REFORESTATION GROUPED PROJECT AT PRATIGI ENVIRONMENTAL PROTECTION AREA

Project Title	Reforestation Grouped Project at Pratigi Environmental Protection Area
Version	3.0
Date of Issue	15 - July - 2014
Prepared By	OCT – Land Conservation Organization from the Southern of Bahia; and C_3 - Floresta, Meio Ambiente & Energia
Contact	Km. 386 of the BR101 route –APA do Pratigi Gateway– Serra da Papuã, Rural area- Ibirapitanga municipality, Bahia. +55 (73) 9812-0371 www.oct.org.br contato@oct.org.br

Abbreviations

ACSA	Cooperative Alliance for Environmental Services
AFOLU	Agriculture, Forestry and Other Land Use
AGB	Above-Ground Biomass
AGIR	Pratigi EPA Stewards Association
AMUBS	Association of Municipalities of Southern Bahia
APA	Environmental Preservation Area
APP	Permanent Preservation Areas
A/R	Afforestation and Reforestation project activities
BGB	Below-Ground Biomass
CCBS	Climate, Community and Biodiversity Standards
CCMA	Central Corridor of the Atlantic Forest
CDA	Coordination of Agricultural Development of Bahia State
CDM	Clean Development Mechanism
CFA	Family Water House
CFR	Rural Family House
CFRI	Igrapiúna Rural Family House
CIAPRA	Pratigi EPA Intermunicipal Consortium
CJ	OSCIP Youth House
COOPALM	Cooperative of Heart-of-Palm Producers of Southern Bahia
COOPATAN	Cooperative of Rural Producers of Presidente Tancredo Neves
COOPECOON	Cooperative of Fisherman and Shellfish-gatherers of Southern Bahia
CR	Critically Endangered
CRA	Environmental Resources Center (actual INEMA)
DBH	Diameter at Breast Height
EMBRAPA	Brazilian Agricultural Research Corporation
EM	Endangered
EPA	Environmental Protection Area
FNMA	National Environment Fund
FRVJ	Fazendas Reunidas Vale do Rio Juliana
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GIS	Geographic Information System
GP	Grouped Project
GP-D	Grouped Project Document
GPS	Global Positioning System

HDI-M	Municipal Human Development Index
IBAMA	Brazilian Institute for the Environment and Natural Resources
IBio	BioAtlantic Institute
IBGE	Brazilian Institute of Geography and Statistics
IDB	Inter-American Development Bank
IDC	Citizenship Development Institute
IDES	Sustainable Development Institute of Southern Bahia
INCRA	National Institute of Colonization and Agrarian Reform
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
INPE	National Institute for Space Research
LK	Leakage
LULUCF	Land Use, Land-Use Change and Forestry
MCT	Ministry of Science and Technology
MST	Landless Movement
NDVI	Normalized Difference Vegetation Index
NPK	Fertilizer based on the relative content of the chemical elements nitrogen (N), phosphorus (P), and potassium (K)
NT	Near Threatened
OCT	Land Conservation Organization of the South of Bahia
PAI	Project Activity Instance
PDCIS	Development and Integrated Growth Program with Sustainability
PP	Project Proponent
QA	Quality Assurance
QC	Quality Control
RL	Legal Reserve
RPPN	Private Reserves of Natural Patrimony
SAF	Agroforestry Systems
SEMA	State Secretary of the Environmental
SOC	Soil Organic Carbon
SOP	Standard Operating Procedures
TNC	The Nature Conservancy
UEFES	State University of Feira de Santana
UESC	Universidade Estadual de Santa Cruz
UFRB	Federal University of Reconcavo Bahiano
UN	United Nations
UNDP	United Nations Development Programme

VCS	Verified Carbon Standard
VU	Vulnerable
VVB	Validation and Verification Body

Table of Contents

List of Figures

List of Tables

1 PROJECT DETAILS

1.1 Summary Description of the Project

The Reforestation Grouped Project (GP) at Pratigi Environmental Protection Area (EPA) is inserted in the Carbon Neutral Program Pratigi and is located in one of the areas of the Development and Integrated Growth Program with Sustainability (PDCIS) of the EPAs Mosaic of Southern Bahia, which are State Protected Areas for Sustainable Use. The Grouped Project is located at Pratigi EPA that has the important role of linking biodiversity conservation in the region through the sustainable use of natural resources. The PDCIS is located in the Central Corridor of the Atlantic Forest (CCMA) that is considered a biodiversity hotspot[1].

Located along Brazil's Atlantic coast, the Atlantic Forest encompasses Latin America's largest population centers, including São Paulo and Rio de Janeiro, and generates 80 percent of Brazil's Gross Domestic Product. Coastal development, rapid urbanization, and large-scale agriculture and industry, especially over the last century, have reduced the forest to about 13,7 percent of its original extent[2]. In spite of this destruction, what remains is one of the greatest repositories of biodiversity on the planet, with more than 20,000 known species of plants alone[3].

In the Pratigi EPA, the natural resources wealth and potential agricultural coexist with social exclusion, poverty, the lack of sustainable economic alternatives and illiteracy, which limit sustainable development. To reverse these trends, non-governmental organizations and the Government at federal, state and municipal levels joined to promote social inclusion and eliminate poverty. Due that, the Grouped Project is under the Cooperative Alliance for Environmental Services (ACSA) created in 2011 by the Land Conservation Organization from the Southern of Bahia (OCT[4]), supported by Odebrecht Foundation. This Grouped Project has the objective of developing and implement projects and environmental services programs to leverage resources and financial incentives, generate and negotiate programs of ecosystem services (water, carbon and biodiversity) in the Pratigi EPA.

Due to the characteristics of the use and occupation of the land in the project area combined with the dynamics of landscape structure the land tenure profile is small farms (with an average size of 15 hectares). So, the Grouped Project was adopted as the development strategy, which aims to certify the Pratigi EPA for reforestation activities and in the term of 10 years after its validation, new areas may be part of this initiative.

This approach will enable the mobilization and community awareness with regard to valuation and restoration of environmental services and will also enable the beginning of the process of environmental retrofitting of small properties, being the forerunner of a new economy-focused on the valuation of environmental assets of the Pratigi EPA. This Grouped Project will be a national and international reference when using the concept of provider-payer for generating multiple benefits to society, biodiversity and local communities. Further, this GP is already validated under the Climate,

[1] A biodiversity hotspot is a biogeographic region with a significant reservoir of biodiversity that is under threat from humans.
[2] RIBEIRO, et al. 2009.
[3] The Nature Conservancy.
[4] OCT is the *Organização de Conservação de Terras do Baixo Sul da Bahia.*

Community and Biodiversity Standards (CCBS)[5,6] since September, 2nd 2013 - CCB Standards Second Edition Climate Adaptation & Biodiversity Gold Level, which is focused on demonstrating benefits not only for the climate but also for local communities and biodiversity. Also, CCB Standards foster the integration of best-practice and multiple-benefit approaches into project design and implementation.

The combination of recuperation of degraded lands along with the change of the currently natural resource uses to a new model based on the conservation and production agricultural products and environmental services in a small property will create a model focused on an economy based on conservation, that will enable small, medium and large farms, options for income generation along with biodiversity conservation.

Degraded areas will be restored using two different approaches - which may be flexible according to specific environmental, economic and social properties - forest restoration and agroforestry systems. The same model will enable owners the opportunity to recover degraded areas along with income generation.

OCT will lead this Grouped Project and also each associated Project Activity Instance with support of local partners. All Project Activity Instances will detail information of each singular project that will meet all requirements, principles, criteria, approaches and premises adopted under Grouped Project level. Those Projects will take place on areas in the Pratigi EPA, beginning by **Fazendas Reunidas Vale do Rio Juliana** and, also, in **47small farms** which has their owners (proprietary and squatters) characterized as agricultural farms (Project Activity Instance #1). This PAI will restoration 101.82 hectares of degraded lands that will remove **49,069 tCO_2** in 30 years. In addition to this benefit, OCT has in its macro planning the restoration of 200 hectares per year after 2013 focusing on eligible areas for carbon credits under this Grouped Project.

The main purpose of the Grouped Project is to restore the environmental integrity of the area, specifically:

1. To contribute to climate change mitigation by increasing carbon stocks through the growth of planted trees and the enhancement of natural regeneration;

2. To preserve biodiversity through the reforestation of native forest species;

3. To improve the quality and stabilize the flow of water in the Pratigi EPA System through the restoration and protection of springs and riparian zones;

4. To improve soil management practices;

5. To bring community benefits, such as payment for environmental services, direct work opportunities and technology transfer.

[5] Project documents and supporting documents are available at <http://www.climate-standards.org/?s=pratigi>. Accessed on November, 28th 2013.

[6] Due to updating in the CDM small scale AR methodologies in 2012, that used in the CCB-PD (AR AMS0001) is different from that used in this VCS GPD (AR AMS0007).

1.2 Sectoral Scope and Project Type

This Grouped Project is eligible under the VCS Program for sectoral scope 14 (AFOLU, Agriculture, Forestry and Other Land Use) within the Afforestation, Reforestation and Revegetation (ARR) project category, since it will increase carbon sequestration by restoring native vegetative cover through planting, sowing and human-assisted natural regeneration of woody vegetation.

This Grouped Project will be structured to allow the expansion of project activities subsequent to the GP validation within the geographic areas described in this document. The subsequent project activities, called Project Activity Instances, following the CDM terminology for CDM Project Activity, will meet the pre-established criteria defined in this document.

1.3 Project Proponent

Land Conservation Organization[7] (OCT)

OCT is part of the inter-institutional Development and Integrated Growth Program with Sustainability (PDCIS). This network is made up of the State Government, the Sustainable Development Institute of Southern Bahia (IDES), the Citizenship Development Institute (IDC), the Cooperative of Rural Producers of Presidente Tancredo Neves (COOPATAN), Rural Family House (CFR), the Cooperative of Fisherman and Shellfish-gatherers of Southern Bahia (COOPECOON), Family Water House (CFA), the Cooperative of Heart-of-Palm Producers of Southern Bahia (COOPALM), the Igrapiúna Rural Family House (CFRI), the Cooperative of Producers of the Pratigi EPA, the Agroforestry Family House, Pratigi EPA Stewards Association (AGIR), the Pratigi EPA Intermunicipal Consortium (CIAPRA) and the OSCIP Youth House (CJ).

During the ten years that OCT has been working in the region, it has achieved the following results:

i) In partnership with the State Government (Environmental Resources Center (CRA), it prepared a document to promote public policy for conservation of environmental heritage in the Atlantic Forest within private properties;

ii) Supported the creation of three Agro-ecological Associations in the Pratigi EPA;

iii) Supported the implementation of 350 ha of Private Reserves of Natural Patrimony and working to add 1,870 ha;

iv) Developed and executed the socio-environmental education project Young Environmental Citizen;

v) Created the Jatimane and Nilo Peçanha Ecological Clubs;

vi) Logistical and financial support of Land Rights Regularization in the Pratigi EPA in 2008 through an agreement between OCT, the Secretary of Agriculture of the State of Bahia and CDA, the Coordination of Agricultural Development of Bahia State. This work resulted in registering and

[7] *Organização de Conservação de Terras do Baixo Sul da Bahia*

mapping of more than 300 rural properties. Granting the land titles to their respective landowners depends on the environmental compliance of the property.

vii) Support for the creation of AGIR, association that unites 33 community associations of rural farmers in the Pratigi EPA;

viii) Worked to mobilize small rural land owners to restore forests in spring areas and the margins of bodies of water;

ix) Prepared projects along the Central Corridor of the Atlantic Forest to promote the permeability of the landscape, associating job and income generation through forest restoration with Agroforestry Systems and recomposition of native forests in Legal Reserves and Permanent Preservation Areas.

x) Developed the “Registry of Conserved Areas”, a GIS tool that allows social, economic and environmental management in southern Bahia in cooperation with the State Secretary of the Environmental (SEMA) and the Brazilian Institute for the Environment and Natural Resources (IBAMA), allowing inspection and licensing of projects;

xi) Executes the “Endless Waters” Project in partnership with the Ituberá Municipal Government, SEMA and local community associations with the goal of restoring springs and the headwaters of rivers that make up the only river supplying the city of Ituberá. This project is being financed by the National Environment Fund (FNMA);

xii) Coordinates and executes the Integrated and Sustainable Development Plan for the Pratigi EPA, which has partnered with the Bahia State Government, the Inter-American Development Bank (IDB) and the UN.

xiii) Coordinates and executes the Neutral Carbon Pratigi which has been validated under the Climate, Community and Biodiversity Standards (CCBS)

Although the focus of OCT actions is the Pratigi EPA, the larger vision is to replicate the experiences and projects in the five EPAs in southern Bahia.

OCT’s infrastructure includes an office in Ituberá, Bahia. Its Board is made up of well-known people in nature conservation and sustainable development, including businessmen and consultants, respresenting institutions such as the Odebrecht Foundation, PriceWaterhouseCoopers, J.C. Teles & Advogados Associados and the BioAtlantic Institute (IBio).

Over the last 10 years in the Pratigi EPA, OCT has established a large network of partners, such as the Secretary of the Environment and Water Resources (SEMA), Fundação SOS Mata Atlântica, Instituto Floresta Viva, Universidade Estadual de Santa Cruz (UESC), the regional Landless Movement (MST), the Serra da Papuã and Juliana Valley Agro-Ecology Associations, the Boitaraca and Jatimane Community Associations, the Association of Municipalities of Southern Bahia (AMUBS), the Pratigi EPA Intermunicipal Consortium (CIAPRA) and the Pratigi EPA Steward Association (AGIR).

Name of contact person: Renan Akio Kamimura

Title: Project Coordinator

Department: Small Enterprise of Environmental Conservation

E-mail: contato@oct.org.br / renankamimura@oct.org.br

Address: Km 386 of BR 101, Serra da Papuã – Pratigi EPA Portal, Ibirapitanga, BA

CEP: 45.435-000

Mail address: Caixa Postal 26 – CEP 45450-000, Gandu, Bahia.

OCT website: http://www.oct.org.br/.

1.4 Other Entities Involved in the Project

Cooperative Alliance for Ecoystem Services[8] (ACSA): With the objective of reversing the current environmental degradation trend in the Pratigi EPA, three organizations (Odebrecht Foundation, OCT and the BioAtlantic Institute[9] (IBio) created ACSA to transform the Pratigi EPA into a center of reference for generating and negotiating ecosystem services (water, carbon and biodiversity) for national and international clients. Their goal includes concrete results for forest restoration and conservation along with the development and improvement of the quality of life of local populations.

Odebrecht Foundation[10]: Institution responsible for the creation and management of Development and Integrated Growth Program with Sustainability of the Mosaic of EPAs of Southern Bahia.

Name of contact person: Joaquim Cardoso

Title: Executive Director OCT

Address: Av Luís Viana, 2841 - Paralela. Salvador - Bahia

Phone: +55 71 3206-1111

Email: joaquimcardoso@odebrecht.com

Odebrecht Foundation website: www.fundacaoodebrecht.org.br

Guardian Association Pratigi EPA[11] (AGIR): it is responsible for supporting mobilization and organization of meetings with land owners and rural communities at Pratigi EPA. Having 32 associations linked to AGIR, it will be also the responsible of spreading comments directly with communities to seek effective engagement of them, which represent communities potentially affected by the Grouped Project. Their comments will be collected by AGIR in order to be considered under a transparent manner by the Grouped Project.

Name of contact person: Pedro Paulo

Title: Executive Director

[8] *Aliança Cooperativa de Serviços Ambientais*
[9] *Instituto BioAtlântica*
[10] *Fundação Odebrecht*
[11] *Associação Guardiã da APA do Pratigi: http://www.pratigi.org/*

Address: km 386 – BR101 – Serra da Papuã; km 06 of Parque da Cidadania Road; Portal of Pratigi EPA - Ibirapitanga, Bahia, Brazil

Phone: +55 73 9983-8058

Email: pedropaulo@pratigi.org

Intermunicipal Consortium of EPA do Pratigi[12] (CIAPRA): it will promote articulated connection between the municipalities involved in the sustainable development planning in the region, creating joint mechanisms for consultations, studies, implementation and supervision of their actions, according to a Model for Sustainable Development.

Name of contact person: Francisco Pereira

Title: Executive Secretary

Address: km 386 – BR101 – Serra da Papuã; km 06 of Parque da Cidadania Road; Portal of Pratigi EPA - Ibirapitanga, Bahia, Brazil

Phone: +55 73 9977-8937

Email: franciscopereira@ciapra.org.br

C_3 - Floresta, Meio Ambiente & Energia: It is in charge of VCS PD (GPD and PAI#1) preparation, adjustments, as well as technical support to the developers regarding to the VCS and AFOLU issues.Name of contact person: Diego Serrano

Title: Director and AFOLU/LULUCF specialist

Address: Alameda Rio Claro, 137, conj. 22, Bela Vista, São Paulo - SP, CEP: 01332-010

Phone/fax: +55 75 98283988 and +55 11 32887959

Email: c3floresta@gmail.com

1.5 Project Start Date

The Reforestation Grouped Project at Pratigi Environmental Protection Area starting date is May 1st, 2011, which is the date on which the generation of GHG emission removals are implemented. This date represents the signature of the teaming agreement (annex 10) between OCT and the one of the members of first Project Activity Instance: *Fazendas Reunidas Vale do Juliana* (hereafter referred as *Reunidas*). This agreement has the objective of developing and implementing environmental services project (water, carbon and biodiversity) on the sub-basins *Mina Nova* and *Vargido*, which are on lands of *Reunidas* (PAI #1), in order to transform environmental services to liquid assets for national and international clients, attract financial appeal to enable the recuperation of degraded lands and forest conservation, pay families units and rural owners responsible for the production and maintenance of environmental services generated and add value to the natural heritage in the region of South of Bahia.

[12] *Consórcio Intermunicipal da APA do Pratigi (CIAPRA)*

1.6 Project Crediting Period

The project crediting period is from May 1st, 2011 through April 30th, 2036, totalizing 25 years. The Grouped Project, at this time, may be renewed to the maximum extent currently possible (up to four times of 25 years to a maximum of 100 years), which would continue the period through April 30th, 2110.

Each Project Activity Instance will have an operational lifetime of 30 years, following CDM rules related to the definition of the maximum crediting period for afforestation/reforestation projects.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

This Project Activity Instances is part of the small scale Grouped Project of Pratigi is small scale, such as the Project Activity Instances will be included in.

Project	x
Large project	

Table 1 - Estimated the cumulative GHG emission removals (tCO2e).

Years	Estimated cumulative GHG emission removals (tCO_2e)
2011	1.139,26
2012	2.278,53
2013	3.791,90
2014	5.305,28
2015	6.818,66
2016	8.394,22
2017	9.969,78
2018	11.613,74
2019	13.257,71
2020	14.901,68
2021	16.622,40
2022	18.343,12
2023	20.148,28
2024	21.953,43
2025	23.758,59
2026	25.637,45
2027	27.516,32
2028	29.809,15
2029	32.101,98
2030	34.394,81
2031	35.862,24
2032	37.329,66

2033	38.797,08
2034	40.264,50
2035	41.731,92
2036	43.199,35
2037	44.666,77
2038	46.134,19
2039	47.601,61
2040	49.069,03
Total estimated ERs	**49.069,03**
Total number of crediting years	**30**
Average annual ERs	**1,636**

1.8 Description of the Project Activity

The Grouped Project is located in a proposal of enlargement of the State Conservation Unit of sustainable use Pratigi Environmental Protection Area, which is in the Southern State of Bahia, with the territorial units adjoining three Environmental Protection Areas: Tinharé-Boipeba EPA, Camamu EPA and Caminhos Ecológicos da Boa Esperança EPA. They all together form the mosaic of EPAs in the Southern Bahia (figure 1), as named by the PDCIS.

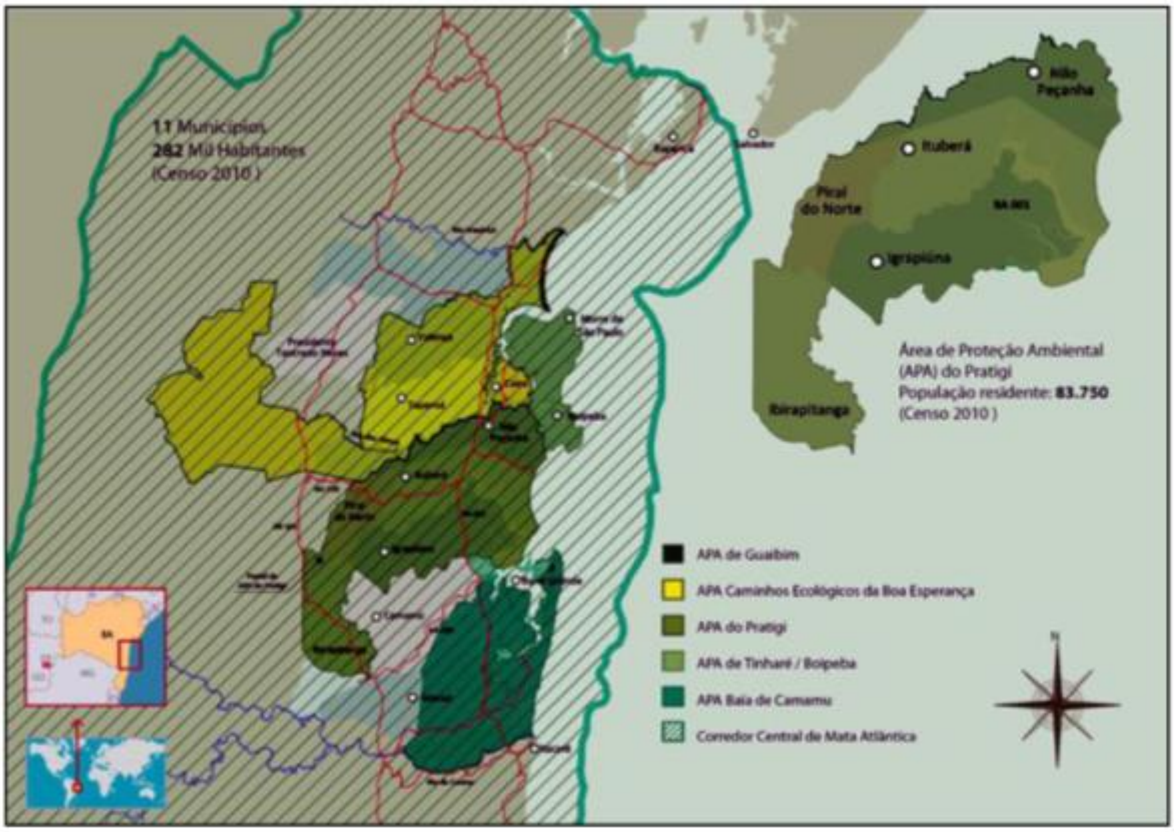

Figure 1 **-** Map of mosaic of EPAs in the Southern Bahia and Pratigi EPA.

The target area covers nearly 170,900 hectares of private lands for which zoning and management plans, biotic and abiotic assessments and GIS database are available. Over half of the area is owned by small and medium-scale landowners and members of traditional communities. Currently, conservation or restoration of private forests is not a viable land use for small and medium-scale landowner: it incurs costs and no revenues. Although required by law, protection of rainforests represents a net financial loss to the landowner, and in practical terms, the result is continuous deforestation and reduction of biodiversity.

In environmental protection areas such as the Pratigi EPA, deforestation is a very low-profile process in order to avoid attracting attention from authorities. It is a micro deforestation process, called *desmatamento formiga* in Portuguese (literally translating to ant deforestation). Landowners clear plots of one to five hectares at a time (Figure 2). **Erro! Fonte de referência não encontrada.**

Figure 2 - Micro deforestation (*Desmatamento Formiga*). Photos: Valverde, 2008.

The predominant land use change in the area is the conversion of rainforest into low-value crops, such as cassava and banana, or into low-grade pasturelands. A few agroforestry systems exists on midsized properties, but the most common uses of rainforest ecosystems includes poaching, illegal logging and real estate and urban development.

In order to ensure widespread protection of the existing carbon stocks and high conservation value forests, revenue must be generated for the property owner. Through the mechanism proposed in this Grouped Project, private property owners will receive regular payments that will vary according to ecosystem services generated by the provider which will be calculated by the amount of carbon removal and biodiversity contained in their land and the duration of time for which they are willing to commit their lands to the project. In exchange, the landowner agrees to yield the management of the reforested and forest land in their property, as well as the rights to sell carbon credits for the crediting period of this Grouped Project, which is 100 years.

Therefore, this Grouped Project will contribute to climate mitigation by increasing carbon stocks through the growth of trees. It will also promote biodiversity conservation by restoring and maintaining a native ecosystem. Finally, the Grouped Project brings community benefits in the form of payments to landowners for ecosystem services, improved water and soil quality, direct work opportunities during the reforestation process, technology transfer and dissemination of information regarding climate change and the value of standing forests[13].

This project will achieve climate mitigation by reforestation of native species using seedlings, implantation of AgroForestry Systems and isolation of degraded areas to promote the natural regeneration of the ecosystem. The carbon financing resulting from this Grouped Project will provide funds to permit payments to communities engaged to the project in PES arrangements.

The forest restoration will achieve GHG removals through tree growth. Carbon will be sequestered from the atmosphere through the growth of trees and stored in the aboveground biomass and belowground biomass of those living trees. Emissions due to implementation activities, including emissions due to the burning of fossil fuels for transportation and machinery, and nitrogen emissions from the fertilizer used, will occur on a small scale and are not significant enough (less than 5% of net removals)[14] to consider in the calculation of net removals, as described in section 3.2 below (Project Emissions).

Regarding the restoration techniques to be used in this Grouped Project, it is planned to restore forest ecosystems in areas legally defined as Permanent Preservation Areas (APP), particularly around springs, water courses and, as well as Legal Reserves as defined in Law No 12651/2012. Different restoration methods will be used depending on the original vegetation characteristics, the current land use and the local characteristics that indicate the degree of human use and alterations in the ecosystem (Botelho, Scolforo and Oliveira, 2011).

Reforestation activities will follow some steps and standards and will use the methodological framework of the Pact for the Atlantic Forest Restoration (LERF/ESALQ, 2009)[15] adapting it according to environmental and ecological features of the area of intervention (there will be some particularities in the case of the Agroforestry System), including those that deserve attention and will be used as ground zero for the restoration update.

Regardless the restoration technique used (models 1, 2 or 3), all PAIs´ activities will be designed in order to guarantee the following:

I. The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;
II. The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity;
III. The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity.

[13] Please refer to annex 4 CCB GPD

[14] In addition, according to AR AMS0007 v.3: *"GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero"*

[15] Annex 8

Diagnosis of Areas to be restored: In addition to GIS data of the region dealing with environmental features, it is needed to perform several actions that, generally, can be called diagnostic or environmental zoning. This diagnosis will lead to an environmental intervention, which corresponds basically to establish actions that result in the conservation, management and environmental restoration, particularly the Permanent Preservation Areas and Legal Reserves. It happens due to current legislation and some particular situations that, although not protected by law, should also be recovered with regional native species, since the environmental benefit of this type of recovery is much bigger than if the area is kept for agricultural activities. Amongst these situations, we can highlight those with great potential for linking the remaining fragments (ecological corridors), areas with low agricultural and/or high forest fitness, situations with high erodibility, among others.

Model Artificial Regeneration 1 (Total Seedling) - Botelho, Scolforo and Oliveira (2011)

This restoration model is recommended for areas with planted pastures with slopes less than 12% located at any distance from the forest fragments. The lower slopes allow mechanized equipment to be used to prepare the soil. Because of the previous use, the soil preparation should be intensive, since soil compaction is possible. After this, mixed planting should be carried out in the entire area.

The following operations, necessary for applying this model, should follow these basic guidelines:

Soil Preparation

Preparation of the planting area should be done before the start of the rainy season so that the planting coincides with the first rains, increasing the chances of survival for the seedlings and stimulating higher initial growth.

The combination of the subsoiling, plowing, harrowing, and row-digging operations might be used if necessary, but always taken into account the first two bullets mentioned above (I and II). This conventional soil preparation is difficult to avoid in some areas where there are evidences of compacting and surface sealing of the soil. These operations should be performed considering the need to follow the soil conservation methods, such as leveling and, if necessary, building terraces and containment basins to prevent erosion. This adjustment should be made specific for each area, but always avoiding to damage the existing threes.

Digging and spacing of the planting

For planting seedlings, holes along the rows should be at least 30 cm deep and an average of 30 cm in diameter.

The area per plant should be 6 m^2 with a spacing of 2 x 3.0 cm, or 2 m between rows and 3.0 m along the row, which results in a density of 1,666 trees per hectare, using an offset pattern that results in the distribution in field shown in Figure 3.

Selection of species for the planting

Native species from the local ecossystem should be used, selected according to the floristic survey and other information from available literature (Table 2). Another factor to be considered in the selection is the availability of seedlings in the region, which is deficient, but this may be corrected with actions proposed in the plan. The fundamental aspects of the selection include information on the ecological group (regeneration guild) and on their adaptation to the adverse conditions of the site in question.

The floristic composition of this planting model is defined as 50% of plants from pioneer species and 50% of plants from climax species, with 30% of the climax species requiring sunlight (or secondary) and 20% of them tolerant of shade conditions (climax). The plants from the different ecological groups should be distributed in alternating rows, with one line of pioneer species and another line of secondary and climax species, as shown in Figure 3. The species listed in Table 1 are considered pioneer.

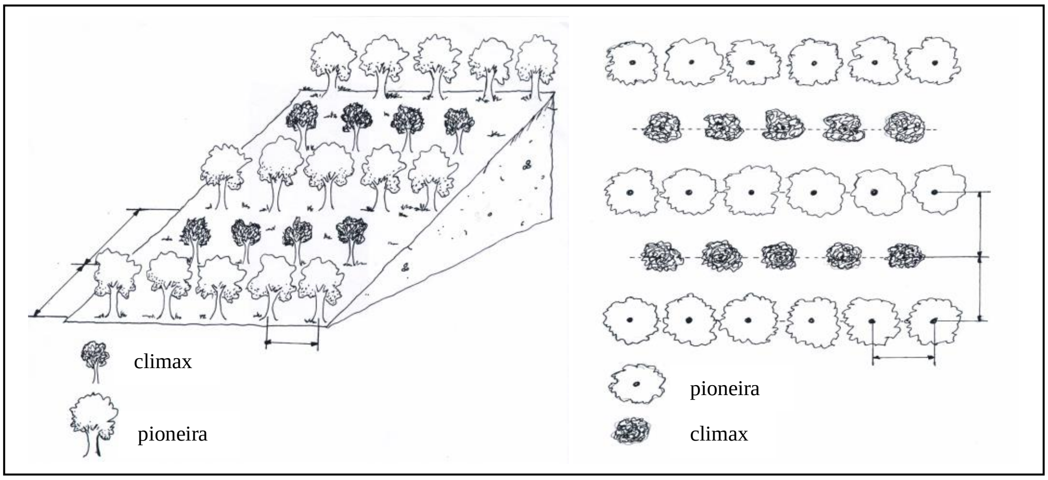

Figure 3 - Offset distribution of plants, which consists of one slower-growth plant (climax) in between four rapid-growth species (pioneer) plants.

Table 2 - List of species considered to have rapid growth in the degraded areas of the Pratigi EPA, used by OCT. *Species in botanical identification phase.

Species (popular name)	**(Botanical name)**
CURIMRIBA	*
ANDIROBA	*Carapa guianensis Aubl*
MURICI BOI	*Byrsonina sericea*
CAPIANGA	*Vismia ferruginea H.B. or* *Vismia guianensis (Aubl.) Choisy*
CAPIANGA FOLHA LARGA	*Vismia ferruginea H.B. or* *Vismia guianensis (Aubl.) Choisy*
EMBAÚBA	*
FUMO BRABO	*
PAU POMBO	Tapirira guianensis Aubl
TARARANGA	*Pouroma guianensis*
MUNDURURU DE REGO	*
LOURO SABÃO	*Ocotea SP*
SORTEIRA	*
CARNEIRO DE POMBA	*

MATATAÚBA	*Schefflera morototoni*
IMBIRUÇÚ	*
PAU BRASIL (falso) CORAÇÃO DE NEGO	* *
PAPARAÍBA	*Tabebuia cassinoides*
PIQUI DE CAPOEIRA	*Miconia minutiflora*
IMBIRUNA	*Melanoxylon braúna*
PUTUMUJU	*Centrolobium microchaete*

Obtaining quality seedlings

The seedlings will be produced in the OCT nursery, using only species collected in the local forests by the communities that the area is inserted in the collectors network of Pratigi EPA to maintain the genetic base of the region.

The seedlings should meet the quality standards: they should be strong, healthy, well-acclimated, with a well-formed root system with no folding and should be 25 to 30 cm in height with a stem diameter of more than 3mm. Seedlings that are too small or too large may have high mortality rates and increase costs because of replanting.

Fertilizing the planting

Fertilization of the mixed forest planting is based on general information on nutritional requirements known for various species and on the fertility conditions of the local soils. Considering the diverse conditions in the Pratigi EPA, it is recommended that during the planting 150 grams of simple superphosphate be added to the hole for supply of phosphorus.

Planting and Replanting

Planting should be carried out preferably during the region's rainy season, avoiding the use of irrigation, which burdens the planting, thus ensuring a high index of seedling survival and growth.

Basic care should be taken during the planting, principally with the root system to prevent damaging it. If the mortality rate is higher than 5%, replanting of the seedlings is recommended, approximately 15 to 30 days after the planting.

Surface Fertilization

To supply other macro-nutrients essential to establishing the seedlings, it is recommended that 50 grams of NPK 20-00-20 be used approximately 60 days after the planting, repeating after 12 months. It is important to remember that the soil must be adequately moist to apply surface fertilizers.

Control of invasive plants

Control of pasture grass growth is very difficult because of the high resistance and regeneration capacity of these species, which create an effective seed bank in the soil and have a high capacity for sprouting. This fact, along with the sensitivity of the tree species relative to competition from the grasses and the decision not to use chemicals makes it necessary to have an effective plan for controlling competition in these areas. The frequency and intensity of the operations should be defined and carefully monitored for each particular area, and should consist of weeding operations around the crowns and selective mowing of the remaining area, taking care not to eliminate the tree species that are naturally regenerating.

Manual weeding along the crowns in a minimum radius of 50 cm will be necessary to control invasive plants along with selective mechanized mowing in the rest of the area. The selective mowing will involve cutting the above-ground part of the potentially invasive plants, plants that are not part of the local ecosystem, especially grasses and native species with high invasion potential, such as species of the genus *Pteridium* (fern). This operation should be done with appropriate care to preserve the tree species that will establish themselves in the area through natural regeneration.

The frequency of invasive plant control activities will be defined for each area depending on the types of plants present and the level of infestation. An average period of three years of control activities is expected.

Control of leaf-cutter ants

The control of leaf-cutter ants is necessary because they can cause damages during the start of the restoration process. Ant control should start before planting and last as long as required, monitoring over longer intervals until no more anthills are observed at a level that could damage the plants.

Granulated bait should be used because it is more practical and lower in cost and the technical and environmental manufacturer's instructions should be followed. The ant control period is expected to average three years.

<u>Artificial Regeneration 2 (induction/isolation)</u>

This model is of utmost importance for the recovery of degraded areas, because leverages the potential of auto-recovery of the area in order to take into consideration this potential, being able to initiate and/ or conduct the natural restoration processes. Thus, it is possible that at least part of the natural vegetation is restored from stock induction and conduction of natural regeneration itself.

This has the effect of not only reducing the cost of environmental compliance, but also a greater guarantee of success of these actions.

Regeneration sites will be evaluated according to guidelines of the Pact for the Atlantic Forest Restoration based on the following three-level approach:

- *Low expression of natural regeneration:* The regeneration of native species is "thin", having failures in closing the canopy area by these species or few individuals of the same distributed by area. For practical purposes, areas of low expression of natural regeneration are considered to be those who have not reached the population of plants used in conventional crops, ie: about 1,700 individuals/ha. This indicates that the planting of seedlings to supplement the occupation of the area will be necessary, and in most of these cases, also need enrichment.

- *High expression of natural regeneration with low floristic diversity:* The native species are present throughout the area at high density and shading much of the soil surface, where regeneration is at a more advanced stage. However, this regeneration is usually composed of initial species of forest succession (pioneer), which resulted from the seed bank. As a result, regeneration is often composed of few species, their enrichment with final species (secondary and primary) to forest sustainability is needed.

- *High expression of natural regeneration with high floristic diversity:* Especially in rich areas of preserved forest fragments, in which the activity of scatterers is high, regeneration may exhibit high floristic diversity (about 80 species), not requiring the introduction of seedlings for their complementation

Artificial Regeneration 3 (Agroforestry System)

This approach reflects the reality and environmental dynamics of the Pratigi EPA. As described in above, the region is historically characterized by using different local clusters that contributed to the conservation of the region (known as the "cabruca ").

This approach meets the new environmental legislation relating to native vegetation (Federal Law No. 12,651/12) that allows farmers who fit the definition of family farmers restoration of Areas of Permanent Preservation (APPs), which are regarded as the legal standard as established areas.

Since a considerable number of producers in the Pratigi EPA own profile family farmers (with an average size of 15 ha rural property) this approach ends up having a potential of generating income and contributing to climate change mitigation, besides promoting environmental suitability of these rural properties.

The main model that OCT is using is described in figure below jointly with the likely number of individuals to be planted.

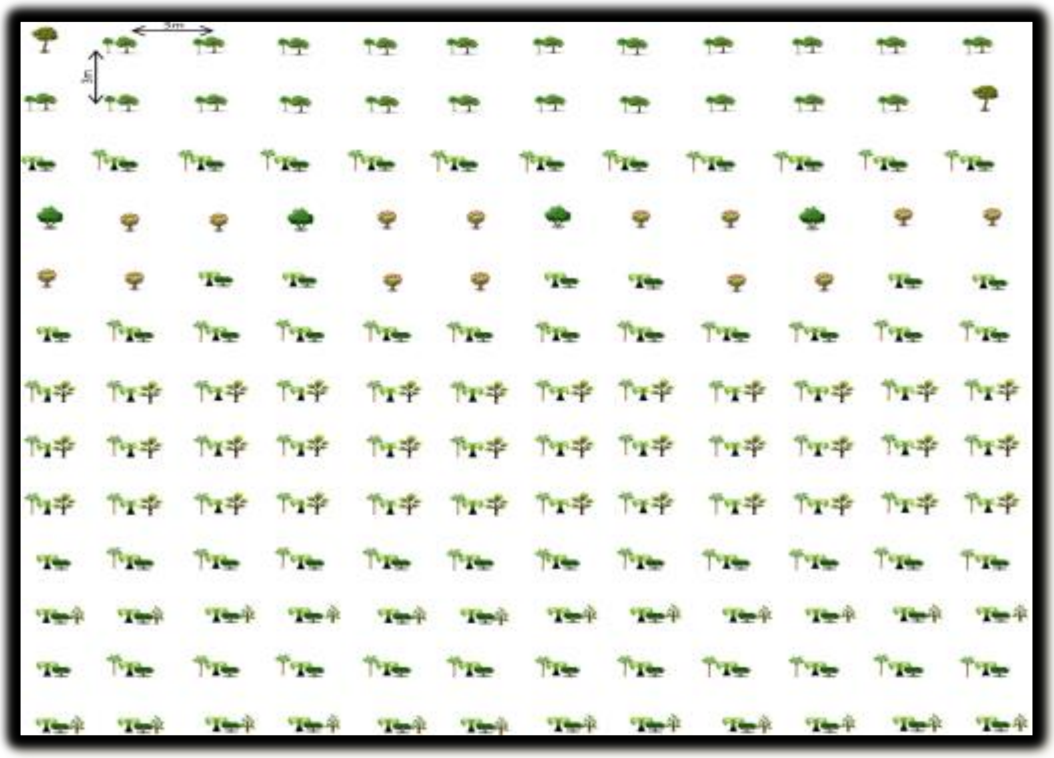

Figure 4 - Main model of plantation. Source: OCT.

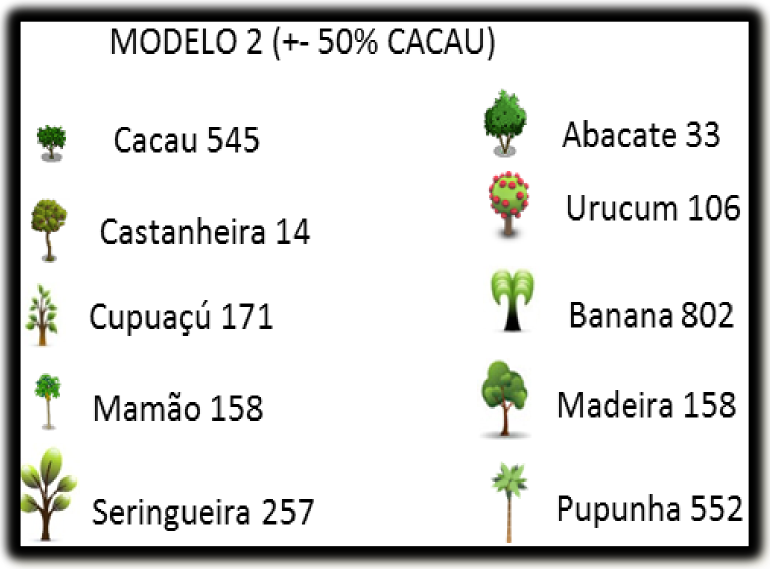

Figure 5 - Main species of plantation. Source: OCT.

Average data of increment tCO_2/ha/ano for above-ground

To calculate ex-ante carbon removal for the Grouped Project of Pratigi EPA, the increment value obtained from the data published by Embrapa Forestry, TNC and SPVS (annex 6) will be used. For the principle of conservative approach between the possible values available in the literature, average annual rates of increase of carbon dioxide that was the lowest value, thus its use is preferable in the absence of accurate local data.

This study analyzed 165 experiments in the Atlantic biome, most have been conducted in good soil fertility, making difficult a comparison between increment of biomass and soil, although soil fertility influence on the growth of the species . Edaphic situation similar to the APA Pratigi .

All the methodological framework for the activities of forest restoration is based on the methodology of the Pact for the Atlantic Forest Restoration and all calculations performed by OCT in this section considers a density of 1,666 trees per hectare (following the spacing 3x2m).

Table 3 - Increment data tCO2/ha Above-Ground for each Year Group based in the BEF approach.

Year Group	Above-ground increment tCO_2/ha
0-4.9	9,86
5-9.9	14,95
10-14.9	21,24
>15	27,29
average	**18,33**

Eligibility Criteria

Following VCS procedures, it has been shown that the land where the project activities will be carried out was not a forest (according to the definition above) in 2001, and is not a forest in the began of the project. The methodology to assess the eligibility criteria of the project area to integrate this Grouped Project is described below[16].

For a determined area to be considered eligible, any pixel characterized as lacking vegetation from the older date must also be lacking vegetation in the more recent image. To comply with the VCS protocol, pixels are eligible if they are classified as deforested in images from 2001 and 2011.

The Interministerial Commission on Global Climate Change, in its resolution no. 2, defines forests as lands having growing trees with:

- A minimum tree crown cover of 30%;
- A minimum area of 1 hectare; and
- A minimum potential height of 5 meters at maturity.

[16] In addition to the methodology presented in this section, a complementary methodology had to be developed in order to encompass small areas not covered by this approach due to restriction of Landsat image resolution, please refer to annex 9 and annex 5 (methodology update).

These threshold values of the forest definition from the Brazilian governmental agency comply with the UNFCCC definition and are used for this A/R project activity.

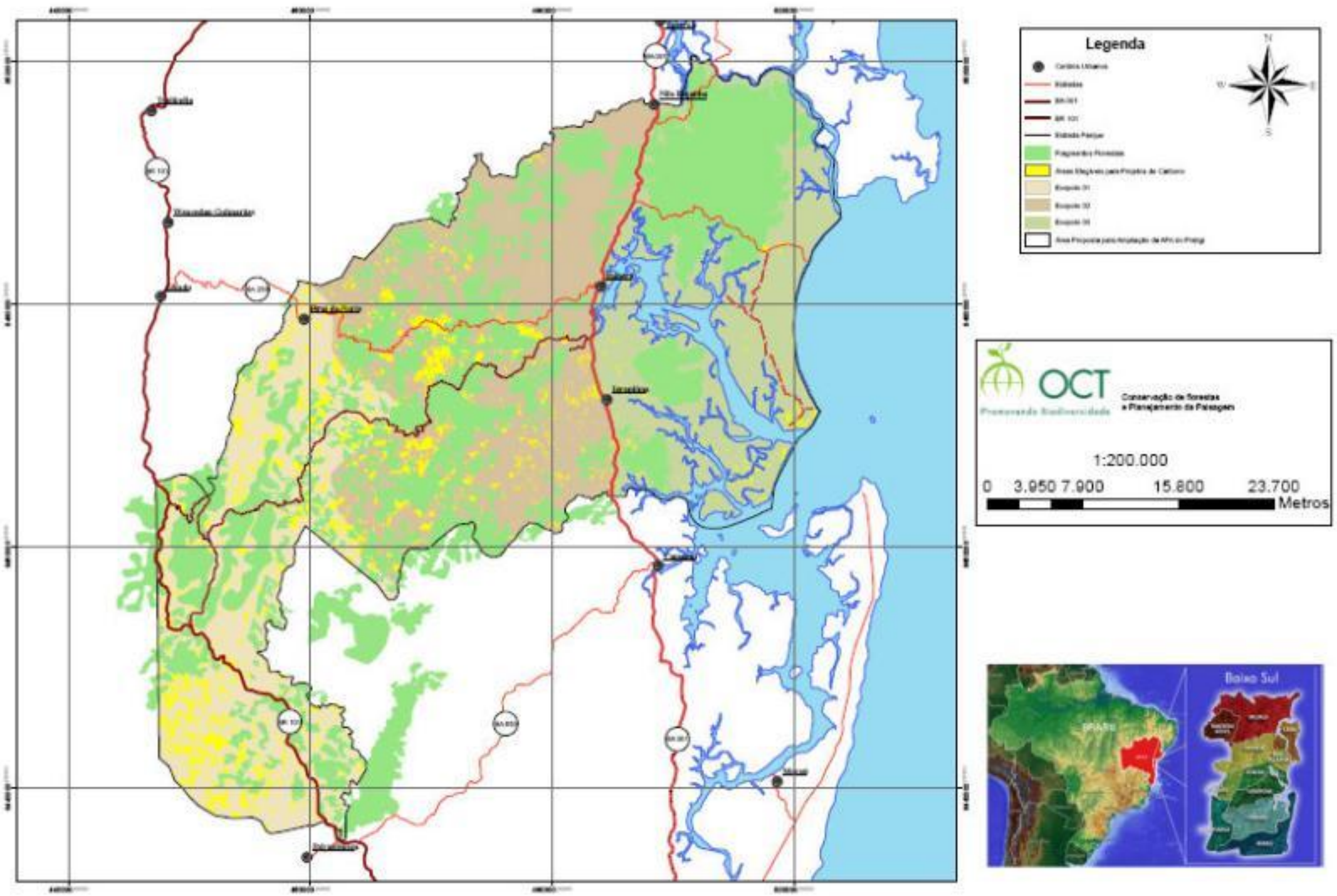

Figure 6: Areas eligible for the Pratigi EPA Grouped Project.

The criteria for including a Project Activity Instance (PAI) into the Grouped Project are:

- The proposed PAI must be within the Pratigi EPA;
- Current land use/cover on the PAI areas must be one or more of the types described in the Grouped Project: (i) pasture (Characterized by the dominant presence of grasses being the predominant species (Panicum Maximum) (Brachiaria decumbens) and HUMIDICOLA (Brachiaria humidicula) with little or no occurrence of invasive species, or woody plants); (ii) degraded pasture (Characterized by the occurrence and prevalence of the species mentioned above, but with levels of soil degradation (bare) marking the landscape, occurring or not formation of erosion gullies laminar); (iii) dirty pasture (areas occupied predominantly by grasses, but begin to occur the presence of shrubs and small trees. These are areas that have been opened for deploying temporary crops or pastures, but at one point were in many cases abandoned); (iv) Pastures occupied by "Fetos" (these are areas that have been transformed into pasture, but due to the high degree of soil acidity, these areas were colonized by pteridophytes, Pteridium SP, locally known as “feto”);
- The duration of the crediting period for each instance must start and finish within the Grouped Project timeframe (see Section 1.6).
- The current or planned commercial alternatives uses of the PAI areas is cattle ranching, despite the fact that the properties can have other commercial uses as well as in other areas that are not the PAI;
- Each PAI area is along steep and riparian zones. Any flat areas within each PAI will not make up a significant part of the restoration area and will be used as part of the landowner’s legal reserve always stimulating the ecological corridors formation;
- The landowner must follow the Brazilian labor law requirements.
- The combined tool for assessing baseline and additionality described in this Grouped Project (Section 2.5) should be applied to the PAI, and the results should be within the range defined by the Grouped Project.

  All methodological choices for the PAIs will follow exactly the pattern described in this Grouped Project.

1.9 Project Location

This Grouped Project will take place in the Pratigi EPA, located in Bahia state, Northeastern Region in Brazil. It is also located in the northern part of the Atlantic Forest Central Corridor, which is considered one of the most biologically diverse areas in the Atlantic Forest Biome, with about 12,280,000 ha spread over Southern *Bahia*, *Espírito Santo* and a small part of eastern *Minas Gerais*.

The Pratigi EPA was created in April 1998, initially covering two municipalities of Southern Bahia: *Nilo Peçanha* and *Ituberá*, and about 49,000 ha. It considered several land-use possibilities: Wildlife Preservation Zone, Vegetal Extractivism Zone, Agroforestry Zone, Consolidated Urban Center, and

Tourism Zone. The zoning was developed under the premise of preserving native forest without jeopardizing the traditional way of life of the local inhabitants.

In 2001, the Pratigi EPA area was expanded to 85,686 ha, and another expansion was proposed by OCT in 2010, to expand the EPA area to 170,000 ha. This proposed area almost completely covers the municipalities of *Nilo Peçanha*, *Ituberá*, *Igrapiúna*, *Piraí do Norte* and *Ibirapitanga*. The boundary of the EPA is contained within the coordinates 13^{o}35’S, 14^{o}09’S, and 39^{o}29’W, 38^{o}57’W. Regardless of the approval of the proposed expansion of the limit for Pratigi EPA, the Grouped Project includes the original boundaries of the EPA and its expansion area, which is also the focus area of the PDCIS. Thus for the inclusion of PAIs in the Grouped Project, it is considered the region boundary proposed by OCT and will be called herein as "Pratigi EPA".

The figure below displays a physical map of the Pratigi EPA showing the complete detailed boundary, which is also the boundary of this Grouped Project, the main geographical features and land cover.

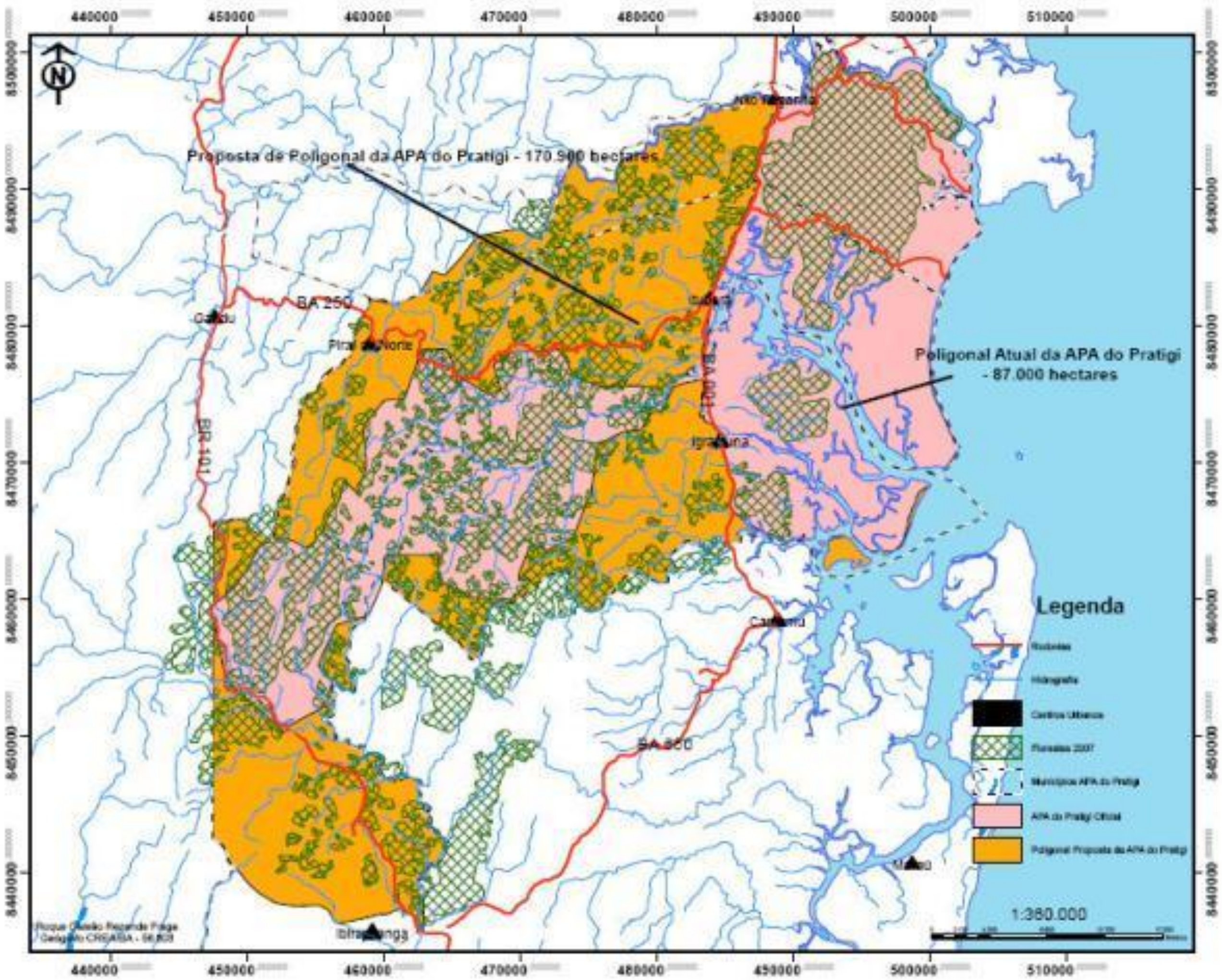

Figure 7: Proposed enlargement for the Pratigi EPA in orange. Pink marks current boundary of Pratigi EPA.

The figure below presents the areas covered by this first Project Activity Instance (PAI #1):

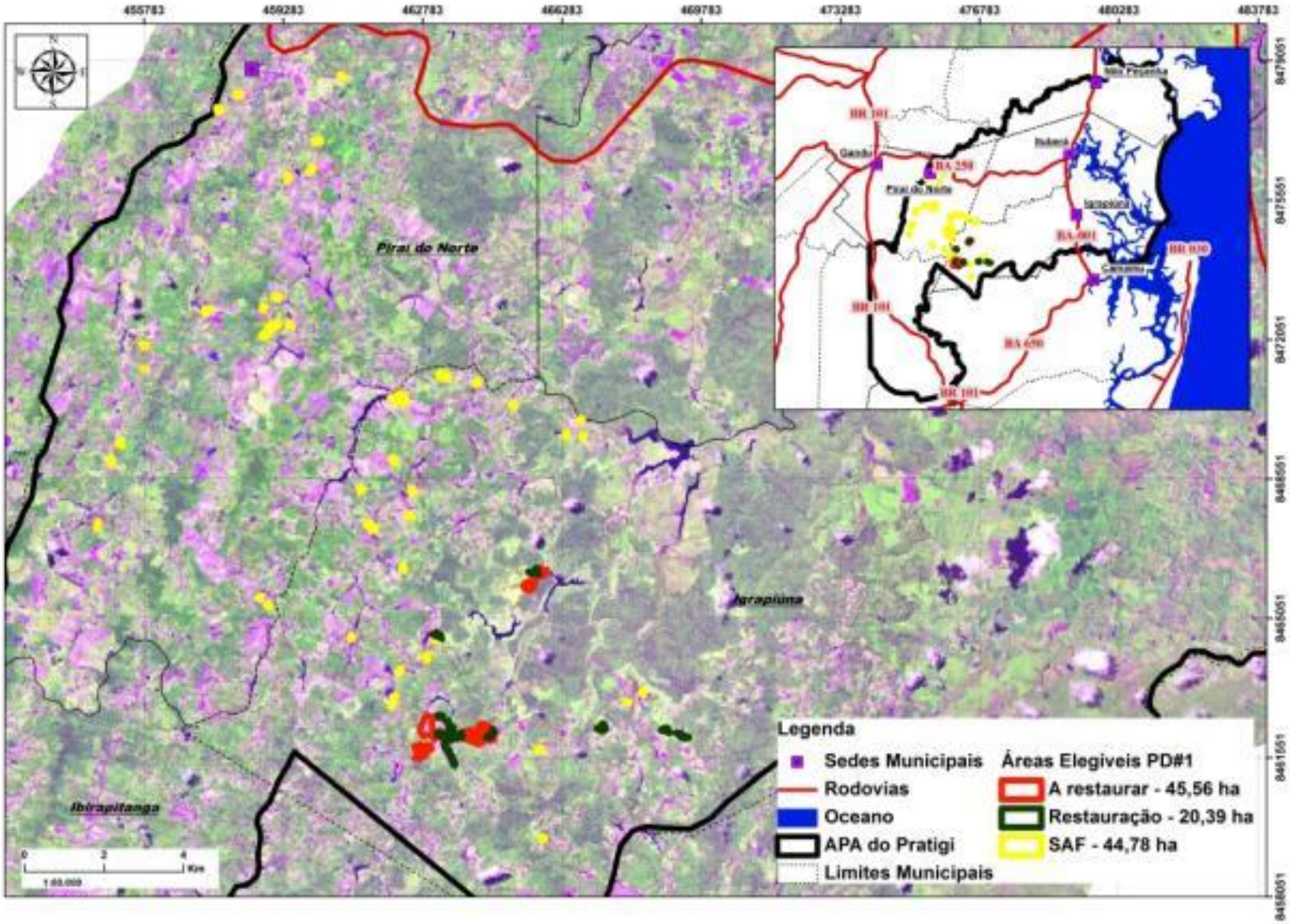

Figure 8 - Areas included under the first Project Activity Instance (PAI #1).

And the table below presents a general information by this first PAI #1:

Table 4 - Listing of PAIs with general information: number of PAI, PAI identifier, recovery model, recovery area, land owner and geographic coordinates.

Number	ID - Identifyer	Model	Area_ha	Farmer's Name	Farm's Name	X	Y
1	9	SAF	1,02	Adenilton Pereira do Nascimento	Sítio Antônio Rocha	462061	8470535
2	28	Restoration	0,35	Agenor Felix de Souza	Fazenda Jesus Me Ama	469329	8462064
3	2	SAF	0,57	Anacreto Ferreira da Silva	Sítio Três Irmãos	466827	8469607
4	6	SAF	0,49	André da Silva	Fazenda Santo André	465804	8459519
5	47	SAF	0,77	André José Ângelo dos Santos	Fazenda Boa Esperança	458781	8472843
6	7	SAF	0,97	Angelino de Jesus Santos	Sítio Novo Tempo	462536	8468243
7	5	SAF	0,92	Antônio da Silva Mamédio	Fazenda Brasileira	459981	8476316
8	4	SAF	1,48	Antônio Francisco de Jesus	Fazenda São Francisco	463246	8471153
9	54	SAF	1,21	Antônio Mamede dos Santos Brito	Fazenda Laranjeira	459392	8476117
10	56	SAF	1,04	Arival dos Santos Mamede	Fazenda Tubarão	454952	8468997
11	48	SAF	0,99	Carlito Conceição Santos	Sítio Bom Sossego	459118	8472418
12	3	SAF	0,35	Damiana Rosa dos Santos	Sítio Capim Verde	467919	8462935
13	12	SAF	0,86	Edson de Jesus	Fazenda Riachão	464156	8470976
14	49	SAF	0,94	Elezir Jesus dos Santos	Fazenda Boa União	465057	8470392
15	0	SAF	0,73	Fábio Ferrerira Monge	Fazenda Palmeira	462191	8463719
16	29	Artificial Regeneration	6,24	FRVJ	FRVJ	465620	8466218
17	30	Artificial Regeneration	2,97	FRVJ	FRVJ	465620	8466218
18	37	Artificial Regeneration	7,29	FRVJ	FRVJ	463220	8462124
19	38	Artificial Regeneration	13,28	FRVJ	FRVJ	463220	8462124
20	43	Artificial Regeneration	9,27	FRVJ	FRVJ	464505	8462133
21	44	Artificial Regeneration	6,52	FRVJ	FRVJ	464505	8462133
22	31	Restoration	1,36	FRVJ	FRVJ	465620	8466218
23	33	Restoration	0,94	FRVJ	FRVJ	463220	8462124
24	34	Restoration	1,72	FRVJ	FRVJ	463220	8462124
25	35	Restoration	2,04	FRVJ	FRVJ	463220	8462124
26	36	Restoration	3,37	FRVJ	FRVJ	463220	8462124
27	39	Restoration	4,49	FRVJ	FRVJ	463220	8462124
28	40	Restoration	1,46	FRVJ	FRVJ	463220	8462124
29	45	Restoration	1,09	FRVJ	FRVJ	464505	8462133
30	14	SAF	0,53	Henrique Régis dos Santos	Fazenda Boa Esperança	462011	8462878
31	16	SAF	0,78	Jailton Cipriano dos Santos	Fazenda Bom Sossego	462871	8464070

Continuation…

Nº	ID	Model	Area_ha	Farmer - Name	Farm - Name	X	Y
32	17	SAF	0,58	Jaime de Souza	Fazenda Boa Esperança II	461235	8468277
33	18	SAF	1,06	Jaime Lourenço Silva	Fazenda Três Coqueiros	459118	8473102
34	50	SAF	1,03	Jânio Silva Santos	Fazenda Santa Cruz	462459	8467621
35	41	Restoration	1,14	Jermilson Souza de Jesus	Fazenda Boa Esperança	467295	8462271
36	19	SAF	0,87	Jermilson Souza de Jesus	Fazenda Boa Esperança	467270	8462362
37	13	SAF	0,87	Jilberto Chagas Rosa	Fazenda Santo Antônio	462293	8466306
38	51	SAF	1,16	João Deolino Jesus Santos	Sítio Bom Sossego	461537	8467309
39	20	SAF	0,59	João Luís de Menezes	Fazenda Santa Luzia	468316	8463195
40	8	SAF	0,21	José Carlos Régis	Fazenda Boa Esperança	462073	8463087
41	15	SAF	1,05	José Eleutério de Jesus	Fazenda Boa União	455784	8471907
42	46	Restoration	0,13	José Soares dos Santos	azenda Morro da Conquist	468812	8462250
43	59	Restoration	1,41	Jovan Rocha do Nascimento	Fazenda Porto Alegre	462268	8470554
44	58	SAF	0,95	Jovan Rocha do Nascimento	Fazenda Porto Alegre	462268	8470554
45	21	SAF	0,58	Jovenal Deolino Jesus Santos	Sítio Bom Riacho	461405	8467410
46	53	SAF	1,37	Leonizio José dos Santos	Fazenda Boa Vista	458809	8472142
47	22	SAF	1,50	Marcelino Francisco de Jesus	Fazenda São Francisco	463378	8471124
48	52	SAF	1,15	Marcelo Mamede Mucugê	Fazenda Três M	457658	8477817
49	32	Restoration	0,57	Maria da Glória dos Santos	Fazenda Água Amarela	469305	8462112
50	11	SAF	0,36	Maria de Jesus dos Santos	Fazenda	455797	8471319
51	60	SAF	1,04	Mário de Andrade do Nascimento	Sítio Nascer do Sol	462156	8470857
52	23	SAF	0,47	Marivaldo Santos	Sítio União	466768	8470034
53	42	Restoration	0,91	Pedro Terezo de Jesus	Sítio Não Qebra	468905	8462219
54	10	SAF	0,84	Raimundo Cosme Sales Che	Fazenda São José	455181	8469438
55	24	SAF	0,93	Ronivaldo Rosa Santos Assunção	Sítio Abençoado Por Deus	465728	8461750
56	55	SAF	1,38	Rubens Máximo de Jesus Filho	Fazenda Modelo	458160	8478202
57	1	SAF	0,62	Sirlam Conceição de Jesus	Sítio Santa Luzia	460989	8464569
58	26	SAF	0,54	Valdir de Jesus Souza	Sítio Fé em Deus	466386	8469662
59	27	SAF	0,86	Vicentina de A. Mamédio Ché	Fazenda Renascer	454614	8467375
60	25	SAF	0,50	Waldemar de Oliveira Bahia	Fazenda Sonho Dourado	458910	8465369
61	57	SAF	1,14	Zeilza dos Santos Mamede	Fazenda Brasileira	460148	8477038

1.10 Conditions Prior to Project Initiation

Hydrology

The Grouped Project area is within the south Atlantic basin and comprises any river that drains into the Atlantic Ocean and is located between the São Francisco River and Rio de Janeiro and São Paulo states. This area is recognized for rivers with hydroelectric potential (e.g., Paraguaçu River). The Grouped Project area is specifically located in the south Recôncavo Basin, which consists of the Juliana, Oricó and Peixes Rivers and their tributaries. It covers 17,540 km^2 of land. The Juliana River sub-basin is the most important within the area.

The rivers in the Pratigi EPA do not have large flood plains due to their geological characteristics. However, because of the great flow of water in the rivers and the lack of native vegetation along the riverbeds, some sites have become silted. Damming of the rivers and pumping of water for agriculture also aggravate this phenomenon. These practices directly influence water quality (Ricklefs 2003). Previous water quality assessments of the rivers and tributaries in the Recôncavo Basin, showed “good conditions” compared to Brazilian standards (Centro de Recursos Ambientais 2000). However, more recent studies (Centro de Recursos Ambientais 2004) show that some indices are high in phosphate and fecal coliforms when compared to Brazilian standards. This is the result of uncontrolled domestic and agricultural waste into rivers.

Geology

The Pratigi EPA is located in the eastern portion of the São Francisco Geological Province (Almeida, et al. 1977) within the South-American Continental Shelf. The São Francisco Geological Province is classified as the São Francisco Craton due to its geological formation. This continental shelf is made up of sedimentary rock, more specifically gneiss-granite terrains with volcanic-sedimentary intrusions and granite terrains – both dating back to the formation of the Earth.

During the Cretaceous Period (145 – 0.5 million years ago), South America and Africa separated and formed the Atlantic Ocean, which consequently formed the Recôncavo Basin and the project area’s topographical and geo-morphological characteristics. The Pratigi EPA is situated on granite rock and thick layers of quartz intrusions that make up the Jequié Geological Complex, dating back 2.6 billion years (Ministério das Minas e Energia 1981). Granite is used by the local population for general construction.

The Pratigi EPA is divided into three distinctive sub-regions based on climatic and geological characteristics: Ecopole I (Sierra Papuã), Ecopole II (Central plains sub-region) and Ecopole III (Coastal sub-region).

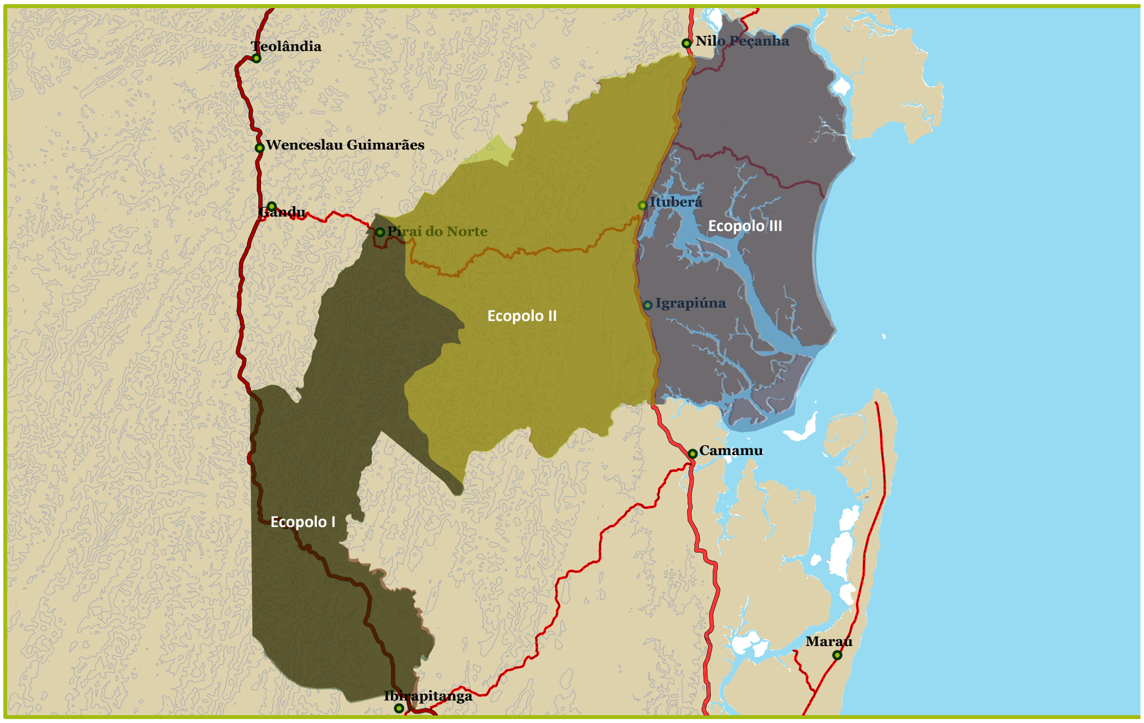

Figure 9 - The three sub-regions of the Pratigi EPA.

Serra Papuã

The Sierra Papuã is made up of four mountainous ranges. This area is the highest in altitude in Pratigi EPA. It has important natural springs that irrigate the region and supply the Peixe, Oricó, and Juliana Rivers. The mountains are about 200m in altitude (above sea level) and are located in the southwestern part of the Almada River watershed. Rock formations in this area originated from gneiss and granite, and they are deep, clayey, and very fertile. Cacao grows well in this area. Within this area also exists a mesa-like formation with low-fertility soils (Moreau *Análise Sócio Ambiental*).

Central plains

Within the Central plains sub-region, also known as the Juliana River Valley, are some of the largest fragments of the Ombrofila Forest. A large part of this forested land is in the middle of this valley on medium and large properties with large agroforestry cultivations. Planters use agroforestry systems extensively for growing cacao and rubber in this sub-region. The system for growing cacao, called cabruca, involves using a canopy of native trees to shade the cacao plants. When cacao and rubber are raised together, the rubber trees act as a canopy for the cacao plants and no native trees are necessary. The mosaic of preserved forest fragments and agroforestry plantations permits and guarantees the connectivity of the forest between the various properties. Rock formations in this sub-region are associated with granite, syenitic, and basic rock intrusions. Granite formations are especially hilly (Moreau *Análise Sócio Ambiental*).

Coastal sub-region

The topography of the coastal sub-region varies from rolling hills to plains and can be divided into three distinctive landscapes: sandbank, mangroves, and fragments of the Ombrofila Forest. The sandbanks occur in the western part of this sub-region and the terrain is mostly low altitude plains. Soil on the coastal plains is made up of relatively young sandy soils. The sandbanks make up the main vegetation in this area because they are well adapted to the sandy, infertile soil. These adaptations have allowed the sandbanks to remain in a very good state of preservation (Moreau *Análise Sócio Ambiental*).

Geomorphology and Soils

As erosive processes and tectonic forces carved the topography of the region, the soil characteristics vary considerably and can be divided into classes based on EMBRAPA's classification (Empresa Brasileira de Pesquisa Agropecuária 1999).

Soil types include yellowish utilsol which has a sandy/clayey texture, yellowish latosol which has a clayey texture, and inceptisol with a hilly terrain and clayey texture. Utilsol consists of soils with by diverse mineral matter and clay. Considering its various pedological characteristics, utilsol has restricted agricultural application due to its topography, soil composition, and compatibility. The latosol classification comprises ancient soils with high pedogenic development rates. Because of this and its mineral composition, latosol has important environmental roles of water retention and purification. Latosol has restricted use for farming; thus, within the project area, its major use is as pasture for cattle. Finally, inceptisol is made up of non-hydromorphic minerals and has a low rate of pedogenic development. Despite its moderate organic matter levels, inceptisol is considered a fertile soil due to its lithology: high values of biotite and iron.

Climate

The climate conditions in Bahia state are influenced by three air masses: the Atlantic Tropical air mass, the Atlantic Equatorial air mass, and the Atlantic Polar air mass. These three air masses characterize the project area's climate, according to the Köppen classification, as Tropical Rainforest (Af) and Tropical Monsoon (Am). Tropical rainforest climate has no well-defined dry season and has average precipitation above 1500 mm per year.

The air masses influencing this region induce a climate phenomenon known as "aseasonality" – referring to the lack of significant differences in daylight and mean monthly/daily temperature throughout the year in tropical zones (Chutter 2004). Temperature variation is very small, resulting in climate stability.

The Sierra Papuã and coastal sub-regions of Pratigi EPA are both tropical rainforest climates. Sierra Papuã includes Ibirapitanga and Piraí do Norte while the coastal sub-region of Pratigi EPA comprises part of Ituberá and Nilo Peçanha. This area is characterized by a hot and humid climate and no well-defined dry season. Temperatures are typically high with little variation. Precipitation is over 60mm in the driest month and is over 1330 mm annually. Cacao grows well in the fertile soils of the Sierra Papuã. The land in the coastal sub-region is used for various crops including cacao, rubber, clover, heart of palm, and fish farms. Tourism in the coastal sub-region is growing, and Ituberá can be considered the main vehicle for tourism development and extreme sports in the region.

Most of the Central Plains area has a Tropical Monsoon climate. Average temperatures are over 23°C and 18°C during the coolest month. Rain is consistent throughout the year except for a very short dry season. Precipitation varies from 500mm to 1100mm annually. During the driest months, August and September, rainfall is less than 100mm (Moreau *Análise Sócio Ambiental*).

Biodiversity currently within the project zone

The project site is within the most biologically diverse Brazilian ecological corridor: the Central Corridor. Encompassing Minas Gerais, Espírito Santo and Bahia states over about 12,000,000 ha of land, the Central Corridor is one of the last refuges of the native Brazilian Atlantic Forest.

Most of the Central Corridor region, where the project will take place, was originally covered with Atlantic Rain Forest. During the settlement of the region, harvesting of wood (timber extraction or logging of hardwoods), cattle ranching, and agriculture, mostly sugarcane and cacao, led to deforestation and continues today. About 12% of the area remains covered by native forest today (Critical Ecosystem Partnership Fund 2001).

Pau-Brasil tree (*Caesalpinia echinata*), which was used as a natural dye that became hightly valuable in Europe during the 16th and 17th centuries, was the main trigger for the first deforestation cycle in the region. Deforestation today is due to cattle ranching, and agricultural activities, mainly, banana and, manioc.

Because of deforestation, several species that live in the region are endangered and under threat of extinction.

- Terrestrial Fauna

One of the most biologically diverse areas of the Atlantic Forest is the southern Bahia region (Thomas and de Carvalho 1997) within the Central Corridor. In general, the Central Corridor harbors more than 50% of bird species endemic to the Atlantic Forest. In addition to the high bird diversity, the primate communities in Southern Bahia and in the highlands of neighboring Espírito Santo State are particularly interesting because at this location, all six Atlantic Forest primate Genera occur together. Twelve primate species, or 60% of primates endemic to the Atlantic Forest, occur in this region (Critical Ecosystem Partnership Fund 2001).

In the Pratigi EPA area, there are nearly 260 bird species, 77 mammals, 66 amphibian species, and 63 reptile species, in addition to the countless number of insects (Centro de Recursos Ambientais 2004).

As indicated by The International Union for Conservation of Nature (IUCN) Red List of Threatened Species (iucnredlist.org) and the BirdLife International Initiative (BirdLife International 2000), it is worth noting the status of six species.

First, the cougar (known as *onça-parda* or *Puma concolor*) is considered near threatened (NT), i.e. the evaluation does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

The red-billed curassow (known as *mutum-do-oeste*, *Crax blumenbachii*), white-winged cotinga (*anambé-de-asa-branca*, *Xipholena atropurpurea*), manned sloth (*preguiça-de-colera*, *Bradypus torquatus*) are considered endangered (EN), i.e. their population is severely fragmented with decreasing rates of extent occurrence, area of occupancy and number of mature individuals.

The Bahia spinetail (*joão-baiano*, *Synallaxis cinerea*) is classified as vulnerable (VU), i.e. its population density decreased more than 30% over the last 10 years, its area range is severely fragmented, and it is likely that there are less than 1000 mature individuals.

The yellow-breasted capuchin (*macaco-prego-do-peito-amarelo*, *Cebus xanthosternos*) is considered critically endangered (CR) – its population size has decreased about 80% over the last 10 years, its area range is less than 100 km^2, and the number of reproductive specimens is less than 50 individuals.

According to the Environmental Management Plan of the Pratigi EPA (Centro de Recursos Ambientais 2004), there are still some species within the APA that are considered very rare, such as the brown howler monkey (*bugio*, *Alouatta guariba*), the ocelot (*jaguatirica*, *Leopardus pardalis*), and the little spotted cat (*gato-do-mato*, *Leopardus tigrinus*). Others have already been classified as extinct in the region: jaguar (*onça-pintada*, *Panthera onca*) and Brazilian tapir (*anta*, *Tapirus terrestris*).

Figure 10 - Saí-verde (Chlorophanes spiza). Source: OCT/UEFES, 2013.

Figure 11 - Endemic specie and endangered in Atlantic Forest (Cotinga maculata).
Source: OCT/UEFES, 2013.

Figure 12 **-** Endemic specie and endangered in Atlantic Forest (*Myrmotherula urosticta).* Source: OCT/UEFES, 2013.

Figure 13 - *"Preguiça de coleira"*. Source: Fernando Flores, 2013.

Figure 13 **-** Puma concolor, picture taken with camera traps.
Source: Renato Marques, 2009.

- Aquatic Fauna

The scientific community already recognizes the importance of plankton in an aquatic ecosystem (e.g., Begon, Harper and Townsend 2006). In addition to serving as a measure of water quality, this microorganism is the major “recycler of nutrients”. Divided into four different classes (i.e., phytoplankton, zooplankton, protozooplankton and prokaryotes organisms) (Brandini, et al. 1997), plankton isresponsible for recycling organic matter, providing O_2 through photosynthesis, and feeding almost all animals in water ecosystems as primary producers (Ricklefs 2003).

According to Centro de Recursos Ambientais’s (CRA) environmental report (2004), within the Pratigi EPA area, both phytoplankton and zooplankton communities had low values of biomass per water volume, even though their rates of relative abundance and biological diversity would infer ecological stability.

This low index of plankton population density is likely due to some human interference at the Pratigi EPA’s rivers, but further study is necessary to verify (Centro de Recursos Ambientais 2004).

Another biological community well-established within the project area’s rivers is zoobenthos (e.g., insect’s larva, mollusks and crustaceans). This biological group, like plankton, has great importance within the food chain in water ecosystems. Due to its role, zoobenthos has been used as an indicator for pollution and ecological stability (Ricklefs 2003).

The CRA report analyzed the biotic index, i.e. the taxonomic identification of each species and, through this classification, measured the biodiversity rate within the water ecosystem (Tuffery and Verneaux 1968). Moreover, these numbers show that it is possible to confirm the pollution level. Several of the sites analyzed in the Pratigi EPA have a low biotic index, due primarily to human influence and high pollution levels.

As a final point, there are 30 species within 13 Families of ichthyofauna, or fish, in the Pratigi EPA. Within Todos os Santos Bay along the coast of Bahia, more than 80 species of fish have been identified (Haimovici and Klippel 2000; Lopes, et al. 1999).

The CRA report considered the current biodiversity of fish within the Pratigi EPA low. This result could be due to the low primary production (i.e., low plankton numbers and benthos biological diversity), degradation and soil erosion (decreasing the soil capability of water retention and river's reload), un-sustainable fishery practices, and deforestation (Centro de Recursos Ambientais 2004).

- Flora

The Atlantic Forest appeared when the Gondwana super-continent fragmented during the Jurassic Period, approximately 120 million years ago (Bigarella 1991). Because of its age, the Atlantic Forest Biome underwent geomorphological, climatic, biological, and ecological events that contributed to its natural complexity. The Atlantic Forest once covered the entire eastern coast of Brazil, spanning the length from Rio Grande do Sul to Rio Grande do Norte states, about 1 million km^2 of land area. Due to its vastness and many habitat types, the exceptionally high biodiversity of the Atlantic Forest is widely accepted by the scientific community.

Some biologists assert that the Atlantic Forest, because of its high soil quality, numerous valuable tree species and lack of governmental control, is destined to deforestation and forest degradation (Câmara 1992). As described earlier, this deforestation process began in the 16th century with *Pau-Brasil* extraction, followed by sugarcane, coffee, cacao, and banana cultivation. These agricultural activities, combined with real estate speculation and subsistence farming, are the main reasons for Atlantic Forest degradation (Joly, Leitão-Filho and Silva 1991).

Despite the damages suffered throughout the centuries, the Atlantic Forest continues to have remarkable biodiversity. According to Mori et al. (1981), of every two tree species found in the Atlantic Forest Biome, one is endemic to it. The Atlantic Forest Biome, according to Thomas & Carvalho (1997), can be divided into four distinctive ecosystems: beach strand, mangrove, *restinga* and southern Bahia wet forest.

The beach strand comprises the sandy area above the high-tide line as well as beach-derived sand dunes. *Ipomea*, *Remira* and *Spartina* trees characterize this vegetation type.

The mangrove is very important for marine life, even though its vegetation diversity is relatively low.

The southern Bahia wet forest belongs to the Atlantic Forest Domain and its characteristics are a wet climate (i.e., 1,300 mm/year of rainfall with no dry season), very tall forest with trees about 20 meters high, and moderate soil fertility, which is maintained by plant organic matter that falls to the ground (i.e., litter).

One of the most biologically diverse regions of the Brazilian Atlantic Forest, Southern Bahia had 300 new plant species and five new genera identified and classified between 1978 and 1980 (Dean 1996). The CRA report identified several sites with a moderately high degree of conservation within the Pratigi EPA. Unfortunately, the report also notes that some important tree species (e.g., *Buchenavia sp*., *Lecythis pisonis*, *Pteriogota brasiliensis*, *Simarouba amara*, and *Balizia sp.*) had been cut because of the expansion of monoculture boundaries.

Vegetation types and conditions within the project area

The extended Pratigi EPA area has about 63,000 ha of forest fragments (different stages of conservation and regeneration), 10,700 ha of mangroves and 7,800 ha of salt marshes in an area of 170,900 ha, which represents approximately 48% of total area.

The phytophysiognomies and/or types of vegetation present in the territory are grouped among the classes: Alluvial Tropical Rain Forest, Tropical Rain Forest of the Lowlands; Sub Montana Dense Rain Forest, Tropical Rain Forest Montana; Pioneer Formations with fluvial influence; Pioneer Training with marine influence, Secondary Vegetation, they are spatially distributed heterogeneously in the landscape presenting high degree of fragmentation and its ratio to the Grouped Project is described in the table below.

Table 5 - Vegetation types and their ratio in the area of Group Project.

Phytophysiognomies	Area (ha)	% of area
Tropical Rain Forest Montana	664	0.39
Tropical Rain Forest Sub-montana	41891	24.53
Tropical Rain Forest of the Lowlands	20535	12.02
Latosol Dense Rain Flood	1389	0.81
Pioneer Formations with River and marine Influence	17469	10.23
Pioneer Formations with Marine Influence	6031	3.53
Secondary formations	170	0.1

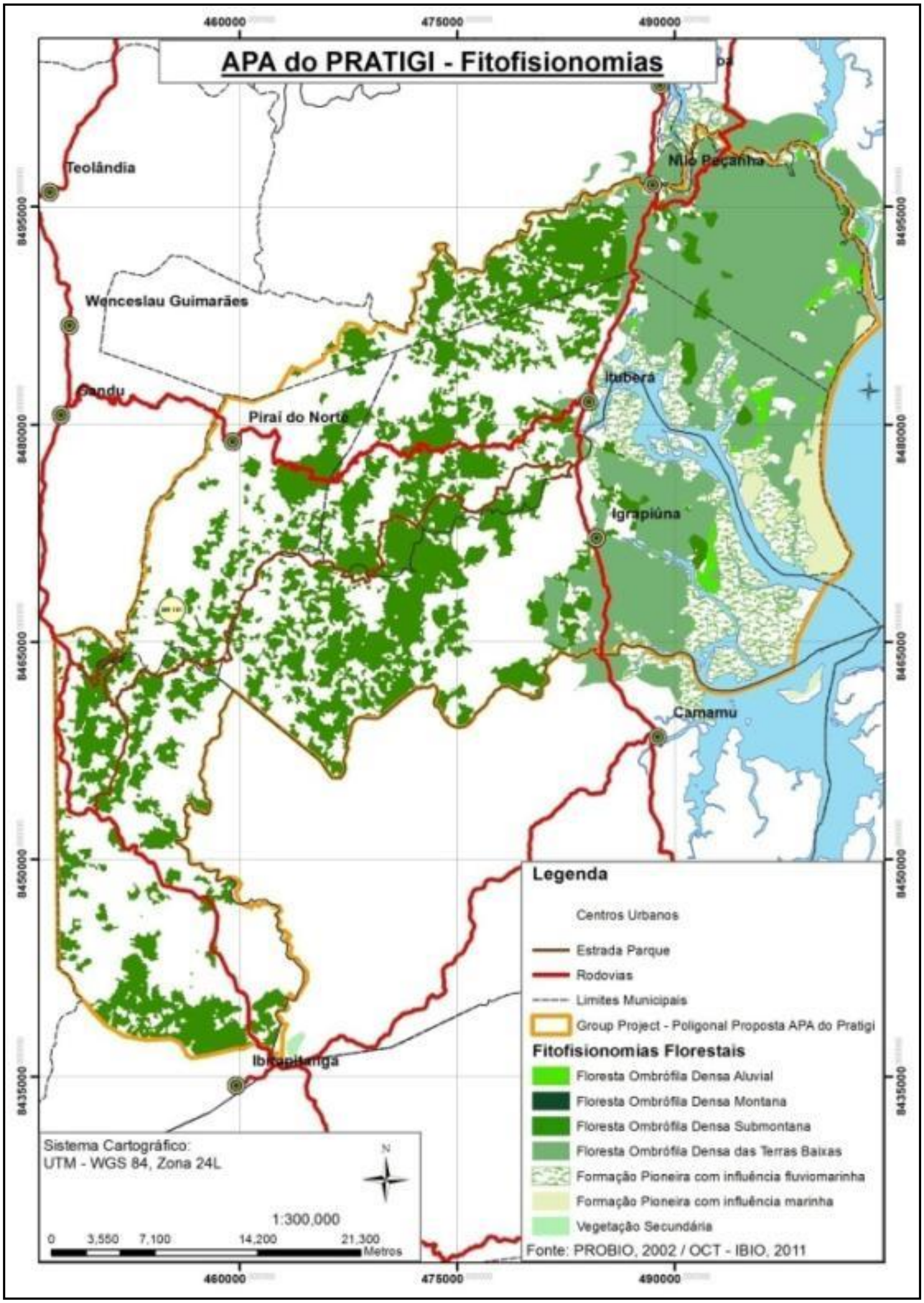

Figure 14 - Map of forest physiognomies. Source: PROBIO, OCT/IBIO, 2011.

Project Stratification

The Grouped Project zone is located within the range of the Atlantic Rainforest, an extremely diverse and threatened biome that stretches along Brazil's Atlantic coast. Because of its isolation from other major rainforest blocks in South America, the forest structure of the Atlantic Rainforest contains multiple canopies that support an extremely rich vegetation mix. The land in the Grouped Project area can be classified into different categories, based on current land use/cover, and therefore carbon content.

Four strata were defined in the pastures in the Pratigi EPA. Examples are shown in photographs below.

Cleared pasture: Characterized by forage grasses, predominantly *colonião* (*Panicum Maximum*), brachiaria (*Brachiaria Decumbens*) and humidicola (*Brachiaria Humidicula*) with no or only few invasive species or woody plants.

Figure 15 - Cleared pasture characterized by forage grasses in the GP area.

Degraded pasture: Characterized by the occurrence and predominance of the species listed above (in clear pastures) but with soils exhibiting various levels of degradation (exposed soil) in the landscape, with or without the formation of gullies by erosion.

Figure 16 - Degraded pasture characterized by exposed soil in the GP area.

Pasture with early forest regrowth: Areas occupied predominantly by grasses but with some bushes and small trees. These areas were cleared to create pastures or temporary crops but in many cases they have been abandoned.

Figure 17 - Pasture with early forest regrowth characterized by grasses with some bushes and small trees in the GP area.

Pasture occupied by ferns: These areas were transformed into pastures but because of the high level of acidity in the soil, these areas were overtaken by ferns, *Pteridium sp.*

Figure 18 - Pasture occupied by ferns characterized by high level of acidity in the soil in the GP area.

Land use

All of the project areas are located on privately owned and tenure peaceful land. These areas are all used for extensive cattle ranching.

Each Project Activity Instance will include figures to delineate the areas where the program activities will take place and each type of current land cover. Only areas of high and low potential for self-regeneration will be reforested by this Grouped Project.

Communities located in the Grouped Project zone

The Association of Pratigi EPA Guardians (AGIR) published a Diagnostic Report on the Socioeconomic and Environmental Conditions in the Pratigi EPA in 2007, which thoroughly evaluated the local populations through questionnaires and interviews. This evaluation reveals a disturbing and unhappy scenario for the residents in the study. The rate of illiteracy, which averages 34%, is much higher than the national average in Brazil, which is 10.9% (IBGE 2002). This low level of education among the interviewed residents may make it difficult to introduce new activities that will protect the environment and generate income and work for the communities. The average number of 4.5 children per family also indicates a general lack of family planning throughout the communities.

The average income for the families is R$357.10, lower than the national minimum wage. Agriculture was cited as the principal source of income for 88.6% of those interviewed. The low profitability of the farming activities undertaken by those interviewed is associated with the unsatisfactory productivity of the farm labor, due in large part to the low level of technology used, the lack of technical assistance, and the lack of organization among producers in bringing their products to market. Most farmers sell to middlemen.

Infrastructure indices on the properties of those interviewed are alarming, as only 41.71% have electrical power, 56.06% have no running water, 67.15% have no sewage system, and 50% dispose of their trash in the open air. All of these factors pose human health risks in these communities.

The major needs cited by those interviewed were better roads (63.88%), healthcare (59%), access to electricity (47.8%), work opportunities (38.53%), and transportation (24.21%).

Above all, the families in this region must have the minimum required to survive, such as sanitation, electrical power, running water, healthcare, education, and dignified homes. These ingredients are necessary and responsible for creating a solid foundation that will provide the means to reach development goals. Any project aiming toward sustainable communities must consider raising the self-esteem of local people and preparing them for development goals, leaving them receptive for innovative activities and stimulating them for the creation of a collaborative process (Diagnóstico Socioeconômico 2007).

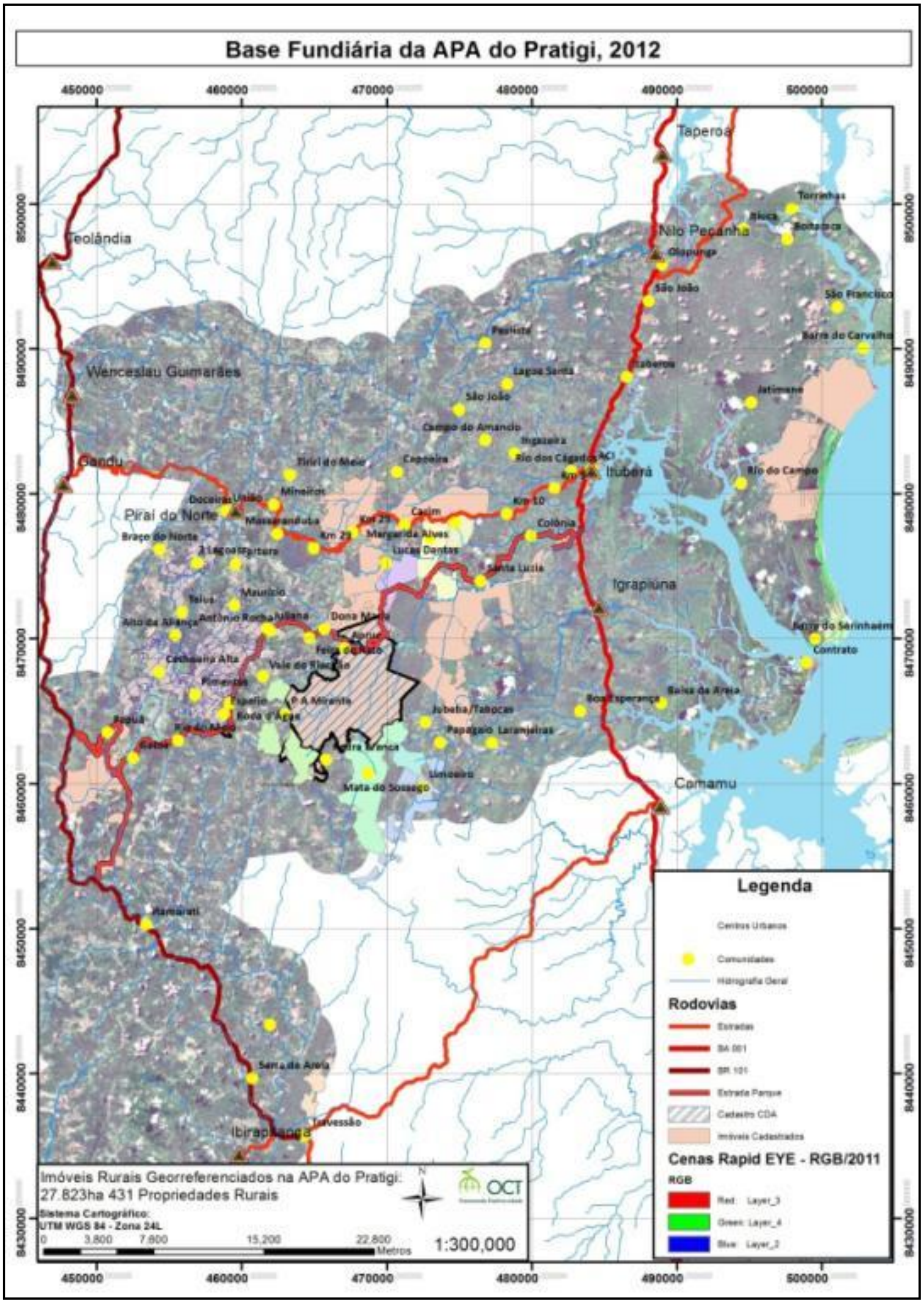

Figure 19 - Map of land structure and communities of Pratigi EPA.

Background information

The southern Bahia region has a unique history due to its role in early Brazilian history and economic development. Occupation of the region began in 1534 because of its strategic location near the first coastal Portuguese settlements. During this century, the Portuguese monopolized the export of *Pau Brasil* (*Caesalpinia echinata* Lam) to Europe. However, these settlements suffered from frequent attacks by indigenous tribes known as the *aimorés* and the *tupiniquins* (Souto 2003).

In the following century, indigenous attacks became less frequent, enabling the growth of the settlements through *Pau-Brasil* harvest and sugarcane plantations. During this period, southern Bahia became one of the most productive areas in the state.

As Brazilian sugarcane production declined due to fierce competition with Asian plantations in the 19th century, southern Bahia diversified its production with cotton, coffee, and cacao plantations. In the 20th century, however, Brazilian coffee production decreased due to the worldwide economical crisis of 1929. These new circumstances secured cacao as the major crop in southern Bahia. During the last century, southern Bahia's region expanded its agricultural structure to include other crops such as banana, manioc, coconut, piassava, rubber, and African oil palm (known as *dendezeiro* or *Elaeis guineensis*) (Fisher 2007).

In addition to these agricultural practices, the area also has pasturelands for raising cattle.

Pratigi EPA Area

The Grouped Project area includes five municipalities (Ibirapitanga, Igrapiúna, Ituberá, Nilo Peçanha, and Piraí do Norte) and has a similar occupational history to the one described above. All five municipalities began as settlements in the early 17th century due to *Pau-Brasil* extraction. Because of population growth and economic development, by the 19th century these settlements were considered villages by the Portuguese Crown, and by the 20th century, they were considered municipalities (Fisher 2007).

Table 6 - Population of southern Bahia, with totals for Bahia and Brazil, during the last three decades. Estimation to year 2008 (*). Source: adapted from IBGE, 2000 and IBGE-Cidades web site (Instituto Brasileiro de Geografia e Estatística 2006).

Municipalities	1991	2000	2010
Ibirapitanga	26,784	22,177	22,610
Igrapiúna	12,935	14,960	13,347
Ituberá	20,313	24,133	26,592
Nilo Peçanha	12,290	11,213	12,530
Piraí do Norte	13,759	10,425	9,835
Total	***86,081***	***82,908***	***84,910***
Brazil	119,011,052	146,825,475	190,987,291*
Bahia	9,455,382	11,867,991	14,076,212*

Table below shows the population distribution of the five municipalities within Pratigi EPA. Note that all the municipalities except for Ituberá have higher rural populations than urban. In all four cases, over 70% of the population is settled in rural areas.

Table 7 - Population distribution within Pratigi EPA. Source: IBGE, 2010.

Municipality	Population Distribution		
	Rural	Urban	Total
Ibirapitanga	16,447	6,136	22,610
Igrapiúna	9,070	4,227	13,347
Ituberá	7,349	19,243	26,592
Nilo Peçanha	9,426	3,104	12,530
Piraí do Norte	6,139	3,696	9,835

The major economic activity in the region is cacao cultivation (monoculture and agroforestry plantations) followed by manioc (as temporary farming for subsistence). Due to the economic similarity among these municipalities, their social indexes (using the Municipal Human Development Index, HDI-M) are almost the same.

Table 8 - 1991 Human Development Indicators for Pratigi EPA Municipalities (Source: Atlas do Desenvolvimento Humano, 2000).

Municipality	Longevity Index (HDI-L) 1991	Income per Capita ($R in 2000)	Income Index (HDI-R) 1991	Education Index (HDI-) 1991	Human Dev. Index (HDI-M) 1991	National Rank (out of 5507)
Ibirapitanga	0.569	47.15	0.424	0.382	0.458	5129
Igrapiúna	0.607	61.39	0.444	0.352	0.468	4924
Ituberá	0.546	58.60	0.458	0.493	0.499	4549
Nilo Peçanha	0.512	61.24	0.454	0.388	0.451	5155
Piraí do Norte	0.593	59.08	0.450	0.312	0.452	5156

Table 9 - 2000 Human Development Indicators for Pratigi EPA Municipalities (Source UNDP).

Municipality	Longevity Index (HDI-L) 2000	Income per Capita ($R in 2000)	Income Index (HDI-R) 2000	Education Index (HDI-) 2000	Human Dev. Index (HDI-M) 2000	National Rank (out of 5507) 2000
Ibirapitanga	0.651	70.52	0.483	0.668	0.601	4646
Igrapiúna	0.694	63.85	0.467	0.642	0.601	4647

Ituberá	0.626	95.05	0.533	0.700	0.620	4307
Nilo Peçanha	0.571	72.37	0.488	0.717	0.592	4816
Piraí do Norte	0.694	60.82	0.459	0.661	0.605	4578

Both Tables above show that the HDI in the project region rank very low even when compared to other municipalities within Brazil. All HDI have improved during the time period; however, income per capita continues to be quite low, well below the national minimum wage. Among other factors, these low HDI are a consequence of social and educational policies of Bahia state.

Ninety-four percent of the Pratigi EPA region is made up of farms of less than 100 ha. This confirms the importance of an Integrated Sustainable Development Program with the small and micro landowners of the rural areas, most of whom run small farms (Moreau 11). The table below groups property in each municipality according to total area.

Table 10 - Establishments in Pratigi EPA according to total area (ha) (Source: IBGE 2005).

Municipality	**Establishments according to total area (ha)**					
	> 10	**10 to 99**	**100 to 199**	**200 to 499**	**500 to 1999**	**2000+**
Ibirapitanga	321	502	74	29	3	-
Igrapiúna	1,434	720	36	11	1	1
Ituberá	536	358	21	8	13	2
Nilo Peçanha	1,169	558	34	14	3	-
Piraí do Norte	932	532	22	10	2	-
TOTAL	1789	2670	187	72	22	3
TOTAL (%)	**37.7**	**56.3**	**3.9**	**1.5**	**0.5**	**0.1**

Many establishments in the municipalities of Pratigi EPA operate in commercial activities such as manufacturing, construction, automobile repair, general repair, food, transport, communication, real estate, and public administration. However, the majority of laborers (48%) work in the agricultural sector (PM da APA do Pratigi 225). In fact, 88.6% of people interviewed by AGIR (include reference) in Pratigi EPA in 2007 claimed that agriculture served as their principal source of income.

Households in this region have an average of 4.5 children per family, or a typical family size of about 6 people. Average monthly income for households is R$357.10, lower than the national minimum wage, which is R$380. Divided by family size, income is about $R60 per capita. Landowners typically cultivate several different crops, the most predominant of which is cacao, viewed as the most profitable crop by most landowners. Other crops include manioc, rubber trees, banana, and clover, in order of approximate land area used for each crop (AGIR 2007).

The Pratigi EPA region can be separated into three subregions based on social and environmental characteristics. The subregions of the Pratigi EPA vary considerably in geology, topography, and native vegetation, thus the characteristics of the residents differ as well. In the subregion containing Ibirapitanga, part of Igrapiúna, and Piraí do Norte, the most predominant crop is cacao and other significant crops are banana and manioc. Clover, rubber, and guaraná are also grown by some planters. This subregion is characterized by mountain ranges with fertile soil and plateaus with sandy soils. Near the riverbeds in this subregion, cacao, banana and pasture are the most typical uses for the land.

In the subregion consisting of Ituberá and part of Igrapiúna, important crops include rubber, clover and guaraná. Typically this region has a higher number of large properties that grow rubber and cacao jointly using a method called multi-layer cropping. Manioc and banana are not commonly planted in this subregion. Near the riverbeds in this subregion, the most common uses for the land include forest, cacau and rubber.

The coastal subregion of the Pratigi EPA comprises part of Ituberá and Nilo Peçanha. This area is characterized by a hot and humid climate and no well-defined dry season. The land is used for various crops including cacao, rubber, clover, heart of palm, and fish farms. Tourism in this region is growing, and Ituberá can be considered the main vehicle for tourism development and extreme sports in the region.

Communities known as *quilombola* live in this area, which are communities of people descended from fugitive slaves. These communities survived for centuries on the harvest of piaçava, the native tree valued for its strong, resilient fiber.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Conceived in 1965, the Brazilian Forest Code[17] was the first law regarding natural resources in Brazil. It outlines the basic procedures for forest preservation and natural resource conservation in any forest areas in Brazil. Though poorly enforced, the Brazilian Forest Code is extremely stringent and aims to preserve and conserve the most important biodiversity spot in the globe, the Amazon Forest (Myers, et al. 2000).

The Code also protects the Atlantic Rainforest regions by defining areas considered Atlantic Rainforest in Brazil and setting the amount (percentage) of areas to be preserved for land use and agricultural activities, among others.

The project will restore areas defined by Federal law 12.651/12 as:

Permanent Preservation Area (APP-*Área de preservação permanente*)

APPs are protected areas where it is prohibited to cut down any vegetation unless for very specific and limited reasons such as national security, public health, or public infrastructure. The law does not require the owner to reforest the area in cases in which it is already degraded.

[17] Brazilian Vegetation Code: Federal Law No 12651/2012

Areas considered APP by the law, regardless of whether they are on public or private land, and that are relevant to the project include:

- 30 meters on each side of water courses less than 10 m wide;
- 50 meters on each side of water courses between 10 and 50 m wide;
- 100 meters on each side of water courses between 50 and 200 m wide;
- 200 meters on each side of water courses between 200 and 600 m wide;
- 500 meters on each side of water courses greater than 600 m wide;
- Around ponds, lakes, water reservoirs, both natural and artificial;
- Around the springs and Water eye, whatever its topographical situation;
- Slopes, sandbanks , stabilizing dunes of mangroves, mangroves, edges
- Top of hills, hills, mountains and hills, areas in altitude exceeding 1,800 meters, whatever vegetation;
- Paths in the marginal range, in horizontal projection.

Also, the recent legislation proposed a cumulative approach for protection, as described in the table below:

Table 11 - Detailed approach for protection areas given in the recent Vegetation Code. Note: 1 fiscal module = 20 hectares.

Rivers with width up to 10 meters
Properties 0-1 fiscal module - retrieves 5 meters, provided they do not exceed 10% of the property
1 to 2 modules - retrieves 8 meters, but may not exceed 10% of the property
2 to 4 modules - recovers 15 meters, provided they do not exceed 20% of the property
From 4 to 10 modules - recovers 20 meters
Over 10 modules - recovers 30 meters
Rivers wider than 10 meters
From 0 to 1 module - retrieves 5 meters, provided they do not exceed 10% of the property
1 to 2 modules - retrieves 8 meters, but may not exceed 10% of the property
2 to 4 modules - recovers 15 meters, provided they do not exceed 20% of the property
From 4 to 10 modules - recovers 30 ~ 100 meters
Over 10 modules - recovers 30 ~ 100 meters

It is worth mentioning that National Forest Code is widespreadly not enforced. The current data of forest cover in the Atlantic Rainforest of 1,059,027.85 km^2 [18], which sums 26.95% of native recovery of this biome, of which 20.81% are composed of different forest formations. It reflects the lack of compliance and a need to seek incentives to increase the engagement of landowners and rate of compliance.

Reforestation activities under the Grouped Project described herein will take, mainly, place in areas considered APP.

Specific to the Atlantic Rainforest Biome, the Atlantic Rainforest Law (11428/2006) prohibits the logging, suppression, and exploitation of primary vegetation and secondary vegetation in advanced or medium stages of regeneration. Selective logging is permitted with strict limitations.

The project area is located within any Conservation Units created under Federal Law 9985/2000, which instituted the National System of Conservation Units (SNUC).

The compliance with labor legislation seeks to avoid risks to health and safety of workers. For this purpose, Norm 3123 will be used as a guiding instrument and tool to map out a plan for information of security to the worker, that brings guidelines to ensure and assure safety of the workers related to agriculture, forestry and forestry activities.

Besides, the GP is in accordance with the federal law N° 11,326/06 that establishes guidelines for the formulation of the National Policy of Family Farming.

1.12 Ownership and Other Programs

1.12.1 Right of Use

The area where the Grouped Project is located follows the criteria established in the Right of Use of the Project area of VCS Standard v3.2:

1) A right of use arising or granted under statute, regulation or decree by a competent authority.

2) A right of use arising under law.

3) A right of use arising by virtue of a statutory, property or contractual right in the land, vegetation or conservational or management process that generates GHG emission decreases and/or removals (where such right includes the right of use of such decreases or removals and the Project proponent has not been divested of such right of use).

For the areas included in the GP, the rights of use will also follow local legislation. Following the ordinance No. 13.278/2010 of the state government of Bahia, which establishes as supporting document for use and

[18] Available data at http://www.mma.gov.br/biomas/mata-atlantica/mapa-de-cobertura-vegetal

occupation proof the union's statement, OCT will use it as the main instrument to prove rights of use in the Grouped Project.

The OCT, as a proponent and implementer of the grouped project, will have a clear and undisputed ownership of carbon rights. It will sign with the land owner an term of assignment for carbon credits rights. This term assure OCT the right to negotiate the verified credits and bring that revenue to the Fund for Environmental Services in Pratigi EPA that is in process of creation and will be used to promote the payment for environmental services to the owners who join the program (see the detailed terms in Annex 11).

This term will be a safeguard of OCT and owners with respect to the permanence of credits. Especially because of the absence of a legal framework that guarantees legal certainty future.

OCT in their actions on private lands (certificated and/or possessions[19]) always acts in a participatory manner with the owners or occupiers of land. All lands that join the Grouped Project will be in accordance with the owner or occupiers.

The focus of the Grouped Project is the reforestation of degraded areas, primarily in Permanent Preservation Areas, thereby initiating the process of environmental suitability of the property as a strategy through the Rural Environmental Registry (Portuguese abbreviation, CAR).

Thus, for greater security and to guarantee the permanence of credits, OCT will use two different provisions: current legislation (Law n. 12.651/12) in relation to the environmental regulation; and also a statement of commitment to the owners in order to ensure the maintenance of restored areas. Each Project Activity Instance will have their term of commitment and assignment in function of the number of rural properties involved and their respective owners/occupiers.

Further, since the main objective of the Grouped Project is the reforestation of degraded areas, primarily in Permanent Preservation Areas, thereby initiating the environmental suitability of the property process as a strategy through the Rural Environmental Registry. This Registry will be motivated by OCT in order to prove the environmental responsibility of the landowner, following requirements of Article 29 of Law n. 12,651/12.

Note that the monitoring protocols of OCT for restored areas bring greater assurance and transparency to the process while minimizing the risks to investors, because if any unauthorized intervention in areas restored and certified, OCT will communicate both the entity validator/verifier and the credit´s buyer the occurred and also will guarantee the repayment of the credit without any additional cost to the investor.

For the project monitoring, OCT signed a Term of Partnership with Federal University of Reconcavo Bahiano – UFRB, which will be responsible for local studies regarding average rates of growth in different vegetation types existing in Pratigi EPA. It also will be fostering scientific research in the EPA.

[19] It will be used to Ordinance No. 13.278/2010 the INEMA that in Annex 1 sets out the documents evidencing ownership and possession rural.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable.

1.12.3 Participation under Other GHG Programs

This Grouped Project is seeking certification though the VCS and, has been validated, under Climate, Community and Biodiversity (CCB) Standard (Gold Level)[20].

1.12.4 Other Forms of Environmental Credit

Not applicable.

1.12.5 Projects Rejected by Other GHG Programs

Not applicable.

1.13 Additional Information Relevant to the Project

Project Activity Instance record-keeping and avoidance of double-counting

Procedures for identifying each farm as well as each Project Activity Instance are determined by each local Project Activity Instance manager. Which will be identified by a unique number (Project Activity Instance Number), such as each property by another unique number (Property number) and a name. One Project Activity Instance can include several properties, and each property can include more than one specific restoration area (polygon).

In addition to the name and the Property number, all of the reforestation area will have geographic location references (polygon with latitudes and longitudes) stored in a GIS system for all restoration lands within them. Each Project Activity Instance is identified with this information to ensure single counting in the Grouped Project. Every carbon credit negotiated will be referenced to its corresponding Project Activity Instance to avoid double counting. OCT will use well-known plataforms in order to assure that no double counting will be accounted, such as MARKIT and APX. Ex-ante credits will only be traded when the PAI is registered under VCS, avoiding double counting.

In addition, each local Project Activity Instance manager will guarantee through contractual agreements with the buyers that any credit negotiated will be immediately accounted for and retired in order to avoid any double counting.

[20] http://www.climate-standards.org/2012/10/11/co2-neutro-pratigi-grupo-de-projetos-de-carbono-na-apa-do-pratigi-reflorestamento/

It is important to quote that there is a Carbon Neutral Program in Pratigi EPA which represents a voluntary involvement of stakeholders in offsetting the carbon footprint with the aim of environmental responsibility and green marketing. Credits may be sold to those stakeholders.

Commercially Sensitive Information

The project developers commit to keep information about the project publicly available. Project proponents plan to make the documentation regarding the project publicly available through various means of communication (e.g., own web site[21], magazines, journals etc.).

The available documentation will include the Grouped Project description, stakeholder consultation, mitigation proposals and other relevant contents. Documents generated with each monitoring event will be stored in electronic format and in hard copy form. Each project participant will keep a digital version and will manage storage of monitoring data.

Some data may not be publicly disclosed due to its irrelevance to the project, inaccuracy, and/or consideration as classified information.

Each Project Activity Instance will have attached legal documents, including: the Memorandum of Understanding between partners, the contract between partners and the land owner and the contract between partners and the buyer(s).

Prevention and mitigation of leakage from Project Activity Instance in this Grouped Project

As detailed previously the initiative of the Grouped Project is inserted into the PDCIS and one of the missions of the program is the transformation of the territory adding value in agricultural production by promoting a sustainable low impact activities and a low carbon economy.

Following this logic, all owners that participate in the initiative of the Grouped Project will have the opportunity to participate and access the benefits of PDCIS as a whole from the part of the production chain (palm, fish and other products with high added value) environmental part (as described above) and part of associations, cooperatives and social mobilization.

As stated it is not expected that it will leak occurs due to restoration activities, if they are identified they will be promptly qualified and quantified in order to be held in your debt accounting of credits to be generated.

Further Information

Financial Arrangements

A description of the financial arrangement for each PAI will be included in the PAI design document.

Capacity building

[21] www.oct.org.br

Within this project, the major capacity building activity will be sustainably managing the forest. The project proponents will try to engage all the stakeholders (small, medium and large landowners, researchers, activists, governmental officers and others) in initiatives that support the conservation and reforestation of the Atlantic Forest environment.

Process for handling unresolved conflicts and grievances

The process of construction and planning of the Grouped Project have been conducted in a participatory manner with key local stakeholders and communities, the first presentation of the Grouped Project was held on September 27, 2011 (in celebration of the day of the tree) in Serra da Papuã .

On March 21, 2012 OCT again held a public consultation on the Ituberá City Council to all concerned (the main local actors and communities) and is scheduled to conduct a further public consultation before the end of the project validation.

Note - OCT involvement with local actors and communities process, it is evident from the location of its headquarters in the portal of the Pratigi EPA the beginning of Citizenship working days during which technical preparations are ready to receive and answer any questions and provide appropriate referral for any possible conflict that may occur.

It is noteworthy that the OCT partner institution of the initiative has constantly technicians in the field and they will be guided and trained by OCT in order to receive complaints and conduct of any possible conflict generated by the project and give the appropriate referral to OCT for analysis if case and settlement.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Approved baseline methodology “Afforestation and reforestation project activities implemented on lands other than wetlands” (AR-AMS0007/Version 3.0)[22] was applied to the proposed reforestation Grouped Project.

Further, the following tools are related to the referred approved baseline methodology:

- “Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities”, version 1.1.0;
- “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”, version 4.1;
- “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities”, version 3.0;

[22] http://cdm.unfccc.int/methodologies/DB/J6ZHLX1C3AEMSZ52PWIII6D2AOJZUB

- “Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”, version 4.0.0;
- “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities”, version 1;
- “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”, version 2.0.

In the next sections their applicability to the GP are detailed.

2.2 Applicability of Methodology

➢The reforestation Grouped Project meets all the conditions for the applicability of methodology AR-AMS0007, as follows:

a) The land subject to the project activity does not fall in wetland category;

Rationale: As described in section 1, the Grouped Project will be implemented in Atlantic Forest biome, which in any type of its five forests: Dense Ombrophilous, Mixed Ombrophilous, Semideciduous Seasonal, Deciduous Seasonal and Open Ombrophilous (CAMPANILI, M. E. and SCHAFFER, W. B., 2010). However there is wetland features in Pratigi EPA, this type of ecosystem will not be subject to the project activity, as described in the IPCC Good Practice Guidance for LULUCF (Soils with restricted drainage leading to periodic flooding and anaerobic conditions).

b) Soil disturbance attributable to the project activity does not cover more than 10 per cent of area in each of the following types of land, when these lands are included within the project boundary:

i. Land containing organic soils;

ii. Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in appendices 2 and 3 to this methodology.

Rationale: The areas to be reforested under this Grouped Project does not encompass areas with organic soil, once most of them are characterized as degraded pasture with low percentage of organic matter (less than 12% of organic carbon in its first 20cm).

The technology to be employed under the Grouped Project is based in three different restoration models, as presented in section 1.8. Only two of them have the potential to cause some kind of soil disturbance: models 1 (Total Seedling) and model 3 (SAF). However, none of these two models are supposed to be implemented in short-term or set aside cropland[23] or grassland, but mainly in abandoned degraded pasture. Thus, neither cropland nor grassland in the baseline is subjected to land-use and management practices such described in appendices 2 and 3 of the referred methodology. However if some PAI encompasses one

[23] Cropland does not make part of the Grouped project boundary

of these categories, measures (as manual plantation, and plow avoidance), will be adopted to avoid disturbance in more than 10% of these areas,

➢ The “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities” version 01, is not applicable to this Grouped Project, once the tool states in its second applicability condition: "*This tool is not applicable to small - scale afforestation and reforestation project activities".* Therefore, the project participants shall demonstrate that the Grouped Project is additional using an approved standardized baseline applicable to their project (as described in AR-AMS0007, paragraph 15) and the "VT0001: Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0"

➢ For the "VT0001: Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0" the Grouped Project meets all the following applicability conditions:

a) AFOLU activities the same or similar to the proposed project activity on the land within the proposed project boundary performed with or without being registered as the VCS AFOLU project shall not lead to violation of any applicable law even if the law is not enforced;

Rationale: The Grouped Project is in line with all the national environmental laws and regulations, in particular we can emphasize the following:

- Law No. 12.651 of 25 May 2012 establishing the law on the protection of native vegetation: With the Grouped Project the land owners will be able to go against common practice in the area and begin the process of environmental readjustment;

- Law No. 6938 of 31 August 1981 establishing the National Environmental Policy: which provides in its Article No. 2, the environmental improvement and quality, which will be achieved through the restoration of degraded areas;

- Constitution of the Federative Republic of Brazil 1988: which in his article No. 225, the community ensures an ecologically balanced environment, which will be achieved through the restoration of degraded areas;

- Law No. 9.433 of January 8, 1997 establishing the National Water Resources Policy: which foresees in its Article No. 02 to ensure the quality and quantity of water for future generations and Article No. 32 foresees the recovery of water resources and, consequently, of their sponsors (such as Permanent Preservation Areas, springheads and hilltops);

- Law No. 9.985 of 18 July 2000 establishing the National System of Conservation Units which in its article No. 04 provides the restoration of ecosystems as its objective;

- Law n ° 11.428 of 22 September 2006 establishing the Atlantic Forest Law: it provides in its Article No. 1 protection, conservation and regeneration of the Biome;

- Law No. 12.187 of 29 December 2009 establishing the National Climate Change Policy: which provides in article 04 the strengthening of anthropogenic removals by Greenhouse Gases sinks in the country;

- Bahia State Law No. 12.050 of 7 January 2011 establishing the State Policy on Climate Change: which provides in its Article 4, section III the reduction of the growth rate of emissions of greenhouse gases and the capture and storage of these gases;

- Decision 9/CP.4: Adoption of the Kyoto Protocol to the United Nations Framework Convention on Climate Change - which provides restoration activities under the agreement.

b) The use of this tool to determine additionality requires the baseline methodology to provide for a stepwise approach justifying the determination of the most plausible baseline scenario. Project proponent(s) proposing new baseline methodologies shall ensure consistency between the determination of a baseline scenario and the determination of additionality of a project activity.

Rationale: The most plausible baseline scenario of this Grouped Project is based on the baseline stepwise described in the AR-AMS-0007, version 3.0 (details in section 2.4).

➢For the “Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity” version 04.0.0, whether during the period of the Grouped Project fire happens, this tool will be applied following the below conditions:

a) The tool is applicable to all occurrence of fire within the project boundary.

Rationale: The use of fire does not make part of the project activities, notwithstanding whether during the period of the Grouped Project fire happens within the project boundary (details in section 1.9), this tool will be applied.

b) Non-CO_2 GHG emissions resulting from any occurrence of fire within the project boundary shall be accounted for each incidence of fire which affects an area greater than the minimum threshold area reported by the host Party for the purpose of defining forest, provided that the accumulated area affected by such fires in a given year is ≥5% of the project area.

Rationale: Whether during the period of the Grouped Project fire happens in an area greater than the minimum threshold area reported by the host Party, this tool will be applied to calculate at PAI level the estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to the project activity.

➢For the “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities” version 03.0, there are no applicability conditions that the Grouped Project should meet, but assumptions to be considered. Therefore, no analysis is presented.

➢For the “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities” version 04.0, there are no applicability conditions that the Grouped Project should meet, but assumptions to be considered. Therefore, no analysis is presented.

➢For the “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity” version 02.0, the only applicability condition is if "*the displacement of agricultural activities is expected to cause, directly or indirectly, any drainage of wetlands or peat lands*". Since this situation is not expected to happen under the Grouped Project area, therefore this tool is not applicable.

➢At least, for the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" version 01.1.0, the project is applicable in areas where the baseline scenario and the project activity meet the following conditions:

a)The areas of land to which this tool is applied:

i. Do not fall into wetland category; or

ii. Do not contain organic soils as defined in Annex A: glossary of the IPCC GPG LULUCF 2003;

iii. Are not subject to any of the land management practices and application of inputs as listed in the Tables 1 and 2;

Rationale: wetlands do not occur in the Grouped project boundary, also, as described above, the project activities are not supposed to be implemented in areas with organic soil neither in short-term or set aside cropland[24] or grassland, but mainly in abandoned degraded pasture. Thus, neither cropland nor grassland in the baseline is subjected to land-use and management practices such described in appendices 2 and 3 of the referred methodology.

b) The A/R CDM project activity meets the following conditions:

i. Litter remains on site and is not removed in the A/R CDM project activity; and

ii. Soil disturbance attributable to the A/R CDM project activity, if any, is:

- *In accordance with appropriate soil conservation practices, e.g. follows the land contours;*
- *Limited to soil disturbance for site preparation before planting and such disturbance is not repeated in less than twenty years.*

Rationale: As described in section 1.10, the Grouped Project will keep litter on the ground and regarding the disturbance, as described above, the technology to be employed is the direct planting with minimal soil disturbance before carrying out the plantation activity. Furthermore, in the case where the soil disturbance is unavoidable this will be done only for site preparation before planting and will not be repeated in the future.

2.3 Project Boundary

As described in the methodology AR-AMS0007 version 3.0, the carbon pools selected for accounting carbon stock changes of the Grouped Project are shown below.

[24] Cropland does not make part of the Grouped project boundary

Table 12 - Carbon pools selected for accounting of carbon stock changes.

Carbon pool	Whether selected	Justification/Explanation
Above-ground biomass	Yes	This is the major carbon pool subjected to project activity instances
Below-ground biomass	Yes	Carbon stock in this pool represents an amount of 20% of total carbon stock of the PAI
Dead wood **Litter and** **Soil organic carbon**	No	Carbon stock in these pools may increase due to implementation of the project activity, thus these pools were conservatively not considered.

The emission sources and associated GHGs selected for accounting are shown in the table below.

Table 13 - Emission sources and GHGs selected for accounting.

Sources	Gas	Whether Selected	Justification/Explanation
Burning of woody biomass	CO_2	No	CO_2 emissions due to burning of biomass are accounted as a change in carbon stock
	CH_4	No	Burning of woody biomass for the purpose of site preparation will not be used under this Grouped Project, since the selected methodology to forest restoration does not require use of fire (LERF/ESALQ, 2009)
	N_2O	No	Burning of woody biomass for the purpose of site preparation will not be used under this Grouped Project, since the selected methodology to forest restoration does not require use of fire (LERF/ESALQ, 2009)

The exclusion of dead wood and litter from the estimation of both the baseline net GHG removals by sinks and the actual net GHG removals by sinks does not result in an increase in the net anthropogenic GHG removals by sinks. This is because the project boundary area is composed of pasture and degraded pasture lands that are either in a steady-state condition. Pasture land in a steady-state condition has annual carbon losses and gains that are assumed to balance each other out, so that the net changes in the carbon stocks in all pools are assumed to be zero. Since these pools are actually supposed to stabilize or shrink (due to fires) in the baseline scenario, their exclusion from the estimation of the baseline net GHG removals by sinks is considered conservative.

Soil organic carbon will not be accounted in this Grouped Project. This is a simple and conservative approach for two reasons. First, for lands in a steady-state condition, annual soil carbon gains and losses are assumed to balance each other[25]. Second, in a baseline scenario, where fires can occur, the above ground biomass carbon stock is supposed to shrink, what leads to a negative effect in the flux and storage of soil organic carbon.

Changes in carbon in the soil organic carbon pool from conversion of pasture and degraded pasture to reforested land are also not included for conservative purposes, since "land conversions to forest land on mineral soils generally either maintain similar levels of C storage or create conditions that increase soil C stocks"[26]. In addition, since this methodology is not accounting for the dead organic matter pool in the forested area, small losses in the soil organic carbon pool, if applicable, would be far offset by accumulation of litter and dead wood in the forest floor.

Project Leakage

Leakage (LK) represents the increase in GHG emissions by sources that occurs outside the boundary of the reforestation PAI that is measurable and attributable to the PAI activity. One source of leakage is covered by the tool "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" related to the referred methodology AR-AMS0007 (Version 3.0):

- GHG emissions due to displacement of agricultural activities;

The displacement of agricultural activities involves the relocation of the agricultural activities from areas of land located within the project boundary to areas of land located outside the project boundary.

The landowner may currently use the Grouped Project areas, especially those belonging to the "pasture" stratum, for cattle ranching. When this Grouped Project was presented to the property owners whose land is targeted for reforestation efforts, they saw reforestation using carbon-credit financing as an opportunity to ensure compliance of the property with the existing APP law with no investment on their part.

The areas to be reforested are currently used for low-productivity cattle operations or have been abandoned. In general they are associated to a low income generation or no income. Thus the owners are willing to absorb the relatively small opportunity cost of eliminating cattle in these areas in exchange for a compliant environmental record for the property. The owners will remove the cattle that are currently grazing in the Project Activity Instance restoration areas, and this fact will be monitored as described in section 4.3.

Therefore, no leakage is related to the displacement of grazing activities. In fact, an additional emissions reduction due to the elimination of some heads of cattle can be expected. In any case, to remain conservative, those emissions reductions will not be accounted.

[25] See 2006 IPCC Guidelines, Chap. 6 (Grassland), Section 6.2.3, pp. 6.14

[26] Post, W.M.; Kwon, K.C. (2000) Soil carbon sequestration and land-use change: processes and potential. *Global Change Biology* **6**:317-327.

Prevention and mitigation of leakage from Project Activity Instance in this Grouped Project is discussed in section 1.13.

2.4 Baseline Scenario

As explained below, the baseline scenario of this Grouped Project is perfectly in line with the baseline scenario stated by the AR-AMS-0007, version 3.0: *"The baseline scenario of a small-scale A/R CDM project activity implemented under this methodology is continuation of the pre-project land use".*

The next paragraphs provide an assessment of the land use practices in the project region, in order to support the baseline scenario assumed for the project areas.

Analysis of historical land use

Southern Bahia

The occupation of the Grouped Project region, because of its strategic location, began early in the 16th century through colonies established for extracting *Pau-Brasil*. In the following century, sugarcane cultivation was added to *Pau-Brasil* extraction, and southern Bahia became one of the most productive areas in Bahia state. In the 19th century, due to fierce competition with Asian sugarcane production, the abolition of slavery, and the decrease in sugarcane prices, production in southern Bahia began to fall (IBGE, 2009). Large-scale landowners began to replace sugarcane first with tobacco and then with other crops, such as cotton, coffee, and cacao plantations. Tobacco had a minor contribution because of its productivity and exportation rate (too low in comparison with coffee and cacao cultivations).

In the 20th century, Brazilian coffee depreciated due to the worldwide economic crisis of 1929, and consequently, coffee plantations in Southern Bahia collapsed. From that moment, cacao became the major crop in the Southern Bahia.

In the second half of the century, the region changed its agricultural structure to include other crops such as manioc, bean, coconuts, piaçava, seringa, and African oil palm (known also as dendezeiro or Elaeis guineensis). Among all these crops, seringa, African oil palm, cacao, and coconuts occupied about 86% of all agricultural lands in Southern Bahia, and temporary plantations such as banana and manioc occupied over 6% of agricultural fields (FisCher, 2007).

Table 14 - Agriculture production in Southern Bahia in 2000. Source: adapted from Fischer (2007).

Crop	Plantation Area (ha)	% regarding the total cultivated lands	Production (tons)	Average Productivity (kg/ha)	Income (thousand R$)
Cacao	83,770	50.34	17,460	206	26,975
Bahia coconuts	12,862	7.73	65,004	5,116	25,420
Seringa	14,965	8.99	12,726	852	10,517

African oil palm	31,902	19.17	107,513	3,370	7,522
Total (Permanent Fields)	152,933	91.90	-	-	82,032
Manioc	10,576	6.36	131,900	12,473	11,071
Bean	1,496	0.90	840	561	623
Total (Temporary Fields)	13,487	8.10	-	-	17,730
Total (Southern Bahia)	166,420	100	-	-	99,762

<u>Pratigi EPA</u>

The historical land use in the Pratigi EPA is very similar. Today, according to Fischer (2007), the municipalities within the Pratigi EPA have a mix of a few large-scale farmers and many smallholders with tiny properties. This situation is typical throughout southern Bahia, where big monoculture plantations with extensive fields exist side-by-side with large numbers of minor producers (the majority of the producers) who work on small lands of low fertility.

Table 15 - Land-use distribution for landowner classification for Pratigi EPA's municipalities (excluded Piraí do Norte municipality data). *Classification based on INCRA (1999). Source: Fischer, 2007.

Landowner Classification*	**Number of Properties**	**Area (ha)**	**% (Number of Properties)**	**% (Area)**
Smallholder (≤ 80 ha)	2004	32,823.6	91.76	32.82
Medium-scale Farmer (≥ 81 and ≤ 300 ha)	143	19,823.3	6.55	19.85
Large-scale Farmer ≥ 301 ha)	37	47,306.9	1.69	47.33

Deforestation trends

With all of its riches and rarities, the Atlantic Forest is one of the world biomes most threatened by destruction and genetic depletion. Its forested areas are extremely reduced in size, fragmented, and nearly unrecognizable. Data from 1995 shows that only 7.6% of the original Atlantic Forest remains forested (FUNDAÇÃO SOS MATA ATLÂNTICA et al, 1998). In fact, this figure could be even smaller, because despite the public outlawing of deforestation by Decree 750 of 10 February 1993, clandestine deforestation continues.

Human population growth along with extensive land use has caused fragmentation of natural habitats (Wilcox and Murphy, 1985). Many environments that were once essentially continuous have been transformed into mosaic landscapes, where isolated forest areas are interspersed within areas occupied by humans (FERNANDEZ et al., 1997).

The conversion of natural habitats into fragments of various sizes, degrees of connectivity, and levels of disturbance has become one of the principal threats to biodiversity in the world (MYERS, 2000; SCHAFER, 1990). This process, known as habitat fragmentation, brings theoretically predictable consequences for biodiversity (SCHAFER, 1990), rendering the dynamics of biological communities different from those expected for continuous natural communities (NOSS and CSUTI, 1994).

The south of Bahia remained one of the most forested regions of the Atlantic Forest until the early 1970s, when it began to suffer from intense deforestation. It is estimated that about 1 billion trees were cut down in this region from 1985 to 1990 (FUNDAÇÃO SOS MATA ATLÂNTICA, 1993).

Working with satellite images taken between 1985 and 1998 for the municipality of Una and adjoining areas (200 km south of the project area), found rates of deforestation of up to 15.87% per year, values much higher than the average rates of deforestation for other states in Brazil (FUNDAÇÃO SOS MATA ATLÂNTICA et al., 1998).

Estimates of the forest area remaining in the region range from 1% to 12% (SAATCHI et al, 2001). This variation is due to the differences in the methods used, the scale of time and area analyzed, and the degree of precision of the estimates in distinguishing areas of different land use (SAATCHI et al, 2001). Many estimates of forested areas include, in addition to preserved forests, degraded forests, areas with some new forest growth on previously cleared land, cacao plantations, and any vegetation resembling a forest. The few areas of native forest that remain are also highly fragmented.

Within the Grouped Project boundaries, despite the area’s protection under law, there are also deforestation activities and forest degradation practices.

Deforestation Drivers

The main driver for deforestation in the area is economic. Conservation of private forests is not a viable land use for the small and medium-scale landowners: it incurs costs and generates no revenues. Although required by law, protection of rainforests represents a net financial loss to the landowner, and in practical terms, the result is continuous deforestation and biodiversity impoverishment.

Since preserved forests do not generate income for their owners due to law restrictions regarding any sustainable and non-sustainable use of its products/services, conversion of forests into non-forested fields is a common practice. In areas of environmental protection such as the Pratigi EPA, deforestation happens as a very low profile process, in order to avoid catching the attention of the authorities. It is a micro deforestation process called *desmatamento formiga* in Portuguese (translates literally to ant deforestation). Landowners clear plots of one to five hectares at a time and convert them into land uses with greater economic potential. With hundreds of small and medium landowners following this pattern, the result is an estimated loss of 1,000 ha of native forest every year in a region where the total area covered with forest is slightly over 60,000 ha.

The predominant land use change in the area involves converting rainforest to low-value crops such as cassava and banana, or into low-grade pasturelands. A few agroforestry systems exist on midsized properties, but the most common uses of rainforest ecosystems is: poaching, illegal logging and real estate and urban development. The new land use depends on the type of landowner and the geographic and physical features of the land, as described below.

Hilly areas. Small landowners convert to low value temporary crops.

The western region of the Pratigi EPA features a small mountain range known as Serra de Papuã. This hilly area is covered with small properties, almost all of them smaller than 10 hectares, worked by small landowners with no access to capital or technology. Their lands offer very low productivity due to the steep slopes and low soil fertility. Any forest areas remaining on their small lands would be slowly converted to other uses in search for some additional income. Since they do not have access to the initial capital needed for more productive crops, new uses are typically low-value crops such as banana and manioc, or even pastureland where they would start with one or two heads of cattle.

Unfortunately, due to lack of technical knowledge and entrenched practices, their methods are often very inefficient and unsustainable, also detrimental to the ecosystem where they live, and to the whole planet through global warming. For example, lands converted to banana or manioc, located often in steep slopes, are productive for one to three years until their soils get washed away, when they are left unattended and unproductive.

The typical deforestation process in the area happens as follows:

- The landowner sells any wood that is valuable (if there is any left), and proceeds to slash and burn practice.

- The landowner plants banana or manioc, and in some cases converts the land directly to pasture.

- Areas converted to banana and manioc, because they are located in steep areas and these uses do not retain soils, will typically yield one to two commercial harvests. The soil is washed away and the land is abandoned or dedicated to pasture for one or two heads of cattle.

- The soil of the abandoned areas continues to be washed away and they become infertile, limiting the regeneration.

Flatlands. Medium landowners and capital intensive crops

The middle section of the Pratigi EPA, located between the coast and the mountain range, features flatland areas with more fertile soils. A small number of medium size and large size landowners owns most of the land. The geographical features of the area and the size of the properties make the area suitable to larger-scale agricultural and agro-forestry operations and mechanized work. The owners have easier access to capital and technology, making these lands much more productive. Typical plantation crops include rubber tree (seringa), palm tree (pupunha), and a bi-layer system of rubber tree and cacao (consorcio seringueira-cacau).

Because deforestation is illegal today in the area, and because of the size and visibility of their operations, these landowners are not converting major areas of forest into plantations today. Nevertheless, there is still slow and inconspicuous expansion at the edges of these types of crops.

Flatlands. Settlements (*assentamentos*): timber, fuel and low value crops

A different type of landowner exists in the flatland areas, called *assentamentos* in Portuguese. Brazil is a country with historic land distribution issues, and the fight for the land continues today. A common path to land ownership in the last decades has been the invasion of properties underutilized or abandoned by its owner. In the region this situation happened at times when prices of the crops produced in a property, i.e. rubber tree or cocoa, dropped and it became uneconomical to continue production. Landless peasants, organized in social movements, would invade the unproductive land and establish a camp (*acampamento*). In many cases, after years in this situation, they would get settled in the land with government support consolidating a new settlement (*assentamento, in portuguese*). They obtain collective ownership of the land.

In this section of the Pratigi EPA, there are four settlements and two *acampamentos*. They range in size from about 400 ha to about 1000 ha, for a total of 3,300 ha. The average number of families in each of them is 40. The landless settlements neighbor one another and represent a large continuous area of land.

Due to the dire economic conditions of the settlers and the fact that authorities tend to disregard their activities in their new land, *assentamentos* become a serious deforestation vector in the area. They extract anything they can from the forest. Their activities include logging to sell, firewood for their own uses and for sale, *piaçava* fiber, and poaching. They also contribute to *desmatamento formiga* using slash and burn practices to convert land into low-value banana and manioc crops, or pasture for one or two heads of cattle.

Coastal areas. Piaçava and urban-tourist development

The situation in the coastal area of Pratigi EPA is more stable in terms of deforestation. It is an area with low fertility soils, mangroves and well preserved native restinga, a type of sandbank vegetation that occurs on sandy soils. Due to the conditions of the land, there is much less agriculture or agro forestry in this area.

Forest degradation occurs, though, through the management of native piaçava (a palm tree valued for its fiber). Piaçava is a pioneer species native to the Atlantic Forest that would naturally leave room for secondary and climax species in 15 or 20 years. Through active *piaçava* management has been avoiding other species from growing and piaçava becomes the predominant species. This process results in a great loss of biodiversity and forest carbon sequestration potential due the avoiding of the ecological succession.

Another important deforestation trend in the area is the urban development, mostly driven by tourists, who are attracted by the natural beauty and the beaches of this coastal area.

Because of the abovementioned typical land-use alternative in the Grouped Project area, carbon stocks in these lands will follow a saw tooth pattern, growing for a while up to a certain value, and then dropping (reintroduction of cattle, or using of fire to keep the area cleaned), and a new cycle starts, repeating the pattern over and over. Over the long term, on average, the lands remain at a low carbon state, therefore with zero carbon stock changes over time.

Therefore, baseline net removal by sinks is zero for all strata.

Description of the most likely land-use scenario in the absence of the project

In the absence of any significant legal, regulatory, economic, social, or technological changes, the most likely future scenario for the project is the "business as usual scenario" that is, the current practices continuation of conversion from forest lands into low value crops such as banana, manioc, cacao, and pasture, such as described below.

Land use alternatives

This section describes realistic and credible land use scenarios on lands eligible to be restored under the proposed Grouped Project in the absence of the reforestation activity as proposed by each PAI. Further discussion on the likelihood of each one of the scenarios can be found in the additionality section (2.5) below.

Alternative #1. Continuation of pre-project land use (Most likely)

Continuation of pre-project land use that is abandoned and degraded pasture for extensive cattle ranching by landowners.

This is the most likely scenario and has been selected as the baseline scenario for all PAI areas. The full justification can be found in the additionality section (2.5) below.

Alternative #2. Elimination of grazing activities

Elimination of grazing activities and protection through fencing is required in the areas to protect the reforestation from the cattle. The fire uses to clean the land is a common practice in the region, and therefore fire spreading risk into the areas is highly likely. This activity would put an end to any regeneration that occurs naturally.

Thus, based in the above mentioned, the most likely alternative, as predicted in the referred methodology, is the continuation of the pre-project land use, which it is considered that, at a long-term analysis, according to demand and fluctuations in the economy, the carbon stock decreases or, in the best scenario, remains stable (see figure below).

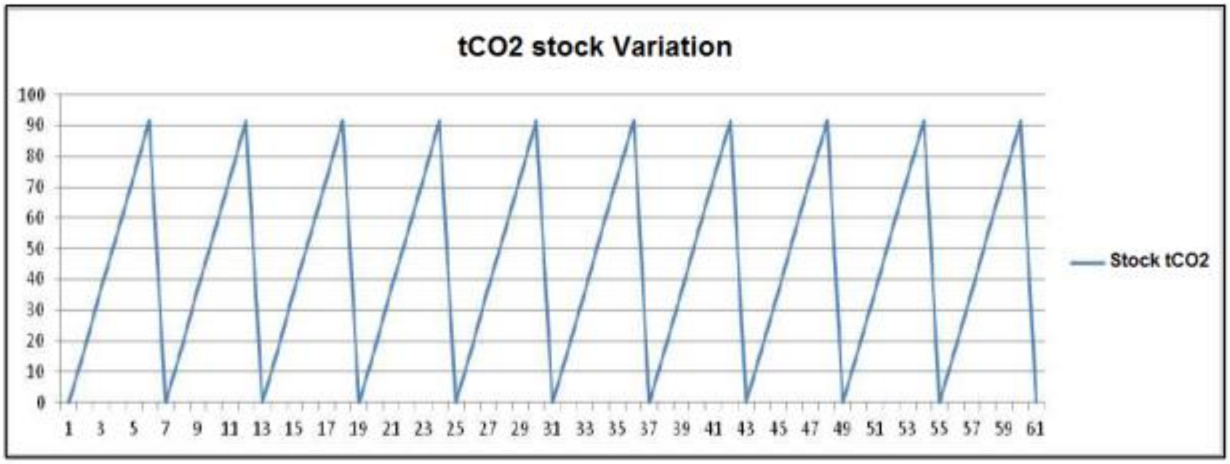

Figure 20 - Change of carbon stock over time presents an average variation equal to zero in the long term (based on database of biomass increment in pasture from IPCC 2006 table 3.A.1.5).

2.5 Additionality

According to the AR-AMS0007 v.3, project participants (PPs) shall demonstrate that the project activity is additional by selecting one of the following options:

(a) Using the barrier analysis outline contained in appendix 1 of this methodology; or

(b) Using an approved standardized baseline applicable to their project.

For this GP, PPs selected option (b) and applied the "VT0001: Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities, v3.0". The next steps will be discussed in order to assess the additionality for the Grouped Project, which will be based on the initial project activity instance, in accordance with VCS Standard version 3.4.

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

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

- *Alternative 1: Continuation of pre-project land use (eg: pasture)*

Areas that are currently pasture or annual crops will continue to be used for these purposes because of the economic advantages of its uses. For degraded pasture or semi-abandoned stage, the most likely scenario is that the land will suffer different cycles. For instance, being used as pasture for a period when the price of bovine arroba is high and then the area is abandoned for an indefinite period until economic activity provides a new valuation. Despite of small regeneration can occur in these areas during this period, they are systematically burned in order to guarantee the availability of already opened areas for future economic land uses.

Typically, these lands are abandoned due to its greater distance and difficulty of access to consumer centers or even because they do not present a significant agricultural productivity, they are not flat like other areas and, consequently, less attractive to the owners to put their cattle on them. Some areas of family farms are abandoned temporarily after the low productivity of nutrients due to improper management, lack of agricultural extension and training of small farmers by responsible agencies (Ministry of Agrarian Development, Bahia Agricultural Development Company, among others). However, when the regeneration occurs or the price of bovine arroba increases, the land owners clean the area to put the herd using techniques that degrade the soil and local biodiversity again.

Another existing factor and that does not allow abandoned areas to regenerate and become forest again is the value of land in the region. Degraded areas, eg: clean and treeless lands with potential to be used for livestock or crop, have a much higher value than other areas that are not cleaned. Saving native forest or natural regeneration is not considered a profitable activity, thus does not figure among the land owners land use options.

Therefore most of landowners within the EPA does not allow regeneration to occur in degraded areas since they believe it should be overpriced to clean up the area again. And commonly, the owners put fire periodically to keep the areas cleaned.

Thus carbon stocks will follow a fluctuating pattern, for a period shows a slight increase of carbon increment and then have a drop to zero (reintroduction of the herd or crop) and then a new cycle starts repeating the pattern. This cycle is considered a common practice in the region. In the long term, on average, lands keep a quite small carbon stock which varies to zero over time.

This alternative is, therefore, the most likely to happen and is considered the baseline scenario to the Grouped Project.

- *Alternative 2: Removal of grazing and annual crops and enforcement of environmental regulations (environmental readjustment) to the occurrence of natural regeneration activities*

Agricultural activities in the region, almost entirely, not respect any determination, rule, regulation or environmental legislation, with rare cases that fit this alternative. The non-enforcement of environmental laws and regulations is widely observed and commonly carried out in the project region. Thus it is a possible scenario to happen, but very unlikely, since the environmental agencies has very limited capacity to oversight and control of the legislation non compliance, and as explained earlier, the opportunity cost of a degraded and potential for agricultural use area is considerably larger than that of a forested or advanced regeneration area.

- *Alternative 3: Reforestation of degraded areas without the advent of carbon credit.*

This alternative is costly due to high costs and most owners do not have this feature to invest in the activity, and in the cases where they have financial resources, the business as usual is to avoid as much as possible to reforest for conservation purposes.

- *Alternative 4: Perennial consortiums (banana, cacao and rubber)*

This alternative is costly due to high costs and most of the small landowners do not have this feature to invest in the activity, which are the public target of the project. Nowadays to implement the standard consortium it´s necessary approximately BRL 20,000.00, there are some governmental funds that borrow this amount to some farmers that fills the land tenure needs, which in the Pratigi EPA is only the case of the medium and big farms.

Besides the economic aspects OCT focus the implementation of the project activities (reforestation and agroforestry systems) specially in the protected areas in the small farms (Permanent Preservation Area and Legal Reserve) in the way that begins the regularization process of the propriety. Also, the alternative 4 is a land use that according to the environmental Federal Law 12651/2012 are not allowed in the farm protected area.

In this case the public that OCT works in the project activities, they don´t have the financial resources necessary to implement this alternative and in most of the cases are not able to access some governmental funds, so the business as usual in the region is not the implementation of the alternative 4.

Outcome of Sub-step 1a: the unique credible alternative for land use scenarios that can occur on the land within the project boundary, in the absence of Project Activity Instances, is Alternative 1, which is the continuation of pre-project land use.

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

- *Environmental Preservation Area (APA)*

The Conservation Unit (CU) for Sustainable Use known as Environmental Protection Area (EPA) is the type of CU with less restriction with regard to rules and standards of use due the fact of allowing areas, almost in its entirety, are in private hands. In fact, the valid use restrictions for any EPA are similar to any property in the country. The legal instrument that guides the rules regarding this type of CU is the National System for CU (Law n ° 9.985/2000).

- *Permanent Preservation Areas (*APP*)*

The Brazilian Environmental Legislation restricts any removal of vegetation areas defined as APP (see Law No. 12.651/2012) restricted only in cases of national security or public utility (ie: infrastructure works) which is not the case for any of the uses described above.

Therefore, only the natural vegetation cover or Agroforestry Systems (for small land owners) is allowed in these areas. Despite the existence of rules and standards of the current environmental legislation for the use of these areas, legislation by itself does not guarantee protection, conservation and restoration of forest. In practice, the non enforcement and the non compliance of environmental legislation is common and widespread in Brazil[27] that brought significant changes especially regarding the need for restoration (article 61-A of Provisional Measure No. 571/12).

[27] please refer to changes imposed to the New Forest Code in 2012, due to the widely non-compliance of the original Forest code regulations

The analysis of satellite images developed by OCT for the initiative of Pact for the Atlantic Forest Restoration to demonstrate the eligibility of project activities, as explained in above sections, as well as the CCB validated Grouped Project (annex 4), and annex 12, shows that the area of the Grouped Project, approximately 9,204 ha of APP (river) have no forest cover equivalent to 36% of the areas of the entire region of APP (OCT, 2012). Thus the mandatory environmental regulations regarding APP (Law No. 12.651/12) is not enforced in at least 60% of the area of the Grouped Project.

- *Law of Mata Atlântica*

The law of the Atlantic Forest (Law No. 11.428 of 22 December 2006) is the newest existing legal framework in the area covered by the Grouped Project. This is more restrictive regarding the use and occupation of land and covers new areas with same phytophysiognomies found in the previous limit the enactment of the law.

This legislation, such as the law No. 12.651/12, are commonly disrespected and not complied as common practice in the Grouped Project area, especially regarding the suppression of regeneration in advanced, medium and early stage. In the advanced and medium stage of regeneration, the vegetal cover removal is not allowed. In early stage it is allowed only by permit application to the environmental agency.

As the local common practice is to use open areas for a few seasons in a row without any care and subsequently abandonment, the non-compliance with the legal requirements is systematic and widespread.

Because of this pattern of use and occupation of the Pratigi EPA, alternative 1 is the most plausible option to describe the baseline scenario of the areas submitted under this GP.

- *Policy on Climate Change State of Bahia*

The most plausible baseline scenario (Alternative I) is at odds with the Policy on Climate Change of the State of Bahia (State Law No. 12.050 of 7 January 2011) in its Article 4 which sets out its objectives. Sections II and III of the policy define: II - mitigation of adverse impacts resulting from anthropogenic interference with the climate system and III - reduction of the growth rate of emissions of greenhouse gases and the capture and storage of these gases .

However, as example of non-compliance of national regulation, the state environmental regulation is also not enforced, but it is expected that this important statewide legal framework, as well as the national environmental regulations, be empowered by the project activities.

Outcome of Sub-step 1b: The unique plausible alternative scenario for the land use to the VCS AFOLU GP, is the continuation of pre-project land use (pastures and abandoned pastures), although it is not in compliance with mandatory legislation and regulations, for the areas of APP and Legal Reserve, this is the very common practice in the GP area. Since legislation is not enforced, more than 60% of the entire Grouped project area does not meet the legal environmental requirements.

Sub-step 1c. Selection of the baseline scenario

The application of above steps led to identify the alternative land use scenario to the proposed VCS AFOLU Grouped Project that is the baseline scenario: Alternative 1, which represents the continuation of pre-project land use (pasture or abandoned pastures).

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

This step aims to determine whether the proposed GP, without the revenue from the sale of GHG credits, is economically or financially less attractive than at least one of the other land use scenarios. Investment analysis was chosen to be performed as a stand-alone additionality analysis.

Reforestation activities undertaken in eligible areas will present, as immediate return, only the financial benefits arising from the possible commercialization of credits.

The focus of the activities is the environmental readjustment and as explained earlier, in Step 1, the systematic non-compliance with environmental legislation due to the opportunity cost of degraded land is common practice in the Grouped Project area. So, in some cases, in order to get awareness and participation of the owners (especially the Familiar Farmers determined by the Law No. 11.326 of 24 June 2006, which establishes guidelines for the formulation of the National Policy of Family Farming) in the initiative, will be introduced and encouraged the establishment of Agroforestry Systems (*SAF*), with the designation of "green embrace" (*Abraço Verde* – in Portuguese).

OCT has developed a new methodology for productive arrangements on which is built a model of productive conservation and restoration through *SAF*s (model 3) using and taking advantage of a natural talent that the region has for this activity. The products from the *SAF*s livelihood will be incorporated as the ownership of beneficiary family.

Sub-step 2a. Determine appropriate analysis method

As restoration activities do not have a priority focus on income generation but the restoration of the environmental services, the main source of financial resources will be carbon credits. In some cases there will be small revenue, as described above, which will vary according to specific areas, but it will not be used as a source of income. Therefore, since the VCS AFOLU Grouped Project presents no financial benefits other than VCS related income, Option I – Simple cost Analysis is applied.

Sub-step 2b. – Option I. Apply simple cost analysis

As detailed previously the only financial benefit generated by the project activities will be derived from carbon credits. Below, following the details of the costs for implementation of reforestation activities (forest restoration and SAF).

Table 16 - Costs of Reforestation (OCT, 2012).

Activity	Operation/Inputs	Unity	BRL/Unit	Amount per hectare	BRL/ha
Ant Control	Pre-Planting	Kg	8	3.33	26.6
	Post-Planting	Kg	8	3.33	26.6
	Laboor	Daily rate	50	8	400.0
Control of initial Competing species	Mowing	Daily rate	50	5	250.0
Control of regrowth (Herbicide)	Glyphosate	Liters	15	3.5	52.5
	Labor - Spray Costal	Daily rate	50	5	250.0
Opening of pits	Opening Manual of pits	Daily rate	50	16	800.0
Crowing	Manual	Daily rate	50	12	600.0
Liming	Labor	Daily rate	50	5	250.0
	Input	T	25	2	50.0
Fertilization Base	Chemistry – Sinple Superphosphate	Kg	1	250	250.0
Planting Cartridge	Slip	Slip	1	1666	1666.0
	Tractor (transport)	hectare	100	1	100.0
Replanting	Slip	Slip	3	84	252.0
Top Fertilization	Chemistry (2 fertilizations 50g NPK 20-0.5-20)	Kg	1.3	166.6	216.6
Cleaning Crowns I	Manual (Glyphosate)	Liters	15	3.5	52.5
	Labor Spray Costal	Daily rate	50	5	250.0
Cleaning Crowns II	Manual (Glyphosate)	Liters	15	3.5	52.5
	Labor Spray Costal	Daily rate	50	5	250.0
Consumption Material	Fuel	Liters	3	99	297.0
Transportation	Transport Expense	ha	436	1	436.0
Administrative	Costs/Expenses	ha	7618	1	7618.0
Total					**14,146.36**

The total cost per hectare is BRL 14,146.36 (value calculated in 2012). Other costs associated with the project include preparation of studies, monitoring, among others that are not required to be shown here in the simple cost analysis.

STEP 3. Barriers analysis

Since it is necessary to undertake at least one of the additionality analysis (Barriers or investment), PP chose Step 2 – Investment analysis.

STEP 4. Common practice analysis.

Due to high implementation costs and low income generation (or simply no income), forest restoration activities, as well as SAF´s are not common practice in the region, nor even in the host country, especially when applied for environmental purposes. Despite of the inherent economic infeasibility of restoration programs, there are some specific examples that goes in this same direction, but does not present continuity, that this GP expect to do. Furthermore, most of reforestation programs of native species currently in progress in Brazil, seek to obtain carbon credits to enable its implementation.

The OCT is the only institution with the expertise and know how in restoration activities in the Grouped Project area (Pratigi EPA) and since its founding in 2001, It has been developing similar activities with the current proposal. However this kind of initiative always depends on external funding for activities implementation, basically because the reforestation activities for environmental purpose do not generate any kind of economic income, besides carbon credits (when applicable).

Due to the institutional and social arrangements that the activities of OCT are inserted, especially with respect to the Development and Integrated Growth Program with Sustainability (PDCIS), This GP has particularities and social environmental objectives that make this initiative different from the most reforestation programs.

Therefore the carbon credits is critical for the OCT to overcome the financial restrictions and reach its goal of restore the forest physiognomy and the environmental services provided by Pratigi EPA.

Outcome: Since similar activities, not registered (or seeking registry) in any kind of GHG program, cannot be considered common practice and considering that reforestation with native species for environmental purpose does not figure as an feasible economic choice, this Grouped Project is deemed additional when compared to the baseline scenario.

2.6 Methodology Deviations

Not applicable.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The baseline net GHG removals by sinks shall be calculated as follows:

$$\Delta \boldsymbol{C}_{\boldsymbol{BSL,t}} = \Delta \boldsymbol{C}_{\boldsymbol{TREE\_BSL,t}} + \Delta \boldsymbol{C}_{\boldsymbol{SHRUB\_BSL,t}} + \Delta \boldsymbol{C}_{\boldsymbol{DW\_BSL,t}} + \Delta \boldsymbol{C}_{\boldsymbol{LI\_BSL,t}} \qquad \text{Equation 1}$$

Where:

$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks in year *t*; t CO_2-e
$\Delta C_{TREE\_BSL,t}$	=	Change in carbon stock in baseline tree biomass within the project boundary in year *t*, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO_2-e

$\Delta C_{SHRUB\_BSL,t}$	=	Change in carbon stock in baseline shrub biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e
$\Delta C_{DW\_BSL,t}$	=	Change in carbon stock in baseline dead wood biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e
$\Delta C_{LI\_BSL,t}$	=	Change in carbon stock in baseline litter biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e

However, according to AR-TOOL14 (Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities v.4)[28] , the carbon stock in trees in the baseline can be accounted as zero if all of the following conditions are met:

(a) The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;
(b) The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity;
(c) The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity.

As presented in section 1.8, all the above mentioned conditions are in line with the Grouped Project activities. Furthermore, measures to guarantee the above mentioned approaches will be taken and will be monitored by the PP during planting and forest inventory activities. Based on this, the baseline carbon stock changes for all PAI´s will be deemed zero, both to ex ante, as for the ex-post, please refer to section 2.4 and 3.1.

Still according to the AR-TOOL 14, the changes in carbon stocks in trees and shrubs in the baseline may be accounted as zero for those lands for which the project participants can demonstrate, through documentary evidence or through participatory rural appraisal (PRA), that the following indicators apply:

(a) Observed reduction in topsoil depth (e.g. as shown by root exposure, presence of pedestals, exposed sub-soil horizons);

(b) Presence of gully, sheet or rill erosion; or landslides, or other forms of mass-movement erosion;

(c) Presence of plant species locally known to be indicators of infertile land;

(d) Land comprises of bare sand dunes, or other bare lands;

(e) Land contains contaminated soils, mine spoils, or highly alkaline or saline soils;

[28] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-14-v4.1.pdf

(f) Land is subjected to periodic cycles (e.g. slash-and-burn, or clearing-regrowing cycles) so that the biomass oscillates between a minimum and a maximum value in the baseline;

Most of the above mentioned indicators are clearly observed in the areas encompassed by the GP boundary, however it´s worth highlight the item (f), that figures as a business as usual in the region, despite of all the advertisements and information campaigns against this practice. In other words, fire is, in deed, the most widely observed and commonly carried out management practice to keep the areas cleaned and available for economic purposes as cattle grazing and cropping, even when it is not for prompt use[29] . More information to this regarding please refer to section 2.5, step 1

3.2 Project Emissions

Project emissions are not supposed to occur under this GP, once biomass burning will not be used for soil preparation, neither for area clearance. In addition, according to the AR TOOL 14 v.4.1, GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero.

In the other hand, once this is an A/R GP, the project activities, leads actually to emissions removal, that will be estimated ex-ante and calculated ex-post, at a PAI level, as following:

The actual net GHG removals by sinks will be calculated as follows:

$$\Delta C_{ACTUAL} = \Delta C_P - GHG_E$$

Equation 2

Where:

ΔC_{ACTUAL} = Actual net GHG removals by sinks, in year *t*; t CO2-e

ΔC_P = Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; t CO2-e

GHG_E = Increase in non-CO2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year *t*, as calculated in the tool “Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity”; t CO2-e

[29] According to the local land market, degraded areas, eg: clean and treeless lands with potential to be used for livestock or crop, have a much higher value than other areas that are not cleaned, furthermore, most of owners do not allow regeneration to occur in degraded areas since they believe it should be overpriced to clean up the area again

As explained in section 2.2. The use of fire does not make part of the project activities, notwithstanding whether during the period of the Grouped Project fires happen within the project boundary (details in section 1.9), the above mentioned tool will be applied.

The Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t* is calculated as follows:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t}$$ **Equation 3**

Where:

$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; t CO_2-e
$\Delta C_{TREE\_PROJ,t}$	=	Change in carbon stock in tree biomass in project in year *t*, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO_2-e
$\Delta C_{SHRUB\_PROJ,t}$	=	Change in carbon stock in shrub biomass in project in year *t*, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO_2-e
$\Delta C_{DW\_PROJ,t}$	=	Change in carbon stock in dead-wood biomass in project in year *t*, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities”; t CO_2-e
$\Delta C_{LI\_PROJ,t}$	=	Change in carbon stock in litter biomass in project in year *t*, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities”; t CO_2-e
$\Delta SOC_{AL,t}$	=	Change in carbon stock in SOC in project, in year *t*, as estimated in the tool “Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities”; t CO_2-e

For the ex-post calculation of changes in the PAI carbon stocks, it is applied the changes in carbon stock in tree biomass and also in shrub biomass, since monitored data will be available at this time, However the shrub biomass will not be accounted in the ex-ante calculation, being in accordance to the paragraph 13 of AR-TOOL 14, v4.1[30] . For the other carbon pools, once changes in carbon stock in dead wood biomass, in litter biomass and in soil organic carbon are supposed to increase due to implementation of the project activity, these pools were conservatively not considered under this Grouped Project, as explained in section 2.3, above.

For the calculation the changes of carbon stock in trees the PAI scenarios (both ex-ante and ex-post), the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities” version 4.1 is used. Under this tool the PP selected to calculate the project removal through the

[30] "For the purpose of ex-ante estimation of carbon stock and change in carbon stock in the project scenario, change in carbon stock of shrubs may be estimated as zero".

carbon stock in trees at a point of time (section 8 of AR TOOL 14). That can be estimated by using one of the following methods or a combination thereof:

(a) Estimation by measurement of sample plots;

(b) Estimation by modelling of tree growth and stand development;

(c) Estimation by proportionate crown cover;

(d) Updating the previous stock by independent measurement of change.

For ex-ante (projected) estimation of tree biomass it applies tree growth and stand development models (option "b")[31]. For ex-post (actual) estimation of tree biomass it uses data from measurements conducted in sample plots (option "a"). Also, remote sensing data may also be used in conjunction with data from measurements conducted in sample plots. Biomass of shrubs is estimated from shrub crown cover.

a) Change of carbon stocks in the trees carbon pools will be monitored and calculated as follow:

For the change of carbon stock in the tree carbon pools, following the “stock change method” and equation 3.2.3 as described in section 3.2 of the IPCC GPG-LULUCF, the mean annual carbon stock change is obtained through equation 3, below:

$$\Delta C_{TREE(t1,t2)} = \frac{C_{TREE,t2} - C_{TREE,t1}}{T}$$

Equation 4

Where:

$\Delta C_{TREE(t1,t2)}$ = Rate of change in carbon stock in tree biomass within the project boundary during the period between a point of time in year t1 and point of time in year t2; (tons CO_2-e yr^{-1})

$C_{TREE,t1}$ = Carbon stock in tree biomass within the project boundary at a point of time in year t1; (tons CO_2-e yr^{-1})

$C_{TREE,t2}$ = Carbon stock in tree biomass within the project boundary at a point of time in year t2; (tons CO_2-e yr^{-1})

T = Time elapsed between two successive estimates, *t*2 and *t*1 (T= *t*2-*t*1); (yr)

[31] Please refer to ex-ante calculus spreadsheet (annex 1)

For ex-ante PAI calculation, PP selected approach (b) due to lack of monitored information for the region, which is used for ex-ante estimation (projection) of carbon stock in tree biomass. Under this method, existing data are used in combination with tree growth models to predict the growth of trees and the development of the tree stand over time[32].

Under method (a), PP chose the 1st option – stratified random sampling for the basis of measurements of sample plots. The carbon stock in trees is estimated and measured on sample plots installed in one or more strata. For the PAI under this Grouped Project, the ex-post calculation, based in the stratified random sampling will be used for the forest inventory data collection.

As described in the referred tool, when estimation is carried out by methods (a), (c) or (d), the date of last measurement of sample plot is considered to be the date of estimation of carbon stock, even if the full process of measurement extends over a period of time.

It is important to note that this method is more efficient when the sample plots are optimally allocated to the strata keeping in view the expected mean tree biomass per hectare and its variability in the strata. Number of sample plots and their allocation to strata will be estimated by using the A/R methodological tool "Calculation of the number of sample plots for measurements within A/R CDM project activities". For more detail regarding sample plot quantification procedures, please refer to section 4.3 of this GP

Using this approach and based on the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities", first it is necessary to estimate the ***mean carbon stock in trees*** within the tree biomass estimation strata as follows:

$$C_{TREE} = \frac{44}{12} \times CF_{TREE} \times B_{TREE}$$

Equation 5

$$B_{TREE} = A \times b_{TREE}$$

Equation 6

$$b_{TREE} = \sum_{i=1}^{M} w_i \times b_{TREE,i}$$

Equation 7

32 Please refer to annex 6

$$u_C = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^{M} w_i^2 \times \frac{s_i^2}{n_i}}}{b_{TREE}}$$ Equation 8

Where:

C_{TREE} = Carbon stock in trees in the tree biomass estimation strata; t CO2e

CF_{TREE} = Carbon fraction of tree biomass; t C (t d.m.)-1. A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.

B_{TREE} = Tree biomass in the tree biomass estimation strata; t d.m.

A = Sum of areas of the tree biomass estimation strata; ha

b_{TREE} = Mean tree biomass per hectare in the tree biomass estimation strata; t d.m. ha-1

w_i = Ratio of the area of stratum i to the sum of areas of tree biomass estimation strata (i.e. $w_i = A_i/A$); dimensionless

u_C = Uncertainty in C_{TREE}

t_{VAL} = Two-sided Student's t-value for a confidence level of 90 per cent and degrees of freedom equal to n – M, where n is total number of sample plots within the tree biomass estimation strata and M is the total number of tree biomass estimation strata

s^2_i = Variance of tree biomass per hectare across all sample plots in stratum i; (t d.m. $ha^{-1})^2$

n_i = Number of sample plots in stratum i.

After the above calculation to achieve the carbon stock in trees, PP is required to calculate the next step, which consist of reaching a *mean tree biomass per hectare* in a stratum, jointly with an associated variance, as follows:

$$b_{TREE,i} = \frac{\sum_{p=1}^{n_i} b_{TREE,p,i}}{n_i}$$ Equation 9

$$s_i^2 = \frac{n_i \times \sum_{p=1}^{n_i} b_{TREE,p,i}^2 - \left(\sum_{p=1}^{n_i} b_{TREE,p,i}\right)^2}{n_i \times (n_i - 1)}$$ Equation 10

Where:

$b_{TREE,i}$ = Mean tree biomass per hectare in stratum i; t d.m. ha-1

$b_{TREE,p,i}$ = Tree biomass per hectare in plot p of stratum i; t d.m. ha-1

s_i^2 = Variance of mean tree biomass per hectare in stratum i; (t d.m. $ha^{-1})^2$

n_i = Number of sample plots in stratum i.

After applying the last two equations for the project activity, PP shall estimate tree biomass per hectare in a sample plot by using one of the plot measurement methods provided in table 1 of appendix 1 of AR tool 14. Where the plot biomass values are estimated from direct or indirect measurements conducted on trees in the sample plot. PP also chose to follow measurement of fixed area plots, which conducts both steps below:

Step 1. Measurement (what is measured): individual tree dimension (e.g. diameter at breast height, diameter at root collar, tree height);

Step 2. Conversion (how measurements are converted into tree biomass):
1. Using allometric[33] equations based on tree dimensions; or
2. Using biomass expansion factors; or
3. Combination of 1 and 2

PP decided to use a combination of allometric equation and biomass expansion. Therefore, through this method, the sample plots of the same size are installed in a stratum. All trees in a sample plot above a minimum dimension are measured and the biomass of each tree is estimated. According to this appendix, the minimum dimension selected can be low (e.g. a diameter of 2 cm) or high (e.g. a diameter of 10 cm) depending upon the applicability of models (e.g. allometric equations or volume equations) to be used for conversion of the tree dimension into tree volume or tree biomass, and upon cost-effectiveness of measurement. In the case of this GP, the minimum DBH contemplated by the Atlantic forest allometric equation used is 4 cm of DBH (please refer to annex 7).

The biomass of the individual trees is added and the sum is divided by the area of the sample plot to obtain the plot biomass value.

It is important to note that where the number of samplings with diameter below the range of diameter applicable to the allometric equation is high, the mean biomass of the saplings in a sample plot can be estimated as follows: (1) Determine the diameter mid-way between the diameter of the smallest sapling existing and the smallest diameter allowed by the allometric equation. (2) Harvest from outside the plot area a few saplings having diameter close to the mid-way diameter and obtain the mean biomass per sapling; (3) Count all the saplings in the sample plot and multiply this number by the mean sapling biomass to obtain their contribution to the plot biomass.

The plot biomass value (i.e. per-hectare tree biomass at the center of the plot) is estimated, for ex-post calculation, as follows (all time-dependent variables relate to the time of measurement):

$$b_{TREE,p,i} = \frac{B_{TREE,p,i}}{A_{PLOT,i}}$$

Equation 11

[33] As described in the tool “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities”, the allometric equation predicts tree biomass on the basis of one or more measurements of a tree (e.g. DBH and/or tree height).

$$B_{TREE,p,i} = \sum_{j} B_{TREE,j,p,i}$$

Equation 12

$$B_{TREE,j,p,i} = \sum_{l} B_{TREE,l,j,p,i}$$

Equation 13

Where:

$b_{TREE,i}$	=	Mean tree biomass per hectare in sample plot p of stratum i; t d.m. ha-1
$B_{TREE,p,i}$	=	Tree biomass in sample plot p of stratum i; t d.m. ha-1
$A_{PLOT,i}$	=	Size of sample plot in stratum i; ha
$B_{TREE,j,p,i}$	=	Biomass of trees of species j in sample plot p of stratum i; t d.m.
$B_{TREE,l,j,p,i}$	=	Biomass of tree l of species j in sample plot p of stratum i; t d.m.

Following the logic, after meeting the above explained Step 1 (measurement), next step will be responsible to answer how measurements are converted into tree biomass in a sample plot, as follows:

For ex-post calculation, next equation is used:

$$B_{TREE,l,j,p,i} = f_j(x_{1,l}, x_{2,l}, x_{3,l}, \dots) \times (1 + R_j)$$

Equation 14

In the other hand, for ex-ante calculation, the follow is applied:

$$B_{TREE,l,j,p,i} = V_{TREE,j}(x_{1,l}, x_{2,l}, x_{3,l}, \dots) \times D_j \times BEF_{2,j} \times (1 + R_j)$$

Equation 15

Where:

$B_{TREE,l,j,p,i}$	=	Biomass of tree l of species j in sample plot p of stratum i; t d.m.
$f_j\,(x_{1,l}, x_{2,l}, x_{3,l}, \dots)$	=	Above-ground biomass of the tree returned by the allometric equation for species j relating the measurements of tree l to the above-ground biomass of the tree; t d.m. Note. The allometric equation used may be based on different units of inputs and outputs. For example, input values of diameter at breast height (dbh) may be in inches and output of biomass may be in pounds, rather than dbh in cm and biomass in kg or t d.m. In such a case, the function should be applied consistently (e.g. convert the dbh values from centimetre to inch units, obtain the tree biomass in pound, and then convert the biomass into metric tonne). For the Grouped Project, this allometric equation will use input data (DBH) in cm, while the output is given in kg of dry biomass, thus the output will be converted into metric tons by dividing the result per 1,000.

R_j	=	Root-shoot ratio for tree species j; dimensionless The value of it is estimated as ($R_j = e^{(-1.085 + 0.9256 \times \ln b)}/b$), where *b* is the above-ground tree biomass per hectare (in t d.m. ha-1), unless transparent and verifiable information can be provided to justify a different value. Note. If trees have grown as coppice regeneration after a harvest, then the value of R_j should be multiplied by a factor equal to $v_{HARVEST} / v_{TREE}$ or 1, whichever is greater, where $v_{HARVEST}$ is the volume per hectare of trees harvested and v_{TREE} is the volume per hectare of trees standing in the plot at the time of measurement.
$V_{TREE,j}$ ($x_{1,l}$, $x_{2,l}$, $x_{3,l}$, …)	=	Stem volume of tree l of species j in sample plot p of stratum i, estimated from the tree dimension(s) as entry data into a volume table or volume equation; m^3 Note. Where the volume table or volume equation predicts under-bark volume (i.e. wood volume, rather than gross stem volume), suitable correction should be applied to estimate the over-bark volume.
D_j	=	Density (over-bark) of tree species j; t d.m. m-3 Values are taken from Table 3A.1.9 of IPCC GPG-LULUCF 2003 unless transparent and verifiable information can be provided to justify different values. Note. Where density (specific gravity) of the bark of a tree species is different from the density of the wood, suitable correction should be applied to estimate a conservative value of the overall (over-bark) density of tree stem.
$BEF_{2,j}$	=	Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species j; dimensionless For ex-ante estimation, the value of $BEF_{2,j}$ is selected by applying, mutatis mutandis, the procedure described in paragraph 7 below. For ex-post estimation the conservative default value of 1.15 is used, unless transparent and verifiable information can be provided to justify a different value.

For ex-ante estimation, the allometric equation, or volume table or volume equation applied to a tree species is selected from the following sources (the most preferred source being listed first):

(a) Existing data applicable to local situation (e.g. represented by similar ecological conditions);
(b) National data (e.g. from national forest inventory or national greenhouse gas (GHG) inventory);
(c) Data from neighboring countries with similar conditions;
(d) Globally applicable data.

The selected allometric equation to calculate the tree biomass (Tiepolo et al. 2002), was obtained from destructive method of trees harvested in the same forest physiognomy of the Grouped Project region (Atlantic rain forest, more specifically, the "floresta ombrofila densa") and uses DBH (diameter at breast height) as an independent monitored variable. This allometric equation is in line with the paragraph 6(c) of EB 65 annex 28 "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" Version 01.0.0 , (please refer to annex 7).

For the Grouped Project ex-ante calculation, the volume table applied is according to the option (a), please refer to annex 6. In order to support the data base adopted for ex-ante project removal calculation, the PP has compiled some values (in tC/ha) obtained from literature for similar forest physiognomy it is worth noting that the ex-ante projections for 30 years in the PAI #1, has reached to 131 tC/ha, what meets the values presented in the table below for forest physiognomies:

Table 17 - Estimated carbon stock of existing vegetation types within the Project Group of the Pratigi EPA area.

Source of data	Type of forest	Below-ground (tC/ha)	Above-ground (tC/ha)	Total (tC/ha)
MCT	Pioneer Formations of River Influence	31.4	7.5336	38.9
	Pioneer Formations of Marine Influence	61.8	14.832	76.6
	Forest	123.6	29.664	153.3
RADAMBRASIL	Lowland Tropical Rain Forest	53.6	12.864	66.5
	Tropical Rain Forest Sub Montana	51.1	12.258	63.3
	Semi Deciduous Seasonal Forest	30.9	7.416	38.3
Britez et al. (2006)	Semi Deciduous Seasonal Forest	108.6	26.064	134.7
	Tropical Rain Forest	152.9	36.696	189.6
	Tropical Rain Forest Alluvial	129.0	30.96	160.0
	Lowland Tropical Rain Forest	105.0	25.2	130.2
	Secondary Vegetation	26.0	6.24	32.2
	Pioneer Formations of Marine Influence	73.0	17.52	90.5
	Pioneer Formations of River Influence	81.0	19.44	100.4
Gonzalez and Marques (2008)	Forest	167.5	40.2	207.7
Lima at al (2008)	Forest	77.3	18.54	95.8
IPCC	Default Value for Tropical Forest	104.5	25.08	129.6

For ex-post estimation, the allometric equation used must be demonstrated to be appropriate for the purpose of estimation of tree biomass by applying the tool “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities”, and the volume table or volume equation used must be demonstrated to be appropriate for the purpose of estimation of tree biomass by applying the tool “Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities”.

For the tropical forest there were found five allometric models to predict tree biomass for Atlantic Forest, based on direct measures of harvested trees. Two of them use DBH as an independent variable, one use DBase, one uses DBH and height, and the last uses DBH and wood density. The one chosen for this GP was developed from trees harvested in a forest near Guaraqueçaba, Paraná State (Tiepolo et al. 2002).

Most allometric models for biomass in tropical forests are based solely on DBH (Chambers et al. 2001, Tiepolo et al. 2002, Chave et al. 2005). Most of the inventories do not include tree height because it is time consuming to measure accurately in the field, and if used accurate measures are needed.

Based in above considerations, the chosen method was Tiepolo et al. 2002, as follows:

Table 18 - Allometric model to estimate dry aboveground biomass (kg) for tropical forests. Biomass regression models uses trunk diameter DBH (in cm).

Reference	Allometric model for AGB with 1 variable - DBH	α	β_1	β_2	β_3	R^2	DBH range (cm)
Tiepolo et al. (2002)	$= \alpha+\beta_1 (DBH)+\beta_2 (DBH)^2$	21.297	–6.953	0.740	-	0.910	4 - 116

Therefore, applying the model, the allometric equation is:

$$AGB_{TREE,l,j,p,i} = 21.297 - 6.953*(DBH) + 0.74*(DBH)^2$$ **Equation 16**

Where:

$AGB_{TREE,l,j,p,i}$ = Above Ground Biomass of tree l of species j in sample plot p of stratum i; kg d.m.

<u>IMPORTANT NOTE</u>: before submit the result of equation 15 ($AGB_{TREE,l,j,p,I\ oin}$ given in kg d.m) to equation 14 ($B_{TREE,l,j,p,I}$ given in t.d.m), the **result of equation 15 must be divided by 1,000.**

Using the tool "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities", the allometric equation is appropriate, since it derived from trees growing in edapho-climatic conditions similar to those in the project area is considered appropriate, and hence can be used for ex post estimation of tree biomass, if at least one of the following conditions is satisfied:

(a) The equation is used in the national forest inventory, or the national GHG inventory, of the host Party;

(b) The equation has been used in commercial forestry sector of the host Party for ten years or more;

(c) The equation was derived from a data set of at least 30 sample trees, and the value of coefficient of determination (R^2) obtained was not less than 0.85.

Tiepolo et al. 2002 identified a total of 12 strata, but only 6 forest strata were under threat of deforestation and therefore used to estimate carbon stocks and offsets. A total of 188 permanent plots were established with 68 in the submontane forest (1,162.5 ha), 11 in the lowland forest (427 ha), 10 in the floodplain forest (173 ha), 63 in advanced/medium forest (1,783 ha), 24 in medium secondary forest (545 ha), and 12 in young secondary forest (279 ha). Twenty-eight clip plots were established on the pasture (409 ha) and shrublands (279 ha). Further, as described in the table above, R^2 is 0.910. Based on that, Tiepolo et al. 2002 allometric equation is deemed appropriate for this GP.

OCT, as proposing institution and developer of the Grouped project, is building strong partnerships with two regional institutions of repute in the area of scientific research: State University of Feira de Santana (UEFES) and the Federal University of Recôncavo Baiano (UFRB) with intention to reach relevant studies for the forest (as carbon stock flux) and biodiversity (diagnosis and monitoring). Considering that studies and local surveys will happen and the data will be used by OCT in the PAI monitorings, some future updating might happened, and if so, these will be adjusted according to the most recent VCS standard review procedures.

b) Change of carbon stocks in the shrubs carbon pools will be monitored and calculated as follow:

The *change in carbon stock of shrubs will not be considered in the* ex-ante calculations, what is in accordance to the AR TOOL 14 statement: *"For the purpose of ex-ante estimation of carbon stock and change in carbon stock in the project scenario, change in carbon stock of shrubs may be estimated as zero"*

However, for the ex-post calculation, the changes of shrubs carbon stock in the PAI scenarios will use the ***estimating carbon stock in shrubs at a point of time*** (section 11 of the AR TOOL 14 v.4.1. This can be estimated by using one of the following methods or a combination thereof:

Carbon stock in shrubs at a point of time is estimated on the basis of shrub crown cover. The area within the project boundary is stratified by shrub crown cover. Those areas where the shrub crown cover is less than 5 per cent are treated as a single stratum and the shrub biomass in this stratum is estimated as zero.

For the strata with a shrub crown cover of greater than 5 per cent, carbon stock in shrubs is estimated as follows:

$$C_{SHRUB,t} = \frac{44}{12} \times CF_S \times (1 + R_S) \times \sum_i A_{SHRUB,i} \times b_{SHRUB,i}$$

Equation 17

$$b_{SHRUB,i} = BDR_{SF} \times b_{FOREST} \times CC_{SHRUB,i}$$

Equation 18

Where:

$C_{SHRUB,t}$	=	Carbon stock in shrubs within the project boundary at a given point of time in year t; t CO2-e
CF_s	=	Carbon fraction of shrub biomass; t C (t.d.m.)-1. A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.
R_s	=	Root-shoot ratio for shrubs; dimensionless. The default value of 0.40 is used unless transparent and verifiable information can be provided to justify a different value.
$A_{SHRUB,i}$	=	Area of shrub biomass estimation stratum i; ha
$b_{SHRUB,i}$	=	Shrub biomass per hectare in shrub biomass estimation stratum i; t d.m. ha^{-1}
BDR_{SF}	=	Ratio of shrub biomass per hectare in land having a shrub crown cover of 1.0 (i.e. 100 per cent) and the default above-ground biomass content per hectare in forest in the region/country where the A/R CDM project activity is located; dimensionless. A default value of 0.10 should be used unless transparent and verifiable information can be provided to justify a different value.

B_{FOREST} = Default above-ground biomass content in forest in the region/country where the A/R CDM project activity is located; t d.m. ha^{-1}. Values from Table 3A.1.4 of IPCC GPG-LULUCF 2003 are used unless transparent and verifiable information can be provided to justify different values.

$CC_{SHRUB,i}$ = Crown cover of shrubs in shrub biomass estimation stratum i at the time of estimation, expressed as a fraction (e.g. 10 per cent crown cover implies $CC_{SHRUB,i}$ = 0.10); dimensionless.

3.3 Leakage

Leakage due to displacement of agricultural activities is unlikely because cattle removal will be monitored during monthly site visits, community monitoring events, and indirectly through satellite images. Every three years, satellite images will be used to generate land-use maps in the Grouped Project area, which will allow for analysis of land-use changes over time in the Grouped Project region. In this way, the forest cover on the property can be verified accurately.

For the Grouped Project, it is considered an average of 3ha /head of cattle; leakage is zero, since the restored grasslands are suitable productively regarding the sustainability of the business (OCT, 2013).

However, whether leakage emissions happen, it shall be estimated as follows:

$$LK_t = LK_{AGRIC,t}$$ Equation 29

Where:

LK_t = GHG emissions due to leakage, in year *t*; t CO_2-e

$LK_{AGRIC,t}$ = Leakage due to the displacement of agricultural activities in year *t*, as estimated in the tool “Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity”; t CO_2-e

There is no provision for moving people during project activities, all areas that are included in the Grouped Project will participate in the initiative spontaneously and voluntarily in the way that will be built jointly between OCT and owners.

Plan of property in which a detailed sketch of the properties will be established and will be encouraged to introduce new production arrangements with the use of perennial crops with high added value will be written. A preventive monitoring of the areas around the total area of the Grouped Project on the baseline (starting point) of the disturbed areas around 10 km from the polygon proposal from the year of commencement of the project.

When applicable, the lands within the project boundary from which the pre-project agricultural activities are to be displaced outside the project boundary are delineated and their area is estimated. In this cases the leakage emission resulting from displacement of the activities is estimated as follows:

$$LK_{AGRIC,t} = \frac{44}{12} \times \left(\Delta C_{BIOMASS,t} + \Delta SOC_{LUC,t}\right)$$

Equation 20

$$\Delta C_{BIOMASS,t} = [1.1 \times b_{TREE} \times (1 + R_{TREE}) + b_{SHRUB} \times (1 + R_S)] \times CF \times A_{DISP,t}$$

Equation 21

$$\Delta SOC_{LUC,t} = SOC_{REF} \times (f_{LUP} \times f_{MGP} \times f_{INP} - f_{LUD} \times f_{MGD} \times f_{IND}) \times A_{DISP,t}$$

Equation 32

Where:

$LK_{AGRIC,t}$	=	Leakage emission resulting from displacement of agricultural activities in year t; t CO2e
$\Delta C_{BIOMASS,t}$	=	Decrease in carbon stock in the carbon pools of the land receiving the activity displaced in year t; t d.m. Note. The factor of 1.1 is used to account for the carbon stock in the dead wood and litter pools as a fixed percentage of the carbon stock in living trees.
CF	=	Carbon fraction of woody biomass; dimensionless. A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.
$A_{DISP,t}$	=	Area of land from which agricultural activity is being displaced in year t; ha
b_{TREE}	=	Mean above-ground tree biomass in land receiving the displaced activity; t d.m. ha-1 The value of this parameter is obtained by applying one of the applicable methods from the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities” to the land receiving the displaced activity. Where the land receiving the displaced activity is unidentified, value of is set equal to the applicable value of mean above-ground biomass in forest in the region or country where the A/R CDM project activity is located, as obtained from Table 3A.1.4 of the IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC GPG-LULUCF 2003) unless transparent and verifiable information can be provided to justify a different value.
R_{TREE}	=	Root-shoot ratio for trees in the land receiving the displaced activity; dimensionless. A default value of 0.25 is used unless transparent and verifiable information can be provided to justify a different value.

b_{SHRUB}	=	Mean above-ground shrub biomass in land receiving the displaced activity; t d.m. ha-1. The value of this parameter is obtained by applying one of the applicable methods from the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" to the land receiving the displaced activity.
R_S	=	Root-shoot ratio for shrubs in the land receiving the displaced activity; dimensionless. The default value of 0.40 is used unless transparent and verifiable information can be provided to justify a different value.
$\Delta SOC_{LUC,t}$	=	Change in soil organic carbon (SOC) stock due to land-use change in the land receiving the displaced activity in year t; tC ha-1. The value of this parameter may be set to zero if: (a) The only displaced activity being received in the land is grazing activity; or (b) The value of the parameter as estimated from Equation (3) is less than zero (i.e. negative).
SOC_{REF}	=	SOC stock corresponding to the reference condition in native lands by climate region and soil type applicable to the land receiving the displaced activity; t C ha-1. The value of this parameter is taken from Table 3 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities".
f_{LUO}, f_{MGP}, f_{INP}	=	Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land before the displaced activity is received; dimensionless. The value of these parameters is taken from Tables 4, 5, and 6 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities".
f_{LUD}, f_{MGD}, f_{IND}	=	Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land after the displaced activity has been received; dimensionless. The value of these parameters is taken from Tables 4, 5, and 6 of the "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities".
t	=	1, 2, 3, …years elapsed since the start of the A/R CDM project activity

3.4 Summary of GHG Emission Reductions and Removals

The tabulated annual values of Estimated net GHG emission removals by this project activity (PAI #1), as well as the total amount of emission removal for the whole period is presented in table below:

Table 19 - Ex-ante calculation (estimate) of baseline removals, project removals, leakage emissions and net GHG removals.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2011	0	1139,26	0	1139,26
2012	0	1139,26	0	1139,26
2013	0	1513,38	0	1513,38
2014	0	1513,38	0	1513,38
2015	0	1513,38	0	1513,38
2016	0	1575,56	0	1575,56
2017	0	1575,56	0	1575,56
2018	0	1643,97	0	1643,97
2019	0	1643,97	0	1643,97
2020	0	1643,97	0	1643,97
2021	0	1720,72	0	1720,72
2022	0	1720,72	0	1720,72
2023	0	1805,16	0	1805,16
2024	0	1805,16	0	1805,16
2025	0	1805,16	0	1805,16
2026	0	1878,86	0	1878,86
2027	0	1878,86	0	1878,86
2028	0	2292,83	0	2292,83
2029	0	2292,83	0	2292,83
2030	0	2292,83	0	2292,83
2031	0	1467,42	0	1467,42
2032	0	1467,42	0	1467,42
2033	0	1467,42	0	1467,42
2034	0	1467,42	0	1467,42
2035	0	1467,42	0	1467,42
2036	0	1467,42	0	1467,42
2037	0	1467,42	0	1467,42
2038	0	1467,42	0	1467,42
2039	0	1467,42	0	1467,42
2040	0	1467,42	0	1467,42
Total	**0**	**49069,03**	**0**	**49069,03**

The methodological approaches for ex-ante and ex-post calculations for estimation of the project net GHG emission removals is presented below.

The net anthropogenic GHG removals by sinks is calculated as follows:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL.t} - \Delta C_{BSL,t} - LK_t \qquad \textbf{Equation 4}$$

Where:

$\Delta C_{AR-CDM,t}$	=	Net anthropogenic GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{ACTUAL.t}$	=	Actual net GHG removals by sinks, in year *t*; t CO_2-e
$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks, in year *t*; t CO_2-e
LK_t	=	GHG emissions due to leakage, in year *t*; t CO_2-e

Calculation of tVCUs and lVCUs

The *tVCUs* and *lVCUs* for a verification period $T = t_2 - t_1$, where t_1 and t_2 are the years of the start and the end, respectively, of the verification period, are calculated as follows:

$$tCER_{t_2} = \sum_1^{t_2} \Delta C_{AR-CDM,t} \qquad \textbf{Equation 5}$$

$$lCER_{t_2} = \sum_{t_1+1}^{t_2} \Delta C_{AR-CDM,t} \qquad \textbf{Equation 25}$$

Where:

$tCER_{t_2}$	=	Number of units of temporary certified emission reductions (tCERs) issuable in year t_2. For the project activity, this parameter will be called tVCUs.
$lCER_{t_2}$	=	Number of units of long-term certified emission reductions (lCERs) issuable in year t_2. For the project activity, this parameter will be called lVCUs.
$\Delta C_{AR-CDM,t}$	=	Net anthropogenic GHG removals by sinks, in year *t*; t CO_{2-}e
t_1, t_2	=	The years of the start and the end, respectively, of the verification period

If $lVCU_{t_2} < 0$ then $lVCU_{t_2}$ represents the number of *lVCUs* that shall be replaced because of a reversal of net anthropogenic GHG removals by sinks since the previous certification.

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	**CF_{TREE}**
Data unit:	t C (t d.m.)$^{-1}$
Description:	Carbon fraction of tree biomass
Source of data:	AR-AM tool 14, version 4.1 “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”
Value applied:	0.47 (applicable to all PAI)
Justification of choice of data or description of measurement methods and procedures applied:	A default value is used unless transparent and verifiable information can be provided to justify a different value.
Any comment:	-

Data Unit / Parameter:	**CF_s**
Data unit:	t C (t d.m.)$^{-1}$
Description:	Carbon fraction of shrub biomass
Source of data:	AR-AM tool 14, version 4.1 “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”
Value applied:	0.47 (applicable to all PAI)
Justification of choice of data or description of measurement methods and procedures applied:	A default value is used unless transparent and verifiable information can be provided to justify a different value.
Any comment:	-

Data Unit / Parameter:	**$F_j (x_{1,l}, x_{2,l}, x_{3,l})$**
Data unit:	Kg.d.m.
Description:	Above-ground biomass of the tree returned by the allometric equation for species j relating the measurements of tree l to the above-ground biomass of the tree
Source of data:	TIEPOLO, G., CALMON, M. & FERETTI, A.R. 2002. Measuring and Monitoring Carbon Stocks at the Guaraqueçaba Climate Action Project, Paraná, Brazil.

	In: International Symposium on Forest Carbon Sequestration and Monitoring. Extension Serie Taiwan Forestry Research Institute 153:98-115.
Value applied:	$21.297 - 6.953(DBH) + 0.740\ (DBH)^2$
Justification of choice of data or description of measurement methods and procedures applied:	The selected allometric equation was obtained from destructive method of trees harvested in the same forest physiognomy of the Grouped Project region (Atlantic rain forest, more specifically, the "floresta ombrofila densa") and uses DBH (diameter at breast height) as an independent monitored variable. This allometric equation is in line with the paragraph 6(c) of EB 65 annex 28 "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" Version 01.0.0[34], (please refer to annex 7)
Any comment:	This allometric equation uses input data (DBH) in cm, while the output is given in kg of dry biomass, thus the output will be converted into metric tons by dividing the result per 1,000.

Data Unit / Parameter:	**R_j**
Data unit:	dimensionless
Description:	Root-shoot ratio for tree species j
Source of data:	IPCC Good Practice Guidance for LULUCF, section 3.2 - forest lands, TABLE 3.A.1.8.
Value applied:	0,22 (applicable to all PAI)
Justification of choice of data or description of measurement methods and procedures applied:	A default value is used unless transparent and verifiable information can be provided to justify a different value.
Any comment:	The most conservative value available for tropical forest in table 3.A.1.8. is used for this parameter (lower range)

Data Unit / Parameter:	**R_s**
Data unit:	dimensionless
Description:	Root-shoot ratio for shrubs

34 http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-17-v1.pdf

Source of data:	IPCC Good Practice Guidance for LULUCF, section 3.2 - forest lands, TABLE 3.A.1.8.
Value applied:	0,34 (applicable to all PAI)
Justification of choice of data or description of measurement methods and procedures applied:	A default value is used unless transparent and verifiable information can be provided to justify a different value.
Any comment:	The most conservative value available for shrubland in table 3.A.1.8. is used for this parameter (lower range)

Data Unit / Parameter:	$\mathbf{D_j}$
Data unit:	T d.m. m^{-3}
Description:	Density (over-bark) of tree species j
Source of data:	Britez, et, al, 2006 (annex 6)
Value applied:	Please refer to annex 6
Justification of choice of data or description of measurement methods and procedures applied:	Britez, et, al, 2006 has compiled an extensive data base of biometric parameters for several Atlantic forest tree species, the PP believes that this is the most complete compilation to this regarding available by the time of preparation of this GPD.
Any comment:	Where density (specific gravity) of the bark of a tree species is different from the density of the wood, suitable correction should be applied to estimate a conservative value of the overall (over-bark) density of tree stem.

Data Unit / Parameter:	$\mathbf{BEF_{2,j}}$
Data unit:	dimensionless
Description:	Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species j; dimensionless
Source of data:	IPCC Good Practice Guidance for LULUCF, section 3.2 - forest lands, TABLE 3.A.1.10.
Value applied:	2.0 (applicable to all PAI)
Justification of choice of data or description of measurement methods and procedures applied:	For ex-ante estimation, the value of is selected by applying, mutatis mutandis procedure, where the volume table or volume equation used must be demonstrated to be appropriate for the purpose of

	estimation of tree biomass by applying the tool "Demonstrating appropriateness of volume equations for estimation of aboveground tree biomass in A/R CDM project activities".
Any comment:	BEF will be used only for ex-ante calculation in the cases where the available data are not enough to use the alometric equation approach (ex-post calculation)

Data Unit / Parameter:	**BDR_{SF}**
Data unit:	dimensionless
Description:	Ratio of shrub biomass per hectare in land having a shrub crown cover of 1.0
Source of data:	AR-AM tool 14, version 4.1 "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"
Value applied:	0.10 (applicable to all PAI)
Justification of choice of data or description of measurement methods and procedures applied:	According to the AR-AM tool 14, version 4.1 a default value of 0.10 should be used unless transparent and verifiable information can be provided to justify a different value.
Any comment:	-

Data Unit / Parameter:	**b_{FOREST}**
Data unit:	t d.m. ha^{-1}
Description:	Default above-ground biomass content in forest in the region/country where the A/R CDM project activity is located
Source of data:	IPCC Good Practice Guidance for LULUCF, section 3.2 - forest lands, TABLE 3.A.1.4.
Value applied:	209 (applicable to all PAI)
Justification of choice of data or description of measurement methods and procedures applied:	According to the AR-AM tool 14, version 4.1, values from Table 3A.1.4 of IPCC GPG-LULUCF 2003 are used unless transparent and verifiable information can be provided to justify different values.
Any comment:	-

4.2 Data and Parameters Monitored

Data Unit / Parameter:	**$DBH_{TREE,l,j,p,i}$**
Data unit:	cm.
Description:	Diameter at breast high (1,3m) of tree l species j in sample plot p of stratum i
Source of data:	Forest inventory
Description of measurement methods and procedures to be applied:	Direct measurement of trees within the sample plots Forest inventory
Frequency of monitoring/recording:	At every verification
Value applied:	depends on each PAI
Monitoring equipment:	measuring tape and caliper rule
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable
Any comment:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied. SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied. Furthermore the forest inventory will be carried out by trained team (OCT and UFRB) headed by a forestry engineering.

Data Unit / Parameter:	**$DGH_{TREE,l,j,p,i}$**
Data unit:	cm.
Description:	Diameter at Ground Height of tree l species j in sample plot p of stratum i
Source of data:	**Forest inventory**
Description of measurement methods and procedures to be applied:	Direct measurement of trees within the sample plots Forest inventory
Frequency of monitoring/recording:	At every verification
Value applied:	depends on each PAI
Monitoring equipment:	measuring tape and caliper rule
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.

Calculation method:	Not applicable
Any comment:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied. SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied. Furthermore the forest inventory will be carried out by trained team (OCT and UFRB) headed by a forestry engineering.

Data Unit / Parameter:	$H_{TREE,l,j,p,i}$
Data unit:	m.
Description:	Height of tree l species j in sample plot p of stratum i
Source of data:	Forest inventory
Description of measurement methods and procedures to be applied:	Direct measurement of trees within the sample plots Forest inventory
Frequency of monitoring/recording:	At every verification
Value applied:	depends on each PAI
Monitoring equipment:	measuring tape
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable
Any comment:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied. SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied. Furthermore the forest inventory will be carried out by trained team (OCT and UFRB) headed by a forestry engineering.

Data Unit / Parameter:	$A_{PLOT,i}$
Data unit:	Ha
Description:	Area of a sample plot
Source of data:	Field measurement
Description of measurement methods and	Standard operating procedures (SOPs)

procedures to be applied:	prescribed in Annex 12 are applied. In the absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied
Frequency of monitoring/recording:	At every verification
Value applied:	0, 024ha (240 m2), for all PAIs
Monitoring equipment:	GPS, Landsat 8 and/or Ikonos satellite images, and GIS software (ArcGIS 10 and Google Earth®)
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable
Any comment:	Constant for all strata. In the absence of these, SOPs from published handbooks, or from the IPCC GPG LULUCF 2003, are applied. Furthermore the forest inventory will be carried out by trained team (OCT and UFRB) headed by a forestry engineering.

Data Unit / Parameter:	$\mathbf{A_i}$
Data unit:	Ha
Description:	Area of strata i
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	georreferencing in field with GPS, remote sensing and others GIS tools
Frequency of monitoring/recording:	At every verification
Value applied:	depends on each PAI
Monitoring equipment:	GPS, Landsat 8 and/or Ikonos satellite images, and GIS software (ArcGIS 9.3 and Google Earth®)
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable
Any comment:	-

Data Unit / Parameter:	$\mathbf{A_{SHRUB,I}}$

Data unit:	Ha
Description:	Area of shrub biomass estimation
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	georreferencing in field with GPS, remote sensing and others GIS tools
Frequency of monitoring/recording:	At every verification
Value applied:	depends on each PAI
Monitoring equipment:	GPS, Landsat 8 and/or Ikonos satellite images, and GIS software (ArcGIS 9.3 and Google Earth®)
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable
Any comment:	-

Data Unit / Parameter:	$CC_{SHRUB,i}$
Data unit:	Dimensionless
Description:	Crown cover of shrubs in shrub biomass stratum i
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Considering that the biomass in shrubs is smaller than the biomass in trees, a simplified method of measurement may be used for estimating shrub crown cover. Ocular estimation of crown cover may be carried out or any other method such as the line transect method or the relascope method may be applied
Frequency of monitoring/recording:	At every verification
Value applied:	depends on each PAI
Monitoring equipment:	-
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable
Any comment:	When land is subjected to periodic cycles (e.g. slash-and-burn, or clearing-regrowing cycles) so that the shrub crown cover oscillates between a minimum and maximum values in the baseline,

	an average shrub crown cover equal to 0.5 is used unless transparent and verifiable information can be provided to justify a different value

Data Unit / Parameter:	$A_{disp,t}$
Data unit:	Ha
Description:	Area of land from which agricultural activity is being displaced in year t
Source of data:	Field measurement
Description of measurement methods and procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Frequency of monitoring/recording:	At every verification
Value applied:	0 for all PAIs, but subjected to monitoring
Monitoring equipment:	GPS, Landsat 8 and/or Ikonos satellite images, and GIS software (ArcGIS 9.3 and Google Earth®)
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable
Any comment:	-

Data Unit / Parameter:	**L**
Data unit:	Dimensionless
Description:	total number of strata
Source of data:	PAI-D and Forest inventory
Description of measurement methods and procedures to be applied:	Direct account based in the planting plan chronogram and location and standard deviation for each stratum calculated in the forest inventory
Frequency of monitoring/recording:	At every verification
Value applied:	depends on each PAI
Monitoring equipment:	measuring tape
QA/QC procedures to be applied:	Standard operating procedures (SOPs) and Quality control/quality assurance (QA/QC) procedures are prescribed in Annex 12 are applied.
Calculation method:	Not applicable

Any comment:	-

4.3 Description of the Monitoring Plan

This monitoring plan will be focused in the collection and handling of all relevant data necessary for:

a) Guarantee that land subject to the project activity instance does not fall in wetland category;

b) Monitoring boundary of Project Activity Instance (PAI);

c) Monitoring of forest establishment to ensure the planting quality and alignment to the project activities described in Section 1.8;

d) Verification of changes in carbon stocks in the pools selected;

e) Verification of project emissions and leakage emissions

Besides the five itens listed above, the monitoring plan will also take into account measures to guarantee that soil disturbance attributable to the project activity does not cover more than 10 per cent of area[35] in each of the following types of land, when these lands are included within the project boundary:

(i) Land containing organic soils;

(ii) Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in appendices 1 and 2 the AR-AMS0007 v.3.

Regarding to this it's worth mentioning that the areas to be reforested under this Grouped Project do not encompass areas with organic soil, once most of them are characterized as degraded pasture with low percentage of organic matter (less than 12% of organic carbon in its first 20cm).

Also, the technology to be employed under the Grouped Project is based in three different restoration models, as presented in section 1.8. Only two of them have the potential to cause some kind of soil disturbance: models 1 (Total Seedling) and model 3 (SAF), However, none of these two models are supposed to be implemented in short-term or set aside cropland[36] or grassland, but mainly in abandoned degraded pasture. Thus, neither cropland nor grassland in the baseline is subjected to land-use and management practices such described in appendices 2 and 3 of the referred methodology. However if some PAI encompasses one of these categories, measures (as manual plantation, and plow avoidance), will be adopted to avoid disturbance in more than 10% of these areas. More information and details about the monitoring plan and quality control and quality assessment are presented in Annex 12.

The data collected shall be archived for a period of at least two years after the end of the last crediting period of the project activity.

[35] For example, digging pits of size 0.50 m × 0.50 m (length × width) at a spacing of 3 m × 3 m is equal to a coverage of 2.78 per cent; continuous ploughing of land is equal to a coverage of 100 per cent.

[36] Cropland does not make part of the Grouped project boundary

a) Guarantee that land subject to the project activity instance does not fall in wetland category;
As presented in section 2.2, the wetlands were not considered in the GP boundary, thus none PAI will be established in this kind of land, however before any new PAI implementation the occurrence of this situation will be checked in order to be avoided.

b) Monitoring boundary of Project Activity Instance (PAI)
The boundary of each PAI will be always defined in line with the Grouped Project area map. The location of each polygon included into a given PAI will be measured in the field using GPS. Results of these measurements (georeferenced poligons) will be consolidated in a unique PAI map and inserted into a database and stored in electronic and paper form.

c) Monitoring of forest establishment to ensure the planting quality and alignment to the project activities described in Section 1.8 and Annex 12
Planting quality, planting method and survival will be monitored by local foresters during and after planting. Foresters will also monitor the way of soil preparation and alignment to at least one of the three models presented in the project activities description (section 1.8). Results of the monitoring will be inserted into a database and stored in electronic and paper form.

d) Verification of changes in carbon stocks in the pools selected

i. Sampling design and stratification

<u>Monitoring of Strata</u>

Details of the initial stratification of the project area are presented in section 1.10 of this document. However, post stratification will be conducted after the first monitoring event to address the possible changes of project boundary and planting year in comparison to the project design, reducing intra-strata heterogeneity, and sampling efforts.

<u>Calculation of the number of sample plots</u>

The initial stratification led to four strata and the number of sample plots for each stratum will be estimated as dependent on required accuracy, following the standard procedure described by A/R methodological tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" v.1[37].

Initial calculations

A = total size of all strata (A), e.g. the total project area; ha
i = index for stratum; dimensionless
L = total number of strata; dimensionless
Ai = size of each stratum i; ha
AP = sample plot size (constant for all strata); ha
sti = standard deviation for each stratum i; dimensionless

[37] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v1.pdf

Ci = cost of establishment of a sample plot for each stratum i; e.g. US $

$$N = \frac{A}{AP} \; ; \; N_i = \frac{A_i}{AP}$$

Equation 26

Where:

N = maximum possible number of sample plots in the project area

N_i = maximum possible number of sample plots in stratum i

Method I (samples drawn without replacement)

The number of sample plots is estimated as being dependent on accuracy and costs.

In addition to the assumptions and parameters listed under initial calculations, it is further assumed that the following parameters are known from the project set up, pre-project estimates (e.g. results from a pilot-study) or literature data:

Q_1 = approximate average value of the estimated quantity Q, (e.g. aboveground wood volume per hectare); e.g. m^3 ha^{-1}

p = desired level of precision (e.g. 10%); dimensionless

Then:

$$E_1 = Q_1 * p$$

Equation 6

Where:

E_1 = allowable error of the estimated quantity Q

With the above information and taken due account that no information on costs is available or the costs may be assumed as constant for all strata, the sample size (minimal number of sample plots to be established and measured) can be estimated as follows:

$$n = \frac{\left[\sum_{i=1}^{L} N_i \cdot st_i\right]^2}{\left(N \cdot \frac{E}{z_{\alpha/2}}\right)^2 + \sum_{i=1}^{L} N_i \cdot (st_i)^2}$$

Equation 7

Where:

n = sample size (total number of sample plots required) in the project area

i = 1, 2, 3, . L project strata

α = 1-α is probability that the estimate of the mean is within the error bound E

$z_{\alpha/2}$ = value of the statistic z (embedded in Excel as: inverse of standard normal probability cumulative distribution), for e.g. 1-α = 0.05 (implying a 95% confidence level) $z_{\alpha/2}$ =1.9599

$$n_i = \frac{\sum_{i=1}^{L} N_i \cdot st_i}{\left(N \cdot \frac{E}{z_{\alpha/2}}\right)^2 + \sum_{i=1}^{L} N_i \cdot (st_i)^2} \cdot N_i \cdot st_i$$

Equation 29

Where:

n_i = sample size for stratum i
i = 1, 2, 3, . L project strata
α = 1-α is probability that the estimate of the mean is within the error bound E
$z_{\alpha/2}$ = value of the statistic z (embedded in Excel as: inverse of standard normal probability cumulative distribution), for e.g. 1-α = 0.05 (implying a 95% confidence level) $z_{\alpha/2}$ =1.9599

<u>note</u>: It is possible to reasonably modify the sample size after the first monitoring event based on the actual variation of the carbon stocks determined from taking the n samples, please refer to item "Monitoring of Strata", above .

<u>Sample plot size</u>

The plot area AP has major influence on the sampling intensity and time and resources spent in the field measurements. The area of a plot depends on the stand density. Therefore, increasing the plot area decreases the variability between two samples. According to Freese (1962)[2], the relationship between coefficient of variation and plot area can be denoted as follows:

$$CV_2^{\,2} = CV_1^{\,2}\sqrt{AP_1 / AP_2}$$

Equation 30

where AP_1 and AP_2 represent different sample plot areas and their corresponding coefficient of variation (CV). Thus, by increasing the sample plot area, variation among plots can be reduced permitting the use of small sample size at the same precision level. Usually, the size of plots is between 100 m^2 for dense stands and 1000 m^2 for open stands.

Considering the PAI´s will be pulverized in several small areas, the sampling plot size for the proposed reforestation project will be set in the minimum size, at 100 m^2.

<u>Determining plot location</u>

a) Following the procedures of A/R tool "Calculation of the number of sample plots for measurements within A/R CDM project activities" v.1, the permanent sample plots will be located systematically with a random start . This is accomplished with the help of a GPS and GIS software. The geographical position (GPS coordinate), administrative location, stratum and stand, series number of each plots will be recorded and archived.

b) The PP will ensure that the sampling plots are evenly distributed in the stratum. If the stratum consists of sites that are geographically separated, then the plots to be allocated to each site should be in proportion of the site area to the total stratum area with rounding of the fractions. For example, if one stratum consists of three geographically separated sites, then it is proposed to:

- Divide the total stratum area by the number of plots, resulting in the average area represented by each plot;
- Divide the area of each site by this average area per plot, and assign the integer part of the result to this site, e.g., if the division results in 6.3 plots, then 6 plots are assigned to this site, and 0.3 plots are carried over to the next site, and so on.

c) To avoid bias in the location of plots, their location shall be marked on a map prior to establishment. This can be done using a simple grid based on the number of plots required. In most cases plots are located away from the edge of the plantation to avoid the edge effect. Check for alignment of boundary and ensure that entire sample plot is within the strata. Use Geographic Information System to locate the sample plots inside 10 m from the project boundary.

ii. Monitoring frequency

Although the verification and certification shall be carried out every five years after the first verification until the end of the crediting period (paragraph 32 of decision 19/CP.9), the monitoring interval may be less than five years. However, to reduce the monitoring cost, the monitoring intervals shall coincide with verification time, i.e., five years of interval.

Thus, monitoring will occur at years 5, 10, 15, 20, 25, and 30 after the Grouped Project starting.

iii. Monitoring of the baseline net GHG removals by sinks.

As explained in section 3.1, according to AR-TOOL14 (Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities v.4)[38] , the carbon stock in trees in the baseline can be accounted as zero if all of the following conditions are met:

(a) The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;
(b) The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity;

[38] http://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-14-v4.1.pdf

(c) The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity.

All the above mentioned conditions are in line with the Grouped Project activities, as presented in section 1.8. Furthermore, measures to guarantee the above mentioned approaches will be taken and will be monitored by the PP during planting and forest inventory activities, especially regarding to item (c) by the time of forest inventory and monitoring procedures. Based on this, the baseline carbon stock changes for all PAI´s will be deemed zero, please refer to section 2.4 and 3.1

iv. Monitoring of the actual net GHG removals by sinks

The monitoring plan described in this section was designed in order to meets both, AR-AMS0007 v.3 and AR-TOOL14, monitoring requirements, as follow:

The monitoring of actual net GHG removals by sinks for each one of the PAIs registered under the GP, will be based in the forest inventory procedures, according to the section 4.3.d, mentioned above as well as chapter 4 of the "Pacto pela restauração da mata atlântica: referencial dos conceitos e ações de restauração florestal" (annex 8), what is in line with the requirement stated in paragraph 27 of AR-AMS0007 v.3: *"Information shall be provided, and recorded in the project design document (PDD), to establish that the commonly accepted principles and practices of forest inventory and forest management in the host country are implemented"*

The monitoring framework of project GHG removals therefore, will be based in the application of monitored parameters (listed in section 4.2) and non-monitored parameters (listed in section 4.1), to the procedures and equations presented in section 3 of this GPD. In this regarding, the forest inventory, together with the parameters available at validation, will provide the input data required by equations listed in the section 3, enabling the PP to quantify and report the actual net GHG removals by the project activities, by the time of monitoring report preparation for verification.

Still according to the AR-AMS0007 v.3: *"GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertilizer application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero".* Based on this and considering that the use of fire does not make part of the project activities (please refer to section 2.2), emission due to project activities is expected to be zero for all PAI under this GP. Notwithstanding, whether during the period of the Grouped Project, fires happen within the project boundary (details in section 1.9), the tool *"Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"* will be applied.

e) Monitoring of leakage

As described in section 2.3, no emission due to leakage is expected to occur under this GP, notwithstanding leakage will be monitored through monthly site visits, community monitoring events, and indirectly through satellite images[39], this last monitoring approach enables the forest cover on the property be verified accurately by the PP.

As presented in section 3.3, A preventive monitoring of the areas around the total area of the Grouped Project on the baseline (starting point) of the disturbed areas around 10 km from the polygon proposal from the year of commencement of the project.

Whenever leakage due to project activities be identified, the associated emission will be calculated through AR-TOOL15 *"A/R Methodological tool Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity"* v.2, as stated in section 3.3.

Other elements of monitoring plan

Organizational structures and responsibilities

The project proponent (OCT) will be responsible for the implementation and management of the monitoring plan, while the UFRB will be in charge of forest inventory activities (field work and forest inventory report preparation).
Once the forest inventory is concluded and its report is issued by UFRB, the PP will prepare the monitoring report, according to the monitoring plan and calculation framework described in section 3 and 4 of the GPD. Finally, when the monitoring report is concluded, the OCT technical manager will submit this to a VVB for verification and VCU´s issuance.

5 ENVIRONMENTAL IMPACT

Environmental impacts analyzed at the Grouped Project level. The overall Grouped Project structure and implementation plan has a general positive impact on environmental ecosystems. The reforestation activity, through assisted natural tree regeneration, will (a) improve the soil characteristics; (b) promote biodiversity through the restoration of habitat; (c) preserve the water supplies (above-ground and below-ground) and (d) restore the Atlantic Rainforest native landscape.

All project activities have been designed for very limited or no negative environmental impact. There is no burning or unnecessary tillage for soil preparation. All soil preparation in slope areas will be conducted manually without the use of any mechanical means. The most sensitive areas, such as riparian zones, do not receive any chemical treatment either.

How the "without project" scenario would affect biodiversity in the project zone

- The maintenance of deforestation process due to the same reasons mentioned above;

[39] Every three years, satellite images will be used to generate land-use maps in the Grouped Project area, which will allow analysis of land-use changes over time in the Grouped Project region.

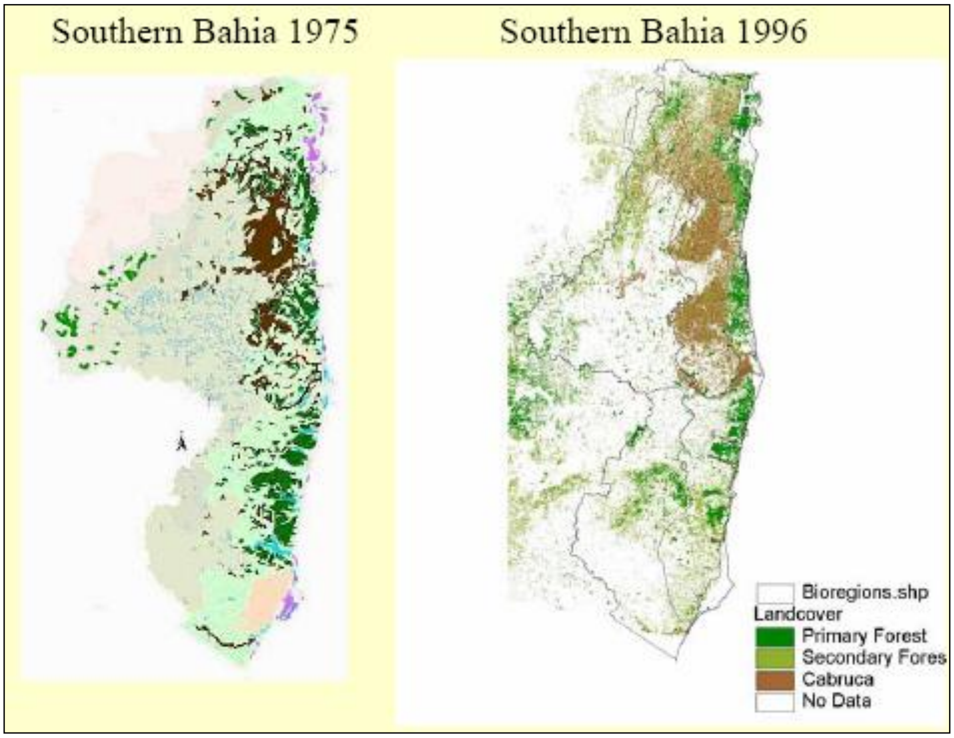

Figure 21 - Maps comparing forested areas in southern Bahia in 1975 and 1996.

- Because of the un-sustainable agriculture practices by the small and medium landowners, the soil degradation is accelerated – lixiviation + relief scenario;

- Absence of governmental control on the protected areas.

Expected results of the Grouped Project

The effect of fragmentation on the forest structure and the remaining fauna and flora diversity has been assessed in different parts of the Atlantic Rainforest. It is a complex matter and the information obtained shows that fragmentation of the natural landscape affects the quality and quantity of the available habitat, and consequently the survival of species, especially those endemic and threatened. Reforestation projects contribute to forest habitat enlargement, to the buffering of forest remnants and to the improvement of forest habitat connectivity; therefore, they are essential for enhancing the resiliency of biodiversity in the area. The restoration efforts can positively affect the dynamics of loss and the colonization of fauna and flora in the remainders of the Atlantic Rainforest, which is essential for the long-term permanence of populations of local species and will also receive specific actions aiming at the reduction of pressure on biodiversity, and actions directed towards the establishment of forest connectivity throughout the territory.

Water and Soils

Deforestation is the main cause of soil degradation. In the Grouped Project area, deforestation and forest degradation occurs today as a result of cattle ranching and agricultural activities. There is a lack of sustainable management of the available natural resources.

The effect of the Grouped Project on the soils will be to improve soil stabilization with the reforestation of degradation areas, increase root net (i.e., enlarging the minerals fixation in the sediment matrix) and promote the deposition of organic matter (e.g., litter) in the soil, enlarging the net primary production in the soil cycle and its fertility.

Although it is a widely accepted concept, the positive relationship between forests and water resources is a difficult generalization to prove, particularly in reference to the quantity (flow), quality (load of sediments and nutrients) and constancy (elimination of pulses of erratic flow). A great variety of factors in one watershed can strongly influence the final result: predominance of uses and vegetative types, including species used in forest monocultures, topography, geological and pedological aspects, rainwater cycles, and the temporal and spatial scale chosen to study the cause-effect relationship, etc. (Calder, 2002; Kiersch & Tognetti, 2002).

In the case of the areas in this Grouped Project, however, the conversion of pasture to native forest cover in the riparian areas would bring benefits more easily proven by the relationship of forests and water resources, that is, protection against erosion. Because watersheds with healthy forests export the lowest levels of sediment of any cover type (Brooks et al., 1997), forests are often looked to as a means of reducing levels of downstream sediment. The high infiltration rate in natural, mixed forests reduces the incidence of surface runoff and reduces erosion transport. Also, the reduced soil water pressure and the binding effect of tree roots enhance slope stability, which tends to reduce erosion (Calder, 2002). Besides helping to stabilize stream banks, riparian forests help to reduce wastewater and chemical discharge into water bodies from upland areas and maintain cooler water temperatures, thus improving dissolved oxygen levels in water (Brooks et al., 1997). These effects, in turn, are likely to bring positive effects on aquatic biodiversity.

The biological communities in riverbed environments are strongly influenced by physical and chemical characteristics of the river system along the upstream-downstream gradients (Vannote et al., 1980), such as the cycles of flow and temperature, structural characteristics of the fluvial channel and its margins, frequency and intensity of disturbances, penetration of light, etc. Thus, the state of biological communities usually reflects the environmental changes occurring in the watershed. These include, for example, the increase in nutrient load in the system, by input (point or diffuse) of nutrients, sediment input (e.g. from erosion), increased light penetration and alteration of temperature cycles in the water course (by the removal of riparian forest cover), chemical pollutants (fertilizers, pesticides), changes in flow (dams for holding water), etc. The deterioriation of the condition of the water and/or the structure of the water courses frequently leads to the loss of taxa sensitive to pollution, the domination of tolerant taxa, and the general decrease in the taxonomic richness or significant changes in the composition and functional roles of the community.

Thus, the developers of this Grouped Project expect that the restoration of native forest cover in the vicinity of the drainage basins will have a very important role in the reconstitution of biological communities and the restoration of ecological processes typical of upstream areas. In these areas, the smaller drainage basins are typically shaded by riparian forests that, on the one hand restricts primary productivity, but on the other hand, constitutes the main source of organic material and debris (e.g. leaf litter, branches, and riparian fruits) and of nutrients used by biological communities. Finally, in these areas the riparian forests constitute the main foundation of livelihood of an expressive diversity (and biomass) of macro invertebrates living in the benthic zone (various organisms that live on, in, or near the substrate of bodies of water, such as aquatic insects, mollusks, annelids and crustaceans, among others) and fish.

The restoration of riparian forest cover contributes not only to the conservation of river ecosystems and their associated biodiversity, but also to the conservation of populations of animal species and terrestrial plants through the increase in available forest habitat and of the connectivity between remaining forests in the region and the restoration of key ecological processes in these environments. The role of forest remnants and riparian forest corridors in maintaining biodiversity in the local landscape should be considered essential, whether the surrounding context is predominantly pasture or eucalyptus monoculture. Many studies have shown that, while areas of native regeneration and exotic tree plantations can provide complementary conservation services, the value of primary forests remnants for biodiversity conservation is irreplaceable (Barlow et al., 2007).

Regarding aquatic biodiversity, the improvement of water quality that will result from the restoration of the riparian forest under this Grouped Project is expected to favor the populations of fish that thrive in the natural conditions of the river habitat.

Potential negative offsite biodiversity impacts

Offsite biodiversity will only benefit from the areas restored through this Grouped Project. Although we do not expect significant offsite negative impacts to take place, three such potential impacts are being considered:

1- Restoring the connectivity between some of the region's large forest remnants is one of the goals of this Grouped Project, thus increased abundance of medium to large mammals and other animals coming from outside the Grouped Project area may occur. Some such species are traditionally targeted by local hunters either for consumption (deer, tapir, and peccaries) or to preempt possible attacks (felids). Increased poaching of such species might occur.

2- The increased connectivity between the region's forest remnants may lead to an increased density of animals transiting throughout the Grouped Project region. Thus, road kill rates at the region's roads and highways might increase.

Mitigation Plans

1- In order to prevent the potential impact regarding increased hunting, frequent awareness building campaigns will be directed to locals regarding illegal hunting.

2- In order to lower the potential impact from road kill, road signs warning of wildlife crossings will be placed in the region. In addition, placement of speed bumps at animal crossing sites will be presented to competent traffic authorities.

3- This Grouped Project includes continuous capacity building within the community and conversations with the participating landowners to reinforce the importance of maintaining standing forests within the Grouped Project community. Despite of leakage due to shifting activity (cattle grazing) are not supposed to occur in the Grouped Project areas, these activities will be monitored (please refer to section 4.3.e) and any deforestation due to shifting of cattle grazing will be taken into account, whether applicable.

6 STAKEHOLDER COMMENTS

Stakeholder comments are invited at the Project Activity Instance level. This is because the entire Grouped Project region covers 1,700 km^2, a relatively large area over which communities are spread far apart. Most importantly, experience has shown that it is not favorable to the public image of the project or to the establishment of confidence between local communities and project developers if the project is presented far in advance of the start of concrete activities in the field. For example, if the potential job opportunities are discussed at a community meeting, but the actual forest restoration is not to begin for at least another year, it will create false expectation and result in disappointment. Since a 10-year period for the incorporation of new Project Activity Instance is included within the Grouped Project timeline, it is far more effective to invite stakeholder comments at the start of each specific Project Activity Instance.

Local stakeholders are invited to comment on the project´s design and implementation through community meetings and interviews. Following local practices, meetings are divulged through fliers placed in locations with good visibility, as well as transmitted by word of mouth, and meetings are held at local gathering places, such as a local church or school. Comments are compiled by project developers and recorded in written format.

Each Project Activity Instance will record and present the stakeholder comments relevant to its own project activities.

Stakeholder identification and involvement

Community Engagement

During the first month, the project will organize and promote several meetings with local stakeholders of all the municipalities involved, with special emphasis on the participation of landowners. The main goals of this activity are:

- Raise awareness about the major environmental problems facing us at a global and local level, specifically climate change, loss of biodiversity, and water access/quality.
- Raise awareness about the major role forests play in those issues, and specifically about the extraordinary importance of the Atlantic Forest biome. Present and elaborate on the idea of looking at forests, and the landowners that keep their forest healthy, as providers of Environmental Services.
- Present the concept of Payments for Environmental Services. Beneficiaries should pay for those services as they pay for many other services within the framework of a market economy. Under this concept, the landowners would get paid for their standing forests.
- Explain that there is already a working mechanism at global level that articulates the payment for one of those environmental services: the storage of carbon that helps mitigate climate change. Harnessing these carbon funds can turn standing forests into a productive asset for landowners, reducing or eliminating the economic drive to deforest land. Other mechanisms are also taking place elsewhere in the country and will be more mature and available in the future, such as payments for water services.
- By associating a hard (cash) value to standing forest, it will be possible to start changing the centuries long tradition of valuing forests and land for what can be extracted from them into a culture of valuing standing forests for the multiple services they provide. This will also help boost the self-esteem of local landowners,

especially when they become aware of how valuable their forests are (also in real cash terms in the carbon markets), due to the high biodiversity and visibility of the Atlantic Forest biome.

- Promote the project and encourage the participation of local landowners in the Initiative.

There is a will of the project proponents to enable the entire project's document on public ways (e.g., web sites, magazines, journals etc.).

Within this document, it will have a revised project design document, stakeholder consultation, mitigation proposals, and other relevant contents.

Although there may be some data that will be maintained restrict due to its project irrelevance, inaccuracy, and/or for its classified information (e.g., landowner's personal information).

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