading scheme program. The project will not generate other forms of environmental credits related to GHG, by emission reductions or removals claimed under the VCS Program.

Conditions of applicability of Methodology	Justification
General Conditions	
If land is not being converted to an alternative use but will be allowed to naturally regrowth (i.e. temporarily unstocked), this framework shall not be used.	Forest clearing in the baseline is followed by establishment of pasture and initiation of livestock raising activities.
Where post-deforestation land use constitutes reforestation this framework shall not be used.	As explained above, post-deforestation land use in the project area is pasture for livestock grazing, and is not reforestation.
Leakage avoidance activities shall not include: • Agricultural lands that are flooded to increase production (e.g. paddy rice); • Intensifying livestock production through use of "feed-lots" and/or manure lagoons	Leakage avoidance activities do not include flooding agricultural land or creating feed-lots or manure lagoons.

Specific Conditions for the Planned Deforestation	
Conversion of forest lands to a deforested condition must be legally permitted.	The Brazilian Forest Law/Legislation, n^{o} 4771 of 1997, in its article 16, allows the owner to suppress up to 20% of the total area for its economic use such as livestock or agricultural activities (see Annex 3). RCC, in 2006 had 197,811.95 ha (prior to geo-referencing in 2008, which established legal recognition of an even larger property area of 209,130.54 ha), allowing legal deforestation of up to 39,562.39 ha. As 10,091.80 ha were already without forest at the time of acquisition of the property by Cikel Group, this left an area of 29,470.59 ha in 2006, which after excluding designated areas of permanent protection, results in an area of 27,934.48 ha that could be legally deforested (of which 27,434.9 ha, the project area, meet VCS REDD project eligibility criteria).
Documentation must be available to clearly demonstrate with credible evidence and documentation that indeed the land would have been converted to non-forest use if not for the REDD project.	Evidence to document the intent to deforest is presented in detail in Sections 1.5 and 2.4. Documentation accompanying this PD include: • IBAMA Protocol (Protocol no. 02018.006149/06-99) of July 2006 with the request of exclusion of the areas to be suppressed from its Forest Management Plan (to allow conversion to an alternate land use) • Suppression Plan (2006) • Livestock Business Plan (2006) All these documents are available for

	validation process.
It shall be demonstrated that post-deforestation land use shall not constitute reforestation.	As explained above, post-deforestation land use in the project area is pasture for livestock grazing, and is not reforestation.
Where, pre-project, unsustainable fuelwood collection is occurring within the project boundaries modules BL-DFW and LK-DFW shall be used to determine potential leakage	No illegal fuelwood collection is expected to occur in the project area in the baseline or with-project case.
Specific Conditions for monitoring	
Where selective logging is taking place in the project case: • If emissions from logging are not omitted as de minimis, logging may only take place within forest management areas that possess and maintain a Forest Stewardship Council (FSC) certificate for the years when the selective logging occurs. • Logging operations may only conduct selective logging that maintains a land cover that meets the definition of forest within the project boundary. • All trees cut for timber extraction during logging operations must have a DBH greater than 30 cm. • During logging operations, only the bole/log of the felled tree may be removed. The top/crown of the tree must remain within the forested area. • The logging practices cannot include the piling and/or burning of logging slash • Volume of timber harvested must be measured and monitored.	At the time of validation in 2012, the entire project area is under FSC certification, and as detailed in Section 1.8, logging practices implemented are selective, low impact logging with a minimum DBH cut of 50 cm. Logging slash is not piled and burned in the with-project case (although some burning of woody debris would occur post suppression activities in the baseline). Harvested timber volumes are routinely measured and recorded in annual harvest reports. To ensure compliance with this applicability condition, the Poty area (377.4 ha), included in the authorized suppression plan but where harvest took place prior to securing FSC certification, was removed from the final delimited VCS project area.

2.3 Project Boundary

Sources of GHG emissions associated with the Baseline, Project and Leakage.

In the table 2.2 are defined the GHG emission sources and justifications for exclusion.

Table 2.2. GHG emission sources and justifications for exclusion

Source	Gas	Included	Justification/ Explanation
Biomass burning	CO_2	No	CO_2 emissions are already considered in carbon stock changes.
	CH_4	No	Conservative to exclude because burning only

Source	Gas	Included	Justification/ Explanation
	N_2O	No	occurs in the baseline (on a limited scale, of wood residues post conversion to clean the area prior to pasture establishment). No biomass burning occurs in the with project case.
Fossil Fuel Combustion	CO_2	No	Emissions from fossil fuel combustion mostly occur in the baseline, and are from fuel consumption in machinery and transport activity for the suppression and livestock. Emissions from fossil fuel combustion are thus conservatively excluded from accounting in the baseline and project cases.
	CH_4	No	Emissions are small and negligible.
	N_2O	No	
Use of fertilizers	CO_2	No	Emissions are small and negligible.
	CH_4	No	
	N_2O	No	Excluded. No increase in fertilizer use is contemplated in the project case as part of leakage mitigation or any other activity.

Calculation of Carbon Stock

This project will include the following carbon pools (Table 2.3).

Table 2.3: Carbon pools

Carbon pools	Included / Excluded	Justification / Explanation of choice
Aboveground	Included	Mandatory to include. Tree biomass only is included, which is the most significant pool. Non-tree woody biomass (e.g. shrubs) is less in the baseline (pasture) than the project case (forest) and is conservatively excluded
Belowground	Included	Included and treated together with aboveground biomass for completeness to include whole tree (above- and belowground) biomass.
Dead Wood	Excluded	The dead wood pool is less in the

Carbon pools	Included / Excluded	Justification / Explanation of choice
		baseline (pasture) than the project case (forest) and is conservatively excluded.
Harvested Wood Products	Included	Included because wood harvest, and transfer of a portion of forest carbon to storage in long-lived wood products, takes place in the baseline (to a greater extent than via limited harvests in the with project case).
Litter	Excluded	Conservatively omitted, as allowed by methodology.
Soil Organic Carbon	Excluded	As per the methodology, exclusion is always conservative. Significant changes in this pool are not expected to occur in the baseline – note that the IPCC default stock change factor for permanent grassland is 1.0, which signifies no change from original, undisturbed (forest) stocks (IPCC 2006GL Vol 4 AFOLU Chapter 6 Grassland, Table 6.2)

1. As noted in the table above, this project will consider three pools of carbon and the applicable modules are: CP-AB "VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools", version 1.0
2. CP-W "VMD0005 Estimation of carbon stocks in the long-term wood products pool", version 1.0

2.4 Baseline Scenario

The project baseline assumes execution of the suppression plan resulting in deforestation of 27,434.9 ha (Table 2.4 and Figure 2.1). Under this plan, the area would be clearcut, with wood from the area extracted for sawnwood and fuelwood markets, followed by implementation of livestock activity.

Table 2.4 – Forest Suppression Schedule for the project area

Year		Effective área (ha)
01	2008	2846.3
02	2009	2838.8

Year		Effective área (ha)
03	2010	2951.1
04	2011	2949.4
05	2012	2840.0
06	2013	2603.9
07	2014	2721.8
08	2015	2336.0
09	2016	2943.4
10	2017	2404.3
		27,434.9

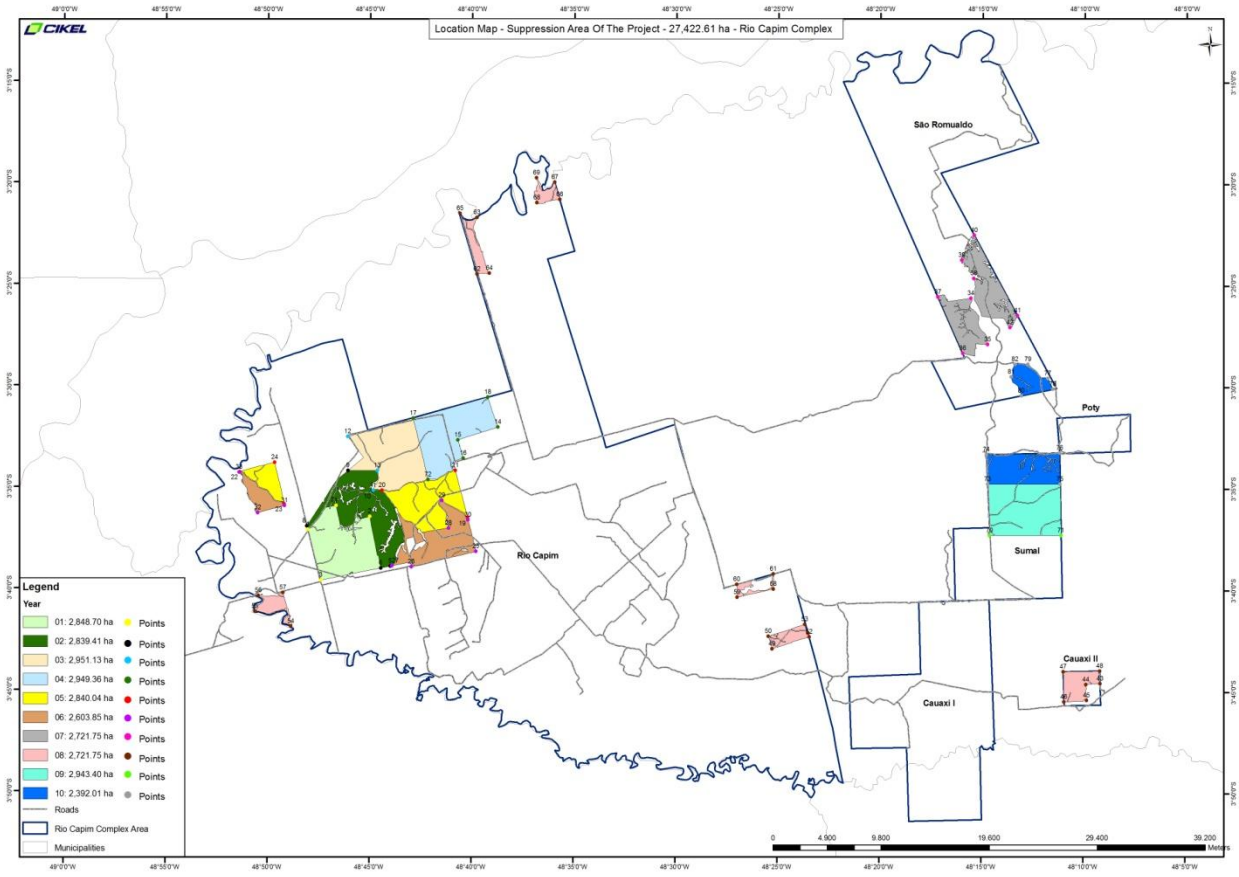


Figure 2.1 Annual forest suppression areas in the project area.

For each annual area deforested, the suppression plan would be implemented with the following progression of activities:

May to October – clearcut area and extract wood

November to December – remove any remaining vegetation by burning

December to January – aerial grass seeding

July – purchase of livestock and beginning of grazing

The baseline will be revised in July 2017.

Deforestation Agent

The agent of deforestation in the case of this Avoided Planned Deforestation Project is the project proponent, CKBV.

2.5 Additionality

The steps described below are in accordance with the "Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities", ver 3.0 (VT0001).

The additionality analysis references the area of the suppression plan 2006, because, as explained above under project start date, the suppression plan in its entirety (notwithstanding which areas were VCS-eligible) was always considered as a single business action by CKBV. The original suppression plan was for an area of 27,934.48 hectares to be suppressed in the Rio Capim, Caculé, Cauaxi, Sumal and Poty farms, as shown in Table 2.5. Note that the eligible project area, excluding roads opened through 2006, areas that were not forest 10 years before the beginning of the project in 1997 and Poty, is 27,434.9 ha.

Table 2.5 – Areas to be suppressed in hectares (APP = designated Area of Permanent Protection, not to be suppressed/deforested).

Sub-parcel of project area	Net suppressed according to the Suppression Plan	APP Area	Effective Area of Suppression
Rio Capim	19,773.03	998.58	18,774.45
São Romualdo	3,720.03	320.17	3,399.86
Cauaxi	697.22	7.73	689.49
Sumal	4,869.38	188.46	4,680.92
Poty	410.93	21.17	389.76
Total	29,470.59	1,536.11	27,934.48

Step 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity

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

Alternative 1:

Clearcut native forest with sale of wood and forest residues, and subsequent use of the opened area for livestock activity, according to the business plan. Details and assumptions for Alternative 1 are provided below.

Timber extraction

The total volume of recoverable timber for the area of 27,934 hectares is 1,420,320.30 m^3 logs, 7,407,031.70 m^3 firewood and 351,244.29 m^3 bolts (values referenced from the original 2006 suppression plan). Logs would be processed on-site and sold as sawn wood to the export market. Firewood and bolts would be sold as wood residues/biomass to produce charcoal, which in turn is supplied to the pig iron industry. Those volumes would be extracted over 10 years, according to the suppression schedule shown in Table 2.6.

Table 2.6 – Original Forest Suppression Plan Schedule of 2006

Year	Farm	Area (ha)	Logs for export (m^3)	Residues		
				Bolt (m^3)	Firewood (m^3)	Total m^3
1	Rio Capim	2,848.95	144,840.62	35,811.30	755,399.09	791,210.39
2	Rio Capim	2,845.46	144,663.19	35,767.43	754,473.72	790,241.15
3	Rio Capim	2,957.84	150,376.59	37,180.05	784,271.28	821,451.32
4	Rio Capim	2,957.84	150,376.59	37,180.05	784,271.28	821,451.32
5	Rio Capim	2,225.28	113,133.24	27,971.77	590,032.99	618,004.76
5	Rio Capim	528.03	26,845.05	6,637.34	140,007.15	146,644.49
6	Rio Capim	2,086.65	106,085.29	26,229.19	553,275.25	579,504.44
6	Rio Capim	621.14	31,578.76	7,807.73	164,695.27	172,503.00
7	Caculé	2,732.93	138,942.16	34,352.93	724,636.39	758,989.32
8	Rio Capim	1,703.26	86,593.74	21,409.98	451,619.39	473,029.37
8	Cauaxi	689.49	35,053.67	8,666.89	182,818.27	191,485.16
9	Sumal	2,948.30	149,891.57	37,060.13	781,741.75	818,801.88
10	Sumal	1,732.62	88,086.40	21,779.03	459,404.19	481,183.23
10	Poty	389.76	19,815.40	4,899.28	103,344.86	108,244.15
10	Caculé	666.93	33,906.72	8,383.31	176,836.49	185,219.80

Livestock activity

Following forest clearance and timber extraction, any remaining vegetation would be dried and burned, and aerial grass seeding completed prior to the wet season, so that the site is ready for grazing and introduction of calves the following year. Calves would be raised to two years of age before sale to the beef market. Livestock production schedule is detailed in Table 2.7.

The area for new livestock activity in the business plan also includes ~20 ha of pre-existing open areas outside the project area that would also be dedicated to livestock, hence the total livestock raising area considered in the business plan is 27,954.84 ha (slightly different than the total area to be suppressed).

Table 2.7 – Livestock activity implementation schedule

Initial year of calves purchase		Area (ha)	Number of initial male calves	Number of final fat oxes for sale after 2 years
1	2008	0	0	0
2	2009	2,832.28	2832	2784
3	2010	2,828.53	2829	2781
4	2011	2,947.92	2948	2900
5	2012	2,943.51	2944	2896
6	2013	2,210.58	2210	2162
7	2014	2,209.17	2209	2161
8	2015	3,831.78	3832	3784
9	2016	3,087.82	3088	3040
10	2017	2,928.02	2928	2880
11	2018	2,135.23	2135	2087

Alternative 2:

Cancel Forest Suppression/Livestock Activity Plan and continue limited forest management.

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

Alternative 1:

The Brazilian Forest Code, Nr 4771, 1997, in article 16, allows the owner to open up to 20% of the total area for economic use, such as livestock activity or agriculture. The total area of the Rio Capim Complex is 209,130.54 ha (legally geo-referenced in 2008), thus the area that can be legally deforested is 41,826.1 ha. Previously, 10,091.80 were opened before CKBV bought the area, thus the area remaining that can

legally be suppressed is 31,734.3 ha (minus areas designated for permanent protection). Note that the original suppression plan from 2006 was based on area estimates made prior to legal geo-referencing.

The first legal step to suppress native forest is to exclude the areas in the authorized Sustainable Management Plan by the competent authorizing agency, which was done by CKBV in 2006. After this, the Suppression Plan must be sent to the same agency to be analyzed and authorized. This last step was not undertaken because of CKBV's decision to cancel the suppression plan and carry out the REDD project.

Alternative 2:

All CKBV's logging with sustainable forest management is authorized by a competent regulatory agency (IBAMA at the federal level until 2006, SEMA at the state level since then), with annual authorizations for each Production Unit. CKBV also has all the operational and environmental licenses.

Sub-step 1c. Selection of the baseline scenario

As per the VCS Additionality tool (VT0001), the baseline scenario is selected and justified applying the methodology, module BL-PL, detailed in Section 3, and corresponds to a component of Alternative 1 here.

Step 2. Investment analysis

It will be demonstrated below, that the project without carbon credits (alternative 2) is not financially attractive in comparison to the alternative use.

Sub-step 2a. Determine appropriate analysis method

As alternative 2 (project scenario) generates revenues beyond VCS-related income, the simple cost analysis cannot be used, and instead the investment comparison analysis method is applied.

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

The financial indicator to be used in the comparison is Net Present Value (NPV), which is more appropriate than Internal Rate of Return (IRR) because alternative 2, continued forest management, does not involve any new investments.

The NPV analyses use the Selic[2] rate from 2007 of 11.8% (Source of Selic Rate: Central Bank, http://www.bcb.gov.br/?SELICTAXA) as the discount rate. The NPV analysis is run for a 20 year period.

[2] Short for Sistema Especial de Liquidação e Custodia, that is, Special System of Clearance and Custody, SELIC is the Brazilian Central Bank's system for performing open market operations in execution of monetary policy. The SELIC rate is the Banco Central de Brasil's overnight lending rate, which can be compared to the Federal Funds Rate in the US.

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

Alternative 1) Suppression/Livestock Activity

The financial analysis reflects the premises and the implementation schedule described for Alternative 1 above.

Table 2.8 shows the cash flow of Suppression/Livestock Activity through year 13, at which point all areas are in stable livestock production. Details of the full 20-year financial analysis are provided in “FINAL investment analysis CIKEL APD.xls.(see Annex 4)”

Table 2.8-Cash flow of Suppression/Livestock Activity 2008 to 2020 (through year 13)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Item	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Suppression													
(+) Revenues	*28,075,122*	*28,040,730*	*29,148,184*	*29,148,184*	*27,132,633*	*26,684,054*	*26,931,797*	*23,579,476*	*29,054,171*	*27,487,396*	*0*	*0*	*0*
. Log	19,767,413	19,743,198	20,522,945	20,522,945	19,103,816	18,787,976	18,962,409	16,602,074	20,456,752	19,353,601	0	0	0
. Bolt	376,019	375,558	390,391	390,391	363,396	357,388	360,706	315,807	389,131	368,147	0	0	0
. Firewood	7,931,690	7,921,974	8,234,848	8,234,848	7,665,421	7,538,690	7,608,682	6,661,595	8,208,288	7,765,648	0	0	0
(-) Costs	*-13,387,400*	*-13,370,999*	*-13,899,080*	*-13,899,080*	*-12,937,981*	*-12,724,080*	*-12,842,214*	*-11,243,687*	*-13,854,251*	*-13,107,147*	*0*	*0*	*0*
. Operational	-12,357,919	-12,342,780	-12,830,252	-12,830,252	-11,943,060	-11,745,608	-11,854,658	-10,379,056	-12,788,870	-12,099,218	0	0	0
. Equipments	-1,029,481	-1,028,219	-1,068,828	-1,068,828	-994,921	-978,472	-987,556	-864,631	-1,065,381	-1,007,929	0	0	0
(=) SubTotal	**14,687,722**	**15,697,950**	**16,317,932**	**16,317,932**	**15,189,573**	**14,938,446**	**15,077,139**	**12,335,789**	**16,265,301**	**15,388,178**	**0**	**0**	**0**
Cattle													
(+) Financial Loan	*33,003,423*												
(-) Financing	*-2,310,240*	*-2,310,240*	*-2,310,240*	*-5,610,582*	*-5,379,558*	*-5,148,534*	*-4,917,510*	*-4,686,486*	*-4,455,462*	*-4,224,438*	*-3,993,414*	*-3,762,390*	*-3,531,366*
. Financial burden	-2,310,240	-2,310,240	-2,310,240	-2,310,240	-2,079,216	-1,848,192	-1,617,168	-1,386,144	-1,155,120	-924,096	-693,072	-462,048	-231,024
. Amortization	0	0	0	-3,300,342	-3,300,342	-3,300,342	-3,300,342	-3,300,342	-3,300,342	-3,300,342	-3,300,342	-3,300,342	-3,300,342
(+) Revenues	*0*	*0*	*0*	*4,279,008*	*4,274,397*	*8,736,308*	*8,725,549*	*12,312,802*	*12,239,006*	*18,067,310*	*16,911,486*	*22,493,870*	*20,119,205*
. Cattle Sale	0	0	0	4,279,008	4,274,397	8,736,308	8,725,549	12,059,302	12,047,006	17,875,310	16,719,486	22,301,870	19,927,205
. Alienation of materials & equipr	0	0	0	0	0	0	0	253,500	192,000	192,000	192,000	192,000	192,000
(-) Costs	*0*	*-1,435,037*	*-1,836,449*	*-3,457,898*	*-3,916,362*	*-5,273,616*	*-5,654,662*	*-8,970,595*	*-9,173,552*	*-11,749,189*	*-11,761,560*	*-11,937,945*	*-11,513,970*
. Operational	0	-245,597	-648,269	-1,030,298	-1,491,702	-1,917,816	-2,302,222	-2,805,757	-3,389,293	-4,377,634	-5,034,279	-4,815,397	-5,034,279
. Calves Purchase	0	-1,189,440	-1,188,180	-2,427,600	-2,424,660	-3,355,800	-3,352,440	-4,965,240	-4,649,400	-6,195,000	-5,546,520	-6,195,000	-5,546,520
. Pasture Regeneration	0	0	0	0	0	0	0	-1,199,598	-1,134,859	-1,176,555	-1,180,761	-927,548	-933,171
(=) SubTotal	**30,693,183**	**-3,745,277**	**-4,146,689**	**-4,789,472**	**-5,021,523**	**-1,685,842**	**-1,846,623**	**-1,344,279**	**-1,390,008**	**2,093,683**	**1,156,512**	**6,793,535**	**5,073,869**
Operational cash flow	**45,380,905**	**11,952,673**	**12,171,243**	**11,528,460**	**10,168,050**	**13,252,604**	**13,230,516**	**10,991,510**	**14,875,293**	**17,481,861**	**1,156,512**	**6,793,535**	**5,073,869**
Income Taxes (25%)	-11,345,226	-2,988,168	-3,042,811	-2,882,115	-2,542,013	-3,313,151	-3,307,629	-2,747,877	-3,718,823	-4,370,465	-289,128	-1,698,384	-1,268,467
Social Contribution (9%)	-4,084,281	-1,075,741	-1,095,412	-1,037,561	-915,125	-1,192,734	-1,190,746	-989,236	-1,338,776	-1,573,367	-104,086	-611,418	-456,648
Net revenue	**29,951,397**	**7,888,764**	**8,033,021**	**7,608,784**	**6,710,913**	**8,746,719**	**8,732,141**	**7,254,397**	**9,817,693**	**11,538,028**	**763,298**	**4,483,733**	**3,348,753**

Alternative 1 Financial Indicator for a 20-year horizon:
NPV: BRL 84,249,704 (discount rate: 11.8%)

Alternative 2) Cancelation of the Suppression/Livestock Activity Plan, and continuation of limited forest management

Analysis of Alternative 2, project activity in the absence of VCS-related revenues, assumes the logging schedule detailed in Table 2.9. The same with-project logging schedule is used in all ex ante analyses throughout the PD.

Table 2.9 – Planned Schedule for Logging in the project area

Year	Harvest Area (ha)	Volume of timber extracted (m^3)	Volume of residues extracted (m^3)
2008	0	0	0
2009	0	0	0
2010	1,122.3	18,417	0
2011	2,766.9	50,744	187,220
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0

Table 2.10 shows the cash flow of continued forest management, Alternative 2, in the same area through year 13, beyond which no further timber harvests are planned over the 10-year baseline period. Details of the full 20-year financial analysis are provided in “FINAL investment analysis CIKEL APD.xls.”

Table 2.10. Cash flow for continued forest management, Alternative 2, through year 13.

	Average Prices, Costs, Taxes		Dimension	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
				2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Volume of harvested logs/toras			**m^3**	**0**	**0**	**18,417**	**50,744**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Sawnwood sold for export	*19.8%*		m^3	0	0	3,647	10,048	0	0	0	0	0	0	0	0	0
Exports revenue	*1,400*	*BRL/m^3*	***BRL***	***0***	***0***	***5,106,400***	***14,069,920***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Volume of forest residues (toretes and lenha)			m^3	0	0	0	187,220	0	0	0	0	0	0	0	0	0
Residues (harvested logs sold to domestic market)	*30%*		m^3	0		5,523	15,218									
Revenue of Forest Residues	*10.50*	*BRL/m^3*	***BRL***	***0***	***0***	***57,992***	***2,125,600***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Revenue - export sawnwood and residues			**BRL**	**-**	**-**	**5,164,392**	**16,195,520**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Operational Cost			***BRL***	***(30,194)***	***(30,194)***	***(4,246,231)***	***(11,646,854)***	***(30,194)***	***(30,194)***	***(30,194)***	***(30,194)***	***(30,194)***	***(30,194)***	***(30,194)***	***(30,194)***	***(30,194)***
Logging	*58.05*	*BRL/m^3*	BRL	0	0	(1,069,105)	(2,945,759)	0	0	0	0	0	0	0	0	0
Sawmill	*210.28*	*BRL/m^3*	BRL	0	0	(3,146,932)	(8,670,901)	0	0	0	0	0	0	0	0	0
FSC certification			BRL	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)	(30,194)
Operational cash flow			**BRL**	**(30,194)**	**(30,194)**	**918,161**	**4,548,666**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**
Income Taxes	*25%*		BRL			(229,540)	(1,137,166)									
Social Contribution over Income	*9%*		BRL			(82,634)	(409,380)									
Net revenue				**(30,194)**	**(30,194)**	**605,986**	**3,002,119**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**	**(30,194)**

Alternative 1 Financial Indicator for a 20-year horizon:

NPV: BRL 2,423,581 (discount rate: 11.8%)

Comparative NPV's for the two alternative land uses are presented in Table 2.11 below.

Table 2.11. Comparative NPVs for Alternatives 1 and 2.

Alternative	Scenario	NPV (BRL)
1.	Suppression/Livestock Activity plan	84,249,704
2.	Continued forest management	2,423,581

As can be seen in the table above, the Suppression and Livestock Plan yields an NPV (BRL 84,249,704) higher than the continued forest management alternative, and therefore is demonstrated to be more financially competitive than the project activity without carbon revenues.

Sub-step 2d. Sensitivity analysis

The results of the financial comparison above are robust to reasonable variations in revenue and costs, borne out the in the sensitivity analysis below (Table 2.12).

Table 2.12. Sensitivity analysis

Alternative land use scenario	Base assumptions NPV (BRL)	Timber/residue costs ↓10% prices ↑10%, livestock costs ↑10% and prices ↓10% NPV (BRL)	Timber/residue costs ↓20% prices ↑20%, livestock costs ↑20% and prices ↓20% NPV (BRL)	All costs ↑20% and prices ↓20% NPV (BRL)
1. Suppression/ livestock	84,249,704	89,111,145	93,972,585	41,810,648
2. Continued forest management	2,423,581	4,232,469	6,041,357	(1,194,194)

In all cases, the NPV of Alternative 1 is many times higher than the NPV of Alternative 2. The consistency of this difference across cost and price scenarios owes to the fact that both alternatives are driven by timber/residue revenues; even within the suppression/livestock alternative, timber and residue sales are more influential in determining NPV in part because they are realized sooner and discounted less than those from livestock.

Result Step 2: As demonstrated above, the project without the financial benefits of carbon VCS is not financially competitive with reasonable alternative economic activities.

STEP 3. BARRIERS

Despite the fact that the previous investment analysis concluded that the project without the benefits of VCU's is not attractive, it is necessary to highlight that there are barriers to be overcome by the project, so that it can be carried out, with reduced risks regarding the permanence of the forest.

In order for these barriers to be overcome, the VCU's financial help will be essential.

Sub-step 3a. Identify barriers that would prevent the implementation of the type of proposed project activity

3.1) The project is the first of its kind

As will be demonstrated in the Step 4 Common Practice section, there is no other private companies to own over 100,000 ha of native forest and whose main business is the wood activity with sustainable forest management, such as CKBV.

Other forests of the same size, with SMFLIL, belong to companies bigger than CKBV and whose main business is in other sectors. Therefore, they don't have the same environmental, economic, sociocultural and political conditions. On the other hand, small farmers, such as CKBV's neighbours, have their areas opened mostly for cattle, and also have financial conditions that are very different and cannot be compared with CKBV.

Not opened the area, apart from reducing a source of immediate revenue due to the sale of timber and residues, the company's financial vulnerability increases as it does not have alternative business outside the timber. Any crisis in the wood market, or delays in the authorization for exploration, affect directly the company's financial health.

3.2) Institutional Barrier

Delay in the issuance of the Authorization for Forest Exploration (AUTFE)

Cikel Group's businesses have always been focused on the wood exploration and since 2006, the residues generated during the exploration. These activities depend on the authorization by the competent organ (IBAMA until 2005, SEMA from 2006), which must be required every year for each Annual Production Unit (UPA) through the delivery of the Annual Operation Plan (AOP). The issuance of the authorization may be delayed due to bureaucratic processes of the competent organ. These delays are beyond CKBV's control.

In 2005 this delay was especially long, mostly due to the transition of the responsible organ, which reduced significantly the operation/wood extraction in the Rio Capim unit during all 2005, the main source of revenue for CKBV and the entire CIKEL group. This led to the request for the cancellation of the Annual Operational Plan (AOP) in December 2005, when the AOP for the next year was delivered.

Reinforcing the delay situation, the forest activities in CRC for 2011 were planned in two farms: Rio Capim and Caculé. Since the AOP in Rio Capim was issued in October 2011, 173 days delay, and the AOP in Calculé was issued December 2011. Table 2.15 shows the time duration for the assessment of the authorization for the exploration.

Table 2.15 – Time duration for the assessment of the authorization for the exploration in CRC

Year	Protocol Date (AOP)	Approval information (AUTFE)	Duration of assessment (days)
2000	13-Oct-2000	20-Nov-2000	38
2001	26-Jun-2001	9-Aug-2001	44
2002	26-Jul-2002	19-Aug-2002	24
2003	15-May-2003	27-Jun-2003	43
2004	29-Mar-2004	19-Jul-2004	112
2005	11-Mar-2005	Cancelled	287 – The time of duration of the assessment considers the information of entrance of AOP of the following year
2006	23-Dec-2005	13-Jul-2006	202
2007	30-May-2007	19-Jul-2007	50
2008	28-Mar-2008	25-Jun-2008	89
2009	15-Apr-2009	19-Aug-2009	126
2010	20-Apr-2010	31-May-2010	41
2011	28-Apr-2011	4-Oct-2011 (Farm Rio Capim) Forest Area Caculé was issued in December 2011	173 (Rio Capim Forest Area)

Reference: AOP protocol and issued AUTFE. These information are available for validation process

Due this frequent delay, CKBV needs to diversify its sources of revenue, which must not depend on the forest activity, being the main alternative the opening/suppression of part of the forest that is legally permitted and using this area for other activities such as agriculture or livestock. VCUs will help CKBV to avoid suppression and keep the trained employees, the patrimonial security of the area, in case the AUTFE is not released.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternative land use scenarios (except the proposed project activity):

The barriers described above make it difficult for SFMLIL to continue in the long term, and so the revenue from the sale of the carbon credits will help CKBV financially to “coexist” with the sector and local situation previously described, guaranteeing a source of revenue to maintain the company’s basic activities like payment, maintenance, asset security, etc. Table 2.16 shows the summary of barriers of the project.

Table 2.16– Summary of barriers of the project

	ALTERNATIVES	
BARRIERS	**Alternative 1 – Suppression and Livestock activity in the project area, Reduction of the management area**	**Alternative 2 – Cancelling Suppression/Livestock plan and continuance of the prior situation. SFMLIL in all CRC area (Project without carbon)**
First Type	Does not prevent. Common practice in the region.	Strongly prevent
Institutional Barrier AOP/AUTFE delay	Does not prevent. The activity does not depend on AOP/AUTFE	Strongly prevent
RESULT	**The barriers do not prevent the Suppression/Livestock activities**	**The barriers strongly prevent the project execution**

STEP 4 – COMMON PRACTICE

The cancellation of an approved permit to conduct suppression activities to clear land for productive use cannot be characterized as common practice in the region of the project. While it is impossible to assess the lack of following through on an intended action on a landowner by landowner basis, there is ample evidence to demonstrate that the reverse, executing legal forest suppression permits, is common practice in the region.

In Paragominas, most legal forest clearing is conducted to open lands for livestock raising, and the prioritization of the livestock activity in the 2006 business plan reflects the predominance of the livestock market in the Paragominas region, providing an environmental and infrastructure conducive to initiating this activity.

Paragominas[3] was the leading livestock producer in Para state for ten consecutive years, from 1983 to 1992, and continues to be among the most important producers in the state. In 2007, Paragominas municipality was the sixth largest livestock producer in Pará, with 419,430 cattle, which is equivalent to 3% of the livestock in Pará (IBGE / PPM). In 2008 there were 1,152 properties in Paragominas with livestock activity (Adepará/Register 2008) as shown in Figure 2.2.

[3]The texts used in this section are taken from the Diagnostic Socioeconomic and Forest City Paragominas, 2009, by Imazon.

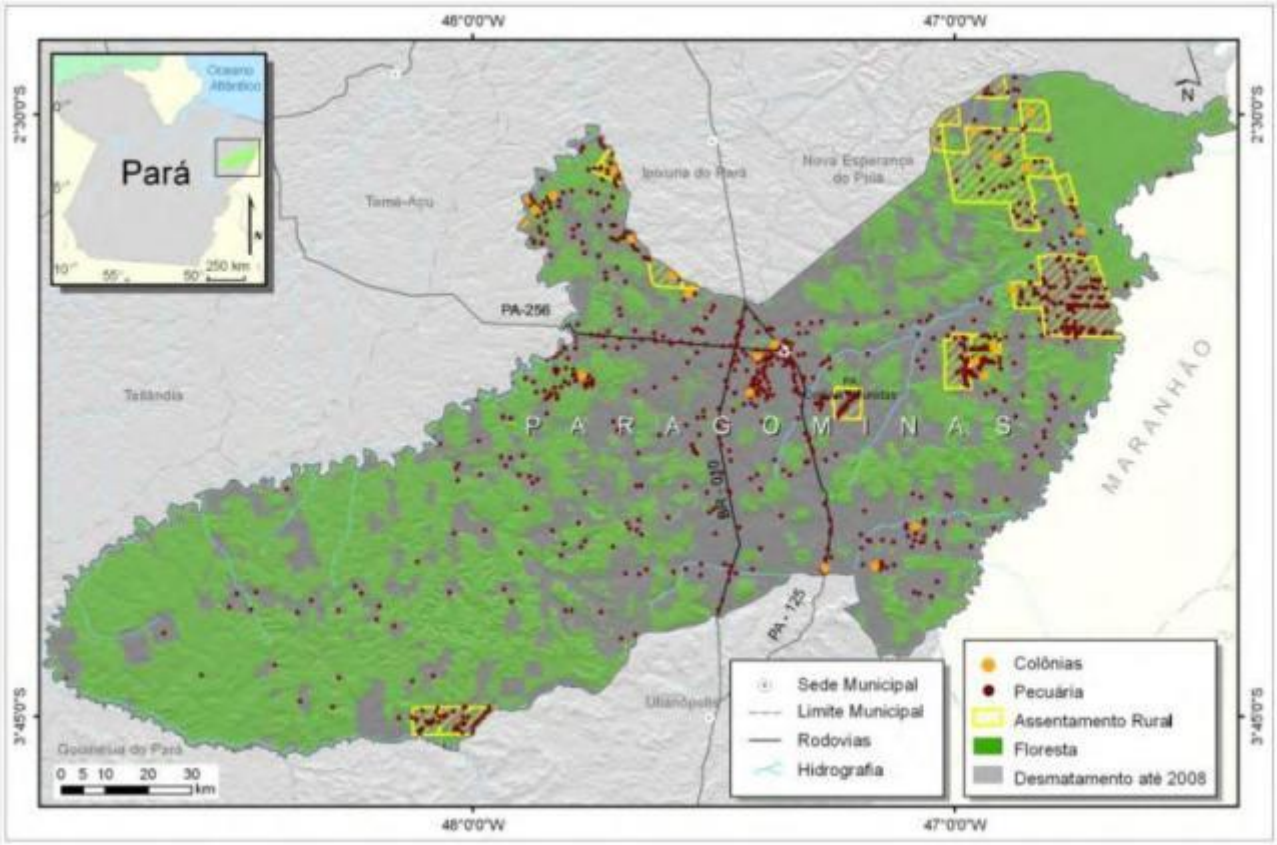


Figure 2.2: Livestock distribution in Paragominas, Pará state. Source: Adepará/Cadastro (2008) [4].

In 2009, the highest proportion of cleared areas in Paragominas was used for livestock, as shown in Table 2.13.

Table 2.13: Land Use of Paragominas in 2009.

	Área (ha)	% related to the municipality area
Area- clearcut[1]	748,000	38.7
Family agriculture[2]	108,569	5.6
Livestock[3]	*599,186*	*31.0*
Grain Crops (rice, corn and soybeans)	34,200	1.8
Undetermined Use[4]	6,045	0.3
Areas with highly forest degraded in 2008	130,693	6.8
Área with Forest cover	1,055,089	54.6
Remaining native Forest	1,015,089	52.5
Reforestation	40,000	2.1
Total área of Paragominas	1,933,089	100.0

[4] Pinto, A., & et al. (2009). *Diagnóstico Socioeconômico e Florestal do Município de Paragominas.* Belém-PA: Instituto do Homem e Meio Ambiente da Amazônia - Imazon.

[1] Based on the analysis of time series of Landsat images, from 1998 to 2008.

[2] To estimate the suppressed area in the segment "family agriculture", it was calculated the rate of deforestation within the polygons of the official settlements, being this equal to 68%, and extrapolated to the entire area occupied by small producers (settlement projects + colonies outside these projects).

[3]It was used a stocking of 0.7 head / hectare, which is the weighted average of data from the last Agricultural Census of IBGE (1995), which indicates an average stocking of 1.38 heads/hectare in the most productive pastures in the Amazon, which corresponds to 20% of the total pasture, and the data of Arima and Verissimo (2002) which indicate an average stocking of 0.5 head / hectare in the remaining 80% Amazon pasture.

[4] The difference between the total clearcut area and areas with size calculated by kind of use.

Although the latter data presented here are from post project start date in 2007, they are representative of conditions and land use change dynamics at that time. Notably, in the immediate vicinity surrounding the project area, 42% properties bordering the Rio Capim property are engaged in livestock activity.

Private landowners in the region that have *not* exercised their rights to legally clear forest (up to 20%), without incentives from carbon market revenues, present essential distinctions from CIKEL. These landowners are characterized as large companies, larger than CIKEL, with business operations not as dependent on land use activities (forestry or otherwise), occupying manufacturing, telecommunications and financial sectors, and are represented by the ORSA group, MARTINS and ALGAR/ABC, all located in the state of Pará.

Table 2.14 below shows the differences in the revenues of the companies.

Table 2.14 – Comparison of CIKEL with landowners in the project region that have not fully exercised legally-permitted deforestation without incentives from carbon.

Company	***Opened area (%)***	***Net revenue Group (R$)***	***Year of reference***
CIKEL	20% (in the baseline case)	128.9 mi	2010
ORSA	10%*[1]	1.5 bi	2010
MARTINS	4.8%*[2]	3.0 bi	2008
ALGAR/ABC	3.1%*[2]	2.6 bi	2010

*[1] Information obtained via email by the responsible of the company

*[2] Summary of the Forest Management Plan publicly known

*[3] Current lease contract between the company and CKBV

Sources of financial information:

CIKEL – Audited Financial demonstration

ORSA – Sustainability annual report 2010

http://www.relatorioanual2010.com.br/algar/Algar_S.A._Empreendimentos_e_Participacoes.pdf

MARTINS – Financial demonstrations December 31 2008, audited

http://portal.martins.com.br/portal/portal/filepublisher/downloadFile.k?id=714

ALGAR/ABC – Annual report 2010 http://www.relatorioanual2010.com.br/algar/

Below, is a brief description of each group

ORSA. *(Source: http://www.orsaflorestal.com.br/)*

Grupo Orsa is a corporation with 100% national capital. With operations in the states of São Paulo, Goiás, Para, Mato Grosso, Amazonas and Amapa, Grupo Orsa carries out wood and non-wood activities. Grupo Orsa is among Brazil's largest producers of paper packages and in the international market it is responsible for approximately 3% of eucalyptus cellulose that is commercialized in the world. 5,644 direct workers and 2,854 indirect workers work for the company.

Orsa Florestal is the company from the group that is responsible for the forest management. It was created in 2003, it is located in Vale do Jari, in the North of the state of Pará, bordering with Amapá state, municipality of Almeirim, left of the Amazon River. Apart from the native and planted eucalyptus (60 thousand ha) in the state of Pará, it has planted forests in the southeast region (39 thousand ha).

MARTINS

(Source: http://www.martins.com.br/ e http://www.martinsagropecuaria.com.br)

Grupo Martins, with more than 57 years in the market, is formed by several companies operating in different market segments: retailing, logistics, and financial solutions. The companies of the group are: Tribanco – retail investment bank (aimed to the production and distribution chain), Tribanco Seguros, Martins do Varejo University, Rede Smart – the biggest Supermarket Network Association in Brazil (small and medium supermarket), eFácil – the biggest network of independent supermarkets (1,100 affiliates, 11 states and Federal District), CasaMart, Marbo – logistics and Martins Agropecuária.

Martins Agropecuária S/A was established in 1978 in Portel (PA), located in the northeast region of the State of Pará, south of the isle of Marajó, between the Pacajá and Tocantins rivers, comprising the municipalities of Portel, Oeiras do Pará, Bagre and Baião.

ABC – Grupo Algar

(Source: http://www.relatorioanual2010.com.br/algar/)

Grupo Algar's core business is the telecommunications sector, generating in 2010 an additional net value of R$ 1.7 billion, R$ 611 million being taxes, R$ 505 million being salaries and encumbrances, R$ 443 million third parties capital remunerations and R$ 185 millions in own capital remuneration.

The group's companies are: CTBC Telecom, CTBC Celular, CTBC Multimídia, Image, Sabe, Algar Tecnologia, ABC Inco, ABC Agricultura and Pecuária S.A (currently Algar Agro), Algar Aviation, Space Tecnologia and Algar Segurança.

The group's company responsible for the forest management is Algar Agro, with own native forest in the municipality of Portel, state of Pará (check if it can be public). Other farms of the company are located in the states of Minas Gerais, Mato Grosso do Sul and they focus on the planting of seeds (such as soybeans, corn, bean and others) and the breeding of cows and pigs. It also has dairy cattle to milk market.

As demonstrated above, activities similar to the project activity cannot be characterized as common practice in the region, and the few instances where they do occur can be shown to have essential distinctions from the project activity/agent.

RESULT OF THE ADDIONALITY ANALYSIS:

As demonstrated above, the project activity, without the revenue from carbon credits, it is not the most financially attractive land use alternative, and it is not a common practice in the region. Therefore, the project is determined to be additional.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions are calculated applying module BL-PL. Area in hectares deforested per year ($D\%_{planned,i,t} * A_{planned,i}$) follows the suppression plan (Table 3.1).

Table 3.1 Area in hectares deforested per year in the project area in the baseline.

Year	$D\%_{planned,i,t} * A_{planned,i}$ **ha**
2008	2846.3
2009	2838.8
2010	2951.1
2011	2949.4
2012	2840.0
2013	2603.9
2014	2721.8
2015	2336.0
2016	2943.4
2017	2404.3

As described in section 1.5, due to financial difficulties in 2005 and 2006, CKBV began the process to obtain authorization to legally deforest the project area and convert to pasture as a means to diversify its business and raise revenues.

The steps taken by CKBV prior to the project start date and prior to consideration of carbon market alternatives, included:

- 2006/July – Delivered the request to exclude the suppression areas from the existing Forest Management Plan area to IBAMA (to permit conversion to an alternative use) IBAMA Protocol (Protocol no. 02018.006149/06-99)

Imminent threat is thus demonstrated with the following evidence:

- *Legal permissibility for deforestation* – As explained previously, The Brazilian Forest Law/Legislation, no 4771 of 1965, in its article 16, allows the owner to suppress up to 20% of the total area for its economic use such as livestock or agricultural activities. RCC, in 2006 had 197,811.95 ha (prior to geo-referencing in 2008, which established legal recognition of an even larger property area of 209,130.54 ha), allowing legal deforestation of up to 39,562.39 ha. As 10,091.80 ha were already without forest at the time of acquisition of the property by CKBV, this left an area of 29.470,59 ha in 2006, which after excluding designated areas of permanent protection, results in an area of 27,934.48 ha that could be legally deforested (of which 27,434.9 ha the project area, meet VCS REDD project eligibility criteria).

- *Suitability of project area for conversion to alternative non-forest land use* – As demonstrated in Section 2.5 (Common Practice), the project region is an important area for livestock production, and the project area was deemed suitable for livestock in the 2006 business plan.
- *If government approval is required for deforestation to occur, the intention to deforest within the project area must be demonstrated by evidence:*
    - *Documentation that a request for approval has be filed with the relevant government department for permission to deforest and convert to alternative land use* - CKBV initiated the approval process in July 2006 with submission of its request to IBAMA to exclude the planned suppression area (including the project area) from the existing Forest Management Plan area (to permit conversion to an alternative use); IBAMA Protocol (Protocol no. 02018.006149/06-99).
- *Intent to deforest—intention to deforest must be demonstrated by the following form of evidence originating prior to the date of all evidence on pursuit of carbon finance/consideration of REDD* (prior to 30 October 2007, when CKBV initiated correspondence with IMAZON to discuss potential for carbon project development):
    - *Where a specific baseline agent has been identified: a valid and verifiable land use management plan for deforesting the project area* – CKBV completed its suppression and business plans for the project area in 2006. The baseline rate of deforestation for the project area is from the suppression plan.

As per BL-PL section 1.4

> "For all other planned deforestation areas (i.e. areas not both under government control and zoned for deforestation), $L\text{-}D_i$ shall be equal to 100%",

likelihood of deforestation ($L\text{-}D_i$) is set at 1.

Estimation of forest biomass stocks was made from direct inventory of the Rio Capim property area, including the project area, and is detailed in Annex 5 "Forest Biomass Inventory Results for the Rio Capim property, CIKEL, REDD project areas, Paragominas, Para, Brazil." Results are summarized by forest type/strata in Table 3.2 below.

Table 3.2. By forest type above- and belowground biomass carbon in live trees ≥ 5 cm dbh (t C/ha). (FOD = floresta ombrofila densa, FS = floresta secundaria, APP = Riparian forest)

Forest type	Ha	Mean ABGB t C/ha	95% C.I.	95% C.I. as % of mean
FOD	19687.4	175.5	9.9	6%
FS	7747.3	100.1	56.4	56%
APP	0.2	119.2	56.5	47%

Post deforestation carbon stocks in pasture in included pools (aboveground and belowground live aboveground trees = $C_{AB\_tree,i}$ and $C_{BB\_tree,i}$) is zero ($C_{BSL,post,i}$ = 0), as the suppression plan involves clearcut timber harvest and no trees are retained on-site following conversion to pasture.

GHG emissions ($GHG_{BSL,E}$) in the baseline are conservatively assumed to be zero. No nitrogen fertilizer application takes place in the project area in the baseline. Biomass burning is conservatively excluded from

accounting in the baseline (explained in Table 2.2 above). While some fossil fuel emissions occur from vehicle and machinery use in the forest conversion process, they are conservatively excluded from the baseline.

Carbon sequestered in long-lived wood products is calculated using module CP-W Option 1, Direct Volume Extraction Estimation, because an approved harvest plan for the project is available. One wood product class (sawnwood, "*s*") is extracted in the baseline. All other wood extracted would be in the form of residues for fuelwood/charcoal production use, and thus involve no long-term sequestration in wood products and are not treated here. All parameters employed in calculations are summarized in Table 3.3 below. Parameters *A* and $V_{ex,ty,j}$ follow the suppression plan for planned extraction of sawnwood ("toras"). Wood density applied, D_j, represents a volume-weighted wood density across all species for the project area, referencing species-specific wood densities from the Forest Products Laboratory (LPF) of the Brazilian Forest Service database (accessed at http://www.ibama.gov.br/lpf/madeira/pesquisa.php?idioma=portugues)[5] and permitted species-specific volumes of sawnwood/toras from the suppression plan. Calculations are detailed "CIKEL APD analysis.xls" (see Annex 6) worksheet "wood products." This represents the volume-weighted average density for commercial species to be extracted as toras in the baseline in the project area. A default carbon fraction of biomass of 0.47 is applied for parameter *CF* (IPCC 2006GL).

Table 3.3. Assumptions used in calculations of the wood products pool.

Parameter	*Value*	*Units*
A	27,434.9	ha
$V_{ex,ty,j}$	1,394,791	m^3
D_j	0.6740	t/ m^3
CF_j	0.47	None
Ty	(s) sawnwood	None
WW_s	0.24	None
SLF_s	0.2	None
Of_s	0.84	None

The t CO_2/ha sequestered in gross volume of sawnwood extracted, $C_{XB,s}$, is calculated as 59.0 t CO_2/ha using equation 1 of CP-W. The proportion retained in long-lived wood products after 100 years (C_{WP}), applying the emission factors for sawnwood for wood waste and fractions emitted through 100 years post harvest, WW_s, SLF_s and OF_s, is 5.7 t CO_2/ha.

Full baseline calculations, following module BL-PL, are detailed in Table 3.4 below.

[5] Where species were unidentified or no species-specific wood density data was available, 0.65 metric tons per cubic meter was applied, which represents the average basic wood density of the Forest Products Laboratory (LPF) of the Brazilian Forest Service database

Table 3.4. Calculations of project baseline, applying module BL-PL of methodology VM0007.

		tC/ha	tC/ha	tC/ha								
		175.5	**100.1**	**119.2**			**forest C stocks**	**pasture stocks**	**wood prod**			
year	**D%planned,i,t * Aplanned,i,t ha**	**FOD (ha)**	**FS (ha)**	**APP (ha)**	**weighted average stock tC/ha**	**L-D_i**	**$C_{BSL,I}$ tCO2e/ha**	**$C_{BSL,post,I}$ tCO2e/ha**	**$C_{BSL,WP,I}$ tCO2e/ha**	**$\Delta C_{BSL,I}$ tCO2e/ha**	**$GHG_{BSL-E,i,t}$ tCO2e**	**$\Delta C_{BSL,planned}$ tCO2e**
2008	2846.3	2846.3	0.0	0.0	175.5	1	643.5	0	5.7	637.8	0	1,815,232
2009	2838.8	2564.0	274.8	0.0	168.2	1	616.7	0	5.7	611.0	0	1,734,495
2010	2951.1	2563.2	387.9	0.0	165.6	1	607.2	0	5.7	601.4	0	1,774,855
2011	2949.4	2717.7	231.6	0.0	169.6	1	621.8	0	5.7	616.0	0	1,816,931
2012	2840.0	26.8	2813.2	0.0	100.8	1	369.6	0	5.7	363.9	0	1,033,488
2013	2603.9	170.1	2433.7	0.0	105.0	1	385.1	0	5.7	379.4	0	987,777
2014	2721.8	2721.8	0.0	0.0	175.5	1	643.5	0	5.7	637.8	0	1,735,812
2015	2336.0	729.8	1606.0	0.2	123.7	1	453.4	0	5.7	447.7	0	1,045,750
2016	2943.4	2943.4	0.0	0.0	175.5	1	643.5	0	5.7	637.8	0	1,877,173
2017	2404.3	2404.3	0.0	0.0	175.5	1	643.5	0	5.7	637.8	0	1,533,356
total												15,354,869

Uncertainty

Total uncertainty in carbon stocks (parameter $Uncertainty_{BSL,SS}$) is equal to combined uncertainty of forest carbon stock estimates across strata/forest types, calculated using propagation of errors (equation 3 of VM0007 module X-UNC). Parameter $Uncertainty_{BSL,SS}$ is thus calculated to be 11.4% at the 95% confidence level. Total uncertainty in the baseline scenario ($Uncertainty_{BSL}$) is then 11.4%, applying equation 4 of VM0007 module X-UNC, because uncertainty in the baseline rate ($Uncertainty_{BSL,RATE}$) is assumed to be zero where the planned deforestation rate is based on actual plans.

Compensation/reforestation

The legal permit to conduct the suppression activity requires that CKBV compensate for the loss of forest by replanting an existing un-forested area, stipulated in the following laws.

The State Law n. 6462 of 2002 establishes in article 10 – The person or entity that explores, uses, transforms or consumes forest raw material remains obligated to promote reforestation.

The State Decree n. 5975 of 2006, reads in article 10. The forest exploitation and ... suppression to clearcut the natural woody vegetation only will be allowed through authorization of suppression for the alternative land use issued by the competent agency of SISNAMA ... [authorization] indicating at least the following information:

1. the georeferenced location of the property, of the permanent preservation areas and of the legal reserves;
2. **compensated reforestation**;
3. the effective use of the areas already converted; and
4. the alternative land use that will be destined the deforested area.

The normative Instruction n. 06 of 2006 article 18, clarifies that the volume of credit granted for reforestation will be **150m^3/ha** (one hundred fifty cubic meters per hectare) …forest plantation.
Thus, to be in compliance with the law, suppression of the project area in the baseline further requires reforestation of 9,299 ha (1,394,791 m^3 sawlogs / 150 m^3/ha). In conformance with the suppression plan, CKBV would plant the area over a 10 year period in the baseline, with 930 hectares planted per year.
The species that were planned to be planted are listed below; growth rates are from the same source, cited below for Jatoba. CKBV was interested in the use of these species for the production of flooring, and had previous experience planting Jatobá and Ipê in other areas of the Rio Capim Complex.

a) 60% (558 ha/year) Jatoba (*Hymenaea courbaril* L.), Growth: 2.9 m^3/ha/year[6]
b) 20% (186 ha/year) Ipê – roxo (*Tabebuia avellanedae* Lorentz ex Griseb.), Growth: 6.0 m^3/ha/year
c) 20% (186 ha/year) Andiroba (*Carapa guianensis* Aubl.), Growth: 6.3 m^3/ha/year

Although technically the reforestation activity would be outside the accounting boundary of the project in the baseline, because non-forest areas are not eligible project areas, for completeness in project accounting, sequestration resulting from this activity is included in the project baseline, as the planned deforestation could not have legally occurred without it.

[6] Tonini, Helio, Arco-Verde, Marcelo Francia and Sá, Sergio Pedreira Pereira de Dendrometria de espécies nativas em plantios homogêneos no estado de Roraima: andiroba (Carapa guianensis Aubl), castanha-do-Brasil (Bertholletia excelsa Bonpl.), ipê-roxo (Tabebuia avellanedae Lorentz ex Griseb) e jatobá (Hymenaea courbaril L.). *Acta Amaz.*, Set 2005, vol.35, no.3, p.353-362. ISSN 0044-5967

Sequestration occurring in the baseline due to the obligatory reforestation activities was estimated using the growth rates above (area-weighted average growth rate among the three species is 4.2 m^3/ha/yr) and employing the following:

- tons biomass converted from m^3 volumes applying Biomass Conversion and Expansion Factor, where t biomass = 4.0 * m^3 volume, for humid tropical natural forests (Table 4.5 in IPCC 2006 GL Chapter 4 Forests)
- Carbon fraction of biomass of 0.47
- Root biomass estimated applying Cairns et al 1997 equation, where Root Biomass Density (t/ha) = EXP (-1.085 + 0.9256 LN(aboveground biomass density))

Results of calculations are presented in Table 3.5 below. Over the 10 year baseline period, the plantations are expected to sequester 1,491,269 t CO_2, which is subtracted from baseline emissions calculations above to produce an estimate of net baseline emissions.

Table 3.5. Estimates of sequestration resulting from compensatory reforestation activities in the baseline, outside of the project area.

	Cumulative tCO_2									
planting year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
1		34,003	67,294	100,342	133,236	166,019	198,715	231,340	263,904	296,415
2			34,003	67,294	100,342	133,236	166,019	198,715	231,340	263,904
3				34,003	67,294	100,342	133,236	166,019	198,715	231,340
4					34,003	67,294	100,342	133,236	166,019	198,715
5						34,003	67,294	100,342	133,236	166,019
6							34,003	67,294	100,342	133,236
7								34,003	67,294	100,342
8									34,003	67,294
9										34,003
10										
cumulative total tCO_2	0	34,003	101,297	201,639	334,875	500,894	699,610	930,950	1,194,853	1,491,269
incremental total CO_2/yr		34,003	67,294	100,342	133,236	166,019	198,715	231,340	263,904	296,415

3.2 Project Emissions

Expected project emissions are estimated ex ante applying module M-MON (VMD0015), version 7 as revised and approved December 2011, of methodology VM0007. Emissions anticipated in the with-project case are associated with limited timber harvest under ongoing FSC-certified management practices (parameter $\Delta C_{P,SelLog}$), and ex ante estimates are based on planned harvests. Emissions resulting from degradation due to illegal logging (parameter $\Delta C_{P,DegW}$) is not expected in the with-project case, based on negative results of surveys of communities surrounding the project area carried out in December 2011, conducted in accordance with prescribed procedures per module VMD0015 of methodology VM0007 (see Annex 7 survey results), and based as well on lack of evidence of illegal logging encountered in the project area during extensive inventory field work conducted August to October 2011.

Anticipated harvests are detailed in Table 3.6.

Table 3.6. Planned Schedule for Logging in the project area.

Year	Harvest Area (ha)	Volume of timber extracted (m^3)	Volume of residues extracted (m^3)
2008	0	0	0
2009	0	0	0
2010	1,122.3	18,417	0
2011	2,766.9	50,744	187,220
2012	0	0	0
2013	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0

Assumptions used in the ex ante analysis of with-project emissions are detailed in Table 3.7 below.

Table 3.7. Assumptions applied in ex ante analysis of with-project emissions

Parameter	Value	Units	Source
Volume sawlogs extracted per unit area	18.34	m^3/ha	Average from RCC logging reports "Annual Operation Logging Report" 2000 to 2006
Volume of residues extracted per unit area	67.665	m^3/ha	Universidade Federal Rural da Amazônia – (UFRA) study
LDF	0.67	tC/m^3	VMD0015
D	0.673963255	t/m^3	volume-weighted average basic wood density of commercial species in project area
CF	0.47		IPCC 2006GL
L_{SKID}	111m/ha	m	average from sample RCCL logging reports "Annual Operation Logging Report" (AOP

Parameter	Value	Units	Source
			activities monitoring report) from the project area
W_{SKID}	4.28	m	average from sample RCC logging reports "Annual Operation Logging Report" from the project area
SK	0.28	tCO_2/m	average stocks for FOD forest class (only forest class to which harvest is directed), average skid width from sample RCC logging reports "Annual Operation Logging Report" from the project area
A_{ROAD}	0.02ha/ha	ha	average from sample RCC logging reports "Annual Operation Logging Report" from the project area
A_{DECKS}	0.005ha/ha	ha	average from sample RCC logging reports "Annual Operation Logging Report" from the project area
C_{EXT}	643.5	tCO_2/ha	average stocks for FOD forest class (only forest class to which harvest is directed)
WW_s	0.24		VMD0015
SLF_s	0.2		VMD0015
Of_s	0.84		VMD0015

The analysis conservatively assumes that all stocks are emitted from within skid trails (rather than limiting emissions to only stocks below a threshold diameter). Estimation of carbon stocks retained in long-lived wood products is limited to volumes of sawlogs (not residues, that will be converted to charcoal and emitted).

Anticipated with-project emissions are calculated in Table 3.8, and are expected to total for the 10-year baseline period 1,101,266 t CO_2.

Table 3.8. Ex ante calculations of with-project emissions applying module M-MON of methodology VM0007.

		m^3	t CO_2/ha	tCO_2	tCO_2	M	tCO_2	Ha	tCO_2	Ha	tCO_2	tCO_2	tCO_2	tCO_2	tCO_2
Year	**Harvest Area (ha)**	V_{EXT}	C_{BSL}	C_{EXT}	C_{LG}	L_{SKID}	ΔC_{SKID}	A_{ROAD}	ΔC_{ROAD}	A_{DECKS}	ΔC_{DECKS}	C_{LR}	C_{WP}	$\Delta C_{P,SelLog}$	$\Delta C_{P,Deg}$
2008	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2009	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2010	1122.3	18416.6	643.5	21390.2	66633.7	124573	34309.7	22.4	14443.7	5.6	3610.9	52364.3	2080.8	116917.2	116917.2
2011	2766.9	237963.8	643.5	276386.2	860983.9	307121	84586.8	55.3	35609.5	13.8	8902.4	129098.6	5733.4	984349.1	984349.1
2012	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2013	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2014	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2015	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2017	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
														total	***1,101,266***

3.3 Leakage

Two sources of leakage are considered: activity shifting and market leakage.

Activity-shifting leakage is treated by applying module LK-ASP. Option 1.2 from LK-ASP is used, where baseline annual deforestation by the deforestation agent, where the deforestation agent has been identified, is based on historic deforestation average over the period 5 years prior to project start, i.e. 2002-2007. Because CKBV had not undertaken any forest conversion activities during this period, parameter $WoPR_{i,t}$, which is the annual baseline deforestation rate, is set to the planned baseline deforestation rate for the project (below). As no deforestation activities are expected by the baseline agent, nor are any non-CO_2 greenhouse gas emissions from fertilizer use or biomass burning, activity-shifting leakage is projected ex ante to be zero, i.e. parameters $LKA_{planned,i,t}$ and $GHG_{LK,E,i,t}$ are expected to be equal to zero throughout the baseline period (Table 3.9).

Table 3.9 Ex ante calculations of activity shifting leakage applying module LK-ASP of methodology VM0007.

Year	$WoPR_{i,t}$ (ha)	$D\%_{planned,i,t} * A_{planned,i,}$ (ha)	$NewR_{i,t}$ (ha)	Ex ante $A_{defLK,i,t}$ (ha)	Ex ante $LKA_{planned,i,t}$ (ha)
2008	2846.3	2846.3	0	0	0
2009	2838.8	2838.8	0	0	0
2010	2951.1	2951.1	0	0	0
2011	2949.4	2949.4	0	0	0
2012	2840.0	2840.0	0	0	0
2013	2603.9	2603.9	0	0	0
2014	2721.8	2721.8	0	0	0
2015	2336.0	2336.0	0	0	0
2016	2943.4	2943.4	0	0	0
2017	2404.3	2404.3	0	0	0

Market leakage is treating applying module LK-ME. In the baseline case, the following volumes of wood products would be removed from the project area (table 3.10 below). The volumes are calculated from the permitted volumes in the suppression plan, i.e. 50.84 m^3/ha of sawnwood for export (“toras”) and 277.72 m^3/ha of residues/fuelwood (including 12.57 m^3/ha bolts (“toretes”) and 265.15 m^3/ha firewood (“lenha”)).

Table 3.10 Wood volumes extracted in the baseline.

Year	Ha	sawnwood for export (m^3)	residues (bolts and firewood) (m^3)
2008	2846.3	144,705	790,469
2009	2838.8	144,325	788,391
2010	2951.1	150,036	819,588
2011	2949.4	149,945	819,095
2012	2840.0	144,388	788,737
2013	2603.9	132,380	723,142
2014	2721.8	138,374	755,885
2015	2336.0	118,762	648,754
2016	2943.4	149,643	817,442
2017	2404.3	122,235	667,722
Total	27,434.9	1,394,791	7,619,226

All sawnwood, processed on-site at CKBV's sawmill units located in RCC and Ananindeua, would be destined for the export market, and thus is not considered further in assessment of market leakage. This conforms with guidance set out in VCS AFOLU Requirements section 4.6.5 "Leakage occurring outside the host country (international leakage) does not need to be quantified" and section 4.6.14 Table 3 "Where leakage is out of country [market leakage discount factor equals] 0", and reflected in module LK-ME "As per the VCS AFOLU requirements international market leakage is not considered." Evidence to support this assumption includes historic sales receipts from CKVB, from 2002 through 2006 (Table 3.11), demonstrating that their sawnwood sales were focused exclusively on the export market.

Table 3.11 History of commercialization of sawn-wood by CKBV from 2002 to 2006; from internal sales records.

	2002	2003	2004	2005	2006	Average
Sawn Wood Commercialization Rate						
Sawnwood Export	100%	100%	100%	100%	99%	**100%**
Sawnwood Internal Market	0%	0%	0%	0%	1%	**0%**

The main domestic market that CKBV had been historically engaged in, and would be expected to receive extracted volumes originating from the project area in the baseline scenario, is the market for woody biomass to produce charcoal. This production includes "toretes" and "lenha", both included in the total volume for "residues" in table 3.10 above. Per the methodology, a fixed leakage factor, LF_{ME}, of 0.4 is used. A default carbon fraction of biomass of 0.47 is applied for parameter *CF* (IPCC 2006GL).

Parameter D_{mn} is set as 0.65 metric tons per cubic meter, which represents the average basic wood density of the Forest Products Laboratory (LPF) of the Brazilian Forest Service database (accessed at

http://www.ibama.gov.br/lpf/madeira/pesquisa.php?idioma=portugues). This is conservative, because the majority of tree species exploited for fuelwood/charcoal are successional/non-commercial species with relatively low wood densities.

Market leakage calculations for fuelwood are detailed in Table 3.12 below.

Table 3.12 Ex ante calculations of market leakage applying module LK-ME of methodology VM0007.

Year	$FG_{BSL,t}$ m^3	$FG_{LP,t}$ m^3	D_{mn} t d.m.m^{-3}	CF t C t^{-1} d.m.	$C_{BSL,XBFWC,t}$ t CO_2	LF_{ME}	$LK_{MarketEffects,FW/C}$ t CO_2
2008	790,469	0	0.65	0.47	885,457	0.4	354,183
2009	788,391	0	0.65	0.47	883,130	0.4	353,252
2010	819,588	0	0.65	0.47	918,076	0.4	367,230
2011	819,095	187,220	0.65	0.47	707,806	0.4	283,122
2012	788,737	0	0.65	0.47	883,517	0.4	353,407
2013	723,142	0	0.65	0.47	810,039	0.4	324,016
2014	755,885	0	0.65	0.47	846,717	0.4	338,687
2015	648,754	0	0.65	0.47	726,713	0.4	290,685
2016	817,442	0	0.65	0.47	915,672	0.4	366,269
2017	667,722	0	0.65	0.47	747,960	0.4	299,184
				$AL_{FW/C,i}$	8,325,086	0.4	3,330,034

Total market leakage from fuelwood is calculated ex ante to be 3,330,034 t CO_2. It should be noted that because of market downturns post project start date, wood residues likely would not have gone to market in the baseline case from 2008 to 2011, and hence market leakage is likely over-estimated using this approach. Market leakage is further over-estimated here, and are to be considered conservative, because the residue wood volumes incorporated in the analysis, parameter $FG_{BSL,t}$, represent the full inventoried wood volumes and conservatively assume perfect efficiency in recovery and zero rotten or hollow components (un-merchantable) of inventoried volume.

3.4 Summary of GHG Emission Reductions and Removals

Net emission reduction calculations are summarized in Table 3.13. Note that sequestration resulting from compensatory reforestation activities in the baseline is subtracted from baseline emissions calculations to produce an estimate of *net* baseline emissions.

Table 3.13. Ex ante estimates of net emission reductions from the CIKEL Brazilian Amazon REDD APD Project.

Years	Estimated baseline emissions or removals (tCO_{2e})*	Estimated project emissions or removals (tCO_{2e})	Estimated leakage emissions (tCO_{2e})	Estimated net GHG emission reductions or removals (tCO_{2e})
2008	1,815,232	0	354,183	1,461,049
2009	1,700,492	0	353,252	1,347,240
2010	1,707,561	116,917	367,230	1,223,413
2011	1,716,590	984,349	283,122	449,118
2012	900,252	0	353,407	546,845
2013	821,758	0	324,016	497,742
2014	1,537,097	0	338,687	1,198,410
2015	814,410	0	290,685	523,725
2016	1,613,270	0	366,269	1,247,001
2017	1,236,940	0	299,184	937,756
Total	13,863,600	1,101,266	3,330,034	9,432,299

* sequestration resulting from compensatory reforestation activities in the baseline is subtracted from baseline emissions calculations to produce an estimate of *net* baseline emissions

4 MONITORING

4.1 Data and Parameters Available at Validation

Details on data and parameters available at validation are provided below for:

Emissions due to FSC-certified selective logging

Data Unit / Parameter:	*LDF*
Data unit:	t C m^{-3}
Description:	Logging damage factor for logging stratum *z*, in stratum *i*
Source of data:	VMD0015
Value applied:	0.67
Justification of choice of data or description of measurement methods and procedures applied:	Default value for broadleaf and mixed forests, VMD0015

Any comment:	

Data Unit / Parameter:	*CF*
Data unit:	t C t^{-1} d.m.
Description:	Carbon fraction of biomass
Source of data:	IPCC 2006GL
Value applied:	0.47
Justification of choice of data or description of measurement methods and procedures applied:	Global default
Any comment:	

Data Unit / Parameter:	D_j
Data unit:	t d.m.m^{-3}
Description:	Basic wood density of species *j*
Source of data:	Sourced from Forest Products Laboratory (LPF) of the Brazilian Forest Service database http://www.ibama.gov.br/lpf/madeira/pesquisa.php?idioma=portugues for species identified in annual harvest reports "Annual Operation Logging Report"
Value applied:	Varies by species
Justification of choice of data or description of measurement methods and procedures applied:	The Forest Products Laboratory (LPF) of the Brazilian Forest Service database is an acknowledged authoritative source for regional species-specific wood density data.
Any comment:	

Data Unit / Parameter:	WW_s
Data unit:	Dimension- less
Description:	Wood waste. The fraction immediately emitted through mill inefficiency by class of wood product *s*
Source of data:	VMD0015
Value applied:	0.24
Justification of choice of data or description	Default value from VMD0015

of measurement methods and procedures applied:	
Any comment:	

Data Unit / Parameter:	SLF_s
Data unit:	Dimensionless
Description:	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest by class of wood product *s*
Source of data:	VMD0015
Value applied:	0.2
Justification of choice of data or description of measurement methods and procedures applied:	Default value from VMD0015
Any comment:	

Data Unit / Parameter:	Of_s
Data unit:	Dimensionless
Description:	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest by class of wood product *s*
Source of data:	VMD0015
Value applied:	0.84
Justification of choice of data or description of measurement methods and procedures applied:	Default value from VMD0015
Any comment:	

Activity shifting leakage

Data Unit / Parameter:	$NewR_{i,t}$
Data unit:	Ha
Description:	New calculated forest clearance in stratum *i* at time *t* by the baseline agent of the planned deforestation where no leakage is occurring
Source of data:	derived in Section 3 of PD
Value applied:	0
Justification of choice of data or description of measurement methods and procedures	Fixed for the first baseline period, derived and

applied:	justified in Section 3 of PD
Any comment:	

Market leakage

Data Unit / Parameter:	$FG_{BSL,t}$
Data unit:	m^3 yr-1
Description:	Average projected annual volume of fuelwood to be gathered in the project area in the baseline scenario in stratum i at time t
Source of data:	Derived in Section 3 of PD in which baseline is set
Value applied:	Set at start of baseline period
Justification of choice of data or description of measurement methods and procedures applied:	Derived and justified in Section 3 of PD in which baseline is set
Any comment:	

Data Unit / Parameter:	D_{mn}
Data unit:	t d.m.m^{-3}
Description:	Mean wood density of commercially harvested species
Source of data:	average basic wood density of the Forest Products Laboratory (LPF) of the Brazilian Forest Service database http://www.ibama.gov.br/lpf/madeira/pesquisa.php?idioma=portugues
Value applied:	0.65
Justification of choice of data or description of measurement methods and procedures applied:	Parameter Dmn is set as 0.65 metric tons per cubic meter, which represents the average basic wood density of the Forest Products Laboratory (LPF) of the Brazilian Forest Service database http://www.ibama.gov.br/lpf/madeira/pesquisa.php?idioma=portugues This is conservative, because the majority of tree species exploited for fuelwood/charcoal are successional/non-commercial species with relatively low wood densities.
Any comment:	

Data Unit / Parameter:	*CF*
Data unit:	t C t^{-1} d.m.
Description:	Carbon fraction of biomass for commercially harvested species
Source of data:	IPCC 2006GL
Value applied:	0.47
Justification of choice of data or description of measurement methods and procedures applied:	Global default
Any comment:	

Data Unit / Parameter:	LF_{ME}
Data unit:	Dimensionless
Description:	Leakage factor for market effects calculations
Source of data:	VM0007
Value applied:	0.4
Justification of choice of data or description of measurement methods and procedures applied:	Default for fuelwood/charcoal in all circumstances; VM0007
Any comment:	

4.2 Data and Parameters Monitored

Details on data and parameters monitored are provided below. Note that:

- "value applied" is left blank because all parameters in this section are monitored
- "monitoring equipment" is left blank to provide flexibility in measurement and monitoring approach, essential for any long term MRV plan
- Where a parameter is calculated from a methodology equation (i.e. not raw data), the methodology module and equation number is specified and "Description of measurement methods and procedures to be applied" and "QA/QC procedures to be applied" are appropriately left blank
- To avoid repetition and maintain an economical use of space in the summary tables, "Description of measurement methods and procedures to be applied" and "QA/QC procedures to be applied" for monitored (not calculated) parameters reference detailed accounts of procedures provided in the monitoring plan description below.

Emissions due to deforestation and natural disturbance

Data Unit / Parameter:	$\Delta C_{P,Def,i,t}$
Data unit:	t $CO_{2\text{-e}}$
Description:	Net carbon stock change as a result of deforestation in the project case in the project area in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 3, VMD0015
Any comment:	

Data Unit / Parameter:	$\Delta C_{P,DistPA,i,t}$
Data unit:	t $CO_{2\text{-e}}$
Description:	Net carbon stock change as a result of natural disturbance in the project case in the project area in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 20, VMD0015
Any comment:	

Data Unit / Parameter:	$A_{DefPA,u,i,t}$
Data unit:	ha
Description:	Area of recorded deforestation in the project area stratum *i* converted to land use *u* at time *t*
Source of data:	Monitored at each monitoring/verification event through analysis of classified satellite imagery
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description. Minimum Mapping Unit (MMU) of 0.81 ha, corresponding to 3 pixels by 3 pixels Landsat resolution (90m by 90m), providing closest conformance possible to 1 ha Brazil DNA forest definition with Landsat.
Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Calculation method:	
Any comment:	

Data Unit / Parameter:	$A_{DistPA,q,i,t}$
Data unit:	ha
Description:	Area impacted by natural disturbance in post-natural disturbance stratum *q* in stratum *i,* at time *t*
Source of data:	Monitored at each monitoring/verification event through analysis of classified satellite imagery
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description. Minimum Mapping Unit (MMU) of 0.81 ha, corresponding to 3 pixels by 3 pixels Landsat resolution (90m by 90m), providing closest conformance possible to 1 ha Brazil DNA forest definition with Landsat.
Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Calculation method:	

Any comment:	

Data Unit / Parameter:	$C_{BSL,i}$
Data unit:	t $CO_{2\text{-}e}$ ha^{-1}
Description:	Carbon stock in all pools in the baseline case in stratum *i*
Source of data:	Estimated from forest carbon inventory
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description
Frequency of monitoring/recording:	Every ≤ 10 years. First re-measurement in 2015.
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description
Calculation method:	
Any comment:	

Emissions due to illegal degradation

Data Unit / Parameter:	$A_{DegW,i,t}$
Data unit:	ha
Description:	Area potentially impacted by degradation processes in stratum *i*
Source of data:	Delineated based on survey results indicating general area of project potentially accessed and typical depth of penetration of illegal harvest activities from points of access
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Repeated each time the PRA indicates a potential for degradation. PRA conducted every ≤ 2 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{DegW,i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Biomass carbon of trees cut and removed through degradation process from plots measured in stratum *i* at time *t*
Source of data:	Estimated from diameter measurements of cut stumps in sample plots
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every $\leq$ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	AP_i
Data unit:	ha
Description:	Total area of degradation sample plots in stratum *i*
Source of data:	Calculated as 3% of $A_{DegW,i,t}$
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every $\leq$ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$\Delta C_{P,DegW,i,t}$

Data unit:	t CO_2-e
Description:	Net carbon stock changes as a result of degradation in stratum *i* in the project area at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 8, VMD0015
Any comment:	

Emissions due to FSC-certified selective logging

Data Unit / Parameter:	$C_{LG,i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Actual net project emissions arising in the logging gap , in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 10, VMD0015
Any comment:	

Data Unit / Parameter:	$V_{EXT,z,i,t}$
Data unit:	m^3
Description:	Volume extracted from logging stratum *z*, in stratum *i* at time *t*

Source of data:	Annual harvest reports "Annual Operation Logging Report"
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{EXT,\,z,i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Biomass carbon stock of timber extracted within the project boundary for logging stratum *z*, in stratum *i* at time *t*
Source of data:	Calculated from $V_{EXT,z,i,t}$
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 11, VMD0015
Any comment:	

Data Unit / Parameter:	$C_{LR,i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Actual net project emissions arising from logging infrastructure in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	

Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 12, VMD0015
Any comment:	

Data Unit / Parameter:	$\Delta C_{SKID,i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Change in carbon stock resulting from skid trail creation in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 13, VMD0015
Any comment:	

Data Unit / Parameter:	L_{SKID}
Data unit:	meters
Description:	Length of skid trails
Source of data:	Annual harvest reports "Annual Operation Logging Report"
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	*SK*
Data unit:	tCO_2/m
Description:	Skid trail emission factor
Source of data:	Calculated from W_{SKID} and $C_{dest,\,i}$; soil carbon ($\Delta C_{SOC\_sk,i}$) change is not included as it is not included in the project boundary, nor will it result in emissions - IPCC stock change factors for sustainably managed forests (IPCC 2006GL, Chapter 5 Cropland, Table 5.10, p. 5.37) are 1, so effectively no emission from this pool from skid trails where the applicability conditions are met
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 14, VMD0015
Any comment:	

Data Unit / Parameter:	W_{SKID}
Data unit:	meters
Description:	Mean width of skid trails
Source of data:	Annual harvest reports "Annual Operation Logging Report"
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{dest,\ i}$
Data unit:	t $CO_{2\text{-}e}$ ha^{-1}
Description:	Mean live carbon stock of trees and non-tree biomass assumed to be killed per unit area in creation of skid trail in stratum i
Source of data:	Sourced from strata-level mean forest carbon stock estimates from forest carbon inventory of project area; conservatively assume that all stocks are emitted from within skid trails
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Re-measured every ≤ 10 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$\Delta C_{ROAD,i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Change in carbon stock resulting from logging road creation in stratum *i* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 17, VMD0015
Any comment:	

Data Unit / Parameter:	A_{ROAD}
Data unit:	Ha
Description:	Area of roads in stratum *i* at time *t*
Source of data:	Annual harvest reports "Annual Operation Logging Report"
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{BSL,i}$
Data unit:	t CO_2-e ha^{-1}
Description:	Carbon stock in all pools in the baseline case in stratum i
Source of data:	Sourced from strata-level mean forest carbon stock estimates from forest carbon inventory of project area; equivalent to $C_{dest,\ i}$
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Re-measured every ≤ 10 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$\Delta C_{DECKS,i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Change in carbon stock resulting from logging deck creation in stratum *i* at time *t*
Source of data:	Calculated

Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 18, VMD0015
Any comment:	

Data Unit / Parameter:	A_{DECKS}
Data unit:	ha
Description:	Area of logging decks in stratum *i* at time *t*
Source of data:	Annual harvest reports "Annual Operation Logging Report"
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{WP\ i,t}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Carbon stock in wood products pool from stratum *i,* at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	

Calculation method:	Equation 2, VMD0005
Any comment:	

Data Unit / Parameter:	$V_{EXT,s,i,,t,}$
Data unit:	m^3
Description:	Volume wood product class "s" (sawnwood) extracted from stratum *i* at time *t*
Source of data:	Annual harvest reports "Annual Operation Logging Report"; estimation of carbon stocks retained in long-lived wood products is limited to volumes of sawlogs (not residues, that will be converted to charcoal and emitted).
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Activity shifting leakage

Data Unit / Parameter:	$\Delta C_{LK\text{-}AS,planned}$
Data unit:	t CO_2-e
Description:	Net greenhouse gas emissions due to activity shifting leakage for projects preventing planned deforestation
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 1, VMD0009

Any comment:	

Data Unit / Parameter:	$A_{defLK,i,t}$
Data unit:	ha
Description:	The total area of deforestation by the baseline agent of the planned deforestation in stratum *i* at time, *t*
Source of data:	Monitored through assessment of aerial/satellite imagery
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every $\leq$ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$LKA_{planned,i,t}$
Data unit:	ha
Description:	The area of activity shifting leakage in stratum *i* at time *t*
Source of data:	Calculated as $NewR_{i,t}$ - $A_{defLK,i,t}$
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every < 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 5, VMD0009
Any comment:	

Data Unit / Parameter:	$\Delta C_{BSL,i}$
Data unit:	t $CO_{2\text{-}e}$ ha^{-1}
Description:	Net carbon stock changes in all pools in baseline

	stratum *i*
Source of data:	Sourced from mean forest carbon stock estimates from forest carbon inventory of project area for equivalent strata in area of activity shifting leakage
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Stock estimates updated every ≤ 10 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Market leakage

Data Unit / Parameter:	$FG_{LP,t}$
Data unit:	m^3 yr-1
Description:	Volume of fuelwood gathered in the project area
Source of data:	Annual harvest reports "Annual Operation Logging Report"
Description of measurement methods and procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	Detailed procedures provided below under monitoring plan description.
Calculation method:	
Any comment:	

Data Unit / Parameter:	$C_{BSL,XBFWC,t}$
Data unit:	t CO_2
Description:	Carbon emission due to displaced fuelwood/charcoal harvests in stratum *i* in the baseline scenario at time *t*
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	

Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 7, VMD0011
Any comment:	

Data Unit / Parameter:	$AL_{FW/C,i}$
Data unit:	t $CO_{2\text{-}e}$
Description:	Summed emissions from fuelwood/charcoal harvests in stratum *i* in the baseline case potentially displaced through implementation of carbon
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 6, VMD0011
Any comment:	

Data Unit / Parameter:	$LK_{MarketEffects,FW/C}$
Data unit:	t CO_2
Description:	Total GHG emissions due to market leakage through decreased harvest of fuelwood and charcoal sold into regional and/or national markets
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Every ≤ 5 years
Value applied:	

Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Equation 5, VMD0011
Any comment:	

4.3 Description of the Monitoring Plan

Revision of the baseline

The baseline as outlined here in the Project Description is valid for 10 years, through July 2017. The baseline will be revised every 10 years from the project start date. Because the entire project area is deforested in the first 10-year baseline period, deforestation rate and emissions in the baseline for all subsequent baseline periods will be equal to zero.

Monitoring of actual carbon stock changes and greenhouse gas emissions

The project area is made up of a combination of mature forest and secondary forest, the latter having initiated since 1992, the year of acquisition of the property by CKBV. Although the secondary forests are accumulating biomass over the project crediting period, for accounting purposes the project conservatively assumes stable stocks and no biomass monitoring is conducted in areas undergoing carbon stock enhancement, as permitted in the methodology monitoring module VMD0015, hence $\Delta C_{P,Enh,i,t}$ is set to 0.

Monitoring of actual emissions in the project area focuses on:

- Emissions due to deforestation and natural disturbance
- Emissions due to illegal degradation
- Emissions due to FSC-certified selective logging

Procedures and responsibilities for monitoring each of the above sources of emissions are detailed below.

Emissions due to deforestation and natural disturbance

Forest cover change due to deforestation and natural disturbance is monitored through periodic assessment of classified satellite imagery covering the project area. Emissions ($\Delta C_{P,Def,i,t}$ and $\Delta C_{P,DistPA,i,t}$ for deforestation and natural disturbance, respectively) are estimated by multiplying area of forest loss

detected ($A_{DefPA,u,i,t}$ and $A_{DistPA,q,i,t}$, for deforestation and natural disturbance, respectively) by average forest carbon stock per unit area (conservatively assuming $\Delta C_{P,Dist,q,i,t}$ and $\Delta C_{pools,Def,u,i,t} = C_{BSL,i}$). Stock estimates from the initial field inventory completed in 2011 (using measurements from 2005 to 2011), are valid for 10 years (per VM0007), minimally through 2015. Post 2015, forest carbon stock estimates will be updated for any strata where deforestation or natural disturbance is detected.

Monitoring changes in forest cover

The project boundary, as set in the PD, will serve as the initial "forest cover benchmark map" against which changes in forest cover will assessed over the interval of the first monitoring period; the entire project area has been demonstrated to meet the forest definition at the beginning of the crediting period. For subsequent monitoring periods, change in forest cover will be assessed against the preceding classified forest cover map marking the beginning of the monitoring interval.

Data collection and analysis to determine forest cover change at each monitoring event will follow the procedures detailed below. The resulting classified image is compared with the preceding classified image (forest cover benchmark map marking the start of the monitoring interval) to detect forest cover change over the monitoring interval, and subsequently becomes the updated forest cover benchmark map for the next monitoring interval. Thus, the forest benchmark map is updated at each monitoring event. All changes in forest cover detected for the monitoring interval will be annualized (to produce estimates of ha for each year) by dividing the area by the number of years in the period.

For each monitoring/verification date, Landsat imagery or equivalent for that year will be acquired and interpreted to produce a classified forest cover map in which forest and non forest are distinguished. Consistent with the original 2007 imagery from which the eligible project area was set, a Minimum Mapping Unit (MMU) of 0.81 ha, corresponding to 3 pixels by 3 pixels Landsat resolution (90m by 90m) will be used throughout the duration of the project crediting period.

1. Data acquisition
   Landsat imagery covering the entire project area will be acquired for the monitoring/verification date. Landsat scenes covering the RCC area include Path/ row 223/62 and 223/63.

   To allow flexibility in selection of cloud-free scenes, Landsat images spanning various months within the year of the monitoring/verification date may be mosaiced to produce a composite image. Thecomposite image shall be at least 90% cloud free.

2. Pre-processing
   The images were subjected to digital processing to perform the mapping and quantification of the land cover classes studied.

2.1. Registration and Georeferencing

The reference Landsat images were georeferenced based on GeoCover 2000 image from NASA (National Aeronautics and Space Administration) (NASA, 2000). After georeferencing, others images from temporal series were registered based on the georeferenced image. Georeferencing and registration are important to detect changes in the forest over time.

In both methods were used the method resampling for nearest neighborhood, available in the software Environment for Visualizing Images - ENVI 4.6. It will be collected at least 40 points in the control of each image and the Root-Mean-Squared-Error – RMSE maximum acceptable will be of 0,5 pixel.

3. Interpretation and classification

3.1. Landsat Images Classification

3.1.1. Masks of water, cloud and shadow of cloud

Amazon has intense cloud cover during most of the year and is surrounded by a highly branched watershed. In this methodology the cloud and water of rivers need to be masked, as they may be misleading by the classifier, which works by detecting changes.

The masking of water will be performed in xWaterMask module from software ImgTools 0.8 Beta, developed by Souza Júnior[7] (personal information), using the fraction images resulting from MMS of every year of the temporal serie, resulting in a water mask for each year of the serie of this study. The xWaterMask uses the bands of vegetation (GV) and bared soil (Soil) and calculates the shade (shade) to perform the masking of the water.

The masking of cloud and shadow will be performed in xCloudMask module, present in ImgTools 0.8 Beta. To generate the masks of cloud were used the fraction images and the masks of water of each year of the temporal serie. xCloudMask uses in its process the Cloud band and Shade band to map the voer of cloud em each scene.

The results of the masking of clouds were ternary images with values 0, 1 e 2, where pixels from the mask of cloud are represented by value 2. The masks of cloud and shadow were subjected to a manual edition (editing) in ENVI 4.7 to eliminate noises of shadow of relief and in some burnt area.

3.1.2. Normalized Difference Fraction Index - (NDFI)

From the images obtained by SMM, it will be generated the NDFI for all images to highlight the signals of forest degradation caused by woody exploration and fire (Souza Jr. et al. 2005). Based on NDFI images, it is possible map trails of forest exploration, characterized by the presence of log storage decks, connected to the roads (skid trails), beyond the fire.

3.1.3 Classification

The classification of NDFI images is performed in two steps: obtaining a map of the base year (Baseline) and obtaining of the maps of increment of deforestation and degradation (MIDD) through the method of change detection (Change Detection).

The baseline will be obtained through xNDFISlicer module presents in the software ImgTools 0.8 Beta, where the NDFI image, referent to the first year of the analysis was classified. In this classification were obtained five thematic classes: forest, non-forest, water, cloud (cloud and shade of cloud) and degradation.

MIDD's were obtained in the xChangeDetection module, available in the software ImgTools 0.8 beta, for this will be necessary the baseline and NDFI images of all years of the temporal serie. In this classification were obtained six thematic classes: forest, non-forest, water, cloud (cloud and shade of cloud), degradation and deforestation.

[7] SOUZA JÚNIOR, C. Instituto do Homem e Meio Ambiente da Amazônia, 2011.

4. Change detection

4.1. Correction of fog and smoke

Then, all images were subjected to a process of correction of fog and smoke, using the method proposed by Carlotto (1999) and implemented in IDL (Interactive Data Language – program language coupled with ENVI) by Souza Júnior[8] (personal information). This method uses infrared band close and medium (4, 5 and 7), which are free from interference of this effect, to correct the spectral band of the visible region (1, 2 and 3), more affected by fog and smoke.

4.2. Atmospheric correction

The raw images that have the pixel values in DN (Digital Numbers), were radiometrically corrected, using the calibration values (gains and offsets) from sensors TM and ETM+ (Chander et. al., 2009). The purpose of this correction is to convert DN's to values of physical parameters, in this case, radiance in W/(m2 sr µm). Subsequently, the images in radiance were converted to absolute reflectance, using the tool FLAASH (Fast Line-of-sight Atmospheric Analysis of Spectral Hypercubes), available in the software ENVI 4.6. The reflectance is the eletromagnetic energy captured.

In FLAASH, parameters as initial visibility (km) and aerosol retrieval were adjusted for each image, by trail and error, to obtain the best spectral curves of the target analysed, in this case, the vegetation.

4.3. Spectral Mixture Model (SMM)

The next step will be to estimate the abundance of the pure components (vegetation pure pixels – GV, bared soil and innative photosynthetically vegetation – NPV) in each pixel, applying the spectral mixture model in the images in reflectance (Adams; Smith; Gillespie, 1993).

The pure components of GV, NPV and bared soil used to generate the SMM were obtained from Souza Jr. *et al.* (2005) (generic pure components), selected from images in reflectance. Tool *Pixel Purity Index* (PPI) from ENVI 4.2 will be used to identify the candidates to pure pixels. The final pure components were selected based on yours spectral curves and location in the image. The mixture model algorithms were implemented in IDL by Souza Júnior[9] (personal information). As a result, fraction images of GV, NPV and bared soil were obtained.

Quality Assurance/Quality Control

To ensure consistency and quality results, spatial analysts carrying out the imagery processing, interpretation, and change detection procedures will strictly adhere to the steps detailed above. All data sources and analytical procedures will be documented and archived (detailed under data archiving below).

Accuracy of the classification will be assessed by comparing the classification with ground truth points or samples of high resolution imagery (e.g. SPOT or Rapidere imagery). Any data collected from ground-truth points will be recorded (including GPS coordinates, identified land-use class, and supporting photographic evidence) and archived. Any sample points of high resolution imagery used to assess classification accuracy will also be archived. Samples used to assess classification accuracy should be well-distributed throughout the project area (as far as is possible considering availability of high resolution

[8] SOUZA JÚNIOR, C. Instituto do Homem e Meio Ambiente da Amazônia, 2006.

[9] SOUZA JÚNIOR, C. Instituto do Homem e Meio Ambiente da Amazônia, 2005.

imagery and/or logistics of acquiring ground truth data), with a minimum sampling intensity of 100 points each for the forest and non forest classes.

Results of the accuracy assessment will be presented and analyzed in a matrix in the format elaborated in the example below.

Land-use class as determined from ground-truth points	**Classification**		**Total**	**Accuracy (%)** ***User's accuracy (# correct/ row total)***	**Error of Commission (%)**
	Forest	**Non-forest**			
Forest (100)	95	5	100	95.0	5.0
Non-forest (100)	9	91	100	91.0	9.0
Total	104	96	200		
Accuracy (%) ***Producer's accuracy (# correct/ column total)***	91.3	94.8			
Error of Omission (%)	8.7	5.2			

The classification will only be used in the forest cover change detection step if the overall classification accuracy, calculated as the total number of correct samples/ the total number of samples, is equal to or exceeds 90%.

Data Archiving

All data sources and processing, classification and change detection procedures will be documented and stored in a dedicated long-term electronic archive maintained by CKBV at its main office in Ananindeua.

Information related to monitoring deforestation maintained in the archive will include:

- Base (raw) imagery used (specifying type, source, resolution, imagery date, acquisition date)
- Any cartographic data used to geo-reference the image (source, base data)
- Data used for training classification
- Definition of land cover classes assessed
- Documentation of software type and procedures applied (including all pre-processing steps and corrections, spectral bands used in final classifications, and classification methodologies and algorithms applied)

- Classified images
- Data used in accuracy assessment - ground-truth points (including GPS coordinates, identified land-use class, and supporting photographic evidence) and/or sample points of high resolution imagery
- Accuracy assessment matrix with minimally the following errors presented: overall classification accuracy, error of omission of each land-use category (forest and non-forest), and error of commission of each land-use category (forest and non-forest)

Data archived will be maintained through at least two years beyond the end of the project crediting period, through July 2029. Given the extended time frame and the pace of production of updated versions of software and new hardware for storing data, electronic files will be updated periodically or converted to a format accessible to future software applications, as needed.

Updating forest carbon stock estimates

Forest carbon stock estimates used to calculate emissions from deforestation and natural disturbance will use estimates derived from field measurements less than or equal to 10 years old. In the event that any deforestation is discovered in the project area, forest carbon stock estimates older than 10 years will be updated for any strata where deforestation is detected.

Where necessary (per above), forest carbon stocks will be re-estimated from new field measurements. Fifteen (15) sample plots will be randomly located in areas within the Rio Capim Complex representative of the stratum(a) where deforestation was detected, and measured following field procedures outlined in Silva et al (2005[10]) and maintaining conformance with field procedures used in the collection of data for the "Forest Biomass Inventory Results for the Rio Capim" document (2011; Annex 5). Biomass will be estimated applying the allometric equations of Higuchi et al (1998[11]) and otherwise maintain consistency with analytical procedures applied in the original inventory ("Forest Biomass Inventory Results for the Rio Capim", 2011).

For each stratum, where the re-measured estimate of forest biomass carbon (live above- and belowground biomass) is within the 90% confidence interval of the 2011 estimate, the 2011 stock estimate will be used. If the re-measured estimate is outside (i.e., greater than or less than) the 90% confidence interval of the 2011 estimate, then the new stock estimate from the supplemental 15 sample plots will be used.

Quality Assurance /Quality Control and Data Archiving Procedures

The following steps will be taken to control for errors in field sampling and data analysis:

1. Professional field crews with extensive prior training in forest inventory will carry out all field data collection and adhere to field measurement protocols outlined in Silva et al (2005). Field crews will have attended periodic update training courses at IFT (Tropical Forest Institute) and/or Embrapa. Pilot sample plots shall be measured before the initiation of formal measurements to

[10] SILVA, J. N. M.;LOPES, J. do C. A. L.; OLIVEIRA, L. C. de; SILVA, S. M. A. da; CARVALHO, J. O. P. de; COSTA, D. H. M.; MELO, M. S.; TAVARES, M. J. M. 2005. Diretrizes para a instalação e medição de parcelas permanentes em florestas naturais da Amazônia Brasileira. Belém, PA: Embrapa Amazônia Oriental, p. 68.

[11] HIGUCHI, N., SANTOS, J., RIBEIRO, R.J., MINETTE L. & BIOT, Y. 1998. Biomassa da parte aérea da vegetação da floresta tropical úmida de terra-firme da Amazônia brasileira. Acta Amazonica 28(2):153-166.

appraise field crews and identify and correct any errors in field measurements. Field crew leaders will be responsible for ensuring that field protocols are followed to ensure accurate and consistent measurement. To ensure accurate measurements, the height of diameter at breast height (1.3 m) will be periodically re-assessed by personnel during the course of the inventory; note that in re-measurements, diameter at breast height will be carried out in places marked previously in old measurements. Field crews will have fine scale forest strata maps for use in the field to precisely interpret strata/forest boundaries and identify potential areas of plot overlap.

2. An opportunistic sample of plots will be re-measured to identify and correct any field measurement issues which arise during implementation of the monitoring plan and to assess measurement errors. Re-measurement for this purpose will be done by a different field crew. Measurement error will be assessed as 1/2 of the mean (absolute) percent difference between re-measured plot level biomass estimates (a valid assumption where teams are equally experienced and there are no systematic errors in measurement, which will also be appraised from the re-measurement results). Target measurement error is < 3-5%.
3. Field measurement data will be recorded on standard field data sheets "FICHA DE CAMPO PARA PARCELA PERMANENTE – ARVORE" and entered to the forest inventory software MFT – Monitoramento de Florestas Tropicais for data management and quality control; MFT identifies and reports potential errors in data entry (anomalous values) which are then verified or corrected consulting the original data sheets or personnel involved in measurement. Original data sheets will be permanently archived at the CKBV office on-site at Rio Capim, and the electronic MFT database of all field measurements will be stored in the dedicated long-term electronic archive maintained by CKBV at its main office in Ananindeua. The electronic database will also archive GIS coverages detailing forest and strata boundaries and plot locations. Note that the 152 original data sheets that are part of this project are distinguished by a label from the others, indicating the plot identification to standardize the nomenclature with maps, spreadsheets and any information regarding the inventory for the carbon stock. Furthermore, in addition to the sheets information it is included the geographical coordinates of the plots.
4. Moreover, in order to update the intern control of the procedures for the implementation and archiving of the permanent plots data, the IOWSE (Instruction of Operational Work of Security and Environment) regarding this process is being reviewed to be in accordance with procedures implemented for quality control and will be presented during the validation process.

Emissions due to illegal degradation

Emissions due to illegal logging will be tracked by conducting surveys in the surrounding areas. Locations surveyed will include:

- Ararandeua Community: located in the municipality of Goianésia do Pará, in the neighboring area of RCC on the bank of the Ararandeua river, an area still known as an Indigenous Land. It is composed of six families who arrived to this land in 2001.
- Barreirinha: Indigenous community of Amanayé ethnic group, located near RCC and has an area of 2,374 hectares on the banks of the Capim river, area known as Indigenous Land. The community is composed of 20 households, of which six are located in a more isolated area that is difficult to be accessed. Therefore, during the collection of data, 14 households will be interviewed.
- Vila Betânia: A traditional community area of 20 hectares located on the left bank of the Capim river, with eight households. They are seeking for the regularization of the area, nad there are doubts if it is located in Paragominas or Ipixuna do Pará.

- Families residing along the neighbouring access between RCC and PA150, composed of different centers of dwellings located in the access route to RCC.
- Nearby farms and rural properties, including 77 households in the surroundings of RCC.

Surveys will produce information on wood consumers (fuel wood and wood for construction and charcoal production) in the surroundings areas, as well as general indications on the areas where wood is sourced from and maximum depth of penetration of harvest activities from access points. Detailed survey forms are provided in Annex 7 of the Project Document.

In the event that any potential of illegal logging occurring in the project area is detected from the surveys (i.e. ≥ 10% of those interviewed/surveyed believe that degradation may be occurring within the project boundary), temporary sample plots will be allocated and measured in the area of the project indicated by the surveys as a potential source area for illegally-harvested wood. The potential degradation area within the project area ($A_{DegW,i}$) will be delineated based on survey results, incorporating general area information and maximum depth of penetration. Rectangular plots 10 meters by 1 kilometer (1 ha area) will be randomly or systematically allocated in the area, sufficient to produce a 1% sample of the area, and any recently-cut stumps or other indications of illegal harvest will be noted and recorded. Diameter at breast height, or diameter at height of cut, whichever is lower, of cut stumps will be measured.

In the event that the sample plot assessment indicated that illegal logging is occurring in the area, supplemental plots will be allocated to achieve a 3% sample of the area. Biomass will be estimated from measured diameters (conservatively assuming that diameters of stumps cut below breast height are equivalent to diameter at breast height) applying the allometric equations of Higuchi et al (1998) and otherwise maintain consistency with analytical procedures applied in the original inventory ("Forest Biomass Inventory Results for the Rio Capim", 2011). Emissions due to illegal logging ($\Delta C_{P,DegW,i,t}$) are estimated by multiplying area ($A_{DegW,i}$) by average biomass carbon of trees cut and removed per unit area ($C_{DegW,i,t}$ / AP_i).

The more intensive 3% sample will be carried out once every 5 years where surveys and limited sampling continue to indicate possibility of illegal logging in the project area to produce an estimate of emissions resulting from illegal logging ($\Delta C_{P,DegW,i}$). Estimates of emissions will be annualized (to produce estimates in t $CO_{2\text{-}e}$ per year) by dividing the emission for the monitoring interval by the number of years in the interval.

The same quality assurance/quality control and archiving procedures as detailed above for updating estimates of forest carbon stocks will be adhered to in the field surveys of potential degradation areas.

Emissions due to FSC-certified selective logging

Project emissions due to FSC-certified selective logging ($\Delta C_{P,SelLog,i,t}$) will be estimated applying module M-MON (VMD0015), version 2 as revised and approved December 2011, of methodology VM0007, covering emissions from the following sources/sinks:

- Emissions from the felling gap ($C_{LG,i,t}$)
- Emissions from construction of infrastructure, including roads, skid trails and logging decks ($C_{LR,i,t}$)
- Removals from storage in long term wood products generated ($C_{WP\,i,t}$)

All monitored parameters will be sourced from annual post harvest assessment reports "Annual Operation Logging Report" prepared for SEMA and for FSC certification. Monitoring objectives and procedures for preparing the annual harvest reports are detailed in the "Plano de Manejo Florestal Sustentável de Uso

Múltiplo Empresarial-v2 (CIKEL BRASIL VERDE MADEIRAS LTDA-COMPLEXO RIO CAPIM Feb 2011) and in CKBV IOWSE.

Sampling/field measurement procedures are detailed below:

- Area of logging decks (A_{DECKS}) created for harvest
- Area of roads created for harvest (A_{ROAD})
- Length (L_{SKID}) and width (W_{SKID}) of skid trails created for harvest
- Volume wood removed, by product class (logs and residues) and species

Area of logging decks (A_{DECKS}) created for harvest

According IOWSE 23 all logging decks shall be measured at widest points; and the measurements shall include open areas by machine when driving or deposit logs beyond the planned area (usually this occur after the roads)

Area of roads created for harvest (A_{ROAD})

According IOWSE 23:

Access roads: measure all access road at each 2.5 km

Main roads: measure all main roads at each 1 km.

Secondary and Tertiary roads: measure at each 250 meters.

Length (L_{SKID}) and width (W_{SKID}) of skid trails created for harvest

According IOWSE 23, the following procedures should be taken:

Measure after and before the night skid; measure after and before the residues harvest.

Measure all skid trails of two maps of 6.25 ha for each Unit of Work, being the first measure at the entrance of the skid trail, the second in the middle and the third in the end.

In the same skid trail, note the presence of exposed soil caused by the blade of the skidder, and measure in cross in the wider parts.

In the same skid trail, re-measure 10 clearing that were measure for the logging report, in cross in the wider parts, randomly at the same map.

In the office, measure the length of all skid trails using specific tool as ARC GIS.

Present final data to the Forest Engineer responsible by the project to data analysis

Volume wood removed, by product class (logs and residues) and species

The procedures are described below:

The volume of wood removed is measured when the logs arrive in the CKBV sawmills. Workers use tape measures perform the length and diameter measurement to calculate the volume of the logs discounting bark, rotten and hollows (if necessary). Measurements and information about logs entry and output are recorded.

The top of the logs measured will be painted and information regarding number of the tree and species code is added in the log. Monthly a log inventory is performed, and if any distinction from the initial volume inventoried is found an investigation is conducted.

Regarding residues, these shall be stacked on carts that are already sized for determined amount (steres) or be measured in the moment of its discharge, according described in IOSWE 22.

Monitored parameters will be entered into the table format below to complete calculations of with-project emissions from FSC-certified selective logging ($\Delta C_{P,SelLog,i,t}$).

Calculation format for with-project emissions from FSC-certified selective logging.

		m^3	tCO_2/ha	tCO_2	tCO_2	m	tCO_2	ha	tCO_2	Ha	tCO_2	tCO_2	tCO_2	tCO_2
Year	**Harvest Area (ha)**	V_{EXT}	C_{BSL}	C_{EXT}	C_{LG}	L_{SKID}	ΔC_{SKID}	A_{ROAD}	ΔC_{ROAD}	A_{DECKS}	ΔC_{DECKS}	C_{LR}	C_{WP}	$\Delta C_{P,SelLog}$
2008														
2009														
2010														
Etc…														

Monitoring of leakage carbon stock changes and greenhouse gas emissions

Two sources of leakage will be monitored: activity shifting leakage and market leakage.

Activity-shifting leakage

Activity-shifting leakage will be monitored by tracking forest cover change across all lands outside of the project area owned or under the management of CKBV ($A_{defLK,i,t}$). This will be accomplished using remotely sensed imagery that covers the properties at the needed monitoring intervals. Imagery that is freely available and accessible using Google Earth will be used preferentially when it is available. When it is unavailable, other remotely sensed imagery will be acquired for analysis. CKBV property boundaries will be overlaid on remotely sensed imagery to assess if forest cover changes have occurred. In the event that deforestation is noted, further confirmation will be made that the deforestation resulted from authorized deforestation activities by CKBV. If annual forest cover change data is unavailable, all changes in forest cover (due to planned deforestation) detected for the monitoring interval will be annualized (to produce estimates of ha for each year) by dividing the area by the number of years in the period.

The CKBV administers the Rio Capim Complex performing the Sustainable Forest Management all over the forest area. Part of the Rio Capim Complex is CKVB property and another part is administered and managed in accordance with a lease agreement of forest land held with the owners of other forest areas: Madeireira Matinha S.A. and Rondon Imóveis Ltda

The owners of companies Madeireira Matinha S.A. and Rondon Imóveis Ltda are members of the Pereira Dias's family, including CKBV Floresta Ltda. (current name of the company Cikel Brazil Verde Madeiras Ltda.), the project proponent.

Thus, the CKBV has the Sustainable Forest Management Plan, as well as all environmental permits to develop forestry activities within the Rio Capim Complex.

Rondon Imóveis Ltda also owns the forest áreas Deus é Bom I and Deus é Bom II, in Maranhão state, since April 4 2011. Before April 4, 2011 these areas were owned by the Copal Compensados Paraensis Ltda, which acquired the property on September 13, 1990 being a company of Pereira Dias's family for many years. These forests have no forestry activities being developed.

The CKBV also manages and develops the Sustainable Forest Management for many years, in other forests owned by companies that do not belong to Pereira Dias´s family members and are located in the Portel municipality, Pará state. These forests are:

1. Jutaituba forest area owned by Martins Agropecuaria S/A: CKVB began the administration of the forest and forest management through the Lease Agreement entered into force on June 18, 2002. The contractual relationship has been renewed over the years and currently in force Lending Agreement and Operating Agreement for Sustainable Forestry, are both dated December 30, 2008.
2. ABC forest area owned by ABC Agropecuária Brasil Norte S/A – Produção e Exportação: CKVB started the administration of the forest and forest management by the Lease Agreement concluded in 1997. The contractual relationship has been renewed over the years and currently in force Lease Agreement is dated January 1, 2009 and has of 35 years term

In summary:

Forest Area	Land Owner	Status
Rio Capim Complex	CKBV and other family companies (see section Proof of Title)	CKBV Forest Management
Deus é Bom I	Rondon Imóveis (family company)	No Forestry Activity
Deus é Bom II	Rondon Imóveis (family company)	No Forestry Activity
Jutaitúba	Martins Agropecuária	Leasing to CKBV for Forest Management, since 18 June 2002
ABC	ABC Agropecuária	Leasing to CKBV for Forest Management, since 1997

Option 1.2 from methodology module LK-ASP will be used to calculate activity shifting deforestation.

Monitored parameters will be entered into the table format below to complete calculations of area subject to activity shifting leakage ($LKA_{planned,i,t}$).

Calculation format for area subject to activity shifting leakage.

Year	$NewR_{i,t}$ (ha)	$A_{defLK,i,t}$ (ha)	$LKA_{planned,i,t}$ (ha)
2008	0		
2009	0		
2010	0		
Etc…	0		

Market leakage

Leakage due to market effects is restricted to reductions in harvest of wood for charcoal production destined for domestic markets (all sawn wood harvested in the baseline is exported and thus not included in accounting of market leakage).

For estimation of market leakage, the main parameter monitored is annual volume of fuelwood harvested from the project area, which will be derived from annual harvest reports "Annual Operation Logging Report" with harvested volumes estimated as per procedures above.

Monitored parameters will be entered into the table format below to complete calculations of market leakage ($LK_{MarketEffects,FW/C}$).

Calculation format for market leakage.

	m^3	m^3	t CO_2	t CO_2
Year	$FG_{BSL,t}$	$FG_{LP,t}$	$C_{BSL,XBFWC,t}$	$LK_{MarketEffects,FW/C}$
2008	790,469			
2009	788,391			
2010	819,588			
2011	819,095			
2012	788,737			
2013	723,142			
2014	755,885			
2015	648,754			
2016	817,442			
2017	667,722			

Estimation of ex-post net carbon stock changes and greenhouse gas emissions.

Estimates of GHG credits eligible for issuance as VCU's will be calculated entering data into the table format below, where

Estimated GHG emission reduction credits =

Baseline emissions, fixed for 10 years at validation *minus*

Project emissions *minus*

Leakage *minus*

Non-permanence Risk Buffer withholding (calculated as a percent of net change in carbon stocks prior to deduction of leakage), fixed at validation

Years	Estimated baseline emissions or removals (tCO_{2e})*	Estimated project emissions or removals (tCO_{2e})	Estimated leakage emissions (tCO_{2e})	Risk buffer (%)	Deductions for AFOLU pooled buffer account (tCO_{2e})	GHG credits eligible for issuance as VCUs (tCO_{2e})
2008	1,815,232			15.5%		
2009	1,700,492			15.5%		
2010	1,707,561			15.5%		
2011	1,716,590			15.5%		
2012	900,252			15.5%		
2013	821,758			15.5%		
2014	1,537,097			15.5%		
2015	814,410			15.5%		
2016	1,613,270			15.5%		
2017	1,236,940			15.5%		

Organization and Responsibilities

For all aspects of project monitoring, CKBV will ensure that data collection, processing, analysis, management and archiving are conducted in accordance with the monitoring plan.

The table below shows the type of monitoring and responsible for monitoring actual emissions in the project area.

Type of monitoring and responsibles for monitoring actual emissions in the project area

	Variables to be monitored	Responsible	Frequency	Record (form and time of archiving)
	Emissions due to deforestation and natural disturbance			
1	Natural Disturbance	CKBV - Forest Management	When a natural event occurs	When there is a natural event, the research team from CKBV will make the registration of the geographical coordinates of the place affected and also register with pictures the disturbances caused by the event. The data field collected are analyzed by the georeferencing team, who elaborates the maps and evaluate the damages in the satellite image; this to register the natural disturbance in the competent environmental agency, where the responsible protocols a letter stating the event. All registers will be archived in digital format till 2029 and original forms for at least 5 years from the date of the event.
2	Legal Deforestation in RCC	IMAZON or another external institution qualified for the monitoring.	Annual	IMAZON or another external institution qualified for the monitoring by satellite images for the deforestation analysis will annually evaluate the project area following the procedures described in the methodology and perform the Accuracy Assessment Report. All shapes and analysis generated will be archived in CKBV, in digital format till 2029.
3	Deforestation in others forest areas from CKBV property or areas where the company works with Forest Management.	IMAZON or another external institution qualified for the monitoring.	Annual	IMAZON or another external institution qualified for the monitoring by satellite images for the deforestation analysis will annually evaluate the project area following the procedures described in the methodology and perform the Accuracy Assessment Report. All shapes and analysis generated will be archived in CKBV, in digital format till 2029.
4	Changes in the vegetation cover in RCC	IMAZON or another external institution qualified for the monitoring. CKBV-Forest Management	Annual	IMAZON or another external institution qualified for the monitoring by satellite images for the deforestation analysis will annually evaluate the project area following the procedures described in the methodology and perform the Accuracy Assessment Report. If necessary, a validation of the data collected in the satellite images will be carried out. All shapes and analysis generated will be archived in CKBV, in digital format till 2029.
5	Re measurement of the Permanent Plots	IMAZON or another external institution qualified for the monitoring. CKBV-Forest Management	1st year: re-measurement of all 71 permanent plots; 2nd re-measurement after 2 years of the 1st re-	The re-measurement of the Permanent Plots will be performed in 71 permanent plots of this project REDD (the measurement will start one year later after the registration of the project), data will be recorded in the document "Field Sheet for Permanent Plot", additional data such as geographical coordinates shall be registered in GPS and also in the field sheets. In the office, data will be transferred to the software of Tropical Forest Monitoring (MFT) that analysis and generate specific data for the depuration, correction and manipulation of the information for the quality control of the data typed. Data are registered in a database, where is

	Variables to be monitored	Responsible	Frequency	Record (form and time of archiving)
			measurement; 3r[d] re-measurement after 3 years of the 2[nd] re-measurement; and then from each 5 years.	possible add data from future re-measurements. The original data sheets will be archived in RCC office, and the original data sheets that are part of this REDD project are distinguished by the others with a label. All register will be archived in digital format till 2029 and original sheets at least for 5 years from the event date. Note that the re measurement of the plots will initiate one year after the registration of this project.
6	Installation of new permanent plots in case of deforestation or natural disturbances.	CKVB - Forest Management	When any event occurs that could modify the carbon stock before 10 years of validation of the inventory.	If there is a need of new permanent plots the research team from CKBV will make the installation of new plots following the procedures indicated in this REDD project. Data will be recorded in the document "Field Sheet for Permanent Plot", additional data such as geographical coordinates shall be registered in GPS and also in the field sheets. In the office, data will be transferred to the software of Tropical Forest Monitoring (MFT) that analysis and generate specific data for the depuration, correction and manipulation of the information for the quality control of the data typed. Data are registered in a database, where is possible add data from future re-measurements. The original data sheets will be archived in RCC office, and the original data sheets that are part of this REDD project are distinguished by the others with a label. All register will be archived in digital format till 2029 and original sheets at least for 5 years from the installation date.
	Emissions due to illegal degradation			
7	Illegal Degradation in RCC	CKVB - Social Responsibility CKBV- Forest Management IMAZON or another external institution qualified for the monitoring.	Every two years	The Social Responsibility team will carry out fields' research among the property from neighbor areas of RCC for possible identification of illegal logging. The questionnaires answered and the reports of data analysis will be archived electronically and physically in CKBV till 2029. Further, an analysis of the area will be carried out through satellite images by a competent entity.
	Emissions due to FSC-certified selective logging			
8	Volume of wood removed	CKVB - Forest Management	Annual	CKVB, through the Forest Management team prepares annually the monitoring report of AOP, that generate data to the monitoring of the Forest Management Plan, and also, for the requirements of the Principles and Criteria of FSC Certification. All registers will be archived in digital format till 2029 and original reports at least for 5 years.
9	Length (L_{SKID}) and width (W_{SKID}) of skid trails created for harvest	CKVB - Forest Management	Annual	

	Variables to be monitored	Responsible	Frequency	Record (form and time of archiving)
10	Area of logging decks (A_{DECKS}) created for harvest	CKVB - Forest Management	Annual	
11	Area of roads created for harvest (A_{ROAD})	CKVB - Forest Management	Annual	
12	Volume of residues removed from the project area	CKVB - Forest Management	Annual	
13	Maintenance of FSC Certification	CKBV - Forest Management, Environment, Work Security and Social Responsability (RSA)	Annual	CKBV will monitor the compliance to the Certification FSC principles and criteria to ensure the maintenance of the certification. In addition to the internal control carried out by internal audit process, FSC Certification is independently audited annually. Reports of internal and independent audit will be archived till 2029, in digital and physical format.

** To ensure the digital records during the time established, CKBV relies on a Information Technology (IT) system with specific servidors and back ups to RSA area. The access to the back up is direct of each worker computer of the area and is under IT management.

5 ENVIRONMENTAL IMPACT

The project activity, cancellation of the planned deforestation and decision to continue Sustainable Forest Management with Low-Impact Logging (SFMLIL), does not require through legislation an environmental impact assessment; however, cancellation of the planned deforestation is expected to have positive environmental impact on biodiversity.

Additionally, continued SFMLIL in CRC requires and will involve:

1) Presenting a Sustainable Forest Management Plan (SFMP) for approval by the competent environmental body.

2) Presenting annually the AOP of the selected areas by the company to be harvested according to the LIL – Low-Impact Logging for approval from the Authorization of the Forest Exploitation (AUTFE) [12]. The AOP will include all the actions that will be taken by the executor of the Forest Management with the aim to assure that the operation implemented will not generate negative net impacts to the environment.

In addition, in pursuit of continuous improvement, in 2009 CKBV undertook a specific research study, related to the low-impact logging management, for the identification of the Risks to the Environment, Machines and Equipments, with the aim to identify the risks related to the operational activities and adopt mitigation actions. In Annex 8 the Identified Risks and Preventive Actions are listed and reference the correspondent Instructions of Operational Health, Safety and Environment (IOSWE)

This study was developed by CIKEL workers, the Safety Worker Engineer Leonardo Nobrega Pedrosa and the Environmental Engineer Francy Rosy Nava de Oliveira Souza, receiving the first place in the Brazil Award Protection of 2010, in the Risk Management category. The award occurred during the Occupational Health and Safety Fair, PrevenRion 2010, providing national recognition to this study.

As a result of this study there was a review and unification of the work instructions of the areas of forest operation, environment, health and safety of the workers, resulting in the IOWSE, which guided the Forest Management activities in RCC, being parameters to control the operation and to conduct internal audits. The IOWSE are updated annually, in the end of the forest operation, to evaluate its effectiveness and if necessary, review identified weakness of the practice.

6 STAKEHOLDER COMMENTS

The main stakeholders of the REDD Project are:

- Municipalities of Paragominas and Goainésia of Pará;
- Communities of the surroundings and their respective institutions;
- NNGOs;
- Universities and Research Institutions.

CKBV interacted with the stakeholders mentioned above during the preparation of this REDD Project and the company also undertakes to carry out a consultation process with the main opinion makers on this final document, while it is under review by the audit team.

Thus, the main interactions with the stakeholders were presentations of what REDD is and about this Project to communities in the project zone and the municipalities of Pará Goianésia Paragominas during the period

[12] All the documentation providing the legality of the Forest Management activities in CRC, as the SFMP, AOP, AUTFE's Will be available in paper and electronic files for the verification of the audit team.

from March 23 to April 1, 2011. During 27th and 28th April, 2011 member of CKVB visited the neighboring farms with the objective to inform this REDD Project.

Also, CKVB customers were invited to a lunch on May 21, 2011, at the headquarters of the Rio Capim Complex, where they received an explanation about the project and CKVB´s other activities.

Between May 30 and June 3, 2011, local municipalities and environmental departments of the municipalities of Paragominas Goianésia Pará, Rondon do Pará, Ulianópolis, Tailandia and Dom Eliseu were visited and informed of the essential aspects of this REDD project.

Throughout the period of the project design, CKBV also interacted with NGOs and research institutions, such as IFT, UFRA, UFPA, Embrapa.

Finally, the CKBV sent an invitation to the main opinion makers for consultation of this PDD. This meeting took place February 2, 2012 in Belem city.

The environmental and social aspects of the project that were raised during this meeting was formally recorded by CKVB, and after that, the comments were compiled and documented in this PDD.

The evidence of these processes of communication is in Annex 9.

Summary of comments received

The project received a support letter from the following stakeholders: Paragominas Municipality, Goianésia Pará Municipality; Amazon Institute of People and Environment (IMAZON), Tropical Forest Institute (IFT), Federal University of Para via the Institute of Biological Sciences (ICB), Brazil Indian Foundation (FUNAI).

From the stakeholder's point of view, mentioned in the letters of support, the activity of this project aims at contributing to the socioeconomic development of the region using the global natural resources in sustainable manner. All those consulted during the preparation of the project expressed their support and appreciation for the CKBV project implementation.

APPENDIX

Appendix I: Technical Team of the Project

CKVB Florestal Team

Name	Responsibilities in the REDD – VCS – Planned Project	Function	Contact
BELÉM			
Aparecida Calixto Pereira Denadai (Cida)	General Director of the REDD Project	Socio-Environmental Responsible Director	cida@cikel.com.br
Francy Rosy Nava de Oliveira Souza	Coordinator of the REDD/VCS Project	Environmental Enginner	francy@cikel.com.br
Josué Evandro Ribeiro Ferreira	Forest Area Responsible	Forest Manager	evandro@cikel.com.br
Eliane Assunção	Responsible by Geoprocessing.	Geoprocessing Auxiliar	eliane@cikel.com.br
Leonardo Nobrega Pedrosa	Responsible by the Work Safety in the Project area	Work Safety Engineer	pedrosa@cikel.com.br
Karen Juliana dos Anjos	Responsible by the social responsability – coordination of the public consult and divulgation of the REDD project.	Social Responsible Manager	karen@cikel.com.br
Geyse Daniele Nascimento dos Santos	Support in the coordination of the public consult of the REDD Project.	Social Responsible Analyst	geyse@cikel.com.br
Manoel Pereira Dias	Responsible by the business of the group.	Vice President of the Administrative Board	manoel@cikel.com.br
Damião Pereira Dias	Responsible by the business of the group.	Member of the Administrative Board	dpd@cikel.com.br
João Bosco Pereira	Responsible by the business of the group.	Vice President of the Administrative Board	jbosco@cikel.com.br
RIO CAPIM COMPLEX			
Francisco de Assis Silva Matos	Responsible by the implementation and maintenance of the REDD Project activities.	Rio Capim Complex Manager	francisco@cikel.com.br
Iralena da Silva	Support in the coordination in the REDD Project and discussant in the public consult.	In charge of the extraction II	iralena@cikel.com.br
Raimundo Nonato	Resposible by the implementation and monitoring of the permanent plots, monitoring of the SMFLIL and fauna.	In charge of extraction II	nonato@cikel.com.br
Joaquim Gomes da Silva Neto / João Batista Rodrigues	Main Permanent Plots Team	Parabotanical/Team leader/Topography auxiliar	No e-mails.

Name	Responsibilities in the REDD – VCS – Planned Project	Function	Contact
Pereira/João Francisco Soares Goldinho			
CURITIBA			
José Pereira Dias	Responsible by the business of the group.	President of the Administrative Board	
Ilson José dos Santos	Responsible by the financial control of the carbon credits of the REDD Project and financial analysis of the additionality.	Financial Manager	ilson@cikel.com.br
Flávio de Souza Batistel	Participation in the financial analysis of the additionality of the REDD Project.	Controller	flavio@cikel.com.br
Rodrigo Augusto Sousa	Responsible by the legal analysis of the REDD Project.	Legal Manager	rsousa@cikel.com.br

33 Forest Capital Team

Name	Responsabilty	Function	Contact
Ivana Cepon	General Manager of the REDD-VCS Project	Technical Director	icepon@33assetmngt.com
Fernando Augusto Pinto	Field activities planning	Project Manager	fpinto@33assetmngt.com
Jenny Sayaka Komatsu	Technical coordination of the development of baseline and additionality sections	Climate Change Senior Expert	jkomatsu@33assetmngt.com
Fernanda Bortolotto	Technical support of field and PDD development	Forestry Engineer	fbortolotto@33assetmngt.com

Terra Carbon LLC Team

Name	Responsabilty	Function	Contact
David Shoch	Technical Director of the PDD	Forester	David.shoch@terracarbon.com
Scott Settelmyer	Internal reviewer	Carbon finance	Scott.settelmyer@terracarbon.com
Rebecca Dickson	Mapping and remote sensing	Geographer	Rebecca.dickson@terracarbon.com

Appendix 2: Other entities involved

Entity	**Embrapa Amazônia Oriental**
Role	Selection and analysis of classified satellite imagery, classified forest cover map in which forest and non forest are distinguished and Accuracy Assessment.
Responsible	Carlos Souza Jr.
Address	Rua Domingos Marreiros, 2020, altos. Cep: 66060-160, Bairro Fatima, Belem, Para, Brazil
Contact	souzajr@imazon.org.br

Entity	**Embrapa Amazônia Oriental**
Role	Selection of strata, selection of the allometric equation and invetory quality control.
Responsible	Lucas Mazzei
Address	Lane Dr. Eneas Pinheiro, no/n. Forest Pavillon. Postbox 48. Belém – PA –Brazil Zip Code 66095-100
Contact	+55(91)32041065

Entity	**Geoflor – Georreferenciamento e Serviços Florestais Ltda**
Role	Inventory of 15 permanent plots.
Responsible	Lúcia de Fátima Menezes Picanço
Address	Lane. Rui Barbosa, n. 1242 Belem– PA – Brazil Zip Code: 66035-220
Contact	+55(91)3212-7915 / geoflor@geoflornet.com.br

Entity	**Paragogeo Paragominas Georreferenciamento e Serviços Florestais Ltda**
Role	Inventory of 18 permanent plots.
Responsible	Jossivaldo Farias da Costa
Address	7 de Setembro St, n 155, Paragominas –PA. Brasil
Contact	+55(91)8745-4110 / paragogeo.para@hotmail.com