RMDLT PORTEL-PARA REDD PROJECT MONITORING REPORT FOR THE 02/JAN/2012-31/DEC/2017 PERIOD

Document Prepared By

Kanaka Management Services Private Limited

Project Title	RMDLT Portel-Para REDD Project
Version	*1.1*
Report ID	*MR 2012-2017*
Date of Issue	*25-Feb-2019*
Project ID	*977*
Monitoring Period	*02-Jan-2012 to 31-Dec-2017*
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

A. Historical Deforestation Context and Dynamics

The project is located in a fast-changing region characterized by forests rich in valuable timber species, illegal logging, unclear land tenure laws, widespread land speculation, overall weak law enforcement and severe poverty. With these variables combined the result cannot be other but the depredation of natural resources in the benefit of few.

Pioneer agents open the path for deforestation agents who cut clear the forest as a measure of providing land ownership and implementing low-cost and practically self-sustained productive activities.

The predominant final land-use in the area is deforestation by cattle ranchers to implement pastures, which occurs simultaneously in two deforestation fronts.

The first is known as “consolidated frontier”, which is the area close to primary roads (federal and state highways) and already occupied mainly by cattle ranching. This frontier continues to expand due to the creation and expansion of secondary and tertiary roads that allow deforestation agents to deforest by using slash and burn.

The second front, known as a “pioneer frontier”, refers to forested areas with low deforestation but with high degradation located farm from primary roads, but easily accessible through navigable rivers. These areas are considered to be of “free access” whenever the presence of the legal landowner is not made evident (i.e., through ongoing forest uses or/and monitoring and enforcement). In this front, landless people known as “riberinhos” slash and burn the forest to implement cassava plantations and pioneer agents such as loggers open penetration roads that allow squatters and ranchers to invade otherwise hard-to-access forest areas. Such penetration roads or “pioneer roads” not only allow access to natural resources but also connect the area to the network that leads to primary roads. This connection allows for a faster transportation of products and opens the area to pioneer agents that generate land speculation.

Brief Description of the Project Area

The project area comprised 177,899.5 Ha in 17 privately owned parcels or “Glebas” adding up to a total of 194,402.8 Ha in the Portel municipality, located in the Portel micro region. The Marajo mesoregion constitutes 3 geographic micro regions (MRG): Arai, Furos de Breves and Portel. The first two regions comprise municipalities located in the continent, on

the right margin of the Pará River. Even though Portel is geographically not a part of the Marajò archipelago. The Portel MRG covers municipalities located in the continent, on the right margin of the Parà River. Even though Portel is geographically not a part of the Marajò archipelago, due to its location on continental lands, it belongs to the mesoregion Marajò. It can be assured therefore that from a geopolitical standpoint, Portel municipality belongs to Marajò (IBAMA, 2004). It is located in the whole region, south / southwest from the archipelago, 278 kms from Belem, the state capital. The major access is by the Acuti-Pereira River on the extreme east, Camarapi and Pacaja rivers on the central region and Anapu River on the north / northwest region.

The main transportation mean to arrive in Portel is by fluvial public transportation (20 hours from Belem) and then using a private boat to get into the Project Area. In the region of the project transportation happens mostly by river although pioneer roads are already connected to the road network of the Transamazonica highway in the consolidated frontier thus providing increasing fast access to project area by road.

Forests in the area consist of large and productive trees connected to each other by lianas and parasites. The most important species according to size and value are: i) Hevea brasiliensis (seringueira); ii) Castilla ulei (caucho); iii) Mauritia flexuosa (Miritis); iv) Euterpe oleracea (Açaizeiros); v) Ceiba pentandra (Samaumeira); vi) Cecropia sp. (Embaubeiras) and vii) hardwoods.

Local population is comprised mainly of settlers known as “Ribeirinhos”, who live along the rivers and along the igarapés (small streams). There are not indigenous communities located either in the project area, the project‟s leakage management area, leakage belt, the project zone or the reference region for deforestation. Economic activities in the area are subsistence timber extraction and sale, fishing and subsistence agriculture.

B. RMDLT Portel – Para REDD Project

The project‟s main objective is to avoid and prevent unplanned deforestation in native forests throughout the project commitment period. The project has proposed to achieve the objective through managing the project area in the form of a “private conservation reserve” through the development and deployment of a management plan. The plan includes a comprehensive monitoring and enforcement plan built up on the existing experience of ongoing surveillance activities in the area since 2008. Such scaled up monitoring activities through patrolling have been undertaken on regular basis since the initiation of project. The medium term goal is to allow forest regeneration thus increasing the amount of carbon sequestered in the forest.

Since the project started in 2008, the project has successfully engaged in removing and identifying illegal logging activities in the project area, the same can be witnessed from the patrolling reports that are available. A staff of guardians that continuously monitor the project area has been performing the monitoring activities for this verification period. The schedules

for monitoring were put in place considering the fact that such a vast area cannot be monitored manually and focus has been to track the roads that are being developed in the vicinity of the project area. This has enabled the project team to control and monitor the activities of illegal entrants into the project area.

The project area has been divided into different segments where brigades are deployed to monitor the same.

During the first monitoring period the project has implemented patrolling and legal documentation to make evident the presence of landowner and to demonstrate clear land tenure. During this verification period the project has enhanced its activities in the other areas encompassing the total project area of seventeen areas. The project has been undertaking capacity development initiatives as identified during the previous monitoring report.

C. Implementation Status of the Project

The RMDLT Portel – Pará REDD project was validated as per VCS standards in April 2013. The project has subsequently undergone the first verification for the period from 01-Jan-2009 to 01-Jan-2012. This monitoring report is developed for the second verification process for the period from 02-Jan-2012 to 31-Dec- 2017. The report covers the activities resulting in net positive GHG benefits for this period, but were not limited to: continuation of patrolling activities, training on MRV to staff, supporting the local communities through capacity development activities, support in legal land ownership rights provision, capacity development activities related to agroforestry, land ownership rights acquisition from government, improved cook stoves distribution.

1.2 Sectoral Scope and Project Type

Project Scope: Agriculture, Forestry and Other Land Use (AFOLU)

Project Category: Reducing Emissions from Deforestation and Degradation (REDD)

Type of Activity: Avoided Unplanned Deforestation & Degradation (AUDD)

Reference of Methodology: Approved VCS Methodology for Avoided Unplanned Deforestation (VM0015) V1.1

1.3 Project Proponent

Organization name	RMDLT Property Group Ltd
Contact person	Ron Dewhurst (RMDLT)

Title	CEO
Telephone	+1 616 773 2822
Email	rdew@telus.net

1.4 Other Entities Involved in the Project

Provide contact information and roles/responsibilities for any other project participant(s). Copy and paste the table as needed.

Organization name	Kanaka Management Services Private Limited
Role in the project	Collation and development of Monitoring Report
Contact person	Mr. K. T. Rao, Director Dr. Nandagopal P, Senior Consultant Dr. R. Madhukar, Senior Consultant
Title	as above
Address	*No. 271, SFS 407, 4th Phase* *Yelahanka New Town,* *Bengaluru – 560064* *Karnataka, India*
Telephone	+91-9008167850
Email	rao@kms-group.com

1.5 Project Start Date

The project started on January 01st, 2008, when on the ground activities to avoid and remove invasions were already taking place. The landowner conceptualized protecting his lands under a carbon project scheme since 2005.

It is in 2005 when the landowner hired the services of a lawyer to clarify any doubts on land tilling and to execute corrective actions through legal means to remove invaders (squatters and illegal loggers). Although, forest protection initiatives and activities were developed back in 2005, setting a 2008 project start date was a conservative approach to make sure the project had enough monitoring and enforcement experience to start producing conservation results.

1.6 Project Crediting Period

The crediting period for the project is for a period of 40 years starting from 01 January 2009.

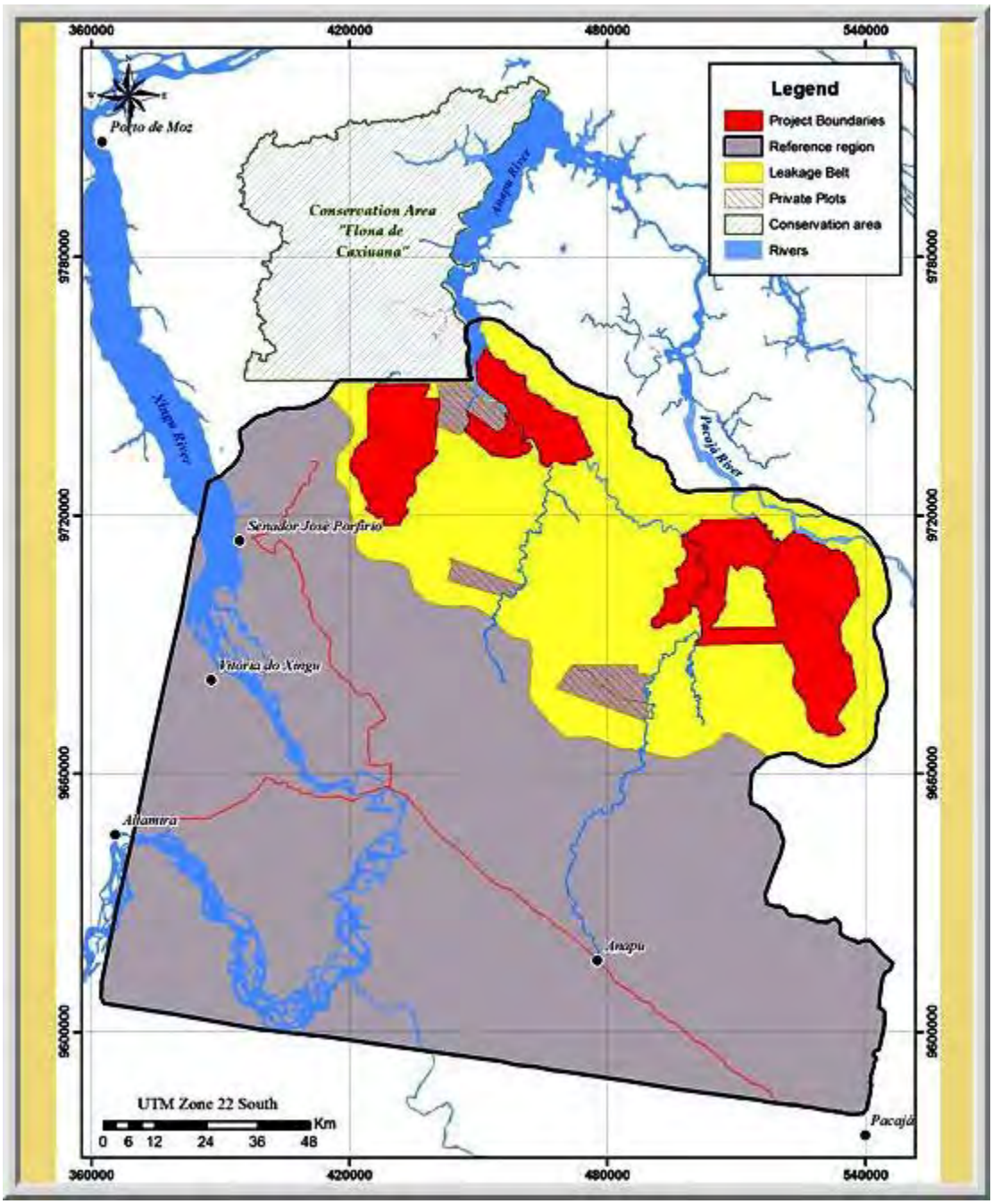
1.7 Project Location

The project is located in northwest of Brazil, in the State of Para, micro region of Portel, municipality of Portel (Map 1). The regular main transport to arrive in Portel is by boat, the trip takes approximately, 20 hours from Belem. Some parts of the area are also accessible by car, as the network of roads of the Transamazonica highway (BR-230) has already connected to logging (pioneer) roads that keep developing in the project area.

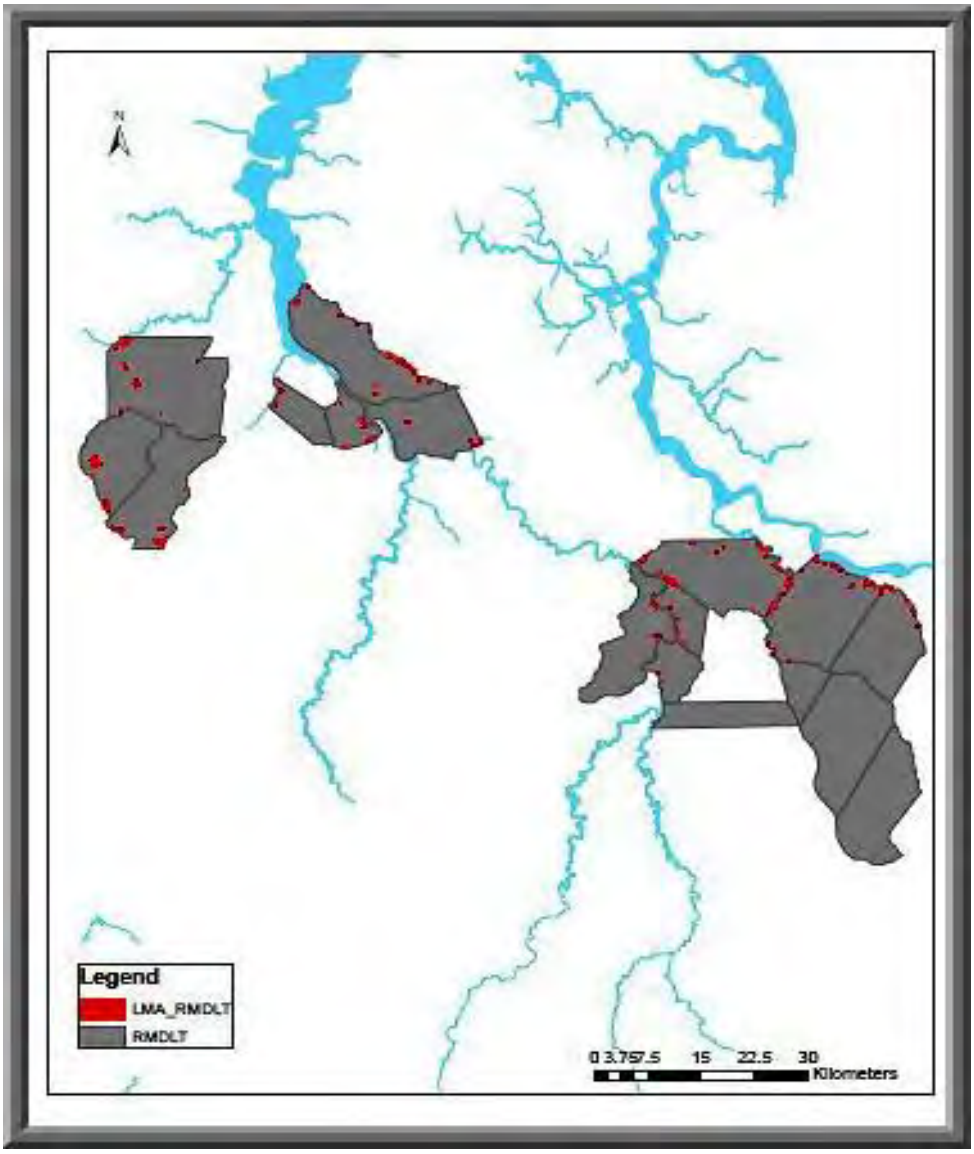
The land of the Project (LP) has 194,402.8[1] ha and the Project Area (PA) has 177,899.5 ha. In total, the project area is constituted by 17 individual Glebas (plots) that contain only forest at project start date. The leakage management area is located within the Land of the Project and is entirely outside the project area (Map 2).

Map 1: Project Location

[1] The "Project area" will be smaller than the project boundary as it has to contain only areas that have been a forest for the past 10 years from the project start date.


Legend
Project Boundaries
Reference region
Leakage Belt
Private Plots
Conservation area
Rivers
Conservation Area "Flona de Caxiuana"
Porto de Moz
Senador José Porfírio
Vitória do Xingu
Altamira
Anapu
Pacajá
Xingu River
Pacajá River
UTM Zone 22 South
Km
0 6 12 24 36 48
360000
420000
480000
540000
9780000
9720000
9660000
9600000

Map 2: Leakage Management Area



1.8 Title and Reference of Methodology

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

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

- VCS Program Guide 3.3
- VCS Program Standard 3.3
- VCS AFOLU Requirements Version 3.3

- VCS Tool VT001 Version 3.0 – Tool for demonstration and Assessment of Additionality in AFOLU Project Activities.
- VCS AFOLU Non-Permanence Risk Tool Version 3.1

As part of the second verification the project follows and uses the following documents and tools:

- VCS Program Guide 3.3
- VCS Program Standard 3.3
- VCS AFOLU Requirements Version 3.3
- VCS Tool VT001 Version 3.0 – Tool for demonstration and Assessment of Additionality in AFOLU Project Activities.

1.9 Sustainable Development

Brazil has been a party in development of Sustainable Development Goals [2]. The RMDLT Portel project is contributing in achievement of SDGs as follows:

i) ***No Poverty***: The project has been working on capacity development activities to develop small sustainable business

ii) ***Zero Hunger***: The communities have access to the non-timber forest produce from the forests, the project is working towards provisioning of improved cook stoves and training the local communities on agroforestry practices to create sustainable livelihoods.

iii) ***Good Health and Well being***: The project abides by the Brazilian national laws and especially Brazilian constitution. Article 225 specifically discusses about „all have a right to an ecologically balanced environment that is an asset of common use and essential to a healthy quality of life.

iv) ***Quality Education****:* Schools have been started from 2013 to give quality education to the community children

v) ***Gender Equality****:* Bi annually workshops are being conducted from 2012 to train the community on social behaviors and gender equality.

[2] Itamarty (2015), Sustainable Development Goals; Available at [http://www.itamaraty.gov.br/en/politica-externa/desenvolvimento-sustentavel-e-meio-ambiente/6298-sustainable-development-goals-sdgs]

vi) ***Clean Water and Sanitation****:* 10 numbers of public water filters have been installed to provide safe drinking water and around 30 public toilets have been constructed to maintain proper sanitation in and around the project boundary.

vii) ***Other parameters such as Affordable and Clean Energy****,* ***Decent work and Economic Growth****,* ***Industry, Innovation and Infrastructure****,* ***Reduced Inequalities****,* ***Sustainable Cities and communities****,* ***Responsible consumption and production****,* ***Climate Action****,* ***Life below water****,* ***Life on Land****,* ***Peace, Justice and Strong institutions and Partnerships for the Goals****:* All the listed points are covered during Bi-annual trainings and workshops from 2013.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

Activities for the second verification period:

Activities	Indicator	Status	Monitored Impact
Patrolling activities	Control program	Implemented	Forest conservation / GHG emission reductions
Legal process to make evident the presence of the landowner and to demonstrate clear land tenure	Negotiation tables	Frequent dialogue with villagers and communities through workshops and capacity development activities	Forest conservation / GHG emission reductions
Provide training on forest and biodiversity monitoring and management, as well as opportunities to work as a monitoring/enforcement staff	Workshops	Annual trainings and awareness have been conducted for the entire monitoring period	Forest conservation / GHG emission reductions / strengthening community capacity
Enhancing community's organisational capabilities	Workshops	Achieved through annual trainings	Forest conservation / GHG emission reductions / strengthening

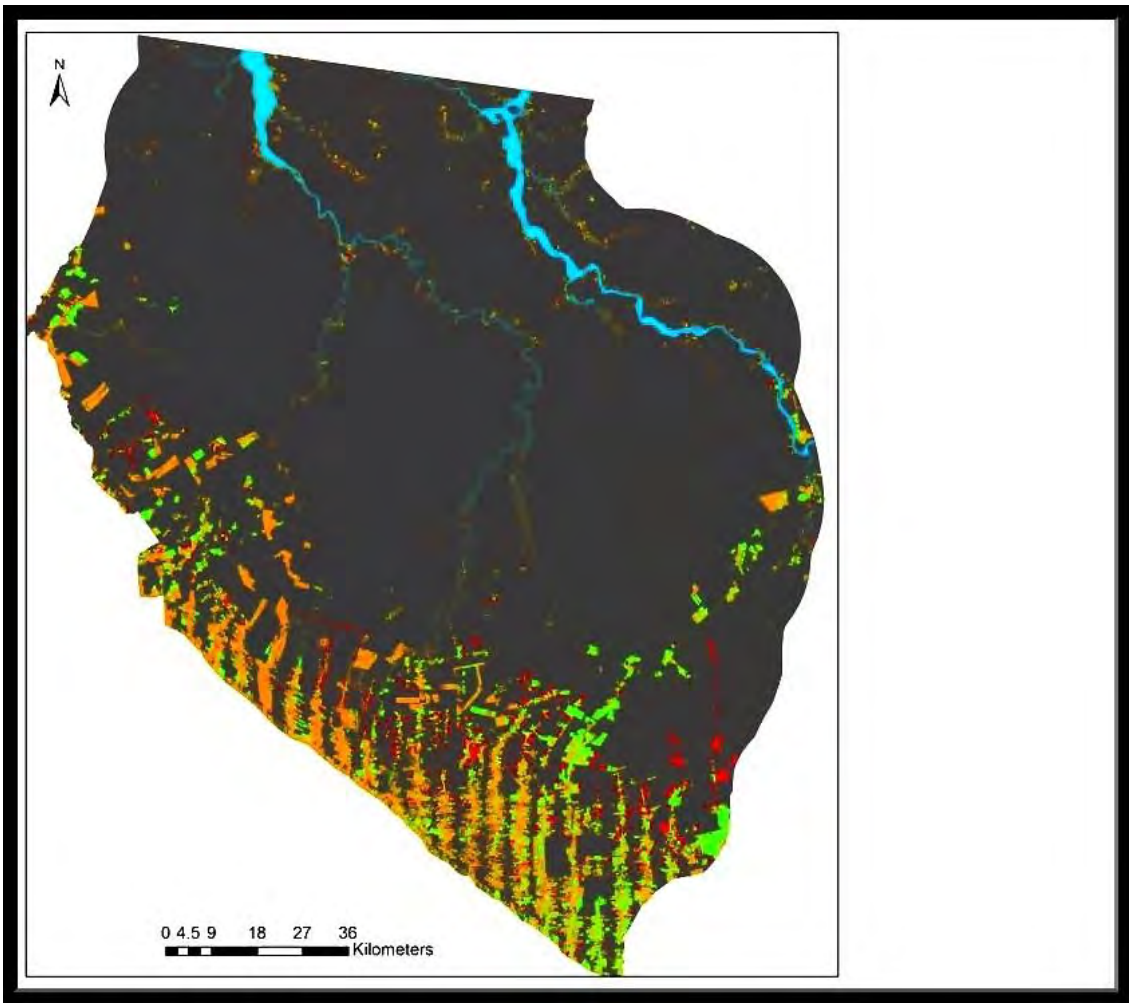
			community capacity
Provide legal land-ownership versus results for conservation	Agreements	Agreements are in place	Forest conservation / GHG emission reductions / strengthening community capacity
Providing capacity building on steps to gain land use rights over government owned forests	Workshops	Achieved through annual trainings and workshops	Forest conservation / GHG emission reductions / strengthening community capacity
Providing capacity building on improved efficiency cook stoves and implement cook stove pilots	Workshops and households benefitted from this activity	Around 200 cook stoves have been deployed	Forest conservation / GHG emission reductions / strengthening community capacity

Summary:

The project has been conducting on the ground monitoring and enforcement through out the second monitoring period. The landowner has been sending teams during the dry season to patrol all his lands. The patrols would generate hand-written monitoring reports during the field trip and once in Portel they would report illegal activities. (i.e., loggers and / or squatters) through anonymous phone calls to IBAMA. Once back in Belem, the lawyers of the landowner would transcribe the information and translate it to English. All reports (original and translations) are kept in electronic format.

For this verification period, leakage has been monitored using a 2018 Landsat TM image Figure 1). Below shown figure illustrates the RMDLT work with satellite imagery:

Figure 1: Leakage monitored using Landsat TM image



2.2 Deviations

There are no specific major deviations for this monitoring period.

2.3 Grouped Project

This is not a grouped project. It does not apply.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	**RRD Forest / Non-Forest Cover Benchmark Map**
Data unit	Ha

Description	Map showing LULC class forest and non-forest at Project start date
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**Project Area Forest Cover Benchmark Map**
Data unit	Ha
Description	Map that shows the stratification and location of LULC class forest in the project area at the project start date (100% forest cover)
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**Leakage Belt Forest Cover Benchmark Map**
Data unit	Ha
Description	Map that shows the stratification and location of LULC class

	forest in the Leakage belt at the project start date (100% forest cover)
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$ABSLRR_t$**
Data unit	Ha
Description	Annual area of baseline deforestation in the reference region at year t
Source of data	Calculated based on results from future deforestation model using peer-reviewed software IDRISI Selva
Justification of choice of data or description of measurement methods and procedures applied	Variables and procedures to calculate baseline deforestation are thoroughly explained in the excel sheet submitted to VVB.
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$ABSLPA_t$**
Data unit	Ha
Description	Annual area of baseline deforestation in the project area at year t

Source of data	Calculated based on the results from future deforestation model using peer-reviewed software IDRISI Selva
Justification of choice of data or description of measurement methods and procedures applied	Variables and procedures to calculate baseline deforestation are thoroughly explained in the excel sheet submitted to VVB.
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$ABSLLK_t$**
Data unit	Ha
Description	Annual area of baseline deforestation in the leakage belt at year t
Source of data	Calculated based on the results from future deforestation model using peer-reviewed software IDRISI Selva
Justification of choice of data or description of measurement methods and procedures applied	Variables and procedures to calculate baseline deforestation are thoroughly explained in the excel sheet submitted to VVB.
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$Ctot_{icl}$**
Data unit	tCO_2-e ha^{-1}
Description	Average carbon stock of all accounted carbon pools in forest class *icl*
Source of data	Determined by using data from carbon inventory developed by SETA Ambiental and supervised by KMSPL

Value Applied	Dense Forest: 468.01 Degraded Forest: 413.35
Justification of choice of data or description of measurement methods and procedures applied	The inventory was carried out in 79 plots of forest comprising two classes namely dense forest and degraded forest, within an area that encompasses the project area and leakage belt. A detailed report can be found in the excel sheet submitted to VVB. but as a summary the following are the highlights of the report: - Sampling plots were randomly located in forest stratum - DBH (Diameter at Breast Height) was measured for all the trees in a plot - Tree biomass was determined using Overman, et al. 1994 equation, which was successfully tested nearby the Project Area by a different study
Measurement Frequency	Only once at Project start
QA/QC procedures to be applied	Sampling protocol can be found in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$Ctot_{fcl}$**
Data unit	tCO_2-e ha^{-1}
Description	Average carbon stock of all accounted carbon pools in forest class f*cl*
Source of data	IPCC 2003 Good Practice Guidance for Land Use – Table 3.3.8
Value Applied	51.65
Justification of choice of data or description of measurement methods and procedures applied	Data is a default value for land converted to grassland in Tropical-Moist & Wet Climate Zones.
Measurement Frequency	Only once at Project start
QA/QC procedures to be applied	The highest value of the error range was utilized (original value reduced in 75%)

Any comment	N/A

Data / Parameter	**CF**
Data unit	tCt-1d.m
Description	Carbon fraction of dry matter
Source of data	IPCC 2003 Good Practice Guidance for Land Use, Chapter 3.2 Forest Land, page 3.25
Value Applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	The value chosen is an IPCC default value as recommended by VM0015 methodology
Measurement Frequency	N/A
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**CF*j***
Data unit	tCt-1d.m
Description	Carbon fraction for tree specie *j*
Source of data	IPCC Good Practice Guidance for Land Use, Chapter 3.2, Forest Land, page 3.25
Value Applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	The value chosen is an IPCC default value as recommended by the VM0015 methodology
Measurement Frequency	At Project Start
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	$f_j(DBH)_{ab}$
Data unit	t.d.m. tree-1
Description	Allometric equation for species j linking DBH to aboveground biomass of living trees, expressed as t.d.m. tree-1
Source of data	Overman"s 1994 equation Overman, Witte, et al (1994) corrected for biomass moisture content (Araujo, Higuchi, et al. 1999)
Justification of choice of data or description of measurement methods and procedures applied	Above-ground biomass for a DBH ≥ 10 cm was calculated using Overman"s equation (Overman, Witte, et al. 1994) corrected for biomass moisture content (Araujo, Higuchi, et al. 1999). Araujo tested Overman"s equation in a location 250 kms from Belem in Para (close to the project area under the same forest type), obtaining predicted results within ±0.6% of the weight determined in the field through destructive sampling.
Measurement Frequency	At project start
QA/QC procedures to be applied	Overman 1994 equation has an R2 of 0.9 and was tested in the same region of the project area, in the same forest type with an error of ±0.6%
Any comment	N/A

Data / Parameter	**LULC Change**
Data unit	%
Description	Percentage of forest that change to non-forest final classes during the historical reference period
Source of data	Landsat imagery from 1996, 2004 and 2008 obtained from INPES website. SEMA (2010) Economic ecological zoning information for the northern area of Para.
Justification of choice of data or description of measurement methods and	Landsat imagery is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.

procedures applied	SEMA"s data is available to the public and is the most up to date and scale adequate official data for the Project Area.
Measurement Frequency	At project start
QA/QC procedures to be applied	Through accuracy assessment in found the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$Fburnt_{icl}$**
Data unit	%
Description	Proportion of forest area burned during the historical reference period in the forest class *icl*
Source of data	Percentage of biomass that is left to burn after timber for wood products is extracted
Value Applied	96%
Justification of choice of data or description of measurement methods and procedures applied	Data is derived from the assessment of durable wood products
Measurement Frequency	Only once at Project start
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**ERCH4**
Data unit	Dimensionless
Description	Emission ratio for CH_4 (IPCC default value = 0.012)
Source of data	VM0015 methodology
Justification of choice of data or description of measurement methods and procedures applied	Default value indicated by VM0015 methodology

Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**$Pburnt_{p,icl}$**
Data unit	%
Description	Average proportion of mass burnt in carbon pool *p* in the forest class *icl*
Source of data	Percentage of biomass that is left to burn after timber for wood products is extracted
Value Applied	96%
Justification of choice of data or description of measurement methods and procedures applied	Data is derived from the assessment of durable wood products
Measurement Frequency	Only once at project start
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**$Cp_{icl,t}$**
Data unit	tCO_2-e ha^{-1}
Description	Average carbon stock per hectare in the carbon pool p burnt at year *t* in the forest class *icl*
Source of data	Determined by using data from carbon inventory developed by SETA Ambiental and supervised by KMSPL Data from IPCC Good Practice Guidance for Land Use Table 3.3.8
Justification of choice of data or description	The inventory was carried out in 79 plots of forest comprising two classes namely dense forest and degraded forest, within

of measurement methods and procedures applied	an area that encompasses the project area and leakage belt. A detailed report can be found in Annex but as a summary the following are the highlights of the report: - Sampling plots were randomly located in forest stratum - DBH (Diameter at Breast Height) was measured for all the trees in a plot - Tree biomass was determined using Overman et al. 1994 equation, which was successfully tested nearby the project area by a different study. Data is a default value for land converted to grassland in Tropical-Moist & Wet Climate zones.
Measurement Frequency	Only once at Project start
QA/QC procedures to be applied	Sampling protocol can be found in the excel sheet submitted to VVB. The highest value of the error range was utilized (original value reduced in 75%)
Any comment	N/A
Used in Equations	N/A

Data / Parameter	$\mathbf{CE_{p,icl}}$
Data unit	Dimensionless
Description	Average combustion efficiency of the carbon pool *p* in the forest class *icl*
Source of data	VM0015 methodology
Value Applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	Presented by VM0015 methodology
Measurement Frequency	Only once at Project start
QA/QC procedures to be applied	N/A

Any comment	N/A

Data / Parameter	**GWP_{CH4}**
Data unit	Dimensionless
Description	Global warming potential for CH4 (IPCC default value = 21 for the first commitment period)
Source of data	VM0015 methodology
Justification of choice of data or description of measurement methods and procedures applied	Presented by the VM0015 methodology
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**DLF**
Data unit	%
Description	Displacement leakage factor
Source of data	VM0015 Methodology
Value Applied	0
Justification of choice of data or description of measurement methods and procedures applied	Presented in the VM0015 methodology. The value is an ex-ante estimation.
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**LKB**

Data unit	%
Description	Percentage of the overlapping leakage belts area to be assigned to project, A,B,…N
Source of data	Map of distance to selective logging from tertiary roads Map of distance to rivers Project area forest cover benchmark map
Justification of choice of data or description of measurement methods and procedures applied	The data was generated using Landsat Imagery that is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB. Relevance of the variable is recognized in the literature
Measurement Frequency	At project start and at each verification
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	$\mathbf{RF_t}$
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	AFOLU Non-Permanence Risk Tool V3.1
Justification of choice of data or description of measurement methods and procedures applied	The value was calculated as a result of applying the guidelines in the aforementioned tool
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	$\mathbf{R_j}$
Data unit	Dimensionless
Description	Root-shoot ratio appropriate for species, group of species of

	forest type *j*
Source of data	IPCC Good Practice Guidance for Land Use Table 3.3.8
Value Applied	0.22
Justification of choice of data or description of measurement methods and procedures applied	Is the lowest value presented in the document for Tropical Wet forests in the IPCC"s tables.
Measurement Frequency	Only once at Project start
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**C*wp***
Data unit	tCO_2-e ha^{-1}
Description	Average carbon stock per hectare in the harvested wood products carbon pool
Source of data	Logging intensity Co-efficient of Volumetric efficiency Carbon Stock Change Factor Carbon Fraction for tree specie *j* Basic Wood density in specie *j*
Justification of choice of data or description of measurement methods and procedures applied	Logging intensity was used as a default for Para as presented by Putz et al. 2008 Coefficient of Volumetric equation is an official default from CONOMA Wood density is a default value from IPCC 2003 Carbon Stock change factor was calculated using the lowest boundary of the 90% CI
Measurement Frequency	Only once at project start and when mandatory
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	$\Delta Ctot_{ct,t}$
Data unit	tCO_2-e ha^{-1}
Description	Carbon stock change factor (also called emission factor) for all accounted carbon pools in category *ct at time t*
Source of data	Calculated
Value Applied	798.02
Justification of choice of data or description of measurement methods and procedures applied	Value calculated based on the corrected values of carbon density for each pool at the lowest boundary of the 90% CI
Measurement Frequency	Only once at Project start and when mandatory
QA/QC procedures to be applied	Lowest boundary of the 90% CI for carbon values in all pools
Any comment	N/A

Data / Parameter	**Map of distance to selective logging from tertiary roads**
Data unit	Kms
Description	Average distance from tertiary roads to areas presenting selective logging
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post-processing can be found in the excel sheet submitted to VVB. Relevance of the variable is recognized in the literature
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	Random sampling of several points in different areas
Any comment	N/A

Data / Parameter	**Map of distance to rivers**

Data unit	Kms
Description	Raster map of distances from navigable rivers in the RRD
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**Map of distance to roads**
Data unit	Kms
Description	Raster map of distances from all roads in the RRD
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**Map of distance to non-forest**
Data unit	Kms
Description	Raster map of distances from non-forest areas in the RRD
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained

	from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**Logging intensity**
Data unit	m3/ha
Description	Volume of commercial timber extracted per hectare in Para
Source of data	Putz et al. 2008
Value Applied	30
Justification of choice of data or description of measurement methods and procedures applied	Data comes a peer reviewed publication
Measurement Frequency	At project start
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**Coefficient of Volumetric Efficiency**
Data unit	NA
Description	Proportion of wood that actually makes it all the way to durable wood products
Source of data	CONAMA 2009
Value Applied	0.45
Justification of choice	Data comes from an official source

of data or description of measurement methods and procedures applied	
Measurement Frequency	At project start
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**EI**
Data unit	%
Description	Ex-ante estimated effectiveness index
Source of data	Calculated
Justification of choice of data or description of measurement methods and procedures applied	Based on results from ongoing on-site monitoring activities since 2008
Measurement Frequency	At project start and annually
QA/QC procedures to be applied	Based on accuracy assessment in Annex submitted
Any comment	N/A

Notation	Description	Unit	Equation	Observation
A	Area of error due to observed change predicted as persistence	Ha	13	Was not used / Does not apply
$Average_i$	Area of "average" forest land suitable for conversion to non-forest land within stratum	Ha	5.b, 6.b, 10	Was not used / Does not apply

$Average_{i,t1}$	Area with forest cover in stratum *i* on "average" areas at time *t1*	Ha	6.b	Was not used / Does not apply
$Average_{i,t2}$	Area with forest cover in stratum *i* on "average" areas at time *t2*	Ha	6.b	Was not used / Does not apply
$ABSLL_{fcl,t}$	Area of final (post-deforestation) non-forest class *fcl* deforested at time *t* within the leakage belt in the baseline case	Ha	14	Was not used / Does not apply
$ABSLLK_{ct,t}$	Area of category *ct* deforested at time *t* within the leakage belt in the baseline case	Ha	15	Was not used / Does not apply
$ABSLLK_{icl,t}$	Area of initial (pre-deforestation) forest class *icl* deforested at time *t* within the leakage belt in the baseline case	Ha	14	Was not used / Does not apply
$ABSLPA_{ct,t}$	Area of category *ct* forest deforested at time *t* within the project area in the baseline case	Ha	15	Was not used / Does not apply
$ABSLPA_{fct,t}$	Area of final (post-deforestation) non-forest class *fcl* deforested at time *t* within the project area in the baseline case	Ha	14	Was not used / Does not apply
$ABSLP_{icl,t}$	Area of initial (pre-deforestation) forest class *icl* deforested at time *t* within the project area in the baseline case	Ha	14	Was not used / Does not apply
$ABSLRRopt\_hrp_{i}$	Average area deforested in $Average_{i}$	Ha	5.a	Was not used / Does not apply

	during the historical reference period			
$ABSLRR_{fcl,t}$	Area of final (post-deforestation) non-forest class *fcl* deforested at time *t* within the reference region in the baseline case	Ha	14	Was not used / Does not apply
$ABSLRR_{i,t}$	Annual area of baseline deforestation in stratum *i* with the reference region at year *t*	Ha	2, 3, 4, 5, 6, 7, 8, 9, 10, 11,12	Was not used / Does not apply
$ABSLRR_{i,taverage}$	Annual area of baseline deforestation in stratum *i* with the reference region at year $taverage_i$	Ha	11	Was not used / Does not apply
$ABSLRR_{icl,t}$	Area of initial (pre-deforestation) forest class *icl* deforested at time *t* within the reference region in the baseline case	Ha	14	Was not used / Does not apply
$ABSLRRopt\_hrp_i$	Average area deforested in $Aoptimal_i$ during the historical reference period	Ha	5.b	Was not used / Does not apply
$ABSLRRopt\_hrp_i$	Average area deforested in $Asuboptimal_i$ during the historical reference period	Ha	5.c	Was not used / Does not apply
$ABSLRR_{i,taverage}$	Annual area of baseline deforestation in stratum I with the reference region at a year $taverage_i$	Ha yr^{-1}	11	Was not used / Does not apply
$Aoptimal_i$	Area of “optimal” forest land suitable for	Ha	3, 7	Was not used / Does not apply

	conversion to non-forest land within stratum *i*			
A*optimal*$_{i,t1}$	Area of forest cover in stratum *i* on optimal areas at time *t1*	Ha	6.a	Was not used / Does not apply
A*optimal*$_{i,t2}$	Area of forest cover in stratum *i* on optimal areas at time *t2*	Ha	6.a	Was not used / Does not apply
AP	Plot Area	m^2	A3-13	Was not used / Does not apply
APDPA$_{icl,t}$	Areas of planned deforestation in forest class *icl* at year *t* in the project area	Ha		Was not used / Does not apply
APF$_{icl,t}$	Annual area of planned fuel-wood and charcoal activities in forest-class *icl* at year *t* in the project area	Ha		Was not used / Does not apply
APLPA$_{icl,t}$	Areas of planned logging activities in forest class *icl* at year *t* in the project area	Ha		Was not used / Does not apply
APNiPA$_{icl,t}$	Annual area of forest class *icl* with increasing carbon stock without harvest at year *t* in the project area	Ha		Was not used / Does not apply
ARR*average*$_{i,t1}$	Area with forest cover in stratum *i* on average and sub-optimal areas at time *t1*	Ha	4.b	Was not used / Does not apply
ARR*average*$_{i,t2}$	Area with forest cover in stratum *i* on average and sub-optimal areas at time *t2*	Ha	4.b	Was not used / Does not apply

ARR_i	Total forest area in stratum *i* within the reference region at the project start date	Ha	6, 11	Was not used / Does not apply
$ARR_{i,t-1}$	Area with forest cover in stratum *i* within the reference region a year *t-1*	Ha	3	Was not used / Does not apply
$ARRoptimal_{i,t1}$	Area with forest cover in stratum *i* on optimal areas at time *t1*	Ha	4.a	Was not used / Does not apply
$ARRoptimal_{i,t2}$	Area with forest cover in stratum *i* on optimal areas at time *t2*	Ha	4.a	Was not used / Does not apply
$ARRsub\text{-}optimal_{i,t1}$	Area with forest cover in stratum *i* on sub-optimal areas at time *t1*	Ha	4.c	Was not used / Does not apply
$ARRsub\text{-}optimal_{i,t2}$	Area with forest cover in stratum *i* on sub-optimal areas at time *t2*	Ha	4.c	Was not used / Does not apply
$Asub\text{-}optimal_{i,t1}$	Area with forest cover in stratum *i* on "sub-optimal" areas at time *t1*	Ha	6.c	Was not used / Does not apply
$Asub\text{-}optimal_{i,t2}$	Area with forest cover in stratum *i* on "sub-optimal" areas at time *t2*	Ha	6.c	Was not used / Does not apply
B	Area correct due to observed change predicted as change	Ha	13	Was not used / Does not apply
BCEF	Biomass conversion and expansion factor for conversion of merchantable volume of total aboveground tree biomass	Dimensionless	A3-9, A3-36	Was not used / Does not apply
BEF*pl*	Biomass expansion factor for converting	Dimensionless	A3-21	Was not used /

	volumes of extracted round wood to total above-ground biomass (including bark), applicable to tree tr, in plot pl			Does not apply
Cab_{cl}	Average carbon stock per hectare in above-ground biomass carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-6, A3-14, A3-36	Was not used / Does not apply
$Cabnt_{cl}$	Average carbon stock per hectare in the above-ground non-tree biomass carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-7, A3-24	Was not used / Does not apply
$Cabt_{cl}$	Average carbon stock per hectare in the above-ground tree biomass carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-7	Was not used / Does not apply
Cbb_{cl}	Average carbon stock per hectare below-ground biomass carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-6, A3-17	Was not used / Does not apply
$Cbbnt_{cl}$	Average carbon stock per hectare below-ground non-tree biomass carbon pool of LU/LC Class *cl*	tCO_2-e ha^{-1}	A3-8	Was not used / Does not apply
$Cbbt_{cl}$	Average carbon stock per hectare below-ground tree biomass carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-8	Was not used / Does not apply
Cdw_{cl}	Average carbon stock per hectare in the dead wood biomass carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-6, A3-25	Was not used / Does not apply

CF_{dc}	Carbon fraction of the density class *dc*	Tonnes C (tonne d.m)$^{-1}$	A3-30	Was not used / Does not apply
cl	1,2,3,…cl LU/LC Classes	Dimensionless	A3-3	Was not used / Does not apply
Cl_{cl}	Average carbon stock per hectare in the litter carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-6	Was not used / Does not apply
$Cldw_{cl}$	Average carbon stock per hectare in lying dead wood carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-25, A3-30	Was not used / Does not apply
$Csdw_{cl}$	Average carbon stock per hectare in standing dead wood carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-25	Was not used / Does not apply
$Csoc_{cl}$	Average carbon stock per hectare in soil organic carbon pool of LU/LC class *cl*	tCO_2-e ha^{-1}	A3-6, A3-33	Was not used / Does not apply
$Csoc_{pl}$	Carbon stock per hectare in the soil organic carbon pool estimated for the plot *pl*	tCO_2-e ha^{-1}	A3-33	Was not used / Does not apply
ct	1,2,3,… CT categories of LU/LC change	Dimensionless	15	Was not used / Does not apply
$CXB_{w,icl,t}$	Mean carbon stock per hectare of extracted biomass carbon by class of wood product *w* for forest class *icl* at time *t*	tCO_2-e ha^{-1}	A3-35, A3-37	Was not used / Does not apply
d1, d2,…, dn	Diameters of intersecting pieces of dead wood	cm	A3-29	Was not used / Does not apply
DBI	Daily biomass intake	kg d.m. head^{-1} day^{-1}	A4-2	Was not used / Does not apply

dc	1,2,3, dead wood density classes	Dimensionless	A3-30	Was not used / Does not apply
DC	Total number of density classes (3)	Dimensionless	A3-30	Was not used / Does not apply
$\Delta CBSLPA_t$	Total baseline carbon stock change within the project area at year *t*	t CO_2-e	14, 25	Was not used / Does not apply
ΔCdw_{ct}	Average carbon stock change factor in the dead wood biomass carbon pool of category *ct*	tCO_2-e ha^{-1}		Was not used / Does not apply
$\Delta CFCdPA_t$	Total decrease in carbon stock due to forest fires and catastrophic events at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CFCiPA_t$	Total increase in carbon stock due to forest fires and catastrophic events at year t in the project area	tCO_2-e		Was not used / Does not apply
ΔCLK_t	Total decrease in carbon stocks within the leakage belt at year *t*	tCO_2-e		Was not used / Does not apply
$\Delta CPAdPA_t$	Total decrease in carbon stock due to planned activities at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CPAiPA_t$	Total increase in carbon stock due to planned activities at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CPDdPA_t$	Total decrease in carbon stock due to planned deforestation at year *t* in the project area	tCO_2-e		Was not used / Does not apply

$\Delta CPFdPA_t$	Total decrease in carbon stock due to planned fuel-wood and charcoal activities at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CPFiPA_t$	Total increase in carbon stock due to planned fuel-wood and charcoal activities at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CPLdPA_t$	Total decrease in carbon stock due to planned logging activities at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CPLiPA_t$	Total increase in carbon stock due to planned logging activities at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CPNiPA_t$	Total increase in carbon stock due to planned protection of growing forest classes in the project area at year *t*	tCO_2-e		Was not used / Does not apply
$\Delta CPSPA_t$	Total project carbon stock change within the project area at year *t*	tCO_2-e	25	Was not used / Does not apply
$\Delta Csoc_{ct}$	Average carbon stock change factor in the soil organic carbon pool of category *ct*	tCO_2-e ha^{-1}		Was not used / Does not apply
$\Delta CUCdPA_t$	Total decrease in carbon stock due to catastrophic events at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CUCiPA_t$	Total increase in carbon stock due to catastrophic events at	tCO_2-e		Was not used / Does not apply

	year *t* in the project area			
$\Delta CUDdPA_t$	Total actual carbon stock change due to unavoided unplanned deforestation at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CUFdPA_t$	Total decrease in carbon stock due to unplanned (and planned – where applicable) forest fires at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$\Delta CUFiPA_t$	Total increase in carbon stock in areas affected by forest fires (after such events) at year *t* in the project area	tCO_2-e		Was not used / Does not apply
ΔCwp_{ct}	Average carbon stock change factor in harvested wood products carbon pool (stock remaining in wood products after 100 years) of category *ct*	tCO_2-e ha^{-1}		Was not used / Does not apply
D_{dc}	Dead wood density of class *dc*	tonnes d.m. m^{-3}	A3-30	Was not used / Does not apply
Dm	Deadwood density	g cm^{-3}	A3-28	Was not used / Does not apply
DM_{pl}	Dry mass of sample *pl*	tonnes of d.m.	A3-24	Was not used / Does not apply
$EBBBSLPA_t$	Sum of (or total) baseline non-CO_2 emissions from forest fire at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$EBBCO2_{icl}$	Per hectare CO_2 emissions from biomass	tCO_2-e ha^{-1}	17, 18, 19	Was not used / Does not apply

	burning in slash and burn in forest class *icl*			
$EBBN2O_{icl}$	N_2O emissions from biomass burning in forest class *icl*	tCO_2-e	16, 17	Was not used / Does not apply
$EBBPSPA_t$	Sum of (or total) actual non-CO_2 emissions from forest fire at year *t* in the project area	tCO_2-e		Was not used / Does not apply
$EBBtot_{icl}$	Total GHG emissions from biomass burning in forest class *icl*	tCO_2-e	16	Was not used / Does not apply
$ECH4ferm_t$	CH_4 emissions from enteric fermentation at year *t*	tCO_2-e	A4-1	Was not used / Does not apply
$ECH4man_t$	CH_4 emissions from manure management at year *t*	tCO_2-e	A4-3	Was not used / Does not apply
$EdirN2Oman_t$	Direct N_2O emissions from manure management at year *t*	tCO_2-e	A4-4, A4-5	Was not used / Does not apply
EF1	Enteric CH_4 emission factor for the livestock group	Kg CH_4 head^{-1} yr^{-1}	A4-1	Was not used / Does not apply
EF1	Emission factor for emissions from N inputs	tN_2O tN^{-1}		Was not used / Does not apply
EF2	Manure management CH_4 emission factor for the livestock group	Kg CH_4 head^{-1} yr^{-1}	A4-3	Was not used / Does not apply
EF3	Emission factor for N_2O emissions from manure management for the livestock group	Kg N_2O-N (kg N^{-1}) head^{-1} yr^{-1}	A4-5	Was not used / Does not apply
EF4	Emission factor for N_2O emissions from atmospheric deposition	Kg N_2O-N (kg NH_3-N and NO_x-N	A4-6	Was not used / Does not apply

	of forage-sourced nitrogen on soils and water surfaces	emitted)-1 $head^{-1}$ yr^{-1}		
$EgLK_t$	Emissions from grazing animals in leakage management areas at year *t*	t CO_2-e	23	Was not used / Does not apply
$EindNOman_t$	Indirect N_2O emissions from manure management at year *t*	t CO_2-e	A4-4, A4-5	Was not used / Does not apply
ELK_t	Sum of ex-ante estimated leakage emission at year *t*	t CO_2-e	23	Was not used / Does not apply
$EN2Oman_t$	N_2O emissions from manure management at year *t*	t CO_2-e	A4-4	Was not used / Does not apply
ERN2O	Emission factor for N2O (IPCC default value = 0.007)	Dimensionless	17	Was not used / Does not apply
fcl	1,2,3,…fcl final (post-deforestation) non-forest classes	Dimensionless	14	Was not used / Does not apply
GWP_{N2O}	Global warming potential for N_2O (IPCC default value = 310 for the first commitment period)	Dimensionless	17	Was not used / Does not apply
H	Height of the tree	Meters	A3-27	Was not used / Does not apply
i	1,2,3,…$I_{RR}A$ Stratum within the reference region	Dimensionless	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	Was not used / Does not apply
icl	1,2,3,…icl initial (pre-deforestation) forest classes	Dimensionless	14	Was not used / Does not apply

j	Number of organic fertilizer classes	Dimensionless		Was not used / Does not apply
L	Length of the line	m	A3-29	Was not used / Does not apply
NCR	Nitrogen/Carbon ratio (IPCC default value = 0.01)	Dimensionless	17	Was not used / Does not apply
Nex	Annual average N excretion per livestock head	kg N $head^{-1}$ yr^{-1}	A4-6	Was not used / Does not apply
OF_W	Fraction of wood products that will be emitted to the atmosphere between 5 and 100 years of timber harvest	Dimensionless	A3-35, A3-37	Was not used / Does not apply
p	Carbon pool that could burn (above-ground biomass, deadwood and litter)	Dimensionless	19	Was not used / Does not apply
$PCab_{pl}$	Carbon stock in above-ground biomass in plot *pl*	tC ha^{-1}	A3-13	Was not used / Does not apply
$PCbb_{pl}$	Carbon stock in below-ground biomass in plot *pl*	tC ha^{-1}	A3-16	Was not used / Does not apply
$Pcom_{icl}$	Commercial volume as a percent of total aboveground volume in initial forest class *icl*	Dimensionless	A3-36	Was not used / Does not apply
PCx_i	Average in situ production costs for one ton of product Px in stratum *i*	$/t	1	Was not used / Does not apply
$Pforage_t$	Production of forage at year *t*	kg d. m. yr^{-1}	A4-2	Was not used / Does not apply

pl	1,2,3,…*PLcl* plots in LU/LC class *cl*	Dimensionless	A3-14, A3-17, A3-24, A3-33	Was not used / Does not apply
PL_{cl}	Total number of plots in LU/LC class *cl*	Dimensionless	A3-14, A3-17, A3-24, A3-34	Was not used / Does not apply
Po	Anhydrous weight of sample	g	A3-28	Was not used / Does not apply
$Population_t$	Equivalent number of forage-fed livestock at year *t*	number of heads	A4-1	Was not used / Does not apply
$PP_{i,t}$	Proportion of stratum *i* that is within the project area at time *t*	%	12	Was not used / Does not apply
PPx_i	Potential profitability of product Px at the location / (pixel or polygon)	$/t	1	Was not used / Does not apply
Ps	Saturated weight of sample	g	A3-28	Was not used / Does not apply
Px	Product x produced in the reference region	Dimensionless	1	Was not used / Does not apply
r1	Radius at the base of the tree	meters	A3-27	Was not used / Does not apply
r2	Radius at the top of the tree	meters	A3-27	Was not used / Does not apply
$RBSLRR\_avg_{i,t}$	Deforestation rate applicable to stratum *i* within the reference region at year *t* after $Toptimal_i$ years and during $Taverage_i$ years	%	4.b	Was not used / Does not apply
$RBSLRR\_opt_{i,t}$	Deforestation rate applicable to stratum *i* within the reference region at year *t* during	%	4.a	Was not used / Does not apply

	the first $Toptimal_i$ years			
$RBSLRR\_sopt_{i,t}$	Deforestation rate applicable to stratum I within the reference region at year t after $Toptimal_i$ + $Taverage_i$ and during $Tsub\text{-}optimal_i$ years	%	4.c	Was not used / Does not apply
$RBSLRR_{i,t}$	Percentage of remaining forest area at year *t-1* in stratum *i* to be deforested at year *t*	%	11	Was not used / Does not apply
$R_{j,pl,tr}$	Root-shoot ratio, applicable to tree *tr* of species *j* in plot *pl*	Dimensionless	A3-22	Was not used / Does not apply
S$x	Selling price of product Px	$/t	1	Was not used / Does not apply
SLF_w	Fraction of wood products that will be emitted to the atmosphere within 5 years of timber harvest	Dimensionless	A3-35, A3-37	Was not used / Does not apply
SPx_l	Selling point I of product Px	map	1	Was not used / Does not apply
t	1,2,3,…T a year of the proposed crediting period	Dimensionless	Almost all equations	Was not used / Does not apply
*t**	The year at which the area $ABSLPA_{fcl,t}$ is deforested in the baseline scenario	Dimensionless	A3-34	Was not used / Does not apply
$Taverage_i$	Number of years in which $Aaverage_i$ is deforested in the baseline case	yr	5	Was not used / Does not apply
$taverage_i$	Year at which $Taverage_i$	yr	9, 11	Was not used /

	ends			Does not apply
$TBab_j$	Above-ground biomass of a tree of species, or species group, or forest type *j*	kg tree^{-1} or t tree^{-1}	A3-10	Was not used / Does not apply
$TBab_{tr}$	Above-ground biomass of tree *tr*	kg tree^{-1} or t tree^{-1}	A3-11, A3-13, A3-21	Was not used / Does not apply
$TCab_{tr}$	Carbon stock in above-ground biomass of tree *tr*	kg tree^{-1} or t tree^{-1}	A3-11, A3-21	Was not used / Does not apply
$TCbb_{tr}$	Carbon stock in below-ground biomass of tree *tr*	kg C tree^{-1}	A3-16, A3-22	Was not used / Does not apply
TC_v	Average transport cost per kilometer for one ton of product Px on land, river or road of type *v*	$/t/km	1	Was not used / Does not apply
TD_v	Transport distance on land, river or road of type *v*	$/t/km	1	Was not used / Does not apply
Thrp	Duration of the historical reference period	yr	2	Was not used / Does not apply
$Toptimal_i$	Number of years since the start of the AUFD project activity in which *Aoptimal* in stratum *i* is deforested in the baseline case	yr	5	Was not used / Does not apply
$toptimal_i$	Year at which $Toptimal_i$ ends	yr	7, 8, 9	Was not used / Does not apply
tr	1,2,3,…TRpl number of trees in plot *pl*	Dimensionless	A3-13	Was not used / Does not apply
$Tsub\text{-}optimal_i$	Number of years in which $Asub\text{-}optimal_i$ is deforested in the	yr	5	Was not used / Does not apply

	baseline case			
v	1,2,3,…V type of surface on which transport occurs	Dimensionless	1	Was not used / Does not apply
$V1_{i,t};V2_{i,t};\ldots;Vn_{i,t}$	Variables included in a deforestation model		11	Was not used / Does not apply
VBC_t	Number of Voluntary Buffer Credits deposited in the VCS Buffer at time *t*	t CO_2-e	24, 25	Was not used / Does not apply
VCU_t	Number of Voluntary Carbon Units (VCUs) to be made available for trade at time *t*	t CO_2-e	24	Was not used / Does not apply
VEF	Volume Expansion Factor	Dimensionless	A3-9	Was not used / Does not apply
$VEX_{w,j,fcl,t}$	Volume of timber for product class *w*, of species *j*, extracted from within forest class *fcl*, at time *t*	m^3	A3-34	Was not used / Does not apply
VOB10	Volume over bark above 10cm DBH	m^3	A3-9	Was not used / Does not apply
VOB30	Volume over bark above 30cm DBH	m^3	A3-9	Was not used / Does not apply
$Volume_{dc}$	Volume of lying dead wood in the density class *dc*	m^3	A3-30	Was not used / Does not apply
V_{pl}	Commercial volume of plot *pl*	m^3 $plot^{-1}$	A3-19	Was not used / Does not apply
V_{tr}	Commercial volume of tree *tr*	m^3	A3-18, A3-21	Was not used / Does not apply
w	1,2,3,… W wood product class (sawn-wood, wood-based	Dimensionless	A3-34	Was not used / Does not apply

	panels, other industrial round-wood, paper and paper board, and other)			
WW_w	Wood waste for wood product class *w*. the fraction immediately emitted through mill inefficiency	Dimensionless	A3-35, A3-37	Was not used / Does not apply
XF	Plot expansion factor form per plot values to per hectare values	Dimensionless	A3-12, A3-13, A3-16, A3-19, A3-20, A3-24	Was not used / Does not apply

3.2 Data and Parameters Monitored

Data / Parameter	**RRD Forest / Non-Forest cover benchmark Map**
Data unit	Ha
Description	Map showing LULC class forest and non-forest at project start date
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**Project area forest cover benchmark map**
Data unit	Ha
Description	Map that shows the stratification and location of LULC class

	forest in the project area at the project start date (100% forest cover)
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**Leakage belt forest cover benchmark map**
Data unit	Ha
Description	Map that shows the stratification and location of LULC class forest in the leakage belt at the project start date (100% forest cover)
Source of data	Landsat imagery from 1996, 2004, 2008 and 2012 obtained from INPES website
Justification of choice of data or description of measurement methods and procedures applied	The data is available to the public free of charge. Details about data pre and post processing can be found in the excel sheet submitted to VVB.
Measurement Frequency	At the start of every fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$ABSLRR_t$**
Data unit	Ha

Description	Annual area of baseline deforestation in the reference region at year *t*
Source of data	Calculated based on the results from future deforestation model using peer-reviewed software IDRISI Selva
Justification of choice of data or description of measurement methods and procedures applied	Variables and procedures to calculate baseline deforestation are thoroughly explained in the excel sheet submitted to VVB.
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$ABSLPA_t$**
Data unit	Ha
Description	Annual area of baseline deforestation in the project area at year *t*
Source of data	Calculated based on the results from future deforestation model using peer-reviewed software IDRISI Selva
Justification of choice of data or description of measurement methods and procedures applied	Variables and procedures to calculate baseline deforestation are thoroughly explained in the excel sheet submitted to VVB.
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**$ABSLLK_t$**
Data unit	Ha
Description	Annual area of baseline deforestation in the leakage belt at

	year *t*
Source of data	Calculated based on the results from future deforestation model using peer-reviewed software IDRISI Selva
Justification of choice of data or description of measurement methods and procedures applied	Variables and procedures to calculate baseline deforestation are thoroughly explained in the excel sheet submitted to VVB.
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**LULC Change**
Data unit	%
Description	Percentage of forest that change to non-forest final classes during the historical reference period
Source of data	Landsat imagery from 1996, 2004 and 2008 obtained from INPES website. SEMA (2010) Economic-ecological zoning information for the northern area of Para
Justification of choice of data or description of measurement methods and procedures applied	Landsat imagery is available to the public free of charge. Details about data pre and post-processing can be found in the excel sheet submitted to VVB. SEMA"s data is available to the public and is the most up to date and scale adequate official data for the project area
Measurement Frequency	At project start
QA/QC procedures to be applied	Through accuracy assessment in the excel sheet submitted to VVB.
Any comment	N/A

Data / Parameter	**DLF**
Data unit	%
Description	Displacement Leakage factor
Source of data	VM0015 methodology
Value Applied	0
Justification of choice of data or description of measurement methods and procedures applied	Presented in the VM0015 methodology. The value is an ex-ante estimation
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**%LKB**
Data unit	%
Description	Percentage of the overlapping leakage belts area to be assigned to project A,B,…N
Source of data	Map of distance to selective logging from tertiary roads Map of distance to rivers Project area forest cover benchmark map
Justification of choice of data or description of measurement methods and procedures applied	The data was generated using Landsat imagery that is available to the public free of charge. Details about pre and post-processing can be found in the excel sheet submitted to VVB. Relevance of the variable is recognized in the literature
Measurement Frequency	At project start and at each verification
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	RF_t
Data unit	%
Description	Risk factor used to calculate VCS buffer credits
Source of data	a
Justification of choice of data or description of measurement methods and procedures applied	The value was calculated as a result of applying the guidelines in the aforementioned tool
Measurement Frequency	Each renewal of fixed baseline period
QA/QC procedures to be applied	N/A
Any comment	N/A

Data / Parameter	**EI**
Data unit	%
Description	Ex ante estimated effectiveness index
Source of data	Calculated
Justification of choice of data or description of measurement methods and procedures applied	Based on results from ongoing on-site monitoring activities since 2008
Measurement Frequency	At project start and annually
QA/QC procedures to be applied	Based on accuracy assessment in Annex submitted
Any comment	N/A

3.3 Description of Monitoring Plan

Quality control and quality assurance procedures:

As monitoring will be conducted mainly by using remote sensing imagery in a GIS environment, quality management procedures are related with GIS data quality. When working with

geographical information, positional accuracy is often synonymous with data quality. Data compilation from several different sources often requires very good data quality.

Quality procedures must be employed to ensure that data are properly collected, handled, processed, used and maintained throughout the data lifecycle while performing monitoring activities.

For Satellite Images, GIS and GPS data:

Quality Management Procedures before data collection:

- Monitoring will be done by trained project personnel, understanding the importance of accurate data collecting.

- Format: Satellite Images will be collected in TIFF raster digital format. Vector files will be collected in shapefile GIS format. GPS will also be collected in digital format.

- Spatial Reference: Data will always use the Projected UTM System, South 22 Zone, Datum WGS84.

- Imagery: Landsat LCDM (Landsat 8) is the type of image selected for permanent monitoring.

- Source: Imagery will be downloaded from the US Geologic Survey website (currently http://glovis.usgs.gov/).

- Responsibility for quality assurance will be assigned to a person with adequate background suitable to the task.

- References on GPS and satellite images calibration are described in this document in the section “Equipment calibration”.

- Metadata: Metadata will be created for the data to be collected.

- GPS accuracy: To obtain accuracies such as those reported, the GPS Receiver must be located in an area that is free from overhead obstructions and reflective surfaces and have a good field of view to the horizon (for example, they do not work very well under a heavy forest canopy). Data coordinates will be collected in meters using the spatial reference units noted above.

- The staff member for monitoring evaluates the data gathering team to identify errors in field techniques, verify measurements processes and correct any identified problems before measurements are carried out.

Quality Management Procedures during data entry:

- Protocols and Guides: Data in digital formats must be treated according to protocols on data management. Methodology to process and classify satellite images must be carried out according to the annexed section on “Classification and Accuracy Assessment”.

- Design an efficient storage system for the data: Data will be stored in a computerized

database for use with specialized software (GPS, GIS, Remote sensing) for processing it. One person should be in charge of managing this dataset.

- All modifications to the dataset shall be documented.

Quality Management Procedures after data entry:

- Regular backup of data helps ensure consistent quality levels.

- Data integrity: Data should not be altered or destroyed in an unauthorized manner, or should not be accidentally or maliciously modified.

- Data integration: Geographical datasets are difficult to integrate when there are inconsistencies between them, which may involve both the spatial and attributes characteristics of the data.

- Given the timeframe of the project, and the pace of production of updated versions of software and new hardware for storing data, electronic copies of data and reports will be periodically updated or converted to a format that can be assessed by any future software applications.

All activities included in the Monitoring Plan are documented, as guides or protocols to be used permanently. It is required a data quality testing in each phase of data capture, including validation of GPS coordinates measured in the field (at a level community scale), choice of relevant data from a relevant source, positional accuracy of satellite images and GIS data, using automated GIS software tools and accuracy assessment of classified images.

Positional accuracy in satellite images.

It is very important to ensure that remote sensing images in a time series overlay properly to each other and to other GIS maps used in the analysis. To geometrically correct the acquired images, it is necessary to have at least one orthorectified image to use as a reference image, and to undertake a process called georeferencing.

Images will be geometrically corrected to the projection UTM Zone 22 South datum WGS 1984 using an orthorectified image by collecting manually selected control points in both images. Among the features to be identified as control point locations we have road or stream intersections, the mouth of a stream, the corner of an established plot, or roads corners. The second-order polynomial transformation and the nearest neighbor resampling technique could be used to correct images. RMS errors of less than one pixel obtained from the geometric correction process will be acceptable.

Accuracy of the baseline deforestation

Accuracy assessment will follow the guidelines of the document „Methodology Procedures Used in Processing, Classification, and Accuracy Assessment of Remotely Sensed Data" included the excel sheet submitted to VVB.

GHG emissions calculations

The tables to calculate GHG emission benefits from the project have been reviewed during the

verification process and errors have been corrected. A cell by cell review was performed to follow the formulas and values to make sure all were correct.

TASK 1: Monitoring changes in carbon stocks and GHG emissions for periodic verification

1.1 Monitoring actual changes in carbon stocks and GHG emissions in the project area;

1.2 Monitoring leakage;

1.3 Ex-post calculation of GHG emission reductions.

1.4 Monitoring the impacts of natural disturbances and other catastrophic events.

1.1 Monitoring actual changes in carbon stocks and GHG emissions in the project area

1.1.1 Monitor the Implementation of the project

This task of developing the monitoring report was the responsibility of Ecosystem Services LLC starting in 2013. However, there has been a change in service provider for developing the monitoring report from Ecosystem Services LLC to Kanaka Management Services Ltd for this verification period. The landowner was in charge of sending patrol brigades to the project area to identify loggers and squatters. The monitoring activities are done by STA solutions located in Belem.

Monitoring waste conducted mainly by using remote sensing imagery. Remotely sensed data have been widely used as a cost effective tool in the mapping and monitoring of large areas (e.g. Danaher et al. 1998; Gould 2000; Mayaux et al. 2000; Freeman et al. 2002). Satellite optical or radar images could be used depending on the availability of the scenes, cloud cover and related acquisition and processing costs. Satellite images need be calibrated (pre-processing procedures) before performing the principal analysis. These preprocessing operations could include (1) radiometric preprocessing to adjust digital values for effects of a hazy atmosphere and/or (2) geometric preprocessing to bring an image into registration with a map or another image (Campbell and Wynne, 2011).

At the same time, monitoring brigades composed by local people will patrol the Project Area to dissuade any invasion or illegal logging attempt. Fieldwork will be done using a ground-based GPS approach to register the geographical position of any activity that need to be reported.

The Project Area was divided in brigades to better manage the extent of the Project Area and LMA and assure an effective on the ground monitoring. Brigade leaders will oversee the activities, compile, and analyze the results from monitoring patrols[3] (Figure 2). Brigade leaders will report to the office in Belem. These two offices will be responsible of informing local authorities about illegal activities happening in the Project Area and to follow up the enforcement of the required measures to remove invaders (Figure 3).

[3] Could be one leader overseeing all the patrols for each type of patrol. This will be decided after validation based on the results from the census

EQUIPMENT CALIBRATION

GPS

Besides any operational considerations when using a GPS receiver in the field, this equipment need not be calibrated for this monitoring. Average positional accuracy of most GPS receivers (15 meters) is enough to register monitoring activities in the field (i.e. location of loggers or squatters in the Project Area). GPS coordinates will be used 'for information only' and its accuracy is considered appropriate to clearly show in maps where any feature or activity in the Project Area is located.

Satellite Images

Monitoring will be conducted mainly by using remote sensing imagery. Before processing the image data to produce land cover maps, satellite imagery need be calibrated, this is, some preprocessing procedures must be applied to the imagery. These procedures enhance the quality of the image data by reducing or eliminating various radiometric and geometric errors caused by internal and external conditions.

a. Geometric correction procedures address errors in the relative position of pixels due to factors such as variation in altitude, attitude and velocity of the sensor platform, Earth curvature, panoramic distortion, relief displacement and non-linearities in the sweep of a sensor (Lillesand and Kiefer 1994). It is very important to ensure that images in a time series overlay properly to each other and to other GIS maps used in the analysis. To geometrically correct the images, it is necessary to have a spread of Ground Control Points (GCPs) located either on a 1:100,000 official topography or an orthorectified image, to undertake a process called georeferencing. For all resampling operations, we will use the Nearest Neighbor algorithm to maintain radiometric integrity of the image.

b. Radiometric correction procedures account for errors that affect the brightness value of pixels due to both a sensor system detector error and an environmental attenuation error (e.g. changes in scene illumination, atmospheric conditions and viewing geometry [Lillesand and Kiefer 1994]). One of these procedures involved conversion of the measured multiespectral brightness values to top of atmosphere reflectance units. This normalization procedure is crucial when creating multitemporal and/or multispatial mosaics as it largely removes variations between these images due to sensor differences, Earth-sun distance and solar zenith angle (caused by different scene dates, overpass time and latitude differences)(Bruce and Hilbert, 2004).

Figure 2: Activities management in the Project area

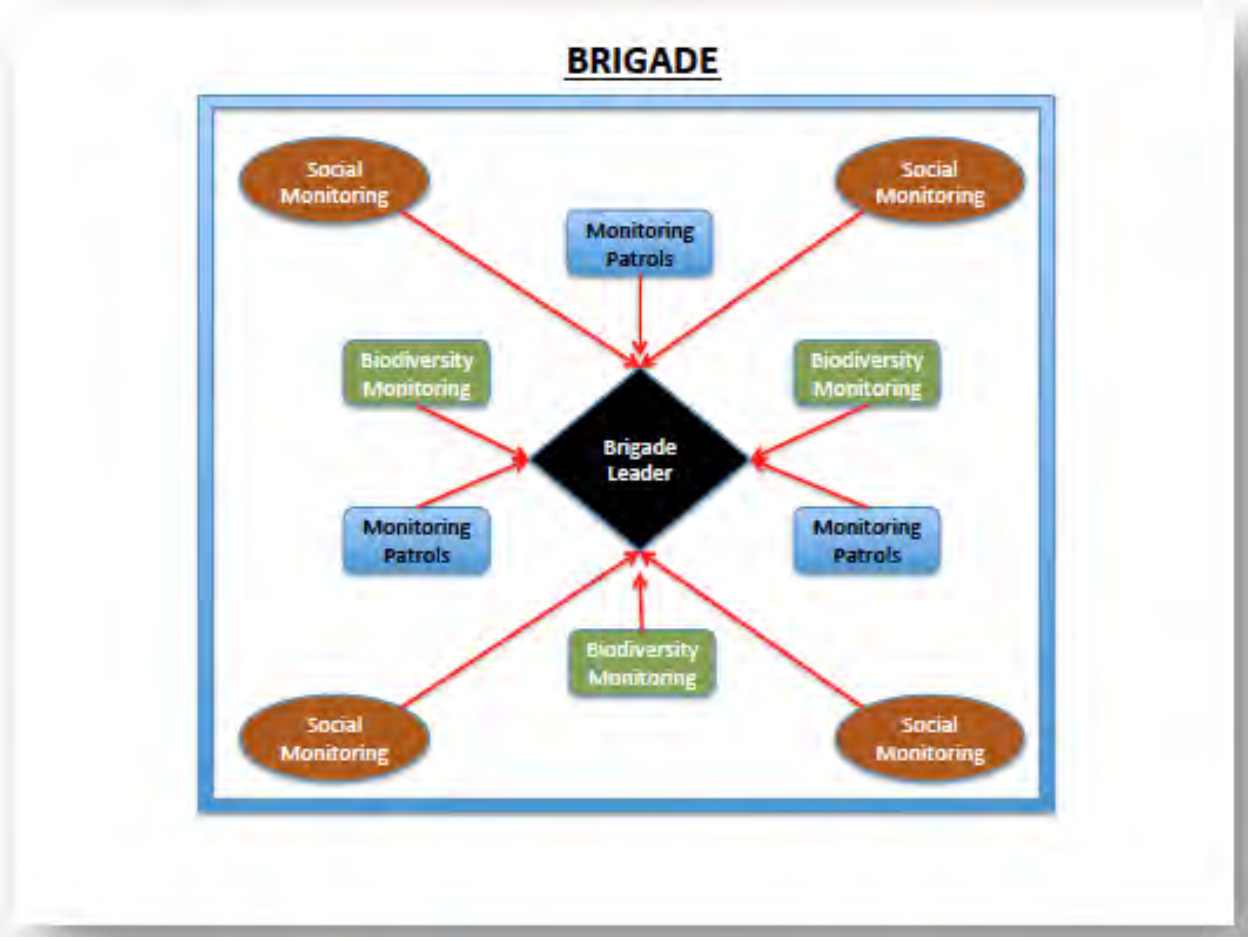
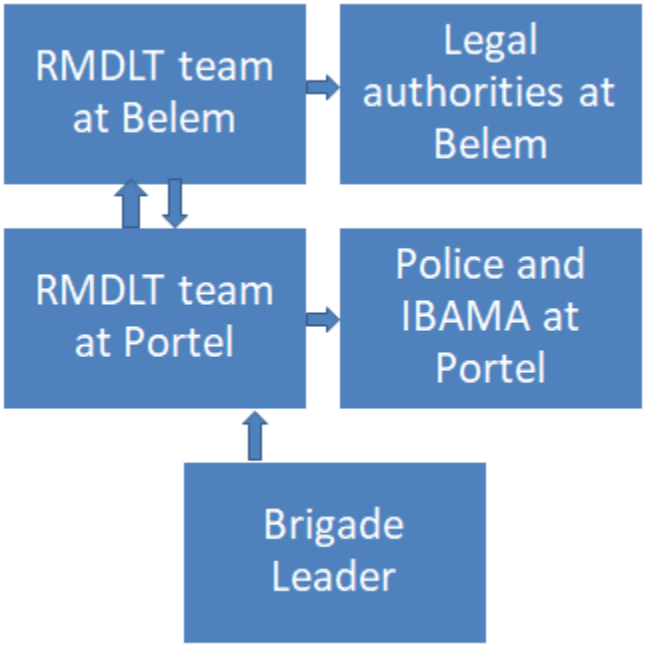


Figure 3: Activities to inform local authorities about illegal activities in the Project area



The activities of the Project and their monitoring can be grouped as follows:

1. Forest monitoring:

Monitoring of forest cover will be done mainly by remote sensing imagery. The choice of imagery will depend on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e Landsat) or radar (i.e Alos Palsar) or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually of by periods depending on the availability of scenes. Therefore, verification event could occur annually of by periods.

The fixed degradation frontier map will be updated at each verification event to account for areas that may have changed their carbon stocks due to unavoided illegal logging activities. The fixed degradation frontier will be assessed based on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e Landsat) or radar (i.e Alos Palsar) or a combination of both.

From 2008 to 2012 the landowner conducted monitoring by sending patrols to the Project Area. These patrols would generate a hand-written report in Portuguese and then a law firm hired by the landowner would clean the reports and translate these to English. During this period no GPS points were taken to identify the exact location of deforestation activities. All original hand-written repots and the official translations are available in digital formats.

Starting in 2013, patrolling activities will be scaled-up by hiring local people as forest monitoring patrols. There will be a responsible for each monitoring patrol who will generate monthly reports unless illegal activities are spotted, in which case a report should be submitted immediately as

described in the next section.

Of particular importance is the implementation of the surveillance system that will allow continuous monitoring of the Project Area to prevent the entry of squatters and illegal loggers. The objective of forest patrolling is to make evident the presence of the landowner and dissuade pioneer agents (i.e loggers, squatters) from encroaching the Project Area. This activity will function as a complement of remote sensing-based monitoring but will not replace it. Furthermore, the generation of carbon credits for avoided emissions will not rely on the results of patrolling,

The Project Area will be divided in brigades[4] to facilitate monitoring such a large area. Each Brigade leader will compile the information from patrolling reports into adequate digital format[5] all the information from the reports to keep track of the areas that are being patrolled each week and what are the findings of each patrol. Digital reports will be sent to the office in Belem to be organized and stored.

The actual size of a brigade and the numbers of villagers to be hired depends on the results from the census that will be conducted after validation. The area of a brigade will need to be a reasonable one to allow for an effective surveillance given available staff. If not enough local villagers are willing to work as monitoring staff; RMDLT will hire technicians from Portel or Breves.

Brigades will identify any illegal activities (invasions and timber extraction) and report them the brigade leader. If illegal activities are spotted, brigades should geo-reference the finding and make a short description of what was found. Brigades should approach squatters or loggers to let them know –in good terms- that this is private land, they cannot undertake such activities there and they should leave immediately.

With the information supplied by each patrol, brigade leaders will fill-up a monitoring report that will include at least the coordinates where the illegal activities are taking place, the date and a brief report of what was identified. Finally, each brigade leader will submit this information to the local police in Portel and to IBAMA in Portel and in Belem.
Monitoring reports should be numbered, filed appropriately, and be scanned to have digital copies in an archive as backup.

Once every two months, brigade leaders perform random site visits to verify that monitoring patrols are covering the assigned area and that each patrol is wearing the adequate field equipment. Brigade leaders should fill up a report that will be submitted to office in Belem. A monitoring patrol that does not wear adequate field equipment or does not cover the designed monitoring route, will receive a warning. If a patrol is a reoffender, the patrol leader will be immediately replaced.

Maps, reports and records will be available to validators at each verification event.

[4] We define as brigades the subdivisions of the Project Area

[5] Such as spreadsheets, tables or others. Also, georeferenced information should be available as shapefile or other adequate format whenever illegal activities are spotted

2. Biodiversity monitoring: monitoring will follow the guidelines described in section "B3. Biodiversity Impact Monitoring" of the associate CCB PDD.

Biodiversity activities and their indicators will be:

1. Biodiversity protection is directly related with ecosystem health, which is in turn linked to forest cover. Positive impacts on biodiversity will be estimated indirectly through remote analysis of forest cover. Preserving forest cover through avoided deforestation and degradation will allow implying that net positive impacts on biodiversity are being generated.

2. Biodiversity spotting by local people. Local people participating in the biodiversity component of the project will be in charge of reporting animal spotting at the boundaries of the LMA and the PA. Spotting frequency and animal species identified will indirectly assess net positive impacts on ecosystem health.

3. Active biodiversity monitoring. Local people will be hired to monitor ants, bats and bryophytes. Results are a good indirect indicator of ecosystem health.

All information should be properly reported following the protocols developed by RMDLT after the fieldwork . Reports should provide geo-referenced information about biodiversity spotting and data as determined by the protocols. All data from the reports should be input into electronic format prior to the analysis. Maps, reports and records will be available to validators at each verification event.

3. Social Monitoring: will be undertaken by social monitoring squads. There will be a responsible for each monitoring squad who will generate monthly activities reports. Each squad will be in charge of specific villages and will use approved questionnaires to gather socio-economic data about the impacts of the activities of the Project. Questionnaires will also include a section for comments to include information that is not contained in the template.

Monthly reports will be submitted to the brigade leader who will input the information into electronic format to analyze it. The results from this analysis will be used to assess the impact of each activity and to identify villages that require particular attention.

The Project management teams in Protel and Belem will held bimonthly meetings to assess the effectiveness of the activities in local villages. Based on the information supplied by the brigade leaders, the management teams will improve the proposed activities.

Maps, reports and records will be available to validators at each verification event.

1.1.2 Monitoring change and land use within the project area.

This task will be the responsibility of RMDLT. According to the categories presented in Table 35 of the VM0015 methodology (Table 2), the Project will implement MRV to identify and assess LULC-changes within the Project Area.

Table 2: Categories that require MRV (refer to Table 35 – VM0015 methodology)

ID	Type	Conditions under which	Explanations	Applicability to

		monitoring is mandatory		the Project
I	Area of forest land converted to non-forest land	Mandatory in all AUD project activities		Applicable
II	Area of forest land undergoing carbon stock decrease	Mandatory only for AUD project activities having planned logging, fuel-wood collection and charcoal production activities above the baseline	Change in carbon stock must be significant according to ex-ante assessment, otherwise monitoring is not required	Does not apply because none of the Project‟s activities involve planned logging, fuel-wood collection and charcoal production
III	Area of forest land undergoing carbon stock increase	Mandatory only for AUD project activities wishing to claim carbon credits for carbon stock increase	Increase must be significant according to ex-ante assessment and can only be accounted on areas that will be deforested in the baseline case	Does not apply because the project will not claim carbon credits from carbon stock increase.

Monitoring of forest cover will be done mainly by remote sensing imagery. The choice of imagery will depend on the availability of scenes, cloud cover, and related acquisition and processing costs.
Remote sensing imagery could be either satellite (i.e Landsat) or radar (i.e Alos Palsar) or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually of by periods depending on the availability of scenes. Therefore, verification event could occur annually of by periods.

LULC-change analysis will be done for the the Reference Region, Project Area and Leakage Belt using the protocol described in detail in the excel sheet submitted to VVB.. This imagery classification analysis will result in forest and non-forest classes that should be compared with the results from the deforestation model for the date of a specific verification event. The results from such analysis will be reported using the appropriate VCS‟ tables and formats.

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

None of the cases presented in Section 1.1.3 of the VM0015 methodology apply to the Project (Table 3). So, the Project is not required to set sampling plots to measure carbon stocks in either the project area or leakage belt.

Table 3: Applicability criteria for monitoring non-CO2 gasses

	ID	Type	Applicability to the Project
	Within the Project Area		

Mandatory monitoring of the carbon stocks	I	Areas subject to significant carbon stock decrease in the project scenario according to ex-ante assessment	Does not apply
	II	Areas subject to unplanned and significant carbon stock decrease e.g., due to uncontrolled forest fires and other catastrophic events	Does not apply
	III	Area of forest land undergoing carbon stock increase	Does not apply
	Within Leakage Management Area		
	IV	Areas subject to planned and significant carbon stock decrease in the project scenario according to ex-ante assessment	Does not apply
Optional monitoring of carbon stocks	Within the Project Area		
	V	Areas subject to carbon stock increase after planned harvest activities	Does not apply
	VI	Areas recovering after disturbances	Does not apply
	Within Leakage Management Areas		
	VII	Areas subject to carbon stock increase due to leakage prevention measures	Does not apply
	Within Leakage Belt		
	VIII	Areas undergoing significant changes in carbon stock	Does not apply

1.1.4 Monitoring of the impacts of natural disturbances and other catastrophic events

Catastrophic events are not expected in the Project Area or Leakage Belt. Nevertheless, if by any chance a catastrophic event presents during the Project"s lifetime, such events will be evaluated and reported if significant. Monitoring will follow VM0015 Tables 20.f, 20.g, 21.f and 21.g to report reductions by catastrophic events.

1.1.5 Total ex post estimated actual net carbon stock changes and GHG emissions in the project area

All ex post estimations in the Project Area will be summarized using the format of Table 24 of the VM0015 methodology.

1. 2 Monitoring of leakage

The Project is not expected to generate any type of leakage. Even so, as mentioned in item 1.1.2 of this Monitoring Plan, monitoring of forest cover will be done mainly by remote sensing imagery. The choice of imagery will depend on the availability of scenes, cloud cover, and related acquisition and processing costs. Remote sensing imagery could be either satellite (i.e Landsat) or radar (i.e Alos Palsar) or a combination of both.

LULC-change analysis using remote sensing imagery could be conducted annually of by periods depending on the availability of scenes. Therefore, verification event could occur annually of by periods.

Any deforestation above the deforestation baseline found outside the Project‟s Boundaries will be considered to be leakage as described in the VCS‟ vm0015 methodology.

Carbon stocks in pre and post-deforestation classes are assumed to remain constant, as there are not significant decreases or increases of carbon stocks in the leakage belt.

1.2.1 Monitoring of carbon stock changes and GHG emissions associated to leakage prevention activities

The activities of the project won‟t generate GHG emissions.

1.2.2 Monitoring of carbon stock decreases and increases in GHG emissions due to activity shifting leakage.

It is not expected for the Project to generate any kind of leakage. Even so, LULC-change will be monitored periodically (annual or multi-annual depending on the frequency of the verification events) using the protocol described in detail in Annex submitted as part of the monitoring activities described in Section 1.1.2 of this monitoring plan.

For the case of the leakage belt, LULC-change analysis will be focused on assessing deforestation above baseline levels. If such deforestation is identified results will be reported in Tables 29.a, 29.b and 29.c.

If deforestation above the baseline levels occurs in the leakage belt during the project lifetime, the exceeding carbon stock loss will be accounted for, and will be deducted from the non-permanence buffer.

Monitoring of increases in GHG emissions

The parameter values used to estimate emissions will be the same used for estimating forest fires in the baseline (table 18 of VM0015 methodology), except for the initial carbon stocks (Cab, Cdw) which shall be those of the initial forest classes burned in the leakage belt area.

The results will be reported using the same table formats (Table 18 and 19 of the VM0015 methodology) used in the ex ante assessment of baseline GHG emissions from forest fires in the project area.

TASK 2 - Revisiting the projected baseline at fixed periods.

2.1 Update information on agents, drivers and underlying causes of deforestation.

RMDLT will be responsible for monitoring these variables. The biophysical variables, agents, vectors, and the underlying causes of deforestation (Step 3). used to project future deforestation from the Reference Region will be reviewed at least every 10 years (fixed baseline period) but they can also be reviewed earlier depending on the requirements of the Project.

2.2 Adjust the component of use and land-use change of the baseline.

RMDLT will be responsible for carrying out this part of the monitoring.
Step 4 of Part 2 of the methodology VM0015 will be repeated to consider at least the following10-year period in the Reference Region (2018-2028). However, the baseline can be modified to consider earlier10-year periods. Such changes in the baseline must be approved by RMDLT and will require undergoing a verification process before they can be implemented.

Updating the baseline scenario will take place both in the modeling component of the system dynamics (which defines the amount of change) and the spatial component that defines the distribution of deforestation. Key variables that will be used to recalculate the baseline in the second 10-year period of the project are:

- Socio-economic information retrieved from the Project‟s monitoring activities
- Distance to new roads
- Average distance to selective logging activities from pioneer roads
- Distance to non-forest
- Planned infrastructure in the region

To collect this information, field visits, surveys and workshops will be held and forest cover dynamics will be assessed using available satellite and/or radar imagery.

2.3 Adjusting the carbon component of the baseline.
According to Section 1.1.3 of this monitoring plan, it will not be necessary to adjust the carbon component of the baseline.

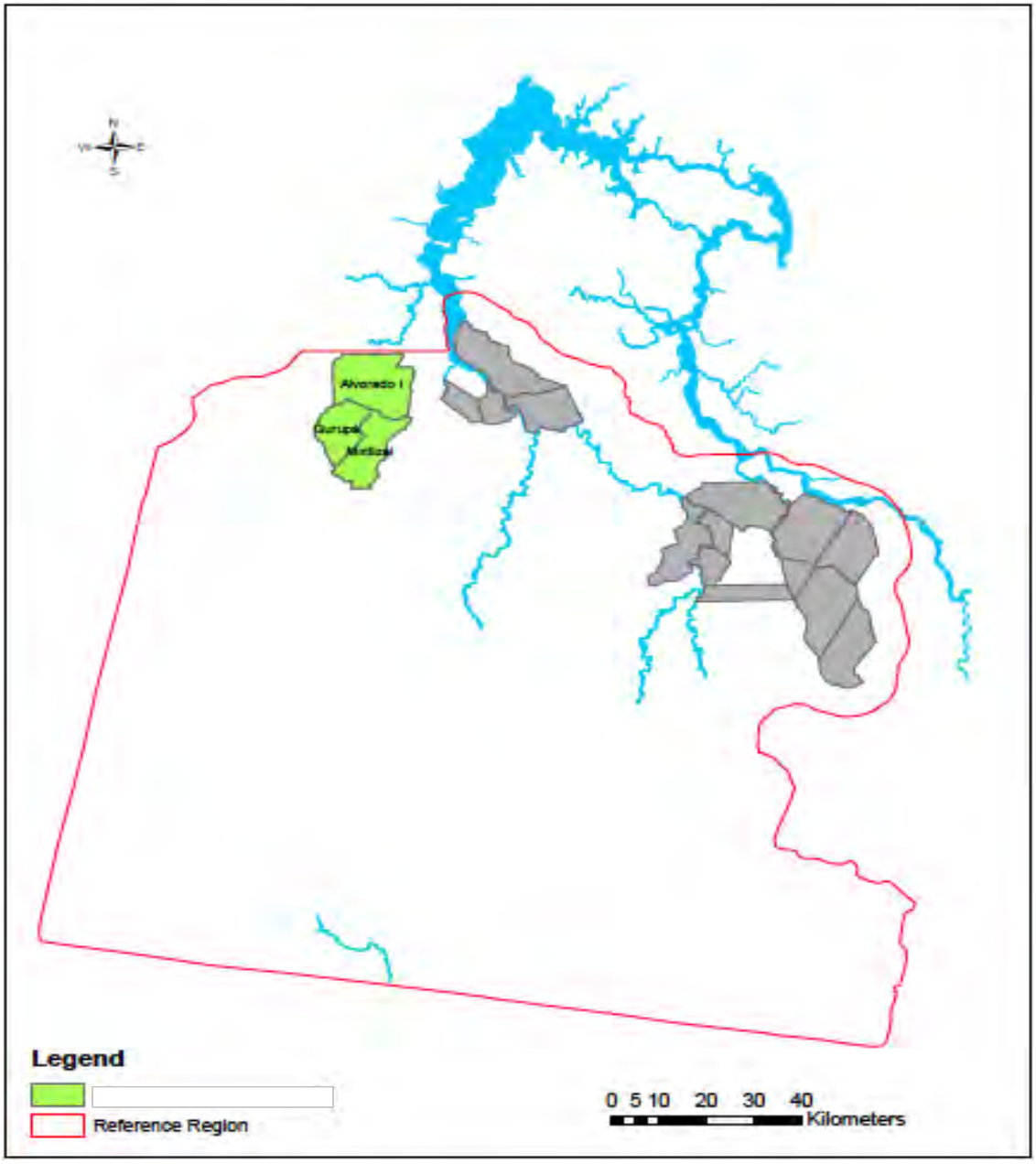
4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

In the first verification event conducted in 2013 the RMDLT project has verified only the emission reductions generated in three of its seventeen areas (or Glebas as locally known). These three areas are Alvorado I, Gurupa and Mirizal (Map 3).

For the second verification that is conducted for this period, the RMDLT project will verify the emission reductions generated from the above three areas only namely Alvorado I, Gurupa and Mirizal (Map 3).

Based on the ex-post analysis, the project avoided the emission of 6,482,073 that after buffer reductions are equivalent to 5,720,431 tradable VCUs during 02/Jan/2012 to 31/Dec/2017.

Map 3: Areas to be verified for the second verification



4.1 Baseline Emissions

The List of all Land Use and Land Cover classes existing at the project start date within the reference region is provided in Annex A of the MR. (refer Table 6)

The Annual areas of baseline deforestation in the reference region is provided in Annex A of the MR. (refer Table 9 a)

Table 9.b: Annual areas of deforestation in the project area is provided in Annex A of the MR.

Table 9.c: Annual areas of deforestation in the leakage belt is provided in Annex A of the MR.
Table 11.a Annual areas deforested per forest class within the Reference region in the baseline case (activity data per forest class) is provided in Annex A of the MR.

Table 11.b: Annual areas deforested per forest class within the project area in the baseline case (activity data per forest class) is provided in Annex A of the MR.

Table 11.c: Annual areas deforested per forest class within the leakage belt in the baseline case (activity data per forest class) is provided in Annex A of the MR.

Table 12.a: Annual areas deforested in each zone within the reference region in the baseline case is provided in Annex A of the MR.

Table 12.b: Annual areas deforested in each zone within the project area in the baseline case is provided in Annex A of the MR.

Table 12.c: Annual areas deforeste d in each zone within the leakage belt in the baseline case is provided in Annex A of the MR.

Table 14. Average carbon stock per hectare of all land use and land cover classes present in the leakage belt and project area is provided in Annex A of the MR.

Table 17.b: Total net baseline carbon stock change in the project area is provided in Annex A of the MR.

Table 18. Parameters used to calculate non-CO2 emissions from forest fires is provided in Annex A of the MR.

Table 19. Baseline non-CO2 emissions from forest fires in the project area is provided in Annex A of the MR.

4.2 Project Emissions

Table 9.b: Ex-post annual areas of unavoided deforestation in the project area is provided in Annex A of the MR.

Table 9.c: Ex-post annual areas of baseline deforestation in leakage belt is provided in Annex A of the MR.

Table 11.b: Ex-post annual areas deforested per forest class within the project area (activity data per forest class) is provided in Annex A of the MR.

Table 11.c: Ex-post annual areas deforested per forest class within the leakage belt (activity data per forest class) is provided in Annex A of the MR.

Table 12.b: Ex-post annual deforestation areas within the project area is provided in Annex A of the MR.

Table 12.c: Ex-post annual deforestation within the leakage belt is provided in Annex A of the MR.

Table 17.b Ex-post carbon stock change in the project area (above-ground, below-ground and litter biomass) is provided in Annex A of the MR.

Table 19: Ex-post non-CO2 emissions from forest fires from the project area is provided in Annex A of the MR.

Table 22. Ex-ante estimated net carbon stock change in the project area is provided in Annex A of the MR. is provided in Annex A of the MR.

Table 24. Total ex-post estimated actual net carbon stock changes and emissions from non-CO2 gasses in the project area is provided in Annex A of the MR.

4.3 Leakage

Table 29.a: Baseline carbon stock change in pre-deforestation (forest) classes is provided in Annex A of the MR.

Table 29.b: Carbon stock change in post-deforestation (forest) classes is provided in Annex A of the MR.

Table 29.c: Total net carbon stock change in the leakage belt is provided in Annex A of the MR.

4.4 Net GHG Emission Reductions and Removals

The project has generated a total of **5,720,431** Tradable VCUs for the period of 02-Jan-2012 to 31-Dec-2017.

Table 34. Ex-ante estimated net anthropogenic GHG emission reductions (DREDDt) and Voluntary Carbon Units (VCUs)

Project year	Baseline		Project		*Ex ante* leakage		*Ex ante* net anthropogenic GHG emission reductions	
	GHG emissions		GHG emissions		GHG emissions			
	annual	cumulative	annual	cumulative	annual	cumulative	annual	cumulative
	$EBBBSLPA_t$	$EBBBSLPA$	$EBBPSPA_t$	$EBBPSPA$	ELK_t	ELK	$\Delta REDD_t$	$\Delta REDD$
	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e	tCO_2-e
2012*	825	825	660	660	132	132	1,083,255	1,083,255

2013	825	1,651	660	1,321	132	264	1,083,285	2,166,540
2014	825	2,476	660	1,981	132	396	1,083,285	3,249,825
2015	825	3,302	413	2,394	83	479	1,077,416	4,327,241
2016	825	4,127	413	2,806	83	561	1,077,416	5,404,657
2017	825	4,952	413	3,219	83	644	1,077,416	6,482,073

**the date starts from 2nd January 2012 subsequent date from first verification*

Table 34 a Summary of Ex-ante estimated tradable net anthropogenic GHG emission reductions (DREDDt) and Voluntary Carbon Units (VCUs) after application of buffer

Project year	***Ex ante* VCUs tradable**	
	annual	Buffer applied
2012*	955973	11.75%
2013	955999	11.75%
2014	955999	11.75%
2015	950820	11.75%
2016	950820	11.75%
2017	950820	11.75%
Total VCUs	**57,20,431**	**11.75%**

ANNEX A

BASELINE EMISSIONS

Table 6: List of all Land Use and Land Cover classes existing at the project start date within the reference region

Class Identifier			Trend in Carbon stock[1]	Presence in[2]	Baseline activity[3]			Description
ID_{cl}	Name	Braod Class			LG	FW	CP	(including criteria for unambiguous boundary definition)
001	Dense Ombrofile Forest	Forest Land	constant	RR	yes	no	no	
002	Degraded Ombrofile Forest	Forest Land	constant	RR	yes	no	no	
003	Grassland	Grassland	constant	RR	no	no	no	
004	Cropland	Crop Land	constant	RR	no	no	no	
005	Dense Ombrofile Forest	Forest Land	constant	PA	yes	no	no	
006	Degraded Ombrofile Forest	Forest Land	constant	PA	yes	no	no	
007	Grassland	Grassland	constant	PA	no	no	no	
008	Cropland	Crop Land	constant	PA	no	no	no	
009	Dense Ombrofile Forest	Forest Land	constant	LK	yes	no	no	
010	Degraded Ombrofile Forest	Forest Land	constant	LK	yes	no	no	
011	Grassland	Grassland	constant	LK	no	no	no	
012	Cropland	Crop Land	constant	LK	no	no	no	

2 RR = Reference Region, LK = Leakage Belt, LM = Leakage Management Areas, PA = Project Area

Table 9.a: Annual areas of baseline deforestation in the reference region

Project year	Stratum *i* in the reference region				Total	
	1	2	…	I_{RR}	annual	cumulative
	$ABSLRR_{i,t}$ ha	$ABSLRR_{i,t}$ ha	$ABSLRR_{i,t}$ ha	$ABSLRR_{i,t}$ ha	$ABSLRR_t$ ha	$ABSLRR$ ha
4	18,788				18,788	56,364
5	18,788				18,788	75,152
6	18,788				18,788	93,940
7	18,788				18,788	112,728
8	18,788				18,788	131,516
9	18,788				18,788	150,304

Table 9.b: Annual areas of deforestation in the project area

Project year	Stratum *i* of the reference region in the project area				Total	
	Omrophile Dense	Omrophile Degraded	…	I_{RR}	annual	cumulative
	$ABSLPA_{i,t}$ ha	$ABSLPA_{i,t}$ ha	$ABSLPA_{i,t}$ ha	$ABSLPA_{i,t}$ ha	$ABSLPA_t$ ha	$ABSLPA$ ha
4	40.0	0.0			40.0	40
5	40.0	0.0			40.0	80
6	40.0	0.0			40.0	120
7	40.0	0.0			40.0	160
8	40.0	0.0			40.0	200
9	40.0	0.0			40.0	240

Table 9.c: Annual areas of deforestation in the leakage belt

Project year	Stratum *i* of the reference region in the leakage belt	Total

	Omrophile Dense $ABSLLK_{i,t}$ ha	Omrophile Degraded $ABSLLK_{i,t}$ ha	… $ABSLLK_{i,t}$ ha	I_{RR} $ABSLLK_{i,t}$ ha	annual $ABSLLK_t$ ha	cumulative $ABSLLK$ ha
4	10,809	0.0			10,809	10,809
5	10,809	0.0			10,809	21,617
6	10,809	0.0			10,809	32,426
7	10,809	0.0			10,809	43,234
8	10,809	0.0			10,809	54,043
9	10,809	0.0			10,809	64,852

Table 11.a: Annual areas deforested per forest class within the Reference region in the baseline case (activity data per forest class)

Area deforested per forest class f*c*/ within the reference	Total baseline

region					deforestation in the project area	
$ABSLRR_{icl,t}$ >	Omrophile Dense	Omrophile Degraded	…	*lcl*		
Name >	Forest				$ABSLRR_t$ annual	*ABSLRR* cumulative
Project year *t*	ha	ha	ha	ha	ha	ha
4	18,788				18,788	56,364
5	18,788				18,788	75,152
6	18,788				18,788	93,940
7	18,788				18,788	112,728
8	18,788				18,788	131,516
9	18,788				18,788	150,304

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

Area deforested per forest class f*cl* within the project area					Total baseline deforestation in the project area	
$ABSLPA_{icl,t}$ >	Omrophile Dense	Omrophile Degraded	…	*lcl*		
Name >	Forest				$ABSLPA_t$ annual	*ABSLPA* cumulative
Project year *t*	ha	ha	ha	ha	ha	ha
4	34.0	5.7			40	40
5	34.0	5.7			40	79
6	34.0	5.7			40	119
7	34.0	5.7			40	159
8	34.0	5.7			40	199
9	34.0	5.7			40	238

Table 11.c: Annual areas deforested per forest class within the leakage belt in the baseline case (activity data per forest class)

Area deforested per forest class f*cl* within the leakage belt					Total baseline deforestation in the project area	
$ABSLLK_{icl,t}$ >	Omrophile Dense	Omrophile Degraded	…	*lcl*		
Name >	Forest				$ABSLLK_t$ annual	*ABSLLK* cumulative
Project year *t*	ha	ha	ha	ha	ha	ha
4	0				0	0
5	10,809				10,809	10,809
6	10,809				10,809	21,617
7	10,809				10,809	32,426
8	10,809				10,809	43,234
9	10,809				10,809	54,043

Table 12.a: Annual areas deforested in each zone within the reference region in the baseline case

Area established after deforestation per class f*cl* within the reference region					Total baseline deforestation in the reference region	
$ABSLRR_{fcl,t}$	Omrophile Dense	Omrophile Degraded	…	*Fcl*		
Name >	Non-forest				$ABSLRR_t$ annual	*ABSLRR* cumulative

Project year v	ha	ha	ha	ha	ha	ha
4	18,788				18,788	56,364
5	18,788				18,788	75,152
6	18,788				18,788	93,940
7	18,788				18,788	112,728
8	18,788				18,788	131,516
9	18,788				18,788	150,304

Table 12.b: Annual areas deforested in each zone within the project area in the baseline case

Area established after deforestation per class f*cl* within the project area					Total baseline deforestation in the project area	
$ABSLPA_{fcl,t}$	Omrophile Dense	Omrophile Degraded	…	*Fcl*		
Name >					$ABSLPA_t$ annual	*ABSLPA* cumulative
Project year v	ha	ha	ha	ha	ha	ha
4	34.0	5.7			40	40
5	34.0	5.7			40	79
6	34.0	5.7			40	119
7	34.0	5.7			40	159
8	34.0	5.7			40	199
9	34.0	5.7			40	238

Table 12.c: Annual areas deforested in each zone within the leakage belt in the baseline case

Area established after deforestation per class f*cl* within the leakage belt					Total baseline deforestation in the leakage belt	
$ABSLLK_{fcl,t}$	Omrophile Dense	Omrophile Degraded	…	*Fcl*		
Name >	Non-forest				*$ABSLLK_t$* annual	*ABSLLK* cumulative
Project year v	ha	ha	ha	ha	ha	ha
4	10,809				10,809	10,809
5	10,809				10,809	21,618
6	10,809				10,809	32,426
7	10,809				10,809	43,235
8	10,809				10,809	54,043
9	10,809				10,809	64,852

Table 14. Average carbon stock per hectare of all land use and land cover classes present in the leakage belt and project area

LU/LC class		**Average carbon stock per hectare ± 90% CI**												
		Cab_{cl}		***Cbb_{cl}***		***Cdw_{cl}***		***Cl_{cl}***		***$Csoc_{cl}$***		***Cwp_{cl}***		***Ctot***
		average stock	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*	± 90% CI	*average stock*
ID_{cl}	Name	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}	t CO_2e ha^{-1}
1	Omrophile Dense	469.6	46.7	105.2	10.5			8.68	0.8					583.5
2	Omrophile	461.2	95.5	103.4	21.3			8.96	1.36					573.6

	Degraded													

Table 17.b: Total net baseline carbon stock change in the project area

Project year	Activity data per category x Carbon stock change factor								Total baseline carbon stock change	
	ID_{ct} = 1		ID_{ct} = 2		ID_{ct} = . . .		ID_{ct} = *Ict*		annual	cumulative
	$ABSLPA_{ct,t}$ ha	$\Delta Ctot_{ct,t}$ tCO_2-e ha^{-1}	*ABSLPAct,t* ha	$\Delta Ctot_{ct,t}$ tCO_2-e ha^{-1}	*ABSLPAct,t* ha	$\Delta Ctot_{ct,t}$ tCO_2-e ha^{-1}	*ABSLPAct,t* ha	$\Delta Ctot_{ct,t}$ tCO_2-e ha^{-1}	$\Delta CBSLPA_t$ tCO_2-e	$\Delta CBSLPA$ tCO_2-e
4	40	578							22,959	22,959
5	40	578							22,959	45,919
6	40	578							22,959	68,878
7	40	578							22,959	91,837
8	40	578							22,959	114,797
9	40	578							22,959	137,756

Table 18. Parameters used to calculate non-CO2 emissions from forest fires

Initial Forest Class		**Parameters**															
IDcl	Name	*Fburnt*$_{icl}$ %	*Cab* tCO_2 e ha^{-1}	*Cdw* tCO_2 e ha^{-1}	*Cl* tCO_2 e ha^{-1}	*Pburnt*$_{ab,icl}$ %	*Pburnt*$_{dw,icl}$ %	*Pburnt*$_{l,icl}$ %	*CE*$_{ab,icl}$ %	*CE*$_{dw,icl}$ %	*CE*$_{l,icl}$ %	*ECO2-ab* tCO_2 e ha^{-1}	*ECO2-dw* tCO_2 e ha^{-1}	*ECO2-l* tCO_2 e ha^{-1}	*EBBCO2-tot* tCO_2 e ha^{-1}	*EBBnN2O*$_{icl}$ tCO_2 e ha^{-1}	*EBBCH4*$_{icl}$ tCO_2 e ha^{-1}	*EBBtot*$_{icl}$ tCO_2 e ha^{-1}
1	Omrophile Dense	96	469.6	0.0	8.7	96	0	100	0.5	0.0	0.5	225.4	-	4.2	229.6	- 0.0	21.0	21.0

2	Omrophile Degraded	96	461.2	0.0	9.0	96	0	100	0.5	0.0	0.5	221.4	-	4.3	225.7	-1.3	20.7	19.3

Table 19. Baseline non-CO2 emissions from forest fires in the project area

Project year	Emissions of non-CO_2 gasses from baseline forest fires								Total baseline non-CO_2 emissions from forest fires in the project area	
	ID_{icl} = 1		ID_{icl} = 2		ID_{icl} = . . .		ID_{icl} = *Icl*			
	$ABSLPA_{icl,t}$	$EBBBSLt_{ot_{icl}}$	$ABSLPA_{icl,t}$	$EBBBSLt_{ot_{icl}}$	$ABSLPA_{icl,t}$	$EBBBSLt_{ot_{icl}}$	$ABSLPA_{icl,t}$	$EBBBSLt_{ot_{icl}}$	annual $EBBBSLPA_t$	cumulative *EBBBSLPA*
	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
4	34	21.0	6	19.3					825	825
5	34	21.0	6	19.3					825	1,651
6	34	21.0	6	19.3					825	2,476
7	34	21.0	6	19.3					825	3,302
8	34	21.0	6	19.3					825	4,127
9	34	21.0	6	19.3					825	4,952

PROJECT EMISSIONS:

Table 9.b: Ex-post annual areas of unavoided deforestation in the project area

Project year	Stratum *i* of the reference region in the project area	Total

	Omrophile Dense $ABSLPA_{i,t}$ ha	Omrophile Degraded $ABSLPA_{i,t}$ ha	… $ABSLPA_{i,t}$ ha	I_{RR} $ABSLPA_{i,t}$ ha	annual $ABSLPA_t$ ha	cumulative $ABSLPA$ ha
4	40.0	0.0			40.0	40
5	40.0	0.0			40.0	80
6	40.0	0.0			40.0	120
7	40.0	0.0			40.0	160
8	40.0	0.0			40.0	200
9	40.0	0.0			40.0	240

Table 9.c: Ex-post annual areas of baseline deforestation in leakage belt

Project year	Stratum *i* of the reference region in the leakage belt				Total	
	Omrophile Dense $ABSLLK_{i,t}$ ha	Omrophile Degraded $ABSLLK_{i,t}$ ha	… $ABSLLK_{i,t}$ ha	I_{RR} $ABSLLK_{i,t}$ ha	annual $ABSLLK_t$ ha	cumulative $ABSLLK$ ha
4	10,809	0			10,809	10,809
5	10,809				10,809	21,617
6	10,809				10,809	32,426
7	10,809				10,809	43,234
8	10,809				10,809	54,043
9	10,809				10,809	64,852

Table 11.b: Ex-post annual areas deforested per forest class within the project area (activity data per forest class)

Area deforested per forest class f*cl* within the project area					Total baseline deforestation in the project area	
$ABSLPA_{icl,t}$ >	Omrophile Dense	Omrophile Degraded	…	*lcl*		
Name >	Forest				$ABSLPA_t$ annual	*ABSLPA* cumulative
Project year *t*	ha	ha	ha	ha	ha	ha
4	34.0	5.7			40	40
5	34.0	5.7			40	79
6	34.0	5.7			40	119
7	34.0	5.7			40	159
8	34.0	5.7			40	199
9	34.0	5.7			40	238

Table 11.c: Ex-post annual areas deforested per forest class within the leakage belt (activity data per forest class)

Area deforested per forest class f*cl* within the leakage belt					Total baseline deforestation in the project area	
$ABSLLK_{icl,t}$ >	Omrophile Dense	Omrophile Degraded	…	*lcl*		
Name >	Forest				$ABSLLK_t$ annual	*ABSLLK* cumulative
Project year *t*	ha	ha	ha	ha	ha	ha
4					0	0
5	10,809				10,809	10,809
6	10,809				10,809	21,617

7	10,809				10,809	32,426
8	10,809				10,809	43,234
9	10,809				10,809	54,043

Table 12.b: Ex-post annual deforestation areas within the project area

Area established after deforestation per class f*cl* within the project area					Total baseline deforestation in the project area	
$ABSLPA_{fcl,t}$	Omrophile Dense	Omrophile Degraded	…	*Fcl*		
Name >					$ABSLPA_t$ annual	*ABSLPA* cumulative
Project year v	ha	ha	ha	ha	ha	ha
4	34.0	5.7			40	40
5	34.0	5.7			40	79
6	34.0	5.7			40	119
7	34.0	5.7			40	159
8	34.0	5.7			40	199
9	34.0	5.7			40	238

Table 12.c: Ex-post annual deforestation within the leakage belt

Area established after deforestation per class f*cl* within the leakage belt					Total baseline deforestation in the leakage belt	
$ABSLLK_{fcl,t}$	Omrophile Dense	Omrophile Degraded	…	*Fcl*		
Name >	Non-forest				$ABSLLK_t$ annual	*ABSLLK* cumulative
Project year v	ha	ha	ha	ha	ha	ha
4	10,809				10,809	10,809
5	10,809				10,809	21,618
6	10,809				10,809	32,426
7	10,809				10,809	43,235
8	10,809				10,809	54,043
9	10,809				10,809	64,852

Table 17.b Ex-post carbon stock change in the project area (above-ground, below-ground and litter biomass)

Project year	Activity data per category x Carbon stock change factor								Total baseline carbon stock change	
	ID_{ct} = 1		ID_{ct} = 2		ID_{ct} = . . .		ID_{ct} = *Ict*		annual	cumulative
	$ABSLPA_{ct,t}$	$\Delta Ctot_{ct,t}$	*ABSLPAct,t*	$\Delta Ctot_{ct,t}$	*ABSLPAct,t*	$\Delta Ctot_{ct,t}$	*ABSLPAct,t*	$\Delta Ctot_{ct,t}$	$\Delta CBSLPA_t$	$\Delta CBSLPA$
	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
4	40	578							22,959	22,959
5	40	578							22,959	45,919
6	40	578							22,959	68,878
7	40	578							22,959	91,837
8	40	578							22,959	114,797

9	40	578							22,959	137,756

Table 19: Ex-post non-CO2 emissions from forest fires from the project area

Project year	Emissions of non-CO_2 gasses from baseline forest fires								Total baseline non-CO_2 emissions from forest fires in the project area	
	ID_{icl} = 1		ID_{icl} = 2		ID_{icl} = . . .		ID_{icl} = *Icl*		annual	cumulative
	$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$ABSLPA_{icl,t}$	$EBBBSLtot_{icl}$	$EBBBSLPA_t$	*EBBBSLPA*
	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
4	34	21.0	6	19.3					825	825
5	34	21.0	6	19.3					825	1,651
6	34	21.0	6	19.3					825	2,476
7	34	21.0	6	19.3					825	3,302
8	34	21.0	6	19.3					825	4,127
9	34	21.0	6	19.3					825	4,952

Table 22. Ex-ante estimated net carbon stock change in the project area

Project year	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoided unplanned deforestation		Total carbon stock change in the project case	
	annual $\Delta CPAdPA_t$ tCO_2-e	cumulative $\Delta CPAdPA$ tCO_2-e	annual $\Delta CPAiPA_t$ tCO_2-e	cumulative $\Delta CPAiPA$ tCO_2-e	annual $\Delta CUDdPA_t$ tCO_2-e	cumulative $\Delta CUDdPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e
4	0	0	0	0	-16,177	-16,177	-16,177	-16,177
5	0	0	0	0	-16,177	-32,353	-16,177	-32,353
6	0	0	0	0	-16,177	-48,530	-16,177	-48,530
7	0	0	0	0	-10,110	-58,640	-10,110	-58,640
8	0	0	0	0	-10,110	-68,750	-10,110	-68,750
9	0	0	0	0	-10,110	-78,861	-10,110	-78,861

Table 24. Total ex-post estimated actual net carbon stock changes and emissions from non-CO2 gasses in the project area

Project year	Total ex ante carbon stock decrease due to planned activities		Total ex ante carbon stock increase due to planned activities		Total ex ante carbon stock decrease due to unavoided unplanned deforestation		Total ex ante net carbon stock change		Total *ex ante* estimated actual non-CO_2 emissions from forest fires in the project area	
	annual $\Delta CPAdPA_t$ tCO_2-e	cumulative $\Delta CPAdPA$ tCO_2-e	annual $\Delta CPAiPA_t$ tCO_2-e	cumulative $\Delta CPAiPA$ tCO_2-e	annual $\Delta CUDdPA_t$ tCO_2-e	cumulative $\Delta CUDdPA$ tCO_2-e	annual $\Delta CPSPA_t$ tCO_2-e	cumulative $\Delta CPSPA$ tCO_2-e	annual $EBBPSPA_t$ tCO_2-e	cumulative $EBBPSPA$ tCO_2-e
4	0	0	0	0	-16,177	-16,177	-16,177	-16,177	660	660
5	0	0	0	0	-16,177	-32,353	-16,177	-32,353	660	1,321

6	0	0	0	0	-16,177	-48,530	-16,177	-48,530	660	1,981
7	0	0	0	0	-10,110	-58,640	-10,110	-58,640	413	2,394
8	0	0	0	0	-10,110	-68,750	-10,110	-68,750	413	2,806
9	0	0	0	0	-10,110	-78,861	-10,110	-78,861	413	3,219

LEAKAGE EMISSIONS:

Table 29.a: Baseline carbon stock change in pre-deforestation (forest) classes

Project year	Carbon stock changes in initial (pre-deforestation) forest classes								Total C stock change in initial forest classes	
	ID_{icl} = 1		ID_{icl} = 2		ID_{icl} = . . .		ID_{icl} = *Icl*		annual	cumulative
	$ABSLLK_{icl,t}$	$Ctot_{icl,t}$	$ABSLLK_{icl,t}$	$Ctot_{icl,t}$	$ABSLLK_{icl,t}$	$Ctot_{icl,t}$	$ABSLLK_{icl,t}$	$Ctot_{icl,t}$	$\Delta CBSLLKi_t$	$\Delta CBSLLKi$
	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	ha	tCO_2-e ha^{-1}	tCO_2-e	tCO_2-e
4	0	0							0	0
5	10,809	97							1,048,434	1,048,434
6	10,809	97							1,048,434	2,096,868
7	10,809	97							1,048,434	3,145,303
8	10,809	97							1,048,434	4,193,737
9	10,809	97							1,048,434	5,242,171

Table 29.b: Carbon stock change in post-deforestation (forest) classes

Project year	Carbon stock changes in final (post-deforestation) non-forest classes								Total C stock change in final non-forest classes	
	ID_{fcl} = 1		ID_{fcl} = 2		ID_{fcl} = . . .		ID_{fcl} = *Fcl*		annual	cumulative
	$ABSLLK_{fcl,t}$ ha	$Ctot_{fcl,t}$ tCO_2-e ha^{-1}	$ABSLLK_{fcl,t}$ ha	$Ctot_{fcl,t}$ tCO_2-e ha^{-1}	$ABSLLK_{fcl,t}$ ha	$Ctot_{fcl,t}$ tCO_2-e ha^{-1}	$ABSLLK_{fcl,t}$ ha	$Ctot_{fcl,t}$ tCO_2-e ha^{-1}	$\Delta CBSLLKf_t$ tCO_2-e	$\Delta CBSLLKf$ tCO_2-e
4	10,809	692							7,476,876	7,476,876
5	10,809	692							7,476,599	14,953,475
6	10,809	692							7,476,599	22,430,075
7	10,809	692							7,476,599	29,906,674
8	10,809	692							7,476,599	37,383,274
9	10,809	692							7,476,599	44,859,873

Table 29.c: Total net carbon stock change in the leakage belt

Project year	Total C stock change in initial forest classes		Total C stock change in final non-forest classes		Total baseline carbon stock change	
	annual	cumulative	annual	cumulative	annual	cumulative
	$\Delta CBSLLKi_t$ tCO_2-e	$\Delta CBSLLKi$ tCO_2-e	$\Delta CBSLLKf_t$ tCO_2-e	$\Delta CBSLLKf$ tCO_2-e	$\Delta CBSLLK_t$ tCO_2-e	$\Delta CBSLLK$ tCO_2-e
4	0	0	7,476,876	7,476,876	-7,476,876	-7,476,876
5	1,048,434	1,048,434	7,476,599	14,953,475	-6,428,165	-13,905,041
6	1,048,434	2,096,868	7,476,599	22,430,075	-6,428,165	-20,333,206
7	1,048,434	3,145,303	7,476,599	29,906,674	-6,428,165	-26,761,372
8	1,048,434	4,193,737	7,476,599	37,383,274	-6,428,165	-33,189,537
9	1,048,434	5,242,171	7,476,599	44,859,873	-6,428,165	-39,617,702