Projeto Concervação Trocano Araretama
Trocano Araretama Conservation Project

PROJECT DESIGN DOCUMENT

Location: **Borba – Amazonas – Brazil**

Project Developer: **Celestial Green Ventures PLC**

Author: **Institute Amazonia Livre**

Date: **March 2013**

CONTENTS

List of Maps

List of Figures

List of Tables

List of Annex Documents

SECTION 1 – PROJECT DESCRIPTION

i.   Introduction

The intersection of man and nature has always been related to the dependencies of the populations and their relationships with natural resources. In the Amazon, this relationship is also an important factor in the dynamics of natural resource use. Today, the maintenance of standing forest has proven an essential step in ensuring survival of the native peoples of the biome, besides having an important contribution for a favourable global climate balance.

The lack of plans covering social and environmental sustainability has generated serious problems for the populations that inhabit the Amazon states. Sudden changes in land use, without planning, generated nothing but weak soil, floristic and faunal impoverishment and epidemics that affected entire populations of indigenous shifting cultivators, rural and coastal. Currently, the environmental degradation of the Amazon forest is globalized to the extent that deforestation the region affects the climate and the population of the biome deplete at an alarming rate.

Because of these problems described, it is extremely urgent to create alternative social and financial compensation for people who traditionally have in Amazonian natural heritage the main source of food and income generation.

The concept of REDD (Reducing Emissions from Deforestation and forest Degradation) indicates a proposal that as a suggestion to include in the accounting of emissions of greenhouse gases are avoided by those that reduce deforestation and forest degradation is an ideal concept that holders in developing countries of tropical forests, they could promote their domestic emissions reductions from deforestation would receive financial compensation corresponding to international emissions avoided. The concept, now known as REDD +, refers to the construction of a mechanism or a policy, which should include ways to provide positive incentives to developing countries that take one or more of the following actions to mitigate climate change:

   a) Reducing emissions from deforestation and forest degradation;
   b) Increase in forest carbon stocks;
   c) Sustainable forest management, and
   d) Forest conservation.

This Projeto de Conservação Trocano aims to change the lives of rural and riverine living in the project area and surroundings, and aims to generate reductions in emissions through deforestation in the project areas mainly due to structural changes that will be undertaken in the region covered by the activities of the project.

The contract between the Municipality of Borba and Celestial Green Ventures PLC was signed to the carbon stocks present in the biomass of native vegetation of Borba be

preserved. Actions will be implemented so that there is the maintenance of biodiversity and people absorb knowledge that helps to environmental preservation and social development.

In this PDD were excluded from the project area Terra Indigenous/Indigenous Lands (TI's) contained within the municipality of Borba. Considering the legal status and forms of interactions of traditional indigenous peoples, they present sustainable use and contribute positively to maintaining the forest.

The project name was chosen from suggestions from locals in order to rescue and value the culture of the city, besides strengthening the relationship with the traditions of their project context. The words Trocano Araretama means "warrior drum where the light originates."

ii.   CGV Geospatial Platform

CGV has developed a Geospatial Platform which is a cloud-based data platform which enables the project to gather multiple layers of environmental data. The software utilizes collated research resources from the NASA Jet Propulsion Laboratory, ESA Globcover, PRODES INPE, MODIS and CGV project data. This platform illustrates the risk of deforestation using the ACEU analysis tool, and applies this rule to any given or drawn area within the Legal Amazon on a five-point intensity scale. The platform also demonstrates existing carbon stocks & biomass density, vegetation types, historic deforestation for the years 2006-2010 and past fire events for 2005-2010. In addition, the use of our Geospatial Platform will enable a more time-efficient process for the Carbon Stock calculations plus the application of the NFS AM001.0 methodology to the project areas.

Spatial data on the project boundaries, carbon stocks, biodiversity and risks are maintained on CGV's Geospatial Platform. The platform automates the calculations of NFCs produced from each project area using approved methods. CGV is responsible for maintaining up to date data from monitoring systems. Reports generated on the Platform are included in the PDD appendix, and made available as required by the Natural Forest Standard.

The validation and verification body will be supplied with a log-in and password to access the platform.

Relevant and appropriate explanations in respect of the utilisation of the Geospatial Platform and its application to the Trocano Araretama Conservation Project are found in the corresponding chapters.

iii.   Project Information

PROJECT TITLE
Trocano Araretama Conservation Project

LOCATION
Municipality de Borba, Amazonia, Brazil
Nearest city is Manaus (150km)

BORBA GEOGRAPHICAL COORDINATES
Latitude: **-4.38835**, Longitude: **-59.5945**
4° 23' 18" South, 59° 35' 40" West

PROJECT AREA
1,346,541.26 hectares or 13,465.4126 km^2

The project area consists of 3 clearly defined areas within the Municipality, totalling
1,346,541.26 hectares.

Full geographical co-ordinates of the project can be found in Annex 10 of this document.

PROJECT START DATE
10th June 2011

PROJECT CREDITING PERIOD
20 years

CONTACT DETAILS

Project Proponents:	**Celestial Green Ventures PLC**
Head Office	
93 St Stephens Green, Dublin 2, Ireland	
Telephone:	+353 1 428 3404
Email:	info@celestialgreenventures.com
Web:	www.celestialgreenventures.com
Name of contact person 1:	Ciaran Kelly
Title:	Chief Executive Officer
Email:	ciaran@celestialgreenventures.com
Telephone number:	+353 1 428 3404 or 3433

Name of contact person 2: Paula Torres Cofré
Title: Senior Administrator
Email: paula@celestialgreenventures.com
Telephone number: +353 1 428 3404 or 3435

Institutional Partners: Instituto Amazon Livre (Institute Free Amazon)
Dr. Almínio Street, 236 – Centro, Manaus - Amazonas – Brazil, CEP: 69005-200
Tel: +55 92 3622 4109
Email: atendimento@amazonialivre.org
Web: www.amazonialivre.org

Name of contact person 1: Antônio José do Nascimento Fernandes
Title: General Secretary
Email: antoniojnf@hotmail.com
Telephone number: +55 92 8143 8420

Name of contact person 2: Waldemar de Lima
Title: President
Email: limawal@hotmail.com
Telephone number: +55 92 9392 6116
              +55 92 8208 2266

Project Partners: Municipality of Borba
Av May 13, 108 – Centro, Borba - Amazonas – Brazil, CEP: 69200-000
Tel: + 0055 92 35122065
Web: www.prefeituradeborba.am.gov.br

Name of contact person: José Maria da Silva Maia
Title: Prefeito (Mayor) de Borba
Email: josebaia.maia@gmail.com
Telephone number: +55 92 3512 1300
              +55 92 9981 4257

Geospatial Platform Developers: Ecometrica Ltd
Head Office:
Top Floor, Unit 3B, Kittle Yards, Causewayside, Edinburgh, EH9 1PJ
Tel: +44 131 662 4342
Web: www.ecometrica.com

Name of contact person: Karin Viergever
Title: Head of Land Use and Spatial Analysis
Email: karin.viergever@ecometrica.com
Telephone number: +44 131 662 4342

1.0   Project Overview

This Project Design Document has been developed and produced to serve as the Management Plan of the Trocano Araretama Conservation Project and will be maintained as a living document for the duration of the project, adapting and adjusting, where applicable, to the progress and developments that the project will incur.

The REDD project of the Municipality of Borba area, called Trocano Araretama Conservation Project, was conceived in order to generate reductions in deforestation in the project areas while preserving existing biomass in this region. This project presents a carbon stock baseline estimation of 65,708,138 tC at risk over the 20 year crediting period of the project, from the project start date of 10th June 2011, as calculated using the Natural Forest Standard AM001.0 methodology and the Geospatial Platform data layers.

It is worth considering the projects high value for biodiversity maintenance and social context of the communities, the benefits that will be observed from the project contribute to the maintenance of global climate.

By applying the project to the Natural Forest Standard (NFS), and through implementing the NFS requirements, the project will achieve certified Natural Forest Credits (NFC's) for the emissions reductions by carrying out the project.

The carbon finance from the sale of the NFC's will enable the project to carry out the project activities that are discussed in general terms within the Project Activities section. The mobilisation of resources for the implementation of effective project activities will come from the efficiency of implementing the Natural Forest Standard and would not be possible without adopting the requirements of the NFS.

1.1   Project Aim

The Trocano Araretama Conservation Project's primary objective is to mitigate GHG emissions through avoided deforestation, and includes the conservation of the natural forest ecosystem, to protect the endangered habitat of the Indigenous Tribes and other communities and biodiversity protection of both the plants and the animals which are reliant on this vulnerable habitat. The additional aim is to provide the local communities with enhanced socio-economic situations, through their involvement in the project, its activities and its objectives.

The project is designed to provide real, measureable and permanent emission reductions within the project area through effective project implementation and robust management practices.

1.2 Project Objectives

The primary objectives of the project are as follows:

- Avoid deforestation within the project area for the duration of the project;
- Categorise the risk of deforestation to the project area, using the ACEU rule as per the NFS AM001.0 methodology;
- Identify the areas most at risk of deforestation and implement effective protection and monitoring;
- Conservation and preservation of the natural forest;
- Raising civic pride and appreciation of the natural forest;
- Strengthening of Local Forest Protection;
- Biodiversity protection of the plants, animals and the ecosystem as a whole;
- Socio-economic enhancements for the local communities, including healthcare, education, employment and infrastructure improvements; and
- Data collection, including inventorising biodiversity, forest, flora and fauna.

There are many further objectives, activities and benefits of the project and these are described throughout this Project Design Document.

These objectives can be met through the existence of the project and through the successful implementation of the project and the effective management and monitoring of the area.

1.3 Brief description of the project area

The project area is included in the Municipality of Borba, Amazonas / Brazil. In the current geographical division, the municipality is part of the 5th sub-region of the Madeira River, which is also formed by the municipalities of Apuí, Humaita, Manipur and New Aripuanã. 150 km far from Manaus in straight line and the 215km waterway, the place has a land area of 44,251 km². In the county seat, about 260 communities that form Borba, counting the seat and the district sectors of the municipality areas, where approximately 34,500 people, 105 of these communities are part of the project area, as described in Table 3. During the implementation of the Conservation Project Trocano Araretama the proposals will be developed to identify precisely all the people living in the project area.

Within this project were excluded from the project area, the (indigenous) TI's contained within the Municipality of Borba.

The project area is composed of three clearly differentiated areas, which are known as:

West Zone
Central Zone
South Zone

These areas together total an area of 1,346,541.26 ha, as shown in Map 1, and are located in the Municipality of Borba, which is situated on the banks of one of the main tributaries of Amazon River, the Madeira River.
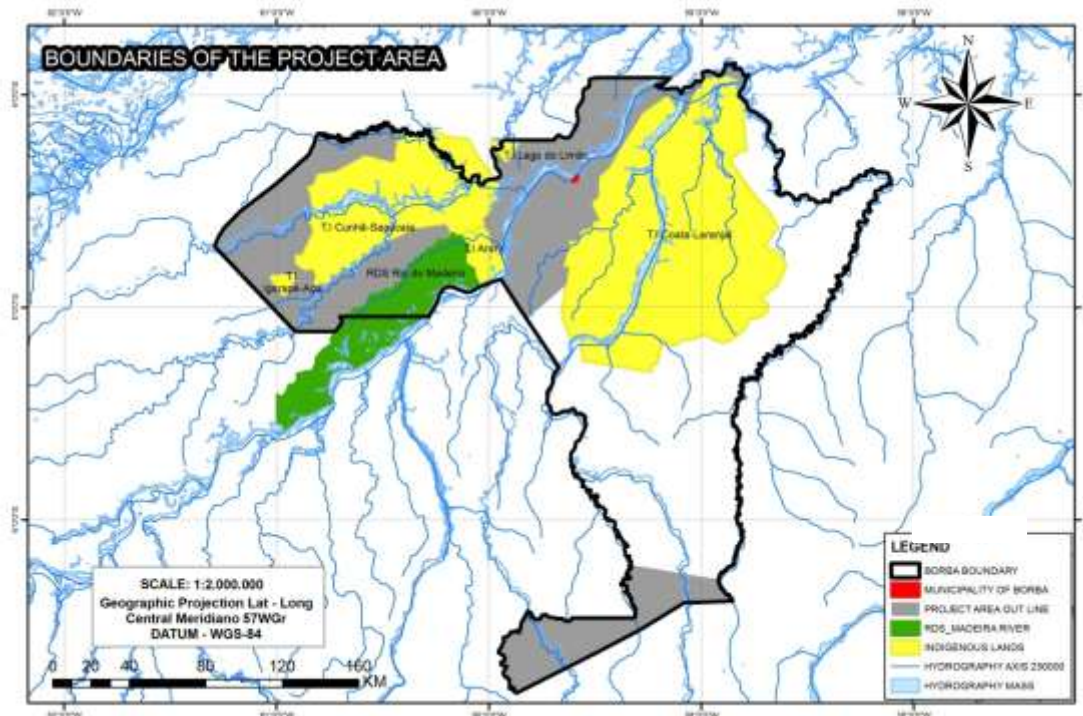
Map 1 – Project area and its limits
Source: IAL, 2011.

The area which this PDD covers refers to the municipal area of Borba with 1,346,541.26 ha and its surroundings, as shown on Map 1, considering excluded:

i)   the urban area of the seat of the municipality identified as 764 ha,
ii)   entitled project area Boundary with 895,303.67 ha, which is prone to project development to drive conservation officer, and
iii)   the areas characterized as Indigenous (TI), as described below:

   - Indigenous Land Arary;
   - Indigenous Land Coatá Laranjal;
   - Indigenous Land Cunhã Sapucaia;
   - Indigenous Land Lake Limão;
   - Indigenous Land Igarapé Açu.

These indigenous lands totalling 1,431,015.07 ha, which together with the project areas, RDS and other areas not intended for the project constitute the total current district of Borba.

Denomination	Area (ha)
Destined area of the project	1,346,541
Indigenous Land areas	1,431,015
Urban area	764,00
Areas of the RDS of Madeira, RDS of Matupiri e none destined area of the project.	1,646,798
Total area of the Municipality of Borba	**4,425,118**

Table 1. Areas present in the Project area surrounding

Map 2 – Urban area of Borba
Source: IAL, 2012

Indigenous lands are regulated to define the use of traditional indigenous peoples, and its ownership of the Union - the Federal Government. Urban areas are regulated by the agrarian sector of the city and have guidelines defined in the Municipal Law of the Master Plan.

Areas for the creation of Conservation and Sustainable Development Reserve (RDS) have government jurisdiction of the State of Amazon, being implemented by the Institute of Environmental Protection of the State of Amazon (IPAAM).

The Madeira River is extremely important for the transport of cargo and soybeans between the cities of Porto Velho (RO), Itacoatiara (AM) and Santarém (PA). According to the report of the National Agency for Waterway Transportation (ANTAQ), the Madeira River is a vital outlet for soybean production in the Midwest of the country for consumer markets abroad, as well as the Amazon region itself, and vital importance for regional development due to its strategic position.

It is practically the only means of transport for the population living in cities along its banks, excluding the city of Humaitá (AM) and Porto Velho (RO), that count, too, with road access. Thus, the main activity source that leads to changes in land use of areas for the project are accessible from Borba on the Madeira River and the BR-319.

Studies show that roads bordering areas, as is the case of the western portion of the municipality of Borba (adjacent to the BR-319), are the most under pressure for being close to areas of runoff. This means that in the project area there is enormous pressure areas located in areas of roads, as the "fishbone effect" (opening of roads in small and medium businesses along the margin of BR-319) is felt broadly in these regions.

In the municipality of Borba, off its western boundary, the population faces a big problem nowadays, since the BR-319, one of the most problematic of the Amazon, is located near the region and is quite unstructured. There is no governance over 90% of the road, which facilitates the opening of deforestation and pasture for cattle.

The action takes place in a consortium. A group of irregular performs invaders "grabbing" the ground, occurs after cleanup that environment, to promote the sale of the timber removed and crude into logs, and therefore is used fire to burn the remaining trees are not cut to the illegal and without certification for the entire world. Finally, place the entry of livestock, which will subsequently be slaughtered also for sale in markets that are not certified. The animals are then introduced and during the breeding period the loss of biodiversity is extensive and intensive.

The profit on these activities depends on proximity to roads for the marketing of products (meat, milk, wood slats, etc), which leads us to admit that the western part of Borba should be a priority for governance actions and maintenance the forest.

On the banks of the Madeira River are located the Production Units (PU's) agropastoral the municipality of Borba. The production unit (PU) or mowing is the locus where the crops are grown seasonal and perennial crops for family consumption and for sale in the trading network of the municipality. Soil preparation is made for clearing the way traditional cutting of the forest and burned forest areas both in poultry and in areas of virgin forest. In summer

the cleared forest intensifies for planting, mainly of cassava (Manhiot esculenta Crantz) used to produce flour and its derivatives.

The entire population of residents of the county seat to buy products without timber certification is an indirect agent of deforestation. The resident population of the town of Borba is active in the service sector (70%), industry (15%) and agriculture (15%), maintaining the traditional characteristics and tend to use products that are less industrialized, but at the same time, keep direct link to large retailers that operate in urban centers.

The region of the project area and its surroundings has a distribution of vegetation characterized primarily by three environments:
  i)   Seasonal flood land forest (Várzea),
  ii)   Upland Forest and
  iii) Flood land forest (Igapó).

The Seasonal flood land forest (Várzea) bordering rivers and its name is due to periodic flooding, which end up acting as a natural fertilizer to the land, making it a preference among the farmers. In this type of vegetation is favored the cultivation of jute, a natural fiber widely used in the manufacture of bags for food and has been encouraged since the year of 2011 by the state government program. Now the upland forest presents giant trees, some over 60 meters tall. It is this type of forest that grow hardwood trees, some of them known commercially as cedar (Cedrela fissillis) massaranduba (Manilkara spp.), Laurel (Licaria brasiliensis) and itaúba (Mezilaurus Itauba). This one has great resistance, and is widely used in the construction of boats, which leads to the extraction process by deforestation intense.

Finally, the flood land forest (Igapó), name originates from a Tupi word (Indian language) meaning water and root, favors the presence of palm trees such as paxiuba (Socratea exorrhiza) and buriti (Mauritia flexuosa).

Overall stand out in the project region phytophysiognomic two main patterns: Forests and Fields. In Forest vegetation type, there are the Rainforest Open and Dense. This typology is divided into:
  1) Dense Tropical Forests of Lowlands, located in the alluvial plains on the banks of streams and rivers, formed by sedimentation, which usually occur endemic species such as some palm trees, mainly of the species "buriti" (Mauritia flexuosa),
  2) Dense submontane tropical forest, located on the slopes of the plateaus and dissected relief, and
  3) Thick Alluvial Rain Forest, which occur along watercourses occupying the terraces of the ancient plains of rivers (Brazil, 1978).

In the project area occurs also contact Field / Forest. The region of the project area and its surrounding includes several campestral formations, where the prevailing vegetation is grassy-woody low, alternating, sometimes small isolated trees and forest galleries along the

rivers (Braun & Ramos, 1959). This vegetation type is differentiated by the size in: open arboreal savanna, Park Savanna and dense arboreal Savanna.

According to Davis et al. (2002), these fields make some mosaics with the surrounding forests. The contact between these vegetation (ecotone) occurs in some places, abruptly, but in others the change in vegetation between the forest and the field is gradual. For Braun & Ramos (1959) plant associations covering the fields of all kinds. The areas of "clean field" are not very extensive, with a predominance of "dirty field", ie, covered by grass fields associated with shrubs and trees, with a predominance of H. speciosa (Hancornia speciosa). In this kind there is a large number of lixieiras (Curatella americana). In the areas near the edges of fields occur true woods, where the spacing varies from trees 1-3 m, reaching sizes ranging from 3 to 5 meters. Among the physiography of Fields and Forests, is an area of ecological tension formations formed by palm forest and savanna.

The forests included within the project area meet the definition of natural forest taking into account the criterion of NFS.

1.4   Forest characteristics

The CGV Geospatial Platform identifies the vegetation types in the project areas. The predominant vegetation type in the total project area is Closed to Open (>15%) broadleaved evergreen or semi-deciduous forest (>5m), which is consistent with the definition of natural forest, having ~1,159,223 ha or 95.2% of this vegetation type. According to the Brazilian Forest Code, the existing natural forests in the project area are defined as primitive and natural forests mainly with large fragments of native primary and secondary native.

Further information regarding the state of the forest in the project area is presented in the table below:

To what extent has the forest been impacted by human interventions?	The human activities described in this document will cause considerable loss of biomass in a period of 30 years. The remnant vegetation will not present the traits of the original natural forest anymore due to the fragility of its ecosystem during this period. As presented in this document from the Brazilian economic growth in 2007, the consumption in the most economic classes present in Borba, especially in the project area, mainly triggered the expansion of cattle ranching.
Are there areas within the project area which need to be restored – areas of degraded natural forest?	No
Have areas which do not meet the definition of 'natural forest' been excluded from the project area?	Yes - Were excluded from the project area both the Protected Areas and Indigenous Lands. Other areas were not incorporated according to various criteria, such as urban and water areas.

Table 2 – Forest Characteristics within the Project Area

1.4.1 Degraded areas

The most frequently used analyses, considered the best descriptions of changes in land use and which we used Landsat images, are held by PRODES Digital, which is the source of the Deforestation layer in the CGV Geospatial Platform. This shows the areas of deforestation by year.

The LANDSAT data up to 1980 are available for only six of the nine states and territories in the Brazilian Amazon. For a state (Rondonia) LANDSAT information is available regarding 1983 (Brazil, Ministry of Agriculture, 1982, 1985). 306 792 000 ha in area for which information is available (61.3% of the total area of Amazon) the cleared areas increased from 0.9% in 1975 to 2.4% in 1978 to 4.0% in 1980. The last of these values is particularly conservative because, although referred to here and in official reports as being given "1980", many of LANDSAT images were actually used in 1979. For example, to cover Rondônia, the Brazilian Institute for Forestry Development (IBDF) used 45 images (including repetitions necessary because of the clouds that partially obscured scenes), these 19 (42%) were taken in 1979 and not in 1980 (Brazil Ministry of Agriculture, IBDF, 1982).

Figures 1-6 below show the deforestation rate from 1989 to 2010 in the 3 specific Trocano project areas. The historic deforestation can also be viewed on the CGV Geospatial Platform using the Deforestation Layer, which is sourced from PRODES INPE Brazil.
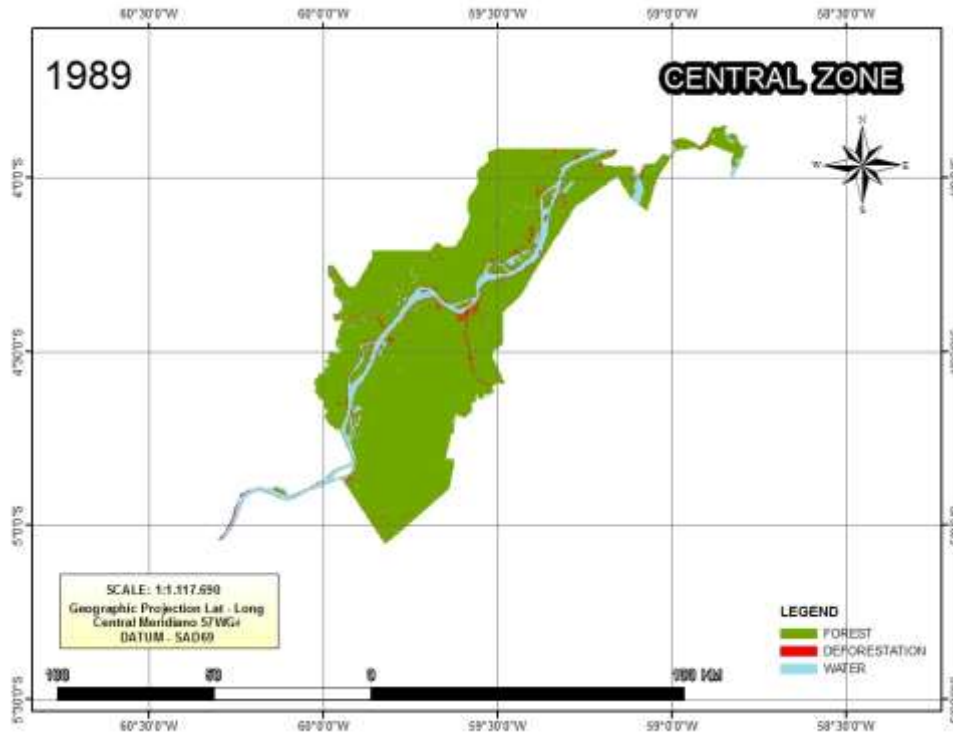
Figure 1 - LANDSAT image central zone, where the seat of the municipality is located, consisting of the bands 3, 4 and 5 from 1989.
Source: IAL, 2012.
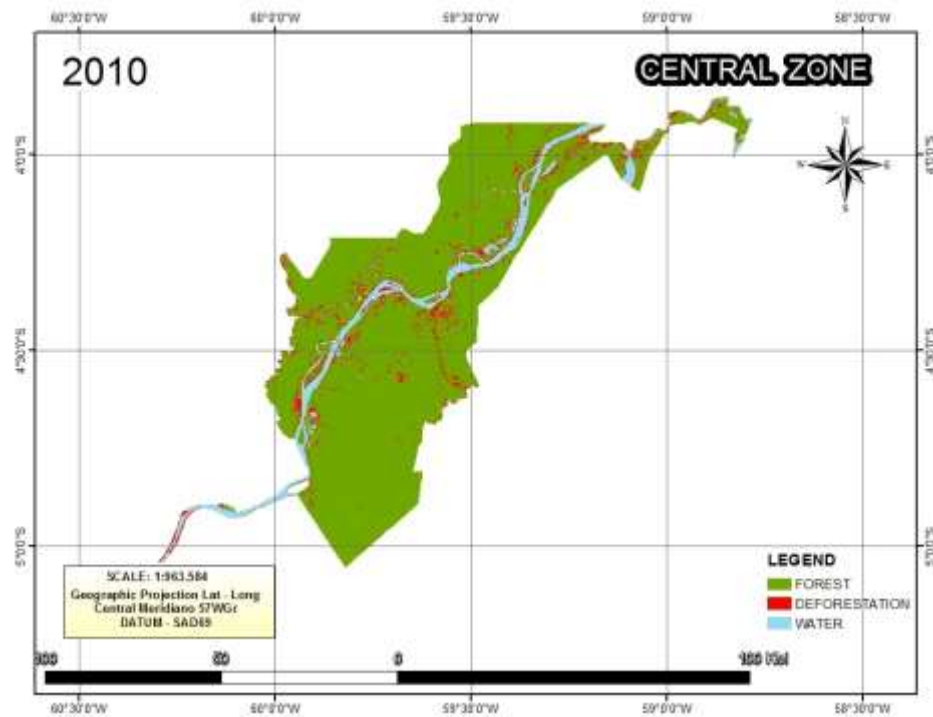
Figure 2 – LANDSAT image central zone, where the seat of the municipality is located, consisting of the bands 3, 4 and 5 from 2010.
Source IAL, 2012
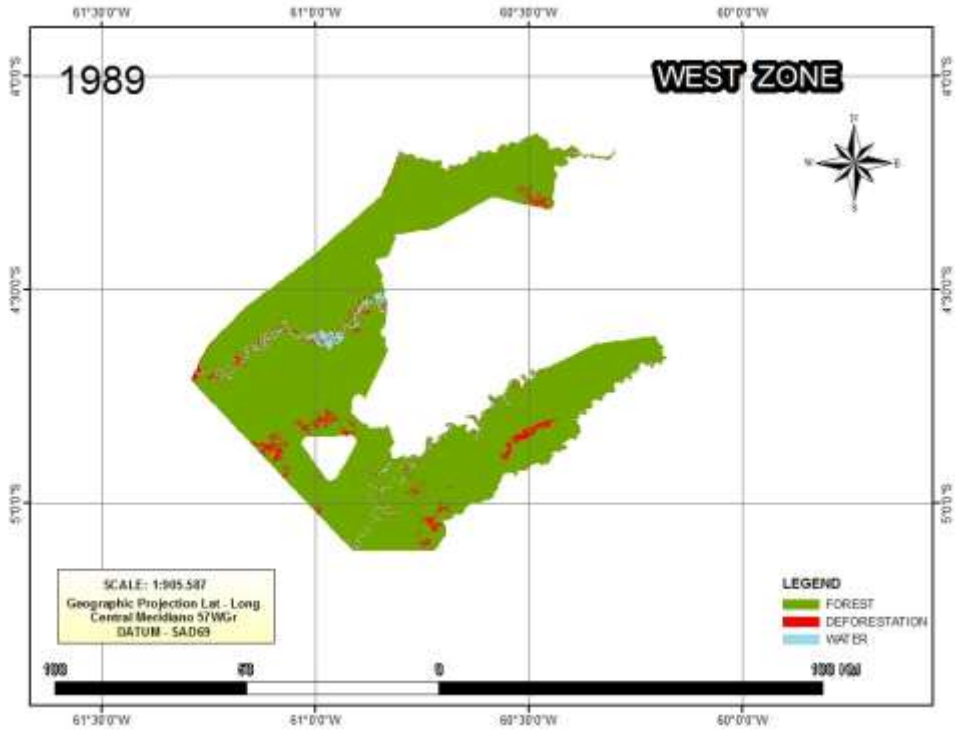
**Figure 3 - LANDSAT image west zone, near the BR 319 motorway,
consisting of the bands 3, 4 and 5 from 1989.
Source: IAL, 2012.**
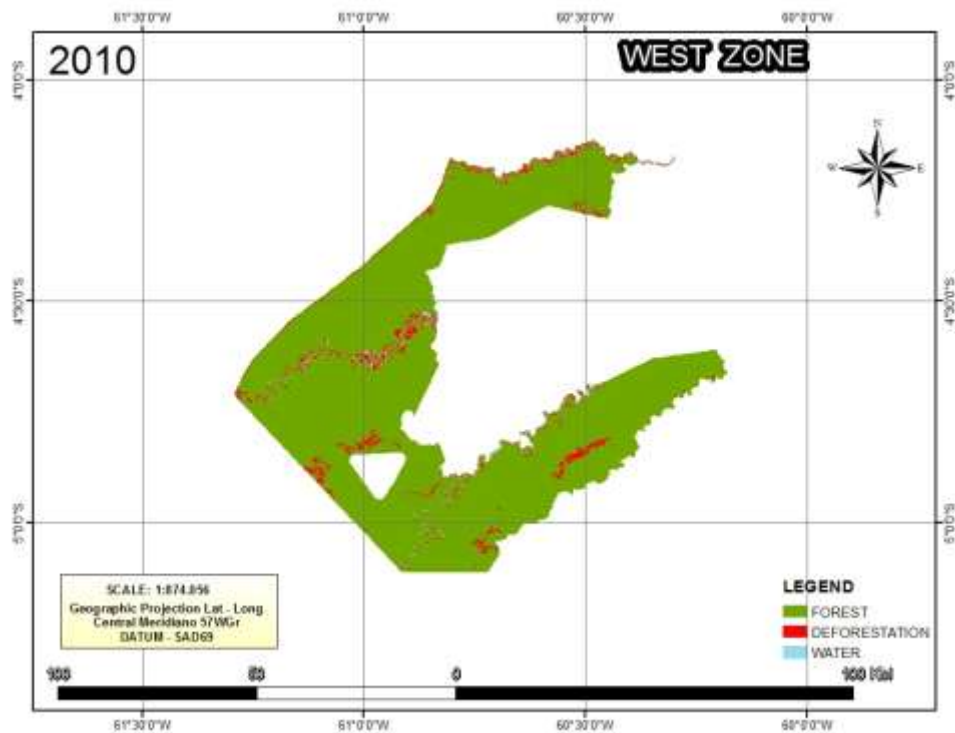
**Figure 4 – Image of LANDSAT West zone, near to BR 319 highway, composted by the 3, 4 and 5 bands of 2010.
Source: IAL, 2012.**
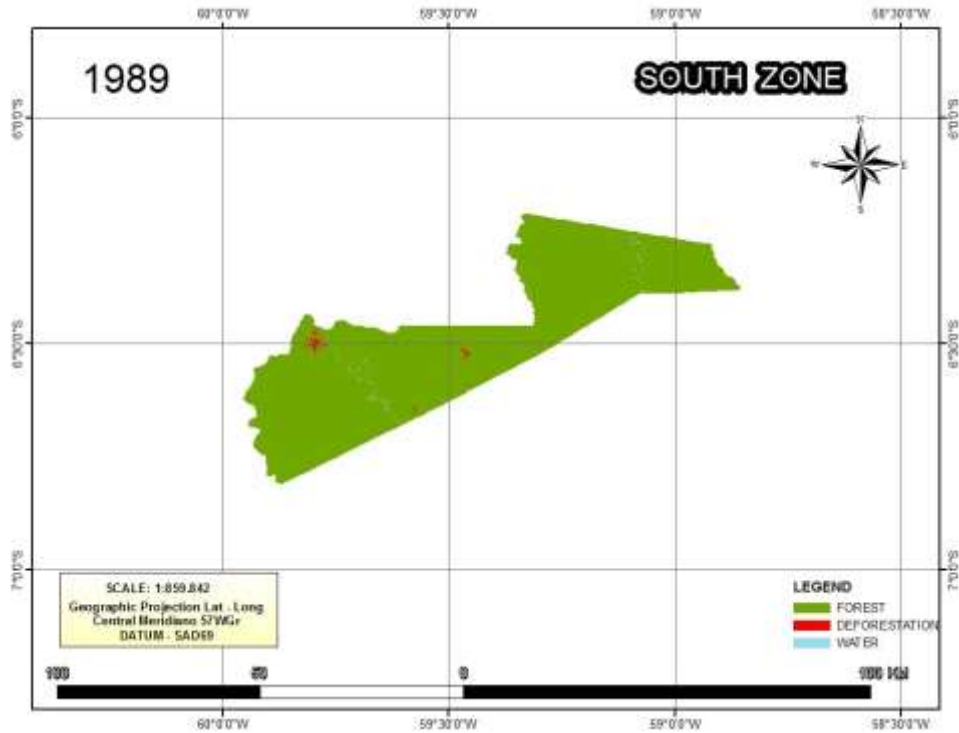
Figure 5 – Image from LANDSAT South zone of Borba, composted by the 3, 4 e 5 bands of 1989
Source: IAL, 2012.
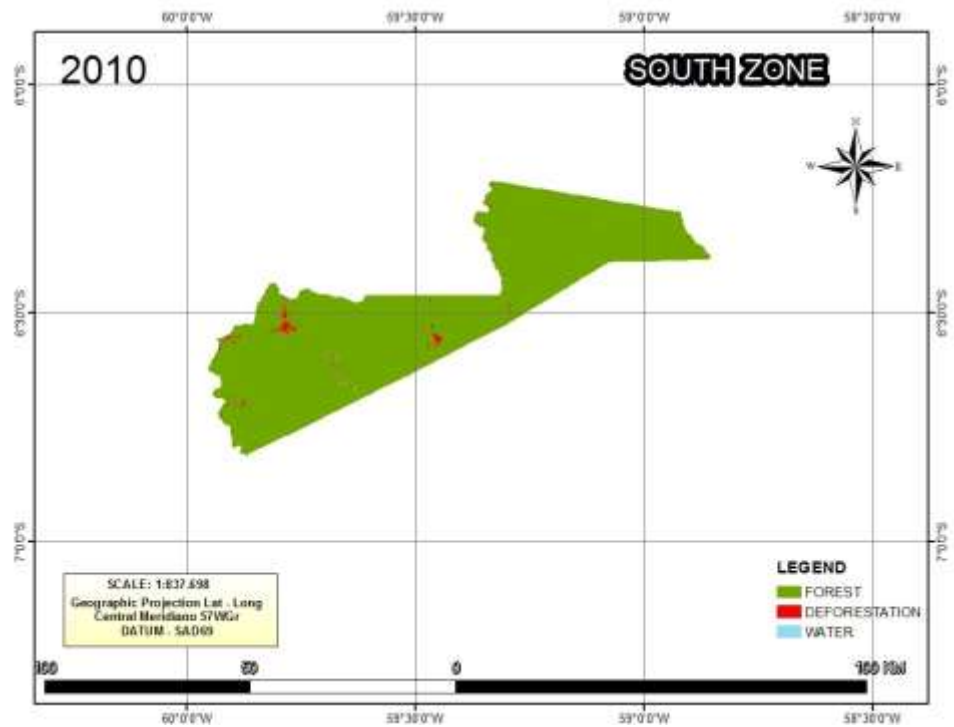
Figure 6 - Image from LANDSAT South zone of Borba, composted by the 3, 4 and 5 bands of 2010
Source: IAL, 2012.

The LANDSAT images presented above show the zones of the project in 1989 and 2010 to observe how the deforestation in the project area were used the images that is the most reliable source for this purpose. As you can see there are no major developments in occupations or changes in land use, but the current situation of consumption and economic conditions are favourable for a rapid change in these conditions.

Proportion to the size of the project area, it is found that deforestation in the long term is not significant, but recent developments is much more significant.

The amount of private land already cleared in Borba is not as significant in relation to other municipalities in the state of Amazonas. What happens is a land speculation in this location, in which the chain of ownership of lands is not always regular which facilitates the deforestation from the lack of governance, since the areas not yet deforested.

It may be noted that the Master Plan of the municipality is a vital document for agreements between the population and Public Power can be signed. Also, via Master Plan, is the easiest way to get oriented social actions that may be effected in the project area.

For more information on the Master Plan, please see section 2.3.

1.5 Project Participants and Associates

The participants in this project are the company Celestial Green Ventures PLC (CGV), Instituto Amazônia Livre [Free Amazon Institute (IAL)] and the Municipality of Borba.

CELESTIAL GREEN VENTURES PLC

The company Celestial Green Ventures PLC, based in Dublin, Ireland, is the project proponent. The application of the project is the responsibility of CGV and the Municipality of Borba, after approval of the text containing the specifics of the agreement on June 7, 2010.

The company Celestial Green Ventures PLC is attentive and sensitized to the problem of global warming caused by rising concentrations of greenhouse gases (GHGs) in the atmosphere, and has specialized in the development of carbon credit projects in the field REDD and methodologies applicable, in order to maintain existing forests as well as providing socio-economic benefits and enhancements to the local communities and incorporating biodiversity protection within the project areas.

INSTITUTO AMAZÔNIA LIVRE (FREE AMAZON INSTITUTE)

The Instituto Amazônia Livre [Free Amazon Institute (IAL)], located Manaus / AM, Brazil, is a non-governmental organization that provided services in preparing this PDD and assist in its implementation.

The Instituto Amazônia Livre [Free Amazon Institute (IAL)] is a nonprofit organization, established in the city of Manaus in Amazonas state whose mission is to train, monitor and

work, employment and income continued to Amazonian, providing its interaction with the contemporary world and at the same time helping them to preserve their culture and ancestral knowledge so that it can worthily take care of the forests and rivers remain in their natural habitat. The ITB is intended to develop policy for the preservation of forest areas in private and public, made official and recognized by the governments of each country member of the Pan Amazon, which are protected or will be protected from encroachment and deforestation. There is more information about the objectives of the Institute's website: http://amazonialivre.org

MUNICIPALITY OF BORBA

The Municipality of Borba has signed an agreement with Celestial Green Ventures PLC for granting the full legal and beneficial rights to all and any carbon credits that can be certified in relation to the land in question for the full term of the 30 year contract. As the contract is directly held with the Municipality of Borba, the official partner in the project, this has the backing of the Municipal Governments legal approval.

According the IBGE, in 2011, the total population of the Municipality of Borba is 34,961 habitants.

1.5.1 Project Staff

The Institute Amazon Livre will be responsible for executing the activities proposed for the Trocano Araretama Conservation Project and, therefore, have a multidisciplinary team of associates, who are appropriately skilled, with some of these key individuals being essential to the construction of this management plan. These associates will work in conjunction with Borba city officials, Celestial Green Ventures PLC and the Trocano Project Management Council for the planning, development and implementation of the proposed activities of the project and actions for the communities of the project area.

The key staff of the multidisciplinary project team are outlined below, together with their functions and responsibilities:

Name	Trocano Project Position	Qualifications	Functions and responsibilities
Antônio José do Nascimento Fernandes (Chief Executive, IAL)	Project Leader	Graduate in Chemistry and MS in Molecular Modelling, with experience in development of dynamical systems, mathematical modelling, research on teaching	Overall co-ordination of the project in accordance with the management plan aims and objectives; Ensure the project process occurs in a satisfactory and planned way; Monitor the operations for conformity, adopting appropriate measures and controls where necessary; Overseeing the dissemination of information regarding the project

			activities and project outcomes; Ensure the project is carried out in compliance to the NFS Standard.
Waldemar de Lima (Managing Director, IAL)	Project Co-ordinator	Entrepreneur with experience in administrative and executive field, one of the creators of the Institute Amazon Free and current president	Responsibility for the management of the organization and coordination of the PMC; Being the link between the Management Council and the rest of the project organization, providing conditions for effective decision making; Assist the PMC in tasks assigned to them; Prepare periodic analysis of the operations progress to be submitted to the Management Council; Oversee and take preventive and corrective actions to achieve the goals and strategies set out in the strategic plan.
José Souza dos Santos (Chief of Finance, IAL)	Finance Officer	Accountant serves as a consultant in various organisations for aid to the production of the Amazon State, with extensive experience in institutional administration. He participated in the creation and administration of associations and cooperatives in various branches of basic productive sector.	Coordination and supervision of the project financial resources, grants and subsidies to the PMC for overall control of the project; Managing the cooperative activities and financial training; Development of tools and reports that facilitate the control and management of the project; Monitoring of PMC programs; Statistical controls and analysis of results of subprojects; Signing cheques, along with another member of the PMC; Supervision of the financial work.
Rodrigo da Costa Lima (Director of Operations, IAL)	Project Operations Officer	Graduate in Environmental Management with experience in developing and executing projects of territorial management and environmental quality	Plan and organize the operations of the project; Coordinate services and project processes; Provide outputs and understanding of the needs of system and infrastructure; Operationalize

		in the Amazon.	the interaction and knowledge about the context in which the project falls: Environmental protection (adaptation to project activities becoming the norm); Social responsibility (safety of employees and the organization's relationship with neighbours); Co-ordinating all training requirements in the project areas; Technological awareness and processes; Knowledge management (documentation, learning, etc.).
Fabiola da Costa	Administrative Manager - Brazil	Graduate in Management with experience in process management and integrated management system, advanced English and international trade relations.	Coordinate and supervise the administrative area; Plan, organize, direct, evaluate, supervise and control the administrative activities and people management involved with the project; Monitor the administrative processes of the project, ensuring goals are reached.
Patrícia de Almeida Santos	Coordinator for Biodiversity Monitoring	Degree in Biology from the University of Amazonas, specialising in microbiology and small mammal taxidermy.	To plan and coordinate the activities for biodiversity monitoring; To coordinate the activities related to the inventory of the fauna and flora; To coordinate courses and training lessons for biodiversity monitors.
Charles Oliveira do Valle	Training Activities Coordinator	Degree in Financial Administration, Postgraduate in Management of Human Resources at the Faculdade Marta Falcão, Executive MBA in Companies and Business Management at the CIESA , Executive MBA in Projects Management at IDAAM/GAMA FILHO and Masters in Business at IDAAM/GAMA	To develop activities in the areas of entrepreneurship; To coordinate and plan courses and training sessions to qualify businesses in the project areas; To coordinate the planning and implementation activities in the field of business management; To coordinate and guide the professionals involved in the business management.

		FILHO/ALCALÁ (from Spain). Entrepreneurship specialist at SEBRAE/AM.	
Antonio Fonseca Picanço	Environmental Monitoring Analyst	Graduate in Social Science and Master of Science for Environment and Sustainability in the Amazon. Oriented research involving sustainability of traditional populations in Amazonia.	Co-ordinate the study of environmental issues including community and project impacts reporting and analysis; Prepare reports and analysis on environmental monitoring of the communities involved in the project and biodiversity; Coordinate and monitor environmental projects conducted in the project area, especially ecotourism.
Cibele Lopes Bastos	Manager of Remote Sensing and GIS – Brazil: Ground Teams Training Coordinator	M.Sc. in Agriculture in the Humid Tropics (Family Farming) by the National Institute for Amazonian Research (2007), graduated in Forestry at the Amazon Institute of Technology (2004) and Administration from Federal Amazon University (2006).	Coordinate the activities of the project geo-referencing and geo-processing; Manage and resolve the field monitoring activities in the project area; Manage the system of quality monitoring, GIS and geo-referencing of the project; Training co-ordinator for on-the-ground monitoring teams.
Jenifer Castilho Marques Pereira	GIS Analyst – Brazil	Degree in Geography from the Federal University of Amazonas with experience in digital image processing, pre-processing, registration, atmospheric correction (classification).	Process, sort and geo-reference information collected in the project.
Rodrigo Pimenta Cézar	GIS Analyst – Brazil	GIS Technician, majoring in Environmental Engineering with experience in land titling, digital image processing.	Process geo-referenced data; Providing use of geo-referenced database; Prepare maps and spreadsheets of geographical coordinates.
Cleuton de Souza	Technical Consultant – Carbon Projects	Researcher in the area of chemistry, with experience in molecular modelling. Specialist works in the area of carbon and agroforestry systems, working on projects related to	Evaluate methodologies to collect and analyse data; Check the application of methodologies and data usage.

		development of the Amazon.	
Renan Rodrigues Albuquerque	Technical Consultant – Socio-Economic	Social Communicator, masters in social psychology (UFPB), Doctor of society and culture in the Amazon (UFAM). It has research experience in the area of perception and psychology, studies on developing roles and social structures between rural and riverine Amazonian groups.	Assess and evaluate social impacts of the project; Evaluation of the economy and society of the Amazon; Implementation of communication in project area.
Mariana Castro	IT Designer	Environmental Management and Web Designer with experience in eco designer.	Develop the visual and online presentation and communication of the project.
Ariovaldo de Souza Junior	IT Developer	Has experience in programming, production designer and 3D media.	Develop educational materials through computational resources.
Marcelo Nascimento Fernandes	IT System Developer	Bachelor's Degree in Statistics with experience in programming and software development and systems software.	Organise and structure overall project database including data collection records, communication records, centralised access to appropriate documents and information.
Enf. Lizandra Livia Farias Monteiro	Consultant – Health	Secretary of Health, Municipality of Borba	Organize health actions; Plan activities for health in partnership with key people in the project; Provide information and activities related to personal health.
Francisco Ferreira das Chagas Filho	Consultant – Education	Secretary of Health – Municipality of Borba	Coordinate activities related to education; Plan and manage activities in the area of education; Support environmental education activities in the project area; Provide information to staff and activities related to education.
Edilson Batista da Fonseca	Consultant – Rural Production and Supply	Secretary for Rural Production and Supply – Municipality of Borba	Act together with the key people of the project, participating and collaborating with the schedules geared to the development of supply

			chains and sustainable extraction services in the project area; Provide database for planning activities aimed at development of rural production and supply in the project area; Provide information necessary for the preparation of development projects.
Jorge Machado	Consultant – Sports, Culture, Tourism and Environment	Secretary of Sports, Culture, Tourism and Environment – Municipality of Borba	Coordinate and monitor activities related to sports, culture, tourism and environment; Monitor and participate in the planning of activities related to sports, culture, tourism and environment; Support the actions and activities related to sport, culture, tourism and environment.
Raimundo dos Santos Machado Neto	City Hall Co-ordinator	Extraordinary Government Secretary – Municipality of Borba	Spokesperson City Hall; Responsible for relations with the city hall project; Organize actions between the secretaries of the Prefeitura and the project; Spokesperson of the Prefeitura.
Paula Torres Cofré (Senior Administrator CGV)	Project Administrator – Head Office, Dublin	B.A in Journalism, Diploma in PR, experience of administration and personal assistant duties for CGV. Fluent in Portuguese, Spanish, English and German.	Upkeep of Management Plan as living document; central amendments log and carrying out of amendments; general project administration; translation work between Portuguese and English; co-ordination of all resources between Head Office Dublin and Project Team in Brazil.

Table 3 - Key Project Staff Functions and Responsibilities

1.5.2   PDD Authors

Antônio José do Nascimento Fernandes; Antônio Fonseca Picanço; Cibele Lopes Bastos; Cleuton de Souza Silva; Renan Albuquerque Rodrigues; Rodrigo da Costa Lima.

1.5.3 Project Associates

Abílio Ribeiro Falcão Neto, Instituto Amazônia Livre; Jeniffer Pereira Castilho Marques, Laboratório de Cartografia e Geoprocessamento (UFAM); José Souza dos Santos, Instituto Amazônia Livre; Marcelo Alberto do N. Fernandes, Instituto Amazônia Livre; Waldemar de Lima, Instituto Amazônia Livre; Patrik Marques dos Santos, Instituto Amazônia Livre; Rodrigo Cézar Pimenta Carvalho, Instituto Amazônia Livre.

1.6   Abbreviations

AAVC	Atributos de Alto Valor para a Conservação
AM	Estado do Amazonas
ANM	Associação Nacional dos Municípios
ANTAQ	Agência Nacional de Transportes Aquaviários
APA	Áreas de Proteção Ambiental
ARPA	Áreas Protegidas da Amazônia
BAU	Business As Usual
CAMES	Cooperativa Agrícola Mista Efigênio Sales
CECLIMA	Centro Estadual de Mudanças Climáticas
CEUC	Centro Estadual de Unidades de Conservação
CGV	Celestial Green Ventures PLC
CNM	Confederação Nacional dos Municípios
CNPq	Conselho Nacional de Desenvolvimento Científico e Tecnológico
CO_2	Carbon
CONAMA	Conselho Nacional do Meio Ambiente
COP	Conferencia das Partes (em inglês: *Conference of Parties*)
CLT	Consolidação das Leis do Trabalho
DNPM	Departamento Nacional de Produção Mineral
DRP	Diagnóstico Rápido Participante
ECO	em inglês: *Ecosystem Certification Organisation*
EIA	Estudo de Impacto Ambiental
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária
EBES	Escala de Bem-Estar Subjetivo
EUA	Estados Unidos da América
FUNAI	Fundação Nacional do Índio
FAPEAM	Fundação de Amparo a Pesquisa do Estado do Amazonas
FESTIVIR	Festival de Artes Folclóricas de Vitória Régia
FPIC	em inglês: *Free Prior and Informed Consent*
GEE	Gases de Efeito Estufa
GERCO	Plano Nacional de Gerenciamento Costeiro
GHG	Greenhouse Gas
Ha	Hectares
HCV	em inglês: *High Conservation Values*
IAL	Instituto Amazônia Livre
IBAMA	Instituto Brasileiro de Meio Ambiente e Recursos Naturais Renováveis

IBDF	Instituto Brasileiro de Desenvolvimento Florestal
IBGE	Instituto Brasileiro de Geografia e Estatística
IDAM	O Instituto de Desenvolvimento Agropecuário e Florestal Sustentável do Estado do Amazonas
IDH	Índice de Desenvolvimento Humano
INCRA	Instituto Nacional de Colonização e Reforma Agraria
INPE	Instituto Nacional de Pesquisas Espaciais
IPAAM	Instituto de Pesquisa Ambiental da Amazônia
IPCC	Painel Intergovernamental de Mudanças Climáticas (em inglês: *Intergovernamental Panel on Climate Change*)
ISA	Instituto Sócio Ambiental
Km	Quilômetro
MAPA	Ministério da Agricultura, Pecuária e Abastecimento.
MMA	Ministério do Meio Ambiente
MS	Ministério da Saúde
NBM	em inglês: *Normative Biodiversity Metric*
NFC's	em inglês: *Natural Forest Credits/Certificates*
NFS	Natural Forest Standard
OCB	Organização das Cooperativas Brasileiras no Estado do Amazonas
OGM	Organismos Geneticamente Modificados
OTCA	Organização Tratado Cooperação Amazônico
OTG	On-the-ground
OMT	Organização Mundial do Turismo
PNUD	Programa das Nações Unidas para o Desenvolvimento.
PA	Estado do Pará
PAREST	Parque Estadual
PAOF	Plano Anual de Outorga Florestal
PMC	em inglês: *Project Management Council*
PDD	em inglês: *Project Design Document*
PIBIC	Programa Institucional de Bolsas de Iniciação Científica
PL	Projeto de Lei
PRODES	Programa de Calculo do Desflorestamento da Amazônia
REDD	Redução de Emissões por Desmatamento e Degradação florestal
RIMA	Relatório de Impacto Ambiental
RDS	Reserva de Desenvolvimento Sustentável
RO	Estado de Rondônia
RTM	em ingles: *Shuttle Radar Topgrafy Mission*
SDS	Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável
SEUC	Sistema Estadual de Unidades de Conservação
SISNAMA	Sistema Nacional do Meio Ambiente
SPHAN	Serviço de Patrimônio Histórico e Artístico Nacional
tC	Tonelada de carbono
TI	Terras Indígenas
TCC	Trabalho de Conclusão de Curso

UFAM	Universidade Federal do Amazonas
UC	Unidade de Conservação
UE	União Europeia
UEA	Universidade do Estado do Amazonas
UNB	Universidade de Brasília
UNFCCC	Convenção-Quadro das Nações Unidas sobre Mudança do Clima (em inglês: *United Nations Framework Convention on Climate Change*)
UNICAMP	Universidade de Campinas
UP	Unidade de Produção
UTAM	Universidade de Ciência e Tecnologia do Amazonas

SECTION 2 - ELIGIBILITY

2.0 Introduction
The Project Trocano Araretama complies with the basic eligibility criteria of the Natural Forest Standard, which is demonstrated in this section.

2.1 Project Activities
The initial project activities that were undertaken, during the project preparation phase were as follows:

1. Formation of the research team of the Instituto Amazônia Livre (Free Amazon Institute) in conjunction with Celestial Green. The main objective was to bring together an interdisciplinary team of the Human Sciences (Anthropology, Sociology, Journalism, Environment), and Exact Sciences (Chemistry, Forestry, Physics, Mathematics). As the social and environmental problems that affect the project area are diverse REDD Borba, an interdisciplinary team can only make a systematic reading, achieving the proposed objectives;
2. Bibliographic survey several libraries in the various fields of knowledge for the theoretical and methodological background of the Project;
3. Preparation of data geo-referencing and geo-processing;
4. Choice and application of models for the estimates of deforestation in the project area REDD Borba.
5. Construction of indices and rates of changes for compliance with standards ECO-NFS.
6. Survey of socio-environmental characteristics of the area and surrounding the Project.

Following these initial activities, the project was able to progress into the development stage, and details of the project are as follows:

The Trocano Conservation Project's primary project activity over the 1,346,541.26 ha total project area is to reduce GHG emissions from avoiding deforestation and degradation within the project area. This will be achieved by implementing an effective monitoring and management plan, whilst encouraging more effective forest governance and providing additional co-benefits to the communities and biodiversity within the project area. The objectives include the following:

- Conservation and preservation of the natural forests;
- Biodiversity protection of the plants, animals and the ecosystem as a whole;
- Socio-economic enhancements for the local communities, including healthcare, education, employment and infrastructure improvements; and
- Data collection, including inventorising biodiversity, forest, flora and fauna.

Project implementation focuses on activities that should mitigate deforestation and leakage. These project activities include the following:

- Development and implementation of effective management plan;
- Provide viable sustainable and economic alternative practices to project area inhabitants;
- Strengthening of Local Forest Protection;
- Incentivise local communities to adapt their current behaviour;
- Incentivise and reward changes in behaviour;
- Capacity-building and environmental awareness;
- Participation in project implementation, through monitoring, management, conservation and other activities;
- Participation in project-related training;
- Environmental Education Programme;
- Raising civic pride of the natural forest.

The project does not involve any commercial forestry activities nor does it currently include any natural forest restoration activities.

The project activities will be developed, implemented and executed by the Municipality of Borba and the Trocano Project Management Council, who will establish forest conservation and community development sub-teams from the project communities, bringing together members of the local business community, community associations and municipal departments. The sub-teams will report back to the Project Management Council who will review progress and approve funding for activities initially on a 3 month basis for the first 2 years and then on a biannual basis.

It is important for the success of the project and successful mitigation of deforestation that the local communities are engaged with the project and its planned activities. To ensure and encourage this participation, for the effective implementation of the project, the following objectives are the initial project activities:

Strengthening of Local Forest Protection
Currently, the Municipality has very limited budget and resources for carrying out effective forest protection and is unable to reach many of the areas that are at risk. The project considers it necessary for the mitigation of deforestation in the project area to have a properly equipped and trained team of full-time Rangers for each of the 3 project areas, who would be further supported by additional part-time local staff and participation from the communities.

The Ranger teams will maintain ground and river-based inspections and tours, and as part of their role will also assist in the surveying, monitoring and data collection of the forest areas.

They will also play an important role in the dissemination of information to the more remote communities within the project areas.

Raising Civic pride and appreciation of the Natural Forest

The Trocano project considers that long-term conservation and forest protection requires long-term changes in behaviour and attitude towards the natural forests in the area. This requires the local people to appreciate and take pride in the natural forest areas which they inhabit through education. Therefore, as part of the project, an Environmental Education Programme will be established to be run and managed by the project and its partners, to include information about the global, national and local importance of the forests within their Municipality and the Trocano project. This will be an important and imperative action of project implementation and through increased knowledge and understanding of the habitat in which they live, and the long-term, global impacts that is associated with the natural forests, will result in mitigation of deforestation in the project area.

Further discussion on the breakdown of these activities can be found in section 2.4.3.

Further detailed project activities cannot be finalised until the income stream from Natural Forest Credit sales is known with some certainty, however initial discussions and consultations with the local participants have identified the following general project activities:

1. Land maintenance
2. Infrastructure
3. Health
4. Sanitation and Housing
5. Education
6. Agriculture
7. Sociocultural
8. Professional Training

Further information for these planned project activities can be found in Section 3.3.3 of this document.

The list of potential activities that can be undertaken by the carbon finance that will be generated through applying the Natural Forest Standard to the Trocano Project is considerable. However, the project proponents are consciously aware that carbon finance cannot address all the development issues within the Municipality, and should not be seen as a substitute for adequate public funding of core services such as health and education. The scope and level of support provided by the project will be kept under review by the Project Management Council.

2.2 Legal Status

Overview

A full legal review of the project documentation has been carried out by legal advisors, dated 31st January 2013 and the summary statement can be found in Annex 14a (original Portuguese) and Annex 14b (English translation). An outline of the conclusions drawn from the legal opinion are as follows:

1. The contract is legally valid.
2. The Mayor of Borba and Celestial Green Ventures are entitled to sign the contract.
3. The Municipality of Borba-AM, through its Main Law, can give the right to its executive representative to negotiate Carbon Credits with any other representatives of the Public Power, companies and municipalities, as well as mixed-capital companies, private companies and international companies.
4. Through the present analysis, both us lawyers mentioned below, after having studied the subject and the material requested by Celestial Green Ventures Ltd regarding the Trocano Araretama Conservation Project located in the Municipality of Borba in the State of Amazonas, in Brazil, have concluded that the specified contract follows the laws as per the Brazilian Constitution, Main Constitution of the State of Amazonas, Organic Law of the Municipality of Borba and the other relevant legislation.

The legal statement can be found in full in Annex 14. It was prepared by Remulo José do Nascimento, OAB/AM 118-A and Juliana Terezinha S. Medeiros , OAB/AM 5360 of the law firm Escritório de Advocacia Remulo José do Nascimento.

2.2.1 Relevant Laws to the Trocano Project

To affect the legality of the project presented here, we highlight the following sections of various laws in Brazil that are in existence today. It is hoped therefore, by identifying these relevant laws it will give scope to the management rights of the Municipality regarding the carbon benefits to be achieved from the project. The legal review in Annex 14 discusses the laws outlined below, how they apply to the project and their relevance.

Note: The laws highlighted and summarised in sections 2.2.2 and 2.2.3 below originate in Portuguese; it is inappropriate to put any interpretation into the translated wording of the Laws as the meaning could be misconstrued. Therefore, where the language is written unclearly, it is a verbatim translation of the law as presented. The laws summarised below are included in Annex 4 of this document in full and in their native language.

2.2.2 Federal Laws

At the federal level, the laws summarised below are aimed at Forest Management in the Amazonia region, specifying the rules for use with communities and Governments.

MANAGEMENT OF PUBLIC FORESTS FOR SUSTAINABLE PRODUCTION
GENERAL PROVISIONS

Article 4 - The management of public forests for sustainable production includes:

I. The creation of national forests, state and local governments, pursuant to art. 17 of Law 9985 of July 18, 2000, and their direct management;

II. The allocation of public forests to local communities, according to art. 6 of this Act;

III. The forest concession, including natural and planted forests and units of management of protected areas referred to in item I of this article.

MANAGEMENT OF FORESTS DIRECT

Article 5 - The Government may exercise directly the management of national forests, state and municipal-created pursuant to art. 17 of Law 9985 of July 18, 2000 and shall be permitted to perform subsidiary activities, sign agreements, partnership contracts or similar instruments with third parties, subject to the bidding procedures and other applicable legal requirements.

§1 The duration of contracts and similar instruments referred to in the heading of this article is limited to 120 (one hundred twenty) months.

§2 In bidding for the signing of this article, in addition to price, the criterion may be considered the best technique provided for in section II of the heading of Art. 26 of this Law.

ALLOCATION TO LOCAL COMMUNITIES

Article 6 – Before performing forest concessions, public forests occupied by or used by local communities will be identified for allocation by the competent authorities, through:

I. Creation of extractive reserves and sustainable development reserves, subject to the requirements of Law 9985 of July 18, 2000;

II. Authorization of use through forest settlement projects, sustainable development, agro-extractive or other similar activities, pursuantof art. 189 of the Federal Constitution and the guidelines of the National Agrarian Reform;

III. Other forms prescribed by law.

§1 - The first destination of the heading of this Article shall be made non-burdensome to the recipient and performed the administrative act itself performed, as provided for in specific legislation.

§2 - Without prejudice to the forms of appropriation under the heading of this article, local communities may participate in the bidding provisions of Chapter IV of this Title, through community associations, cooperatives or other legal entities authorized by law.

§ 3o The Government may, based on socio-environmental conditions defined by regulation, regulate holdings of local communities on areas which they traditionally occupied or used that are essential to the conservation of environmental resources essential for their physical

and cultural reproduction through granting the real right of use or otherwise permitted by law, exempt from tender.

FOREST OF CONCESSIONS
Section I - General Provisions
Article 7 - The forest concession is authorized by act of the grantor and formalized by contract, which shall observe the terms of this Act, the relevant rules and bidding documents.

I - The preliminary environmental reports, environmental permits, environmental impact reports, contracts, inspection reports and audits and other documents relevant to the process of forest concession will be available via the World Wide Web, without prejudice to art.25 of this Law.

Article 8 - The publication of the invitation to bid for each lot of forest concession, should be preceded by public hearing, by region, held by the managing agency, under the Regulation, without prejudice to other forms of public consultation.

Article 9 – Is eligible for awarding the management units under Annual Plan of Forest Concession.

Law No. 6.766/1979 - ON THE INSTALMENT OF URBAN LAND
The Federal Law 6.766/79 defines the powers of the State and Municipality on the issue of division of land. It is an important tool in the interface areas contaminated with urban development. The law does not permit the division of land in polluted areas.

The Act contains administrative regulations for the approval of projects of allotment and dismemberment (Chapter V) and for the registration of subdivision and dismemberment (Chapter VI). Through Article 12 the Municipal Government, in specific cases (Article 13), is responsible for approval. Through Article 18, approved the project, the landlord must submit it to the registration of property (the Property Registry).

Article 49 regulates the receipt of subpoenas and proven notifications (probably an important mechanism in the matter of notification to the owner and consequences related to responsibility for remediation).

The subpoenas and notices under this Law shall be made personally summoned or notified, who will sign the proof of receipt, and may also be promoted through the Registries of Deeds and Documents Registry of the District of the state of domicile of the property or who should receive them.

2.2.3 State Laws

Amazonas is one of the states of Brazil with 97% of its forest remaining intact; however, the pressures on forest resources, wildlife, fisheries and minerals have been increasing every year. To inhibit these pressures and to order the sustainable use of natural resources it is required that a permanent exercise of revision and improvement of environmental legislation is carried out to ensure this is continued.

The principles that guide the environmental agenda in the State of Amazonas are referenced in the Environmental Policy Act passed in 1982, one year after setting the National policy on Environment.

The most relevant legal framework for implementation of the environmental agenda in the State of Amazonas, are:

1. Law No. 1.532/82, which regulates the State Environmental Policy;
2. Law No. 2416/96 which provides for the Grant of License for Exploration and Processing of Forest Products and by-products;
3. Law No. 2.713/01 which provides for the Policy for the Protection of Aquatic and Wildlife Development of Sustainable Fisheries and Aquaculture;
4. Law No. 2.985/05 establishing the State Council on the Environment - CEMAAM;
5. Law No. 3.135/07 which provides on Climate Change, Environmental Conservation and Sustainable Development;
6. Law No. 3.167/07 which provides for the State Policy on Water Resources and Management System of Water Resources;
7. Law No. 3.219/07 which provides for the Environmental Licensing.

This is the basic regulatory framework that is associated with other legislation (decrees, codes, Precedents, Resolutions, Ordinances and Regulatory Instructions) defined under the National Environmental System (SISNAMA). SISNAMA provides the legal basis to support the operationalization of the actions of control, surveillance and environmental monitoring.

Of these laws, No. 3.135/07 is the one that underlies this project, especially in relation to sections IV and VI, which refer, respectively, to the encouragement of initiatives and projects, public and private, that favour obtaining resources for the development and creation of methodologies that certify or 'to be certified' a net reduction of greenhouse gases, and the guidance, encouraging regulation at State level, the operation of the Clean Development Mechanism (CDM) and other projects to reduce net emissions of greenhouse gases and/or reducing emissions from deforestation (RED) within the State of Amazonas, including the Designated National Authority or other competent decision-makers.

2.2.4 Relevant and Supporting Documentation

The following documents underlying this project are available in Annexes 4, 5, 6 and 14:

- Term partnership agreement for the revision of Master Plan;
- Master Plan of the Municipality of Borba
- Signed agreement numbered 473531-1333-610, signed 7th June 2010;
- Law 10.257/2001;
- Law 9.985/2000;
- Law 6.766/1979;
- Law 1.532/1982;
- Law 2.416/1996;
- Law 2.713/2001;
- Law 2.985/2005;
- Law 3.135/2007;
- Law 3.167/2007;
- Law 3.219/2007;
- Legal Review Summary Document.

2.3 Carbon Ownership

As most of the municipal area is membership of the Union, the description of legal titles to land are the result of marking the chain of ownership, the property referenced by government legal, constitutionally protected.

Below, the map highlights the headlines are referenced by points in green, named private lands. Those with land demarcation on the property are legally recognized in the chain of ownership titling in Borba.
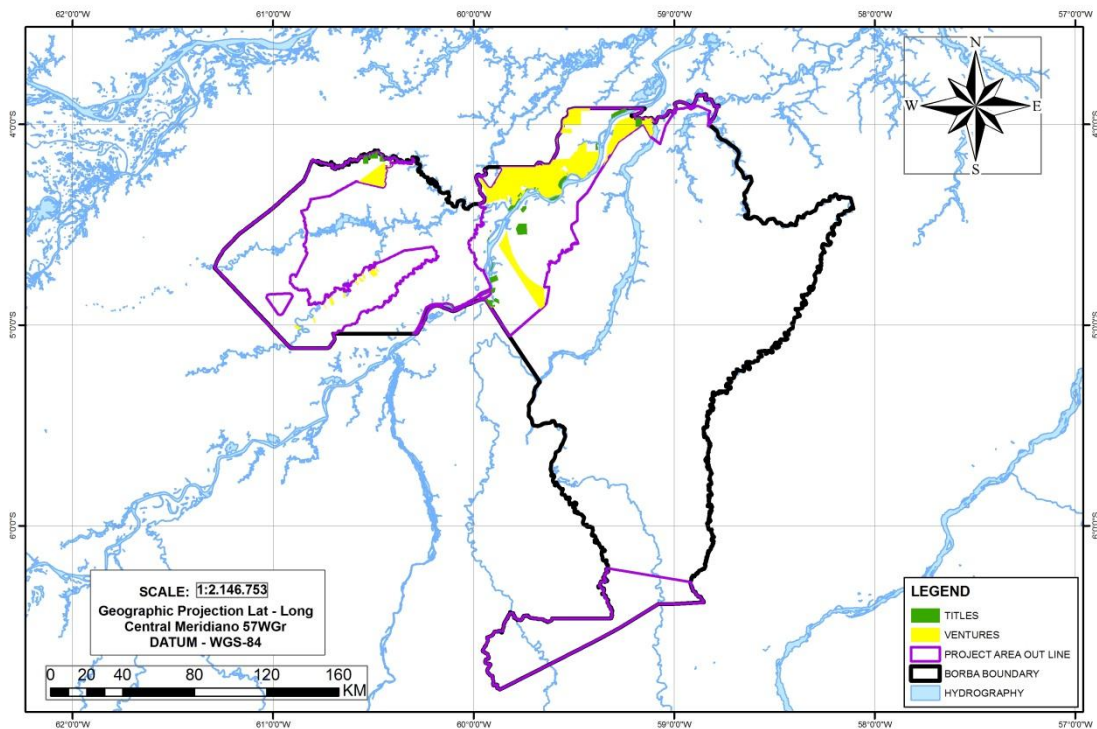
Map 3 - Characteristics of private ownership of the project area.
Source: IAL, 2012.

The traditional population of the Amazonian region, due to their historical relationship with the land, take the responsibility of the land to themselves even before being considered legal owners of the area. This happens and it is acknowledge by the Brazilian legislation. This situation is known as "usucapião", a law instrument that exists and it is valid. This PDD acknowledges the existence of that, which means that this form of occupation of the land in the Amazon was taking into account by the researchers that wrote this document.

The managing system of the municipalities of the State of Amazonas can provide documents to people that show an interest in developing activities of land use. In the ownership legal system, these documents are not considered valid, but are the only documents available. In Borba, people who have this type of land ownership are located within INCRA settlements, within the legal area of this project, which allows considering those ownerships in the PDD.

Landowners that have ownership rights of land in Borba represent around 6% of the total of the areas within the project. Although they do not develop activities that might be harmful for the land use in general, they are contemplated by the PDD as people that will be contacted to get to know the project and give their feedback. That feedback will contribute to have a better understating of which social actions might help mitigating the effects of global environmental changes.

In Brazil, the land use rights are determined by the possession of the land. Examples are the inaugural Indigenous Lands, issued Titles by the municipality to traditional inhabitants and

the determinations of municipal laws, state and federal. So many land titles secured certain rights, such as the construction and sale of goods in the area, but depend on the provisions of municipal laws as the Master Plan to define the types of uses. Thus, the contract agreement ensures, through the commitment of the revisions to the Master Plan (see below), the rights of the carbon credits are designated to Celestial Green Ventures PLC.

The full amount of the carbon contained in the coverage areas of the project correspond to the Celestial Green Ventures PLC[1], which were transferred by the municipality of Borba, as stated in the document of agreement signed on 7th June, 2010, recognized by the numbering 473531-1333-610 (see Annex 13a-f) and as confirmed as legal in the legal review (Annex 14).

Those responsible for managing the activities proposed in this project say that all aspects of the project will positively comply with all laws applicable to such activities was confirmed by a comprehensive review to date of submission to validation.

2.3.1 Carbon rights

The agreement signed between the Municipality of Borba and Celestial Green Ventures PLC clearly grants the full legal and beneficial rights to all and any carbon credits that can be certified in relation to the land in question for the full term of the 30 year contract period (see Annex 13a-f). As the contract is directly held with the Municipality of Borba, the official partner in the project, this has the backing of the Municipal Governments legal approval, and confirmed as legal as per the official legal review (Annex 14).

On the 25th June 2011, the contract signed between CGV and the Municipality of Borba was implemented into a revision of the Participative Master Plan of Urban Development of the Municipality of Borba (Article 132 – Municipal Law number 048/2006 – GPMB).

This revised Municipal Law states that the planned project and land use in the Municipality of Borba will be implemented with the revision of Participative Master Plan from the Municipal government established by Borba for this project, which will be submitted to all areas, both within the federal as the state and individuals. This review is possible based by the Law 10.257/2001, the City Statute, which determines the path to be followed by the municipality to ensure compliance with its function of ensuring the public welfare from investments to generate the signed contract rights carbon. This amended Master Plan is presented in the Supporting Document section of this PDD, in original Portuguese and translated to English.

This review is in relation to the agreement between the Municipality of Borba and Celestial Green Ventures PLC, agreement number 473531-1333-610 (see Annex 13a-f), transferring the rights to carbon credits for the Celestial Green Ventures in the project areas outlined in

---

[1] The contract was signed between the Municipality and Celestial Green Ltd, a wholly-owned subsidiary of Celestial Green Ventures.

this PDD. The municipality, within their legal obligations, should present a comprehensive Participative Master Plan that is consistent with social reality and this amendment ensures that the benefits coming from the increase in the forest reserves of carbon and the sustainable management and conservation of the forests will result in improvements in the quality of living for the population of the Borba Municipality. The benefits distribution mechanism is discussed in section 3.8 of this PDD.

2.4   Additionality

Additionality refers to the degree of success of a project to increase environmental services, compared to the scenario without the proposed activities for this project. This is not unique to environmental additionality; indeed, it is relevant in providing additionality to other fields and provides fundamental enhancements to both social science and biodiversity. In this context, the positivity of this project is situated, primarily, from finance to residents of the towns affected by the activities proposed by the project in this document, and the offsets generated as a result of implementing the requirements of the Natural Forest Standard. By promoting better governance of the residents in relation to their environment and moreover, through practical activities organized in the field will be a way of encouraging more sustainable activities for the cultivators in the territory best of appropriating their land, decreasing the affects related to the environment as it rises and strengthens their relational closeness with nature.

2.4.1   Demonstrating additionality

The additionality of the Trocano project is a consequence of the application of the Natural Forest Standard (NFS). The activities that are discussed in this document are a result of implementing the requirements of the Natural Forest Standard and would not have been implemented had the requirements of the Standard not been in place. The NFS has allowed the Trocano project to implement 3 broad-based project activities that will all result in additionality within the project area as a whole. The main activities that are to be considered additional are:

- Providing socio-economic enhancements by way of the benefits distribution mechanism requirement of the NFS;
- Providing biodiversity protection and quantification by way of the Normative Biodiversity Metric of the NFS;
- Providing reduced emissions through avoided deforestation and forest degradation by implementing effective Management and Monitoring Plans, plus the activities described above, as prescribed in the NFS.

By using the requirements of the NFS, the Trocano project is able to incentivise the local communities to adapt their current behaviours in a beneficial way with regards the environment, socio-economic enhancements and biodiversity protection. By providing an offset mechanism that will both incentivise and reward these changes in behaviour, the project is able to provide and prove additionality in all three of these sectors. Without the

revenue that will be generated from the carbon offsets gained by the project through implementing the NFS within the Trocano project, the benefits that will be available to the project area would not be possible.

2.4.2 Identified threats to the project area

Using the ACEU risk model, the risk of deforestation to the project area has been identified, and the agents of deforestation have been discussed and presented in further detail in section 4.3; current threats to the project area have been identified and discussed in section 6.1. This information is summarised below:

Identified threats to the project area:
   a. Accessibility via road and river
   b. Expansion of livestock farming and cattle ranching
   c. Loggers, squatters and settlers

Direct agents of deforestation:
   a. Timber accessing:
   b. Small-scale farmers
   c. Residents of traditional communities (riparian)
   d. New developments of urban occupations

Indirect agents of deforestation:
   a. Dealers who work in communities and in the town
   b. Distributors of products coming from big cities like Manaus, Porto Velho and Santarém.
   c. Small service providers, such as bakeries and small furniture factories and other wood products of this genre.

2.4.3 Activities for minimising deforestation

Project implementation focuses on activities that are intended to mitigate deforestation, such as local capacity-building for sustainable land use and participation in the project. Deforestation will be mitigated through these project activities being conducted in the project area as the activities focus on educating and engaging the local communities and inhabitants in the protection and conservation of the natural forests and building local capacity for sustainable land-use practices and improving the quality of life in the project area through participative actions.

By providing the project area inhabitants with the opportunity to benefit from protecting their habitat through adopting sustainable and alternative ways of utilising their natural resources, it is the project itself that will act as an activity for minimising deforestation. The project should have a positive impact on the areas adjacent to the project area, due to the significant reduction in deforestation that is associated with implementing forest protection mechanisms.

This is primarily instigated through the contract that is signed between the project developer and the Municipality, which states that the land within the project area must be maintained in its natural state, that it cannot be subject to any activity that would have a negative effect on the generation of carbon benefits and that the Municipality must maintain all forestry, rivers, flora, fauna and indigenous groups in their natural state (See Annex 13).

With the contract in place, it is fundamental to the planned intervention of the threats to deforestation in the project area that activities that will be direct deforestation mitigation actions are implemented and is essential to the success of the project. These activities include the following:

- Development and implementation of effective management plan;
- Provide viable sustainable and economic alternative practices to project area inhabitants;
- Strengthening of Local Forest Protection;
- Incentivise local communities to adapt their current behaviour;
- Incentivise and reward changes in behaviour;
- Capacity-building and environmental awareness;
- Participation in project implementation, through monitoring, management, conservation and other activities;
- Participation in project-related training;
- Environmental Education Programme;
- Raising civic pride of the natural forest.

As local people are generally unaware of other forms of land use and the value of the natural resources of the place, the tendency is that the devastation continues to increase in the project area. Addressing the underlying deforestation drivers and providing education on sustainable and economic alternatives to local community members, is relevant to achieving the objective of the project, which is to reduce emissions from avoided deforestation, by reducing the communities dependence on the forest resources through sustainable practices and education about the effects of deforestation and the benefits of protecting their habitat.

Some alternative and sustainable activities that promote the mitigation of deforestation and reduce the possibility of leakage from displaced activities have been identified as follows:

i. Training in appropriate regional practices;
ii. Course in basic guide tourism, with courses in basic English, French and Spanish;
iii. Incentive production with home-gardens;
iv. Encouraging the practice of actions with emphasis on economic sustainability and maintenance of the cultural characteristics of societies in the municipality;

v.   Training of the communities residents involved to act as forestry and environmental agents, developing inventory and monitoring activities;

vi.   Training course on environmental education agents already exist.

Mitigation actions with reference to mitigating deforestation in the socioeconomic context in the project area should be performed to ensure that all project participants and inhabitants are fully aware of the project, its activities and benefits. It will important to ensure that any identification of deforestation is investigated and the following information is known:

a)   Origin of the community – whether rural or urban and agricultural activities had experience with;
b)   Education level of the community covered by the project;
c)   Socioeconomic context in the areas covered by the project;
d)   Participation of the active population in the production system, and
e)   Weakening of infrastructure for production, such as the existence and condition of roads for production transportation, availability of water for agricultural activities and household supplies, access to electricity and housing.

After characterising these causes, mitigation tends to occur with improved quality and access to social services in health and education, the structure of production, access to financing, the expansion of agricultural income and outside the agricultural production system.

To fight poverty in the project area, it is necessary to link policies to stimulate economic growth and better income distribution. For this, the carbon sequestration project should emerge as an alternative for generating social gains among the population of the Trocano project area.

2.4.4   Risk of Future Deforestation

The risk of deforestation to the project areas can also be demonstrated within the CGV Geospatial Platform. The risk layers have been developed to show the risk of deforestation to the project area and are the result of applying the risk-based methodology developed in accordance with the Natural Forest Standard (NFS AM001.0). The methodology does not provide a prediction of future forest loss but assigns relative risk values, based on the ACEU criteria, as set out in the NFS. This NFS AM001.0 Methodology will be found in full in Annex 9 of this PDD and on the NFS website.

This extent/coverage of these data layers extends to the Legal Amazon Forest region. Further information regarding the risk of deforestation associated to the project area can be found in section 6.2 of this document.

By applying the Natural Forest Standard to the Trocano project, it will mean that the areas at identified as being at risk of deforestation, as demonstrated within the risk layers on the Platform, will be significantly decreased within the project area, through applying the project activities to the Standard requirements.

2.4.5 Socio-economic Additionality

In order to find ways of coping with the increased financial difficulties encountered in Borba Municipality, the mayor seeks the partnership conducted through the agreement with CGV, a means to acquire additional resources to implement its programs for health, education, security and communication in addition to what is possible through the current budget.

With the increase in population being 111% since 1970, (103% since 1991), and the actual number of inhabitants in the Borba Municipality reaching 34,961 in 2010, and a majority of this number being rural-dwellers, the pressure on the forest and its resources is high, and increasing. The IBGE estimates of population in Borba Municipality for 2012, published 31st August 2012, is already estimating the population as 35,919, showing the increase is expected to continue.
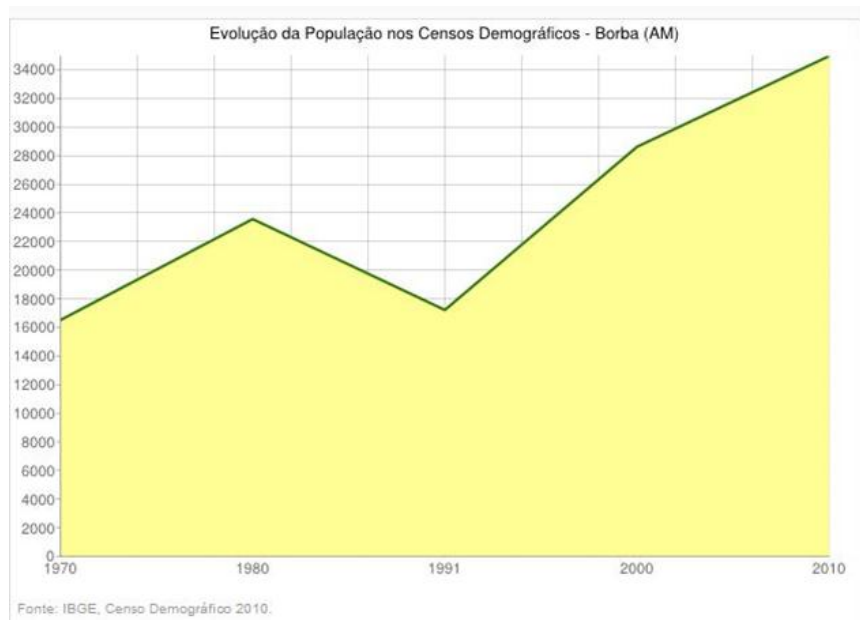
Figure 7 - Population growth for Borba, 1970-2010
Source: 2010 Census IBGE[2]

Population of Borba Municipality 1970-2010					
	1970	**1980**	**1991**	**2000**	**2010**
Urban	2,750	6,928	7,913	11,246	14,434
Rural	13,764	16,640	9,304	17,373	20,527
Total	**16,514**	**23,568**	**17,217**	**28,619**	**34,961**

Table 4 - Population of Borba Municipality 1970-2010 showing urban and rural breakdown
Sources:
2010: 2010 Census IBGE[3] 1991: Official City of Borba website[4]

Municipality of Borba				
% and actual increase in population between 1970-2010				
	1970	**2010**	**% increase**	**Actual increase**
Urban	2,750	14,434	424.87	11,684
Rural	13,764	20,527	49.14	6,763
Total	**16,514**	**34,961**	**111.71**	**18,447**

Table 5 - % increase in population of Borba Municipality from 1970 to 2010
Sources:
2010: 2010 Census IBGE (see footnote 3)
1970: Official City of Borba website (see footnote 4)

Municipality of Borba				
% and actual increase in population between 1991-2010				
	1991	**2010**	**% increase**	**Actual increase**
Urban	7,913	14,434	82.41	6,521
Rural	9,304	20,527	120.63	11,223
Total	**17,217**	**34,961**	**103.06**	**17,744**

Table 6 - % increase in population of Borba Municipality from 1991 to 2010
Sources:
2010: 2010 Census IBGE (see footnote 3)
1991: Official City of Borba website (see footnote 4)

The project will be able to offer opportunities of alternative and sustainable ways of living for the inhabitants to protect and conserve the forest, plus through the project activities there will be opportunities of employment, education (both academic and environmental) and through project participation it will encourage and promote the benefits of conserving the forests in which such a large number of inhabitants rely on.

All waste from headquarters and communities present in the municipality of Borba has no management plan. Thus, the funds from compensation benefits established from this project will contribute to the deployment of the management of these wastes.

---

[3] http://www.censo2010.ibge.gov.br/en/
[4] http://www.prefeituradeborba.am.gov.br/

With the significant increase in population, there is an increased burden on the Municipality with difficulty in supplying health infrastructure and education, transportation available to those essential services are most often presented as disabled. The proceeds from this project will also contribute significantly to the improvement of services such as the example of the services of mobile health units with the increase of boats for this purpose. Currently, there are two such units available to the entire municipality and may be extended with the features of this design for over five units in two years.

There is also the pressure from the increase in demand for livestock. From 1990 to 2007, the number of cattle went from 1,795 to 5,699, according to data from the National Confederation of Municipalities (CNM, 2010).

	2000	2001	2002	2003	2004	2005	2006	2007
Bovino	1.795	1.848	1.912	1.941	2.057	2.118	2.192	5.699
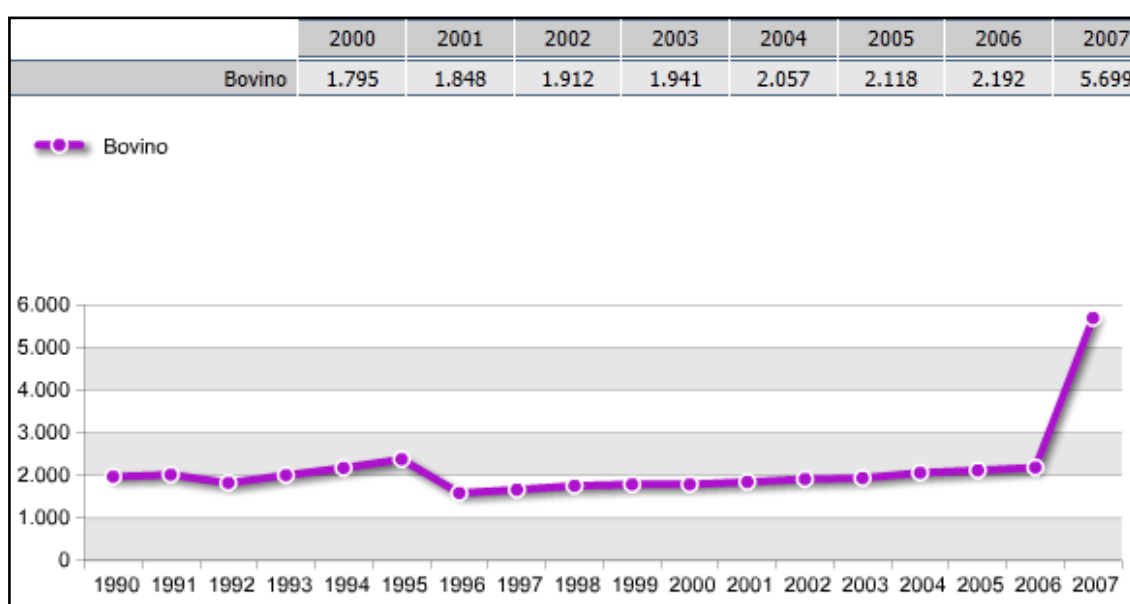
Figure 8 - Graphical representation of the growth of herd in Santo Antônio de Borba
Source: IBGE and CNM, 2010.

The expansion of livestock in the municipality of Santo Antônio de Borba has increased the rate of carbon emissions in the atmosphere, affecting the balance of local ecosystems. Therefore, mitigating alternatives should be pursued and implemented in order to prevent further deforestation caused by the cultivation of grass for grazing. This expansion was due to the increase in meat prices, which varies according to trade fluctuation. From the second half of the decade, meat had its price increased in the market, as well as soybeans and oil, while the executors of the modes of production continued with their activities without caring much about the environmental liabilities left as a result of the extensive trading of these products.

2.4.6   Biodiversity Additionality

An indicator of additionality refers to the proposed inventory, which will lead to the identification and monitoring of different species of fauna and flora, especially animals of

large tracts of forest in order to understand the weaknesses of the same, providing an indication of actions and activities priority. Most additionality will undoubtedly refer to the interfluves Canumã River / Abacaxis River with the characterizations of their species, contributing to the preservation of the environment, decision making and planning activities with the data and information generated. The project will update municipal official plans of land, both urban and rural.

With the benefits of avoided deforestation, the infrastructure of health services and education will have significant improvements.

The implementation of monitoring and reporting system will benefit the communities involved through Internet access and system of internal and external communication.

2.4.7   Restoration activities
As there are currently no planned restoration activities in the project, there is no requirement to address the legal or additional requirements of this in this PDD.

2.5   Timescale
The project activities began in 2010, more exactly from 07/06/10, with the signing of the contract between the Celestial Green Ventures PLC and the Municipality of Borba. The length of the contract is 30 years, with the initial length of the project and crediting period being 20 years. Although this agreement has a specified end date, it is the expectation of the project that after this time, the structures, procedures and mechanisms that will have been implemented throughout the 30 years will be adopted by the Municipality and communities for the long-term and will therefore continue to create benefits to the environment, the communities and the biodiversity long past this date.

It is estimated that the total carbon at risk within the project areas during this 20 year crediting period is 65,708,138 tC. These calculations have been generated using the ACEU risk layer data of the Geospatial Platform and are discussed in further detail in Sections 5, 6 and 7 of this document. The source information for these calculations can be viewed via the Geospatial Platform.

SECTION 3 – GOVERNANCE, SOCIAL AND BIODIVERSITY IMPACTS

3.0   Introduction
The Natural Forest Standard requires projects to apply the principle of FPIC and to have an effective benefit distribution mechanism. Described below are how these requirements of the standard are incorporated into the project and how the social safeguards and benefits mechanisms will be put into practice within the existing parameters.

3.1   General Information for the Borba Area
The municipal seat comprises the largest population density, with typical urban structure. However, this area will not be part of the project area but within the project zone as an area of influence.

At the headquarters of the municipality are installed hospitals, schools and other services to serve the public, however, in communities such services are limited and mostly non-existent. During visits by the team preparing this PDD to communities in the project area, it was observed that where there are schools and / or basic health units, the services available to the inhabitants of these areas as Internet access, for example, are associated these structures.

According to the Municipal Secretary of Education in 179 schools in Borba's activity, of which seven are located in the town while attending the 172 rural communities and 44 of these are part of the indigenous areas, 128 schools include other non-indigenous villages where 35 of them have the equipment for Internet Technology project of distance education and less than half is located in the project area where there are 105 communities, but this internet service is not available to the school, only the service meets the Technological project. Schools located in the project area rely on the work of 146 teachers which gives an average of two teachers from each school to serve about 100 students. Only 15% of these teachers have higher education. School transport meets 100% of the municipality of Borba, however, as noted by the team preparing the PDD, security conditions and adaptation of vehicles does not meet the minimum standards required. The city spends monthly about R$78,000 for the purchase of fuel used in school transport, excluding the cost of rent and maintenance of vehicles.

What is observed in communities in relation to cultural values is the result of an adaptation of the cultures of origin of their constituent groups. Among them are the descendants of these groups of migrants from the northeast Brazilian economic period of rubber, mainly from the indigenous ethnic Mura, and small numerical scale, but of great influence in the customs, the descendants of the founders of the town of Borba.

3.1.1 Population and Community

According to the IBGE census data (2010) the municipality's population currently is 34,961 inhabitants. As the National Confederation of Municipalities (CNM), Borba's population lives mostly in the rural area. According to surveys conducted by the technical work of IDAM, beyond the county seat, about 260 communities in Borba.

Number of communities inside the Project area	107 *	People inside the Project area	~ 10,700 inhabitants
Number of communities affected by the project	~ 150	People affected by the project	~ 15,000 inhabitants
Total number of communities in the Municipality	260*	People living in the municipality	34,961 inhabitants**

Table 7 - Population of the Project area
Sources: *IDAM 2010 and **IBGE 2010

The 2010 population can be divided in urban and rural as shows the following graphic.
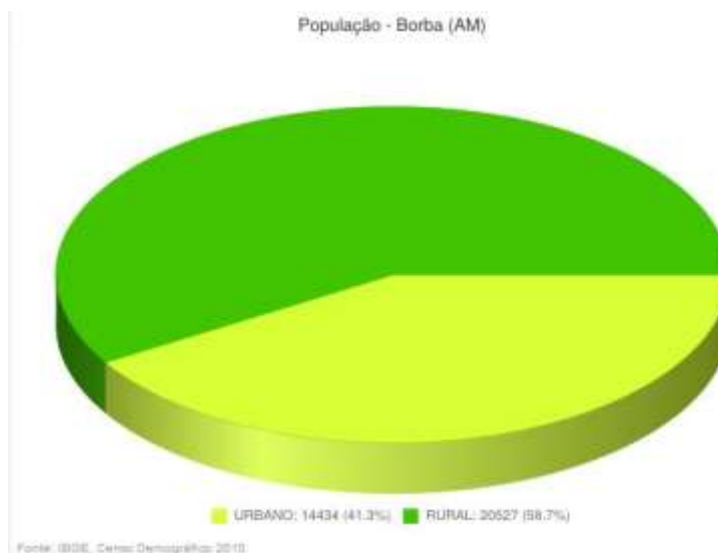
Figure 9 – Distribution of population in Borba
Source: IBGE, 2010.

Of this population, inhabit the project area 105 communities as described in Table 3 below, excluding the communities located in indigenous areas. Since 2010 when the IDAM data was collected, the number of communities within the project area has fallen from 107 to 105, due to occupation movements in the area. The map below shows an illustration of the communities present in the project area. The area of the project, which consists of the area and its surroundings, is diversified with the presence of ethnic Indian and Mura Satere-Mawe, and shifting cultivators of traditional riverine families, extractors and farmers.
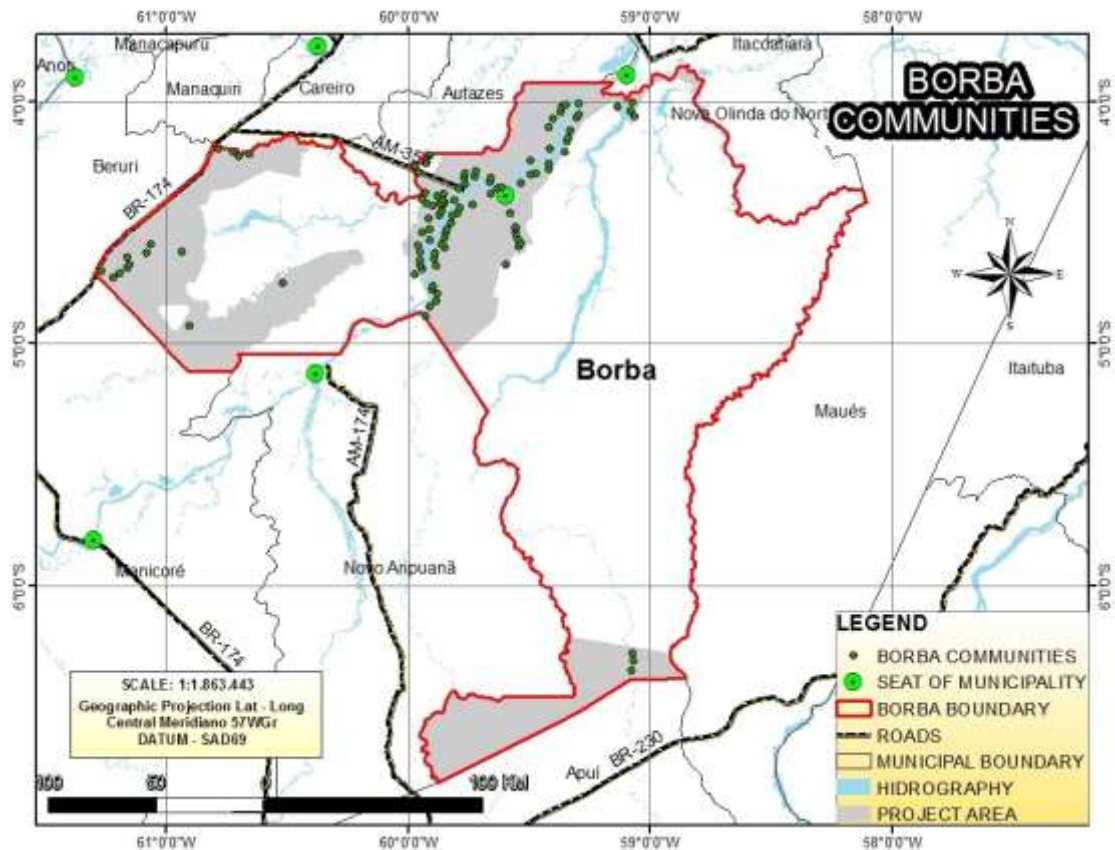
Map 4 – Communities Localization involved with the project
Source: IAL, 2012

The indigenous population residing in the municipality of Borba is formed mostly by ethnic Mura. In relation to this ethnic, according to a survey of the Socio-Environmental Institute (ISA, 2011), Mura occupy vast areas of the complex waterways of the rivers Madeira, Purus and Amazonas. They live in both indigenous lands and in surrounding communities, as well as in regional urban centres such as Borba, Manaus and Autazes.

Nº	Name	Place	Numbers of families	Total Population	Electricity for all (yes/no)	Internet (yes/no)	School (yes/no)	Basic unit of health (yes/no)	Educational /health (yes/no)	Catching of water (well/water box)
1	Miripiti	PAE	-------	---------	No	No	Yes	No	No	River
2	Ponta Grande	No information	-------	---------	--------	--------	-------	-------	--------	-------
3	Sacaí	No information	-------	---------	-------	-------	-------	-------	-------	-------
4	Ponta da Areia	No information	-------	---------	-------	-------	-------	-------	-------	-------
5	Espírito Santo	Paraná do Jacaré	27	135	No	No	Yes	No	No	River
6	Vila Isabel	Paraná do Jacaré	32	262	No (motor)	yes(technological)	Yes	No	Yes	Poço
7	Porto Figueira	Madeira River	4	32	No	No	Yes	No	No	River
8	Boca do Laguinho	No information	-------	-------	-------	-------	-------	-------	-------	-------
9	Bom Jesus	Madeira River	10	83	No	No	No	No	No	River
10	Santo Antônio	Madeira River	10	72	No	No	Yes	No	No	River
11	Porco	No information	-------	-------	-------	-------	-------	-------	-------	-------
12	Pororoca	No information	-------	-------	-------	-------	-------	-------	-------	-------
13	São Joaquim	Madeira River	20	173	No	No	Yes	No	No	River/ caixa
14	Copaíba	Mapiá River	5	46	No	No	Yes	No	No	River
15	Tauari	No information	-------	-------	-------	-------	-------	-------	-------	-------
16	Floresta	Madeira River	15	133	No	No	Yes	No	No	River/ caixa
17	Patauá	No information	-------	-------	-------	-------	-------	-------	-------	-------
18	Santa Maria	Carapanatuba	15	148	No	No	Yes	No	Yes	River/ caixa
19	Catarina	Mapiá River	12	91	No	No	Yes	No	No	River
20	Nova Vista	Urariá	-------	---------	-------	-------	-------	-------	-------	-------
21	Terra Pretinha	Madeirinha River	6	50	No	No	No	No	No	River
22	Arapapa	Madeira River	22	88	No	No	Yes	No	No	River

23	Santa Marta	No information	-------	-------	-------	-------	-------	-------	-------	------
24	Terra Preta Felicidade	Mapiá River	21	127	No	No	Yes	No	No	River
25	Itaúba	No information	-------	-------	-------	-------	-------	-------	-------	------
26	Cantagalo	Madeira River	13	47	No	No	Yes	No	No	River
27	Arapara	No information	-------	-------	-------	-------	-------	-------	-------	------
28	Saco	No information	-------	-------	-------	-------	-------	-------	-------	------
29	Retiro	Madeirinha River	19	97	No	No	Yes	No	No	River
30	Fortaleza	No information	-------	-------	-------	-------	-------	-------	-------	------
31	São Benedito do Arapapá	Madeira River	9	48	No	No	Yes	No	No	River
32	Ponta Alegre	Madeira River	35	161	No (motor)	No	Yes	No	No	Poço
33	Vera Cruz	No information	-------	-------	-------	-------	-------	-------	-------	------
34	Miriti	No information	-------	-------	-------	-------	-------	-------	-------	------
35	Nossa Senhora Aparecida	Paranã do Urariá	12	93	No	No	Yes	No	No	River
36	São João e Santa clara	Madeirinha River	24	90	No	No	Yes	No	No	River
37	Santo Antônio do Bruno	Madeirinha River	6	38	No	No	Não	No	No	River
38	Piabinha	No information	-------	-------	-------	-------	-------	-------	-------	------
39	São Francisco	No information	-------	-------	-------	-------	-------	-------	-------	------
40	Alexandre	Madeira River	35	162	No	No	Yes	No	No	Poço
41	São Felipe	No information	-------	-------	-------	-------	-------	-------	-------	------
42	Terra Preta	No information	-------	-------	-------	-------	-------	-------	-------	------
43	Timbó	Paranã do Mandí	3	22	No	No	No	No	No	River
44	São Francisco	No information	-------	-------	-------	-------	-------	-------	-------	------
45	Awará	Madeira River	30	150	No	No	Yes	No	No	River
46	Nossa Senhora	No information	-------	-------	-------	-------	-------	-------	-------	-------

	da Conceição									
47	São Bento	No information	-------	-------	-------	-------	-------	-------	-------	------
48	Boa Lembrança	No information	-------	-------	-------	-------	-------	-------	-------	-------
49	Santa Helena/ Guaribinha	Madeira River	22	78	No (motor)	No	Yes	No	No	Poço
50	Puxurizal	PA	112	267	Yes	No	Yes	No	No	Cacimba
51	Jacarezinho	No information	-------	-------	-------	-------	-------	-------	-------	-------
52	Iracema	No information	-------	-------	-------	-------	-------	-------	-------	-------
53	São Sebastião	No information	-------	-------	-------	-------	-------	-------	-------	-------
54	Terra Preta	No information	-------	-------	-------	-------	-------	-------	-------	-------
55	São Sebastião do Jauari	Madeira River	6	45	No	No	No	No	No	River
56	Chumbo	No information	-------	-------	-------	-------	-------	-------	-------	-------
57	Santa Ana	Madeirinha River	20	83	No	No	No	No	No	River
58	Santa Clara	Madeirinha River	20	141	No	No	Yes	No	No	River
59	Santa Rita	Trocanã	12	92	No	No	Yes	No	No	Poço
60	Belo Horizonte	Boca do Madeirinha	5	56	No	No	Yes	No	No	River
61	Nova Alegria	No information	-------	-------	-------	-------	-------	-------	-------	-------
62	Sempre Viva	MadeirinhaRiver	36	175	No	No	Yes	No	Yes	Poço
63	São Benedito	No information	-------	-------	-------	-------	-------	-------	-------	-------
64	Acará	Madeira River	5	38	No	No	Yes	No	No	River
65	Barreirinha	No information	-------	-------	-------	-------	-------	-------	-------	-------
66	Novo Remédio	No information	-------	-------	-------	-------	-------	-------	-------	-------
67	São José	Madeira River	29	119	No (motor)	No	Yes	No	No	River
68	São João	No information	-------	-------	-------	-------	-------	-------	-------	-------
69	Costa do Ipiranga	No information	-------	-------	-------	-------	-------	-------	-------	-------

70	Castanhal	Madeira River	27	122	Yes	No	No	No	Yes	River/ caixa
71	Bonfim	Madeira River	3	16	No	No	No	No	No	River
72	Pouso Alegre	No information	-------	-------	-------	-------	-------	-------	-------	------
73	Terra Preta	No information	-------	-------	-------	-------	-------	-------	-------	------
74	Cariri	No information	-------	-------	-------	-------	-------	-------	-------	------
75	Frechal	Madeira River	17	93	Yes	No	Yes	No	No	River/ caixa
76	Boa Esperança	No information	-------	-------	-------	-------	-------	-------	-------	------
77	Suaçú	Madeira River	6	52	Yes	No	No	No	No	River
78	São Sebastião	No information	-------	-------	-------	-------	-------	-------	-------	------
79	São José	No information	-------	-------	-------	-------	-------	-------	-------	------
80	Santana	No information	-------	-------	-------	-------	-------	-------	-------	------
81	São Roberto	No information	-------	-------	-------	-------	-------	-------	-------	------
82	Caiçara	Madeira River	60	310	Yes	Yes	Yes	No	Yes	Poço
83	Limão	Autaz Açú	18	130	No	No	Yes	No	Yes	Poço
84	Torocana	Madeira River	8	75	No	No	No	No	No	Rio
85	Santa Isabel	No information	-------	-------	-------	-------	-------	-------	-------	------
86	São João	No information	-------	-------	-------	-------	-------	-------	-------	------
87	Paricá	Abacaxi River	10	75	No	No	Yes	No	No	River
88	Chaves	No information	-------	-------	-------	-------	-------	-------	-------	------
89	Piquiá	Madeira River	24	95	Yes	No	Yes	No	No	Poço
90	Volta do Timbó	No information	-------	-------	-------	-------	-------	-------	-------	------
91	Puruzinho	Madeira River	22	100	No (motor)	No	Yes	No	No	Poço
92	Guariba	Madeira River	75	302	Yes	No	Yes	No	No	Rio
93	Fortaleza	No information	-------	-------	-------	-------	-------	-------	-------	------
94	Nova Fazenda	No information	-------	-------	-------	-------	-------	-------	-------	------
95	Rio Branquinho	Tucunaré River	30	158	No	No	Yes	No	No	Rio
96	Perseverança	No information	-------	-------	-------	-------	-------	-------	-------	------
97	Castanha	No information	-------	-------	-------	-------	-------	-------	-------	------

98	Anumaã	Madeira River	25	122	No	No	Yes	No	No	Rio
99	Axinim	Madeira River	302	1.218	Yes	Yes	Yes	Yes	Yes	Poço
100	Canumã	Canumã River	362	1.730	Yes	Yes	Yes	Yes	Yes	Poço
101	Porto Paraíso	No information	-------	-------	-------	-------	-------	-------	-------	-------
102	Santa Luzia	Madeira River	10	55	No	No	Yes	No	No	Rio
103	Ararunim	Madeira River	18	66	No	No	Yes	No	No	Rio
104	São Sebastião	No information	-------	-------	-------	-------	-------	-------	-------	-------
105	São José	No information	-------	-------	-------	-------	-------	-------	-------	-------

Table 8 – Communities present in the project area
Source: IAL, 2011

Further information on the Economy of Borba can be found in Supporting Documentation section.

3.2 Project Governance Structures and Procedures

The governance structure of the Trocano Araretama Project will be constituted by the Project Management Council. This council will have the main function decide which are the priority projects among those approved ones by the communities, to be accomplished from the fund raising to benefit the population of the project area always prioritizing the principles of FPIC.

The process of decision-making established and developed during the preparation of the Trocano project, based on the principle of good governance, which has as main features the participation-oriented consensus, accountability, transparency, responsiveness, satisfactory effectiveness and inclusion. At all times this follows the rule of law. All meetings and agreements between the City, residents, landowners and traditional and indigenous communities located within or outside of the project area, associations and institutions of organized society along with the company CGV were developed using these principles.

According to the previously presented on the laws that govern and guide land use, forests and the environment in general, governance will be applied in compliance with legal guidelines. The Project Management Council that will manage the resources and activities of the project has transparency, which means that decisions taken and their applications will be made in order to follow rules and regulations for the information and decision making are informed and are available to all stakeholders.

The implementation of the Project Management Council of the Municipality of Borba, follow the following steps:

1. Administration of members of the Management Council.
2. Approval of goals for the objectives of the Project Trocano.
3. Election and Engagement of the Co-ordination Council Manager.

The Trocano project will be governed by the Project Management Council, formed for the purposes of:

- Co-ordinating, implementing and governing the project activities;
- Establishing and maintaining the management and monitoring plans;
- Facilitating the consultation and communication process and benefits mechanisms.

This board will consist:

i. One representative of Celestial Green Ventures PLC;
ii. One representative of the Institute Amazon Livre;
iii. One representative of the Municipality of Borba;
iv. One representative of the community leaders;
v. One representative of the public ministry by the prosecution in the county;

vi. One representative of the association of agricultural producers in the municipality;

vii. One representative of the association or society techno-scientific strictly on the issues involved in forest carbon.

The main functions of the Project Management Council (PMC) shall be:

• Assessment and approval of the projects presented;
• Co-ordinating grievance process and decision in last resort in resolving conflicts;
• Drafting of Annual Report of conflict resolution;
• Drafting of the annual plan of work;
• Supervision of the Management Plan for the project;
• Supervising the monitoring plan for the project;
• Administration and distribution of benefits through applied mechanism (see below);
• Assessing Social Impact and community and economic benefits;
• Feedback and consultation to and with communities included in the project area.

This Council will function as the main decision-makers as to what are the priority projects and activities to be executed from the acquisition of resources to benefit the population of the project area. They will also ensure the implementation of the plan of action does not usurp in land use system or any of its legal prerogatives. The Council will act transparently, so that the decisions taken and their applications will be made to follow the rules and regulations. The information will be made accessible to all interested parties.

This Council will collectively decide which main function are the priority projects to be run from the fund to benefit to the population of the project area through clear and appropriate consultation with the project participants.

For the distribution of benefits obtained from the carbon credits generated from the project, the Management Council will establish a Council Manager. The proposals for benefit distribution will be presented to the Management Council. Proposals that are submitted must be in accordance with the objectives of the Trocano Project and will be evaluated by Trocano indication of the Management Council. Proposals with a budget greater than R$50,000 must be approved unanimously by the quorum of the meeting. Proposals from R$30,000 to R$50,000 shall have a majority of two thirds in the quorum for its approval. Proposals less than R$30,000 only require a simple majority.

In the first two years of implementation of the Management Council, the minimum number of meetings for evaluation and determination of projects will be 4 (four). In the following years can be reduced to two (2) per year. Once a year, the General Assembly will have to meet to review the Annual Work Plan of the Project Trocano.

The procedure of decisions will follow the provisions made by the Management Council, where discussions will be conducted by the Coordinator and will occur through the

democratic process. The principles of good governance will be followed and will encourage participation from the local communities for input appropriately.

The PMC will report directly to the project proponents on an annual basis giving full and clear assessments of:

- Social Performance Indicators
- Dispute Resolution
- Carbon Stock Monitoring Activities
- Biodiversity Monitoring Activities

3.3 Management Plan

This Project Design Document has been written and produced as the Management Plan of Trocano Araretama Conservation Project and shall be maintained as a living document throughout the duration of the project. It has been developed in conjunction with the communities that are part of the project area; for technical issues researchers with experience in the region and technical researchers from government agencies such as UFAM, IFAM, ITEAM and INPA were also used. As will be discussed in section 3.8, questionnaires were used during the initial data collection and subsequently submitted to the approval of the proposed activities themselves involved with the project.

The Project Management Council is responsible for the supervision and implementation of the management plan and for the effective execution of the processes and procedures identified and will follow the governance structures, processes and procedures that have been identified and outlined herewith. The Management Plan (identified and agreed by all senior project staff as this Project Design Document) will be an internal document that will be maintained and agreed by the senior project staff. It will be available in electronic format to all through the Celestial Green Ventures and Institute Amazonia Livre websites, for viewing and downloading by any interested or involved parties. It will be the ultimate responsibility of the Celestial Green Ventures Head Office team to keep this document maintained, however a central amendments log will be provided to all senior project staff, to make suggestions of amendments that occur throughout the year, with an annual review, discussion and agreement on any appropriate or necessary amendments that are identified. Please see section 3.3.6 for further information.

3.3.1 Management Plan Aim

The Trocano Araretama Conservation Project's primary objective is to mitigate GHG emissions through avoided deforestation, and includes the conservation of the natural forest ecosystem, to protect the endangered habitat of the Indigenous Tribes and other communities and biodiversity protection of both the plants and the animals which are reliant on this vulnerable habitat. The additional aim is to provide the local communities with enhanced socio-economic situations, through their involvement in the project, its activities and its objectives.

3.3.2 Management Plan Objectives

The objectives of the project and its management plan are as follows:

- To avoid deforestation within the project area for the duration of the project.
- To categorise the risk of deforestation to the project area, using the ACEU rule as per the NFS AM001.0 methodology.
- To identify the area's most at risk of deforestation and implement effective protection and monitoring.

These objectives can be met through the existence of the project and through the effective management and monitoring of the area.

3.3.3 Project Activities

The project exists to avoid deforestation within the project area and to provide additional related benefits to the project area. The implementation of the project is primarily by offering communities the opportunity to take an active role in protecting their habitat and surrounding area in its natural state, and also by offering alternative and/or sustainable activities which will in turn, generate employment and income to residents of the project area, combined with protecting the forest from deforestation.

The main project activities are:
- Conservation and preservation of the natural forests of the project area;
- Biodiversity protection of the plants, animals and the ecosystem as a whole;
- Socio-economic enhancements for the local communities, including healthcare, education, employment and infrastructure improvements; and
- Data collection, including inventorising biodiversity, forest, flora and fauna.

Forest protection measures will be implemented to actively respond to any identified activity of deforestation in the project area via the monitoring system in place, and will close down any such activities as part of the project implementation measures.

There are a number of project benefits that will also be integrated within the project via the Benefit Distribution Mechanism; further detail on these is given in Section 3.8.

3.3.4 Identifying Threats

The areas identified at risk of deforestation are shown in the ACEU Risk layer of the Geospatial Platform. By identifying the threats that are present in and around the project area, and from both remote-sensing and on-the-ground monitoring, the project management team will implement an effective structure to facilitate the main project activity of avoided deforestation, enlisting the involvement of the local communities whilst also providing additional activities to these members of the project area, for them to benefit further from the implementation of the project as a whole. This is discussed in further detail in the Monitoring Plan (see section 4).

3.3.5 Implementation

The implementation of the management plan will be administered by the Project Management Council, which is detailed in section 3.2 of this PDD, and will be responsible for its successful operation and continuous development. The PMC will ensure capable sub-teams are created, trained and supervised, to implement the management plan within the project areas.

3.3.6 Maintenance, Review and Evaluation of the Management Plan

The Management Plan, as a living document, will be adapted and adjusted according to developments that occur throughout the duration of the project and any necessary adjustments will be carried out on an annual basis. It will be the responsibility of the senior members of the project to keep this internal document updated and relevant, with the ultimate responsibility of the Celestial Green Ventures Head Office team to record, store and control all amendments. This will be done using the secure internal server for secure storage of all data files.

The upkeep of the document will entail an annual general review as part of the annual reporting of the project, where any amendments that have been identified throughout the year and are deemed required will be implemented, using a central amendment log that is available to all senior project members. In addition to this, every 5 years upon re-verification the whole document will be checked for relevance, effectiveness and efficiency by the Project Management Council and any major changes will be discussed, agreed and implemented. Also the governance structures, processes and procedures that have been identified and outlined in this section of the PDD will be fully reviewed annually as part of the annual report requirement of the Natural Forest Standard.

3.4 Adhering to the Principles of FPIC

The project area is publically owned Municipal land. The Indigenous lands (TI's) that are within the Municipality of Borba are not included in the Trocano project area, as they have already adopted suitable protection of their areas and considering the legal status and forms of interactions of traditional indigenous peoples, they already present sustainable use and contribute positively to maintaining the forest. There are some private lands within the project areas and there are local communities living within the project area.

3.4.1 Establishing FPIC Requirements

As set out in the NFS, the Standard requires projects to obtain FPIC for the development of the project from the carbon rights holders and any communities living or having land use rights within the project area, whose activities will be affected or constrained by the project, or whether activities of the project significantly impact on their lands or resources.

For the purposes of establishing where FPIC was required, it is first important to establish the areas that are included in the project and the areas that are excluded from the project.

The map below demonstrates the project areas, and the TI's and RDS areas which are excluded from the project areas.
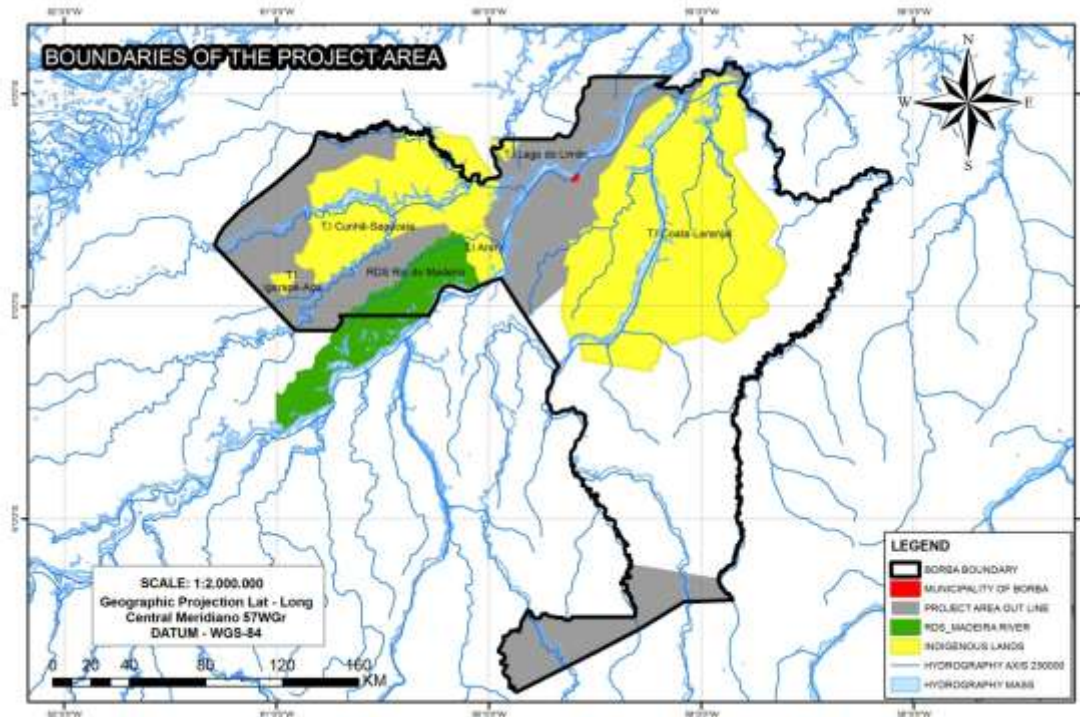
Map 5 - Project area and its limits
Source: IAL, 2011

As stated previously and illustrated in the above map, the Indigenous Lands (TI's) that are within the Municipality of Borba, are not included in the Trocano project area, and so their usual way of life will not be affected or constrained by the project and there will be no direct impact. There may be some indirect positive impacts provided through the project activities increased protection carried out in the surrounding project areas, but there will be no effect on their normal use of resources within the TI areas.

The private lands that fall within the Trocano project areas (see map below) are included in the project, but the project activities that are proposed would not impinge on the landowners usual way of life, as there are already measures in place that state their current land use rights, including the 20% deforestation that is permitted by law within private lands. The project will work together with these groups to establish their boundaries and ensure that neither the project nor the landowners' activities contravene the requirements of the Natural Forest Standard and are not conflicting with one another.
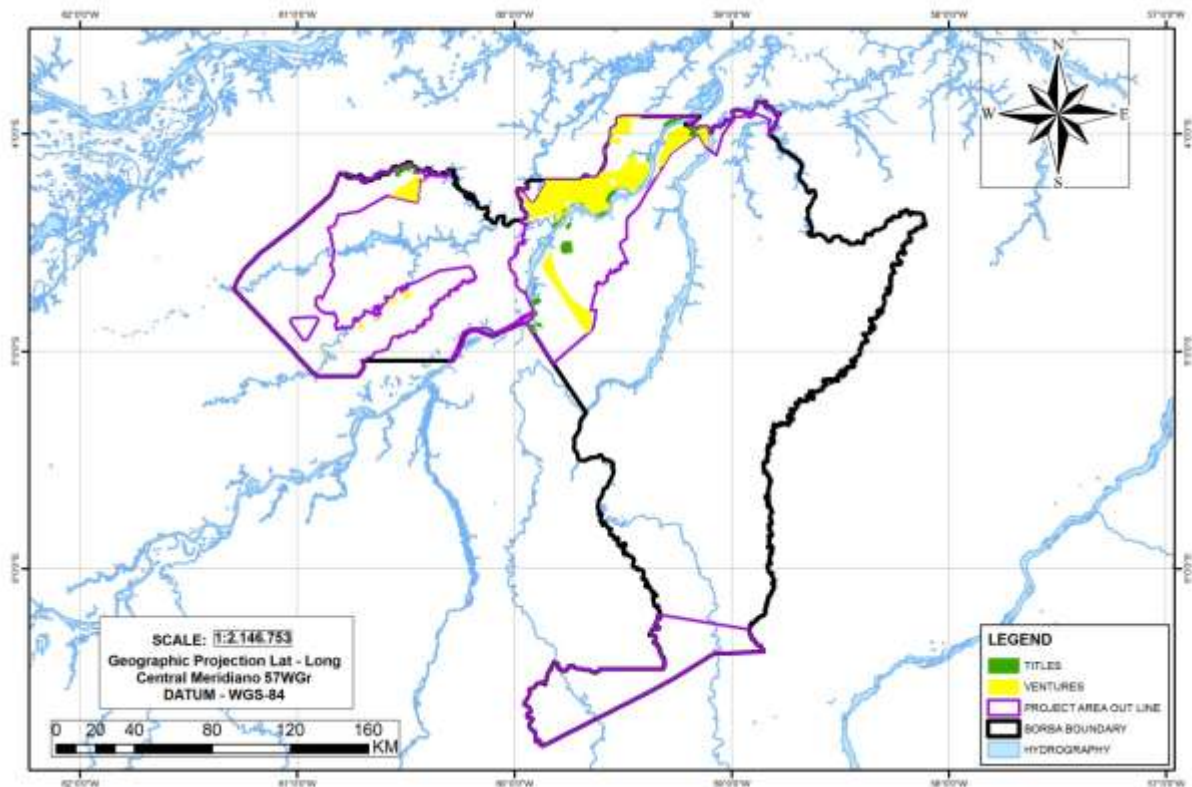
Map 6 - Characteristics of private ownership of the project area.
Source: IAL, 2012.

The communities within the Municipal land, and therefore the project area (see map below) are included in the project, and have been party to information exchanges and have been and are encouraged to act in a participatory manner, including within the decision making process. It has been ensured that a cross-section of the communities and their population have been involved, including remote communities and women. Again, there will be no interruption or negative impact on their usual way of life, and will be the groups that will benefit from the activities of the project being implemented.

Landowners that have ownership rights of land in Borba represent around 6% of the total of the areas within the project. Although they do not develop activities that might be harmful for the land use in general, they are contemplated by the PDD as people that will be contacted to get to know the project and give their feedback. That feedback will contribute to have a better understating of which social actions might help mitigating the effects of global environmental changes.
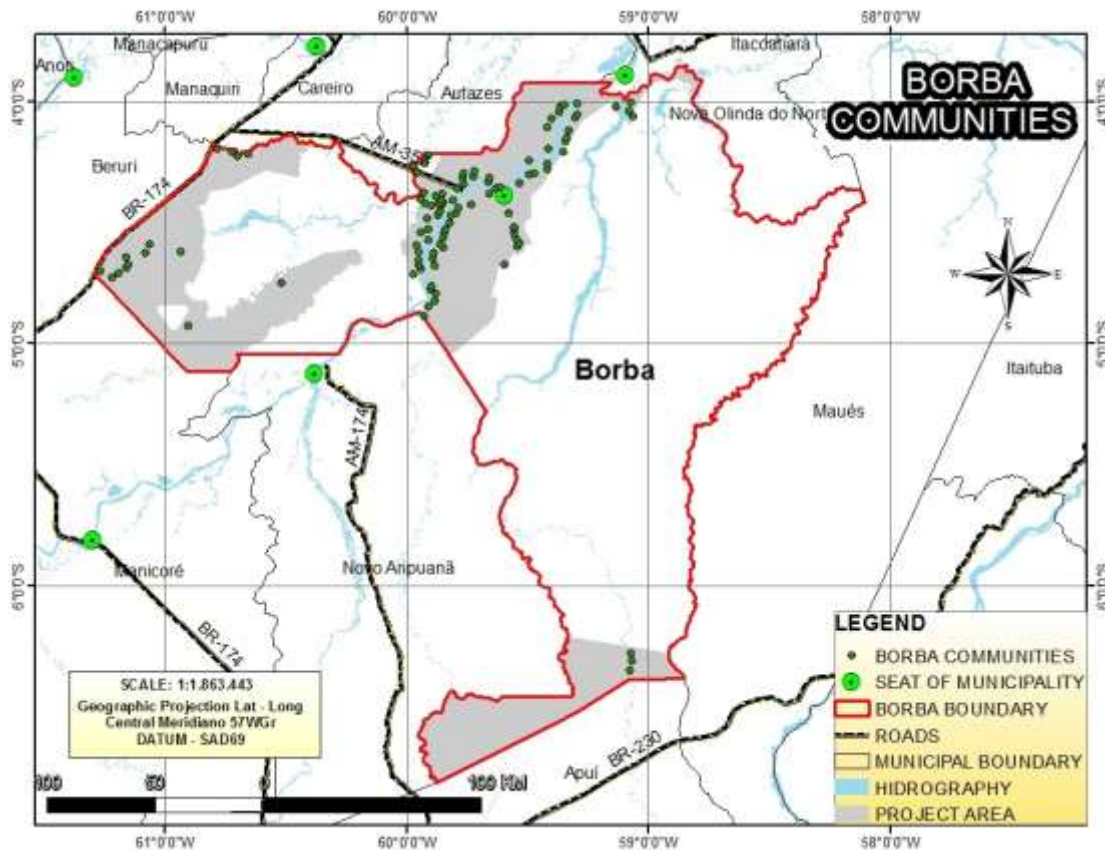
Map 7 – Communities Localization involved with the project
Source: IAL, 2012

Relating the Trocano project and its activities according to the Draft UN-REDD FPIC Guidelines 2011[5], the activities proposed by the project are not in any way removing or impacting on any of the rights of the indigenous peoples or the other relevant rights-holders. The activities of the project are focused on enhancing and encouraging participation in the protection and sustainability of the project areas. The activities of the project are, as described in the UN Guidelines, activities that may not require consent. However, the project has carried out some consultation/community meetings to ensure there is a free flow of information to the communities and people included in the project area.

Activities that do not require consent include scientific and technical studies, carbon stock measurement and the setting up of a monitoring system to measure, report and verify the effect of the project on Greenhouse Gas emissions.

The partnership that is between CGV and IAL references the authorisation necessary for the implementation and execution of the project.

---

[5] http://www.unredd.net/index.php?option=com_docman&task=cat_view&gid=1333&Itemid=53

To implement the action plan, the project will be applied to determination of the Management Council of local characteristics, not interfering with the system of land use and not its legal prerogatives. Moreover, none of the activities of the project requires relocation of people in the area.

The conclusion from this activity is that as the project is included in the Mater Plan laws of the municipality, does not include TI's and does not impinge on the usual way of life for the private landowners and communities, the FPIC process required by the project was more of a consultative nature than requiring consent, as this has explicitly been given through the inclusion in the Master Plan law.

3.4.2   Rights-holders of Carbon and Land Use

As explained in section 2.3, the rights of carbon in Brazil belong the municipalities if they so define in their Master Plan, and through the revision of the Master Plan the activities of the project are included. The TIs, by its special treatment in Brazilian law, the rights correspond to the indigenous communities. In the Trocano project, the TIs are outside of the project area, by which the sole possessor of rights of carbon in Borba would be the city hall. The private landowners within the CGV project areas are included in the Municipal area and therefore part of the Master Plan.

Regarding the involvement of local government in the project, the issue is as follows: the municipality of Borba, through a contract (see Supporting Documentation) has pledged to have the territorial area of the municipality for the implementation of the Conservation Project Trocano. All compensation will be as principles of management needs identified for the improvement of quality of life, with respect to welfare, to rescue cultural, health services and education and economic structures present in Borba. This is as stated in the revision of the Master Plan (Municipal Law number 048/2006).

3.4.3   Information and Prior Meetings

During the year 2010, the CGV began discussions with the Prefeitura de Borba for the legal transfer and ownership of any carbon credits achieved within the specified areas available for the project. This led to the signing of the initial contract between CGV and the Municipality of Borba, on 7th June 2010. This contract was signed with the condition to be ratified once carried out the consultation of the communities (represented by their leaders), farmers and ranchers (represented by their leaders/ associations) and other representatives of civil society. The Prefeitura of Borba has pledged to have the territorial area of the municipality for the application of Conservation Project Trocano, as stated in the Master Plan amendment.

The CGV and IAL began visits to communities that are part of the project area in order to diagnose the key issues involving infrastructure, the economy, the productive system, and how deforestation occurs in communities, to build proposals that contextualised the project in local reality. Stakeholders agreed that the compensation would have as principles to the management of identified needs for the improvement of quality of life, with respect to

social well-being, to rescue cultural, health services and education and the economic structures present in Borba.

During the following months CGV held various meetings with the city officials with the objective of evaluating the suitability of the project areas within the Municipality and establishing the exact areas for the project to be implemented. Detailed information was asked via a series of questionnaires to gain a clear picture of the requirements of the inhabitants of the project areas, and acquiring consent of the communities represented by the presidents of strategic communities that have established a mechanism to spread the word about the project and keep the flow of information going throughout the project. These include the president of Foz do Canumã community which includes 250 families, Vila do Azinim community with 173 families, São João community with 42 families and Caiçara community with 41 families. This led to a contract update signing on the 10th June 2011 and the start date of the project.

In 2011, further numerous visits were carried out with a number of communities to inform and explain the project objectives, apply questionnaires to make the surveys required for drafting the project design document and to explain the proposed construction of participatory activities, investment plans, mitigation of deforestation and training workshops to enter the communities in activities that the project intends to accomplish. This was also used to build proposals that contextualise the project in the local reality. These have been reported to participate in the manner of the process and it was demonstrated that the representatives of these groups and communities agreed this structure.

The questionnaires referred to above will be available for download from www.amazonialivre.org, at the section "projects being developed" (or "projetos em desenvolvimento", in Portuguese). There is a sample selection of the completed questionnaires available in the Supporting Documentation section of the PDD and all paper copies are available from Instituto Amazonia Livre.

After, a visit held on 17th June 2012 in order to add and update information obtained in previous trips, there was a meeting of the representatives of Celestial Green Ventures, the Institute Amazonia Livre, as well as the Mayor of the Municipality, his chief of staff and their secretaries Environmental, Health, Education, Production and Supply, and Civil Defence, where they were addressed issues relating to major needs and shortcoming of communities and farmers, ranchers and owners of private land located within the scope of the project. During the process of drawing up the PDD sought to the extent possible to integrate the proposals of the communities of producers and representatives of civil society.

3.4.4   Negotiations and Consultations

During 2010, in a process that involved several meetings and workshops to explain the project objectives, proposal of participatory baseline construction, investment plans, mitigation of deforestation and workshops, the risks were informed and previously

discussed, in a clear and transparent dialogue between the communities participating in the project. The process of consultation with the stakeholders involved, it was concluded that the best option was the notice of public hearings. This way of acting is very usual in Brazil, and is the basis of the review held for the municipality's Master Plan, because it is mandatory law that the Plan Director is participatory and consulted with the population, which are the same principles to be applied in the case of the Trocano Project.

The review process would be used to inform more in depth to all the agents involved and obtain any consent necessary, always if they agree with the objectives and purposes of the project. It was agreed that the public hearings would be held on the 24/08/2012 giving no less than 30 days' notice of the public hearings, with representatives present from communities, rural producers, farmers, ranchers and the civil society.

The purpose would be to obtain these parties consensus for the project implementation and ensure the communities that fall within the project areas are involved in a participatory way. The decisions prior to and during the implementation of the project shall be taken while respecting the traditions and cultures represented by them. Community leaders, teachers, school directors, health agents, active leaders and people of great respect and influence community have been and will be taking a participatory role in the decision-making of both the project activities and the distribution of the benefits through the benefits mechanism.

24/08/2012 - On this date mentioned were held public hearings where the parties had access to and were informed of necessary information on the environmental services that will be addressed, allowing them to take an informed position on the conduct of this process, evaluating the risks and benefits the implementation of actions in line with sustainable development can lead to its modus vivendi. The agreement was recorded in the minutes and signed by all parties. Private owners, who own land within the area of PDD also attended the meeting and signed the minutes quoted, also giving their consent.

There is a consent document stating that the different public communities in Borba had access to the required information about payments for environmental services, especially on carbon credits, allowing them to take an informed position on the conduct of this process, evaluating the risks and the benefits that the implementation of actions in line with sustainable development can lead to their way of life.

This paper, in the form of minutes, is highlighted in the document signed with the Municipality of Santo Antônio de Borba, which acquired the consent of community leaders, represented by the presidents of the communities that are strategic for the dissemination of the project, such as Raimundo Valderez F. Silva, president of the community of Foz do Canumã with 250 families, Arnobio N. Batista, president of the Vila do Axinim community with 173 families, João de Deus, from the community São João with 42 families and Izonil Viana from the Caiçara community with 41 families. Besides that, residents of small communities that have up to 10 families and high isolation characteristics also seem

optimistic about the benefits presented, which may be, one more time, thoroughly discussed by the time this PDD is validated. Private owners, who own land within the area of the Trocano Project, participated in meetings with the agreement, stating awareness about the information and linking their agroforestry activities to the consents of the Managing Council of the project.

All documentation referred to above will be found in the Additional Project Documentation Chapter.

The process of decision-making established and developed during the preparation of the Trocano project, based on the principle of good governance, which has as main features the participation-oriented consensus, accountability, transparency, responsiveness, satisfactory effectiveness and inclusion. At all times this follows the rule of law. All meetings and agreements between the City, residents, landowners and traditional and indigenous communities located within or outside of the project area, associations and institutions of organized society along with the company CGV were developed using these principles. At no time during this process of decision-making did CGV or IAL interfere in any way with the outcome of the results.

According to the previously presented on the laws that govern and guide land use, forests and the environment in general, governance will be applied in compliance with legal guidelines. The Project Management Council that will manage the resources and activities of the project has transparency, which means that decisions taken and their applications will be made in order to follow rules and regulations for the information and decision making are informed and are available to all stakeholders.

3.5   Communication

The project has established communication channels with the project areas as part of the development of the project. This has been by way of community liaison meetings as well as, where appropriate, email and telephone contact. These communication channels, now established will continue for the duration of the project and will facilitate the smooth dissemination of information. The communication instruments that are being utilised as part of the project are as follows:

1. Local TV: television is a media vehicle with a strong presence in the daily life of the inhabitants of the project area, as well as in different areas of the Amazon. For that reason, the communication will be made through electronic reports, which would be basically information recorded in videotape and broadcasted by the local television. The broadcasting would be through advertisement that will highlight information about the project.

2. Visits to the communities: on a regular basis, there will be visits made to verify the response of the communities to the projects being presented. Media such as

billboards and advertisement on the streets will be used to facilitate the communication between the PDD managers and the population. Billboards can be used in urban areas whereas in rural areas informative leaflets tend to be the best strategy to communicate with the public.

3. Community radio (voice): the community radio is an instrument that can be built according to the needs of the population that is going to benefit from the project. For example, a community radio can reach inhabitants that would have difficulty to receive information on the project and to learn how to help on the decision making process about the actions of the project.

The Project Management Council will facilitate the communication channels throughout the project areas. This will include appropriately positioned "message boxes", that will be both to give and receive information to the project areas. These message boxes will be placed at such places as junctions of rivers and community meeting houses. In addition to this, there will be email communication where access to the internet is available.

In the process of communication, it is important to highlight that the local population will eventually make their enquiring or give feedback about the project. The communication channel will work as following: firstly, the enquires will be gathered by agents linked to the projects or people will speak directly with the agents about the information; then, the information will be written and a simple document will be made to register the activity; after that, a group work will be formed to study the case and promptly give a response.

Similar enquiries will be grouped. Different enquiries will be individually analysed, but also in a timely manner, so that they can be solved in a coherent way. The teams from the Human Science areas will be the main responsible ones for the "transportation" of the information required by the population of the project area. Researchers of the area of sociology and social communication will do the assessments.

Information referring to social issues will have priority in the process of data exchange and knowledge about the project. Information regarding financial aspects will be studied by the managing department before being answered. Everything that is public domain and is in the PDD will be easily accessible; however, information about balance and outstanding amounts, as well as other financial information will be only dealt with publicly during public meetings and hearings.

Throughout the development stages of the Trocano project, the communication mechanism has been established and will continue to be implemented and developed throughout the duration of the project.

3.6   Process for Dispute and Complaint Resolution

The Trocano project will provide a grievance mechanism for dealing with any complaints and concerns of individuals or groups within the project area that may arise.   This mechanism will be available to all parties involved in the project and within the project area. The mechanism will be published and readily available for any group or individual to access.

The project does not foresee any significant impacts on the communities within the project area, and in line with this does not deem it necessary to design a complex or lengthy mechanism.   Following the community liaison meetings that have been held with the communities within the project area, the project expects there to be minimal or no negative impact on the communities. To this end, the mechanism that is appropriate for the project is a straightforward procedure for raising any sporadic complaints that may arise and can be implemented efficiently.

Therefore, the Trocano project draws upon the Forest Stewardship Council (FSC) Dispute Resolution System[6] as a strong, well-established project-level grievance process. The basis of this process is to resolve any disputes that arise as informally as possible, in the first instance using discussion and negotiation, and only when agreement cannot be reached via this channel, would formal procedures be applied. The aim of the mechanism is to be as efficient and transparent as possible, and to proceed in a fair and impartial manner.

There will be opportunity at all community liaison meetings for concerns and grievances to be raised and heard. This opportunity has been communicated within the community liaison meetings that have already been held, making it clear that any grievances should be made openly and will be dealt with appropriately. The community liaison individuals will always be available for receiving comments and grievances and for clarifying any doubts related to the project implementation and forwarding any requests for information or conflicts to the PMC.

The grievance process will be mediated and governed by the Project Management Council, and will be based on fairness and transparency at all times. The objective of the grievance process is to reach agreement between the parties in the most informal and timely way possible. The PMC will take appropriate action to ensure that any grievance raised to them, either anonymously or openly, will be dealt with in accordance with the basic principles of good dispute resolution procedures.

The basic flow-chart of the grievance mechanism for the Trocano project is as follows:

---

[6] Forest Stewardship Council, 2009. *FSC Dispute Resolution System*. Available at:
http://www.fsc.org/resources.10.htm
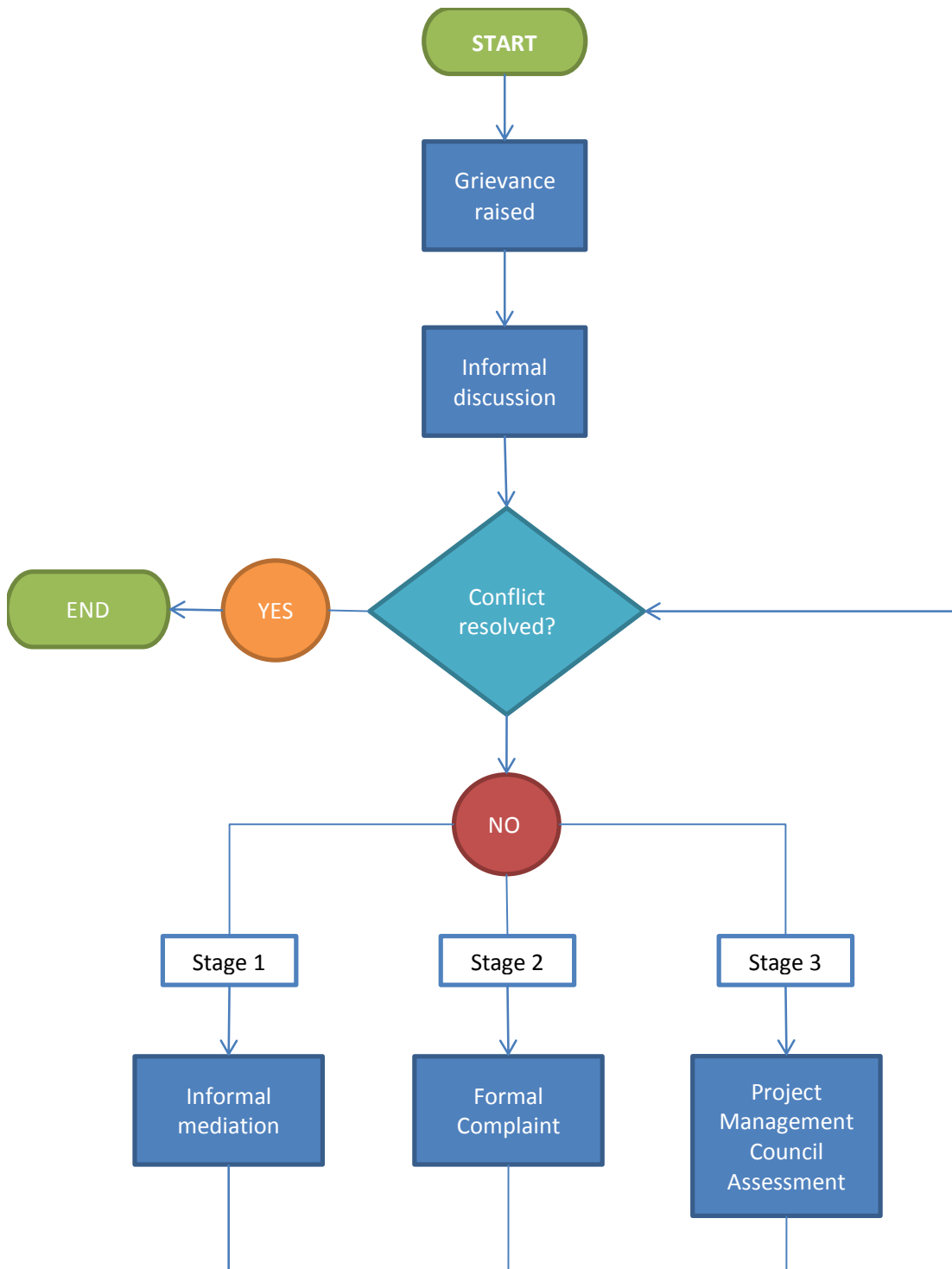
Figure 10: Flow chart of dispute resolution mechanism adopted by the Trocano Project

Any grievance that goes through the process will be documented by the PMC and will be available for viewing by any interested party at any time.

The mechanism will adhere to the good practice guidance principles that are outlined in the Natural Forest Standard Guidance document, taking into account:

- the appropriateness of the procedure in accordance with the expected impact on affected communities,
- cultural custom;
- freely accessible to all, including minority groups and women;
- available in appropriate source (written, verbal or other) in a language that is common to all parties, or translated accordingly and appropriately

The basic principles of the dispute mechanism will follow those as set out in the FSC Dispute Resolution System.

Over all possible inter-group conflict and crisis management actions will be mediated and brokered by the Project Management Council. All decisions will be based on the Statute of the Council prepared to meet all the objectives of the agreement reached between the CGV and the Municipality of Borba.

Any non-compliance detected in the field will be reported through monitoring forms from which it will be possible to analyse the parameters. The standards will be determined based on the information from these monitoring forms with the description of social aspects, included in the Questionnaire of Evaluation of the Project. Aspects such as a) samples and instruments; b) collection procedures and c) analysis procedures; besides the place of non-compliance will be indicated in order to have all the necessary information related to the problems and the correspondent opportunities for improvement: characterisation, classifying, frequency controls and evolution, analysis and identification of the causes, determining actions, monitoring, history, etc.

For all the incidents of crisis and/or conflicts of interests – whether they are serious or not or whether they involve a person or a group of people , that mediation process between the parties will take place

The mechanism for receiving responses, assessment of the complaint and solution of the problem will occur through an open channel 24 hours of receiving messages of type "message box", which will be installed at key points (junctions of rivers, harbours community meeting places etc.). of the territories concerned, in order to facilitate information collection and transfer of data, made monthly.

Upon receiving the grievance, a member of the PMC will contact the parties involved using an appropriate means of communication, which could include email, telephone or in-situ meeting. The representative of the PMC will hold an initial discussion with the aggrieved party and try to resolve the grievance at this point. If agreement is not reached, the 3 stages of using the formal grievance mechanism are as follows:

1. Informal Mediation
2. Formal Complaint
3. Assessment by the Council Manager

These stages are discussed below.

1. Informal mediation

Within 30 (thirty) days of the initial discussion, a representative of the PMC will contact the parties involved, by appropriate means, and arrange an informally-mediated meeting. This can be via telephone or in-situ at a convenient location to all parties. This representative between the parties involved should try to resolve the situation informally, with simple mediation discussions. This mediation person can be either from an external organisation or group, or an internal person to the aggrieved party or the PMC, upon agreement of all parties involved.

The responsible person will record the mediation talks with the parties and write a record in that figure as a minimum:

- The date
- The medium of communication adopted
- The participants in the meetings
- Associated Documents
- The resolutions adopted

If the parties involved are in agreement in the resolutions adopted at the complaint is considered resolved. This will be written in the reported minutes and will be published and available to any interested party. This will also be reported in the annual report for the project proponents. The minutes will be sent to the Council Manager within 15 (Fifteen) days of the mediation.

In the contrary case goes to the next level of resolution of conflicts.

The aggrieved parties involved may give consent to withdraw the conflict at any time of the process.

2. Formal Complaint

The use of the formal complaint stage will always follow the process of informal mediation. The formal complaint should be addressed to the attention of the Council Manager and made in writing. If the party/parties involved have problems by its training to perform this appeal, they should be assisted by a person that is able to assist, in an un-biased manner, possibly a previous mediator.

The formal complaint shall contain at least:

- Name and contact information of the litigant
- Explanatory statement
- Evidence to support the formal complaint (photographs, documents etc)

- Signature/s interested and/or representatives

Within 15 (fifteen) days from the receipt of the formal complaint, the Council Officer should point to one of their representatives for the solution of the problem. The representative or the institution that represents the Council should not be involved in the conflict as parties involved.

The representative, after having heard the parties involved, you can start round of consultations with the people involved (community leaders, members of the Council Manager, people respected by the community, external agents or other). This consultation process may take a maximum of 30 (thirty) days from the timekeeping of the representative.

After the round of consultations, the advisory council representative shall issue a report with a proposal for resolution of conflict within a maximum of 15 (fifteen) days. This written proposal will be sent the parties involved, and must be approved/rejected within 10 (ten) days. If the parties agree on the resolution proposal the case will be closed. If the opposite is happening, it must proceed to the next level of resolution of conflicts.

3. Assessment by the Council Manager

If the conflict after proceeding with the formal complaint is not resolved, it should be assessed in full by the Council Manager. The deliberations will be based on the Status of this Council, prepared to meet the goals of the project Trocano.

If the representatives or the institution that represents the Council are involved in the conflict as parties involved do not have the right to vote in the deliberations. The Council Manager, if necessary, can invite a mediator of technical profile as an external consultant.

The Council manager will receive in audience the parties involved in the conflict within a maximum of 3 (three) months after the non-acceptance by them of a resolution through formal complaint. During this time you can start consultation processes with officers involved in the conflict. The external consultant pointed out or a member of the Council Manager, different to the editor of the first proposal, will be responsible for drafting a new proposal for resolution.

The proposal will be submitted to the deliberation and vote democratically within ten (10) days by the Council. The proposal will be approved if you have a 2/3 majority in quorum for its approval, excluding the members without the right to vote because they are involved.

If the proposal is finally accepted, the conflict is considered as solved. If it wasn't so the last resort will appeal to the ordinary justice system.

Problems such as non-alignment of interests between community and conflicts between beneficiaries of the project will be evaluated for further mediation, to be held between two

or more of the Management Council, and including a mediator if necessary external technical profile as a consultant. The focal opinion of these people will be drawn up advice to be voted on by all members in a democratic way.

All timings are to be adhered to, unless logistically unable, at which point all parties must agree a suitable and congenial timeframe.

Any appeal must be within 30 days after the notification of the decision.

3.7   Reporting

Through the communication mechanisms that have been put in place with the community presidents, through IAL's involvement with the project implementation plus utilising the Project Management Councils presence and channels of communication, the project will produce full, clear, accessible and transparent reports and assessments on the progress of the project, quantifying such subjects as:

- Social Performance Indicators and Impacts
- Dispute Resolution
- Carbon Stock Monitoring Activities and Quantifying Carbon Benefits
- Biodiversity Monitoring Activities and Rating

This information will be compiled on an on-going basis, as a fundamental aspect of the project activities, throughout the lifespan of the project. The results and outcomes will be systematically submitted directly to the project proponents on an annual basis. Celestial Green Ventures will also prepare reports covering relevant information such as credits issued and sold, and resources deployed to the project. These reports, once collated will in turn be submitted to the Natural Forest Standard as part of the on-going verification process of the project.

The Natural Forest Standard supplies a suggested template to assist the project in meeting the requirements of the Standard, which the Trocano project will use to submit the required annual reports to the approved verification body. This is available at
http://www.naturalforeststandard.com/project-index/downloads/.

The annual reports will be published on the following websites:
Natural Forest Standard: http://www.naturalforeststandard.com
Climate Projects: http://www.climateprojects.info/
Celestial Green Ventures: http://www.celestialgreenventures.com/

These reports will also be distributed through the PMC network and channels of communication that have been formed to disseminate the information throughout the project areas.

3.8 Description of Benefit Distribution Mechanism

Introduction

For the distribution of benefits from carbon credits obtained, the Management Council will be constituted as described above in section 3.2 Project Governance structures and procedures and will implement an appropriate Benefit Distribution Mechanism (BDM).

Currently the public municipal management of Borba is responsible for ensuring the social welfare and has been seeking ways to address the problems related to health, education, food security, infrastructure, housing, sociocultural and professional training. To fight poverty in the project area, it is necessary to link policies to stimulate economic growth and better income distribution. For this, the carbon sequestration project should emerge as an alternative for generating social gains among the population of Borba.

During the consultation processes outlined above, part of these discussions with the local communities and the city officials, was establishing the most needed and most appropriate channels the benefits should be directed towards. It is essential that the project participants receive the important and much needed benefits within the project area. By consulting with the local communities and municipality representatives as to the most needed and appropriate benefits that can be provided to the project area, the project has been and will be able to ensure that the benefits that are provided are relevant to the local communities and their needs, plus being compatible with the conservation objective of the project, and not in any way having a negative effect.

For the socio-environmental monitoring the same questionnaires made with the communities for sampling during the data collection period were used. The data will be available for download from www.amazonialivre.org, at the section "projects being developed" (or "projetos em desenvolvimento", in Portuguese). There is a sample selection of the completed questionnaires available in the Supporting Documentation section of the PDD and all paper copies are available from Instituto Amazonia Livre.

After creating a socio-economic profile that will be described next, these aspects will be followed up to verify if the activities proposed by the project are improving the existing social services.

3.8.1 Allocation of Funds

A reasonable and sufficient amount of the funds achieved through the sale of carbon credits will be made available to the Municipality for them to develop projects and programs with the local communities, through which they will be able to enhance their standard of living and habitat, which takes the form of a fixed annual fund of US$4,000,000[7] (four million US Dollars) which will be paid to the Municipality of Borba (see Annex 13f) for the benefit of the project areas as a whole for the duration of the 30 year contract. This fund will be mobilised

---

[7] As per the mid-market rate from http://www.xe.com/currencyconverter/ on the 26.02.2013, this equates to an amount of R$7,946,180.28.

through the issuance of carbon credits from the project area and the finance that is generated from the sale of these credits. The project activities and benefits that are outlined within this document are to be provided through the implementation of project activities, implementation of local projects and programs and the benefits distribution mechanism.

The current annual budget of the Municipality of Borba for 2013 is R$50,508,851, (fifty million, five hundred and eight thousand, eight hundred fifty one Brazilian Reals)[8]. This equates to the fund allocated to the Municipality through the sale of credits from the project, being an approximate increase of 16% on their annual budget. This will mean in real terms, that the Municipality will be able to implement the much needed economic and infrastructural benefits to the project area and the Municipality as a whole, in keeping with the project objectives and parameters.

At around the time of signing the contract, the annual budget of the Municipality of Borba was (most relevant published data available is for 2009[9] from IBGE) was R$34,694,679 (thirty four million, six hundred and ninety four thousand six hundred and seventy nine Brazilian Reals). At this time the US$4 million allocated annual fund equated to a 23.5% increase in their annual budget.

The allocation of funds for the many aspects of the benefit distribution mechanism discussed below will be determined in a transparent, fair and equitable manner for all project area inhabitants to be able to benefit.

3.8.2   Benefits Mechanisms

The benefits mechanism that will be implemented by the project will take a number of forms.

In the context of the Trocano project, the term 'benefits' will include the following meanings:

- Monetary;
- Training and education;
- Employment;
- Enhanced living conditions.

In the context of the Trocano project, the term 'mechanism' will include the following meaning:

- Funds;
- Projects;
- Programs.

---

[8] http://www.diariomunicipal.com.br/aam/materia/661257
[9] http://www.ibge.gov.br/cidadesat/topwindow.htm?1

The proposed benefits of the project outlined above are to be available to all inhabitants and communities within the project area; they will be made aware that they are eligible for all aspects of the proposed benefits. The involvement of the PMC in the process will ensure a fair, transparent and equal opportunity for all to have access to and gain from the benefits available. The PMC will also be responsible for ensuring timely deliverance of the benefits to the individuals and communities as appropriate.

All communities, individuals and inhabitants will be free to submit their interest in the opportunities that are presented and available through engaging with the project implementation. Through involvement with the project, local people will be able to avail of the opportunities and benefits available to them; workshops, training and events will be held to provide the inhabitants with the necessary tools to both improve and sustain their ability to manage their environment in a lasting and sustainable way.

There will also be community-strengthening activities available which will be aimed at promoting the benefits of engaging with the project, both through practicing sustainable living as well as the opportunities available such as education and employment.

The benefit mechanism allows proposals for projects and/or programs in individual communities, to reflect their individual and community needs. The benefit mechanism is designed to be inclusive for all and to allow the different groups, communities and inhabitants the flexibility of having projects and programs implemented specific to their needs and requirements.

All proposed projects or programs that are submitted must be in accordance with the objectives and parameters of the Trocano Project and will be evaluated by Trocano indication of the Management Council for appropriateness in accordance with the project objectives. Proposed projects and programs that require grants above R$30,000 will be presented to the Project Management Council. Projects with a proposed budget greater than R$50,000 must be approved unanimously by the quorum of the meeting. Projects proposed from R$30,000 to R$50,000 shall have a majority of two thirds in the quorum for its approval. Projects less than R$30,000 only require a simple majority and can be approved outside of the quarterly meetings, upon presentation and within a short timeframe from submission.

In the first two years of implementation of the Management Council, the minimum number of meetings for evaluation and determination of projects will be 4 (four). In the following years can be reduced to two (2) per year. Once a year, the General Assembly will have to meet to review the Benefit Distribution Mechanism of the Project Trocano. Please see section 3.9 for further information on the review process.

Once approved, the funds for these projects or programs will be made available and allocated to propose in a specific bank account of Celestial Green Ventures Brazil (CGVB).

The Council Manager will present the projects in priority order with their respective budgets and plans. The CGVB release funds following the same order of priorities.

Where there are training, education and employment opportunities for the inhabitants of the project area, the PMC will ensure that notification is extended to all and the allocation of vacancies will be assessed on proximity to the particular opportunity plus

3.8.3 Local Projects and Programs
Arising from this proposal, such benefits are highlighted as follows:

   a) Reduction in the domestic solid waste amount from each of the homes of the families who will be benefit with the project;
   b) Generation of employment and income in the tourism sector;
   c) Training of local staff to collect and monitor data relating to the project;
   d) Qualification and strengthening of local crafts, along with the manufacture of bio-jewels.

Additional information on benefit types that will be possible through the allocation of funds are described below.

Land maintenance
From the finance that is generated through the sale of carbon credits from the Trocano project, a sufficient fund will be put in place to maintain the land for the duration of the project and to assist the implementation of the project activities. The benefits from this will be used for activities that help the project to meet the requirements required to achieve the objectives of the project and indeed achieve the carbon credits/emissions reductions that are the source of the financing. The benefit mechanism here will include the training and employment of local inhabitants to ensure the land maintenance and conservation is carried out efficiently, effectively and with the maximum local participation possible.

Infrastructure
The Municipality will also receive funding to develop their infrastructure, in ways that benefit the local inhabitants. This will include both hard and soft infrastructure improvements such as water and waste management, communications, renewable energy sources, as well as providing schools, medical facilities and other social, cultural and economic enhancements. It will be essential to the project that these benefits are implemented without detriment to the project activities, and the project activities and scope will be considered at all times.

Health
With regard to the health, emergency transport and infrastructure to support procedures with opportunities for personal development are important in the municipality needs to improve this service to residents. The lack of trained professionals such as doctors, nurses and dentists, to work specifically on the health of communities in the area project, also

presents itself as a major deficiency in the lives of people living in these localities. The difficulties of access, compensation and infrastructure for the practical exercise of their expertise are among the causes of low demand for these health professionals trained to provide services in communities in the project area.

With the proceeds of the carbon credit benefits, this reality should be modified mainly with improving the infrastructure of local services, transport professionals and patients, promoting better wages and benefits for the promotion of health activities in these locations . Another important factor is that these benefits will also be present for those communities that are not part of the project area, but are in their surroundings.

Sanitation and Housing

In relation to sanitation and housing structure, the Trocano project will bring significant improvements for the resident population in the project area. In the case of sanitation, communities that are on the banks of streams, rivers and lakes will receive collection equipment and water purification systems, sewage treatment and effluent treatment, programs for the rational use of water resources, including processes for reuse of storm water, respecting all the standards of the ordinance 2.914/2011 for drinking water.

Already in the communities that there are no rivers, lakes or streams, besides the benefits mentioned above, will be installed wells and water tanks for the storage and supply of these locations. The housing structure will be substantially improved by building and renovating homes for the standardization of homes through the installation of solar energy, toilets and septic tanks, mechanisms to collect and divert rainwater, as well as modern building materials that respect and not harm the environment.

Considering also the variation of houses by communities, for example, there communities with 10 houses and there are those with 70 houses, the initial quantification of homes covered with these benefits will be 50% of the communities located in the project area, that due to significant need to cover as much of initially.

Education

In the case of education, the benefits of carbon credits will have an important impact on training and hiring the labour market of young people and adults who inhabit the project area. In addition to improving the infrastructure of schools, transport, equipment and materials, an important educational exchange will be developed both in promoting the training of education, which in the case of only 15% of teachers who work specifically in the communities involved in the project have higher education, the presentation of new development prospects presented by the proposed works for the conservation of forests and the environment that these people live.

Promoting programs of scholarships abroad is also a great benefit that the Trocano Araretama Project of Borba will enable to the communities that inhabit the project area,

especially in developing language that will promote the communication of the local inhabitants with the rest of the world.

Agriculture
Considering the current existing agricultural practices, new market opportunities for family farms and production less harmful to the environment will be developed in communities in the project area, and food education programs that will contribute to change in the level of consumption of local residents regarding the acceptance of healthier food and adequate, we expect a greater concern with food security and ways of production, development and use by the residents living in the villages of the project.

Sociocultural
Assessing the religious, school, family and production conflicts within the region, is an opportunity for the project to serve as a base and a scale for social transformation. With the improvement in identification with the land, the strengthening of feelings of affection and belonging to place and greater popular participation in the affairs of public life, there will be a realization of identity by the residents. The self-image related to the family will change over the time, in the same sense that habits are changed. With these improvements the REDD PDD of Borba will bring to the communities involved with the project, expected to increase people's esteem and satisfaction in living and protect their habitat. The programs will be developed in socio-cultural communities, will be based on the maintenance, rescue and promotion of local culture.

Professional Training
The professional training will be mainly focused on the development of activities that will encourage communities and forest services.

- Health
- Education
- Food safety
- Drainage / housing structure
- Maintenance and cultural revival
- Professional training

3.8.4 Possible projects, programs, and activities to be provided through the BDM
From the consultations with the local communities, and following the questions conducted during the meeting with the Prefeitura de Borba, and the Secretaries of Rural Production and Supply and Education of the Borba City Hall, among the alternatives that promote job and income creation, as well as livelihood, social and enhancements we can identify some that are a priority within the project area:

- Wood crafts workshop (Molongo) ;
- Regional seeds and other regional raw materials;
- Travel guide tourism base, with courses in basic English, French and Spanish;

- Home-gardens;
- Activities to encourage the practice of actions with an emphasis on economic sustainability and maintenance cultural characteristics of societies in the city;
- Training course for residents of the communities involved to act as forestry and environmental agents, developing inventory and monitoring activities;
- Training course for agents of environmental education;
- Rural radio and telecommunications including internet access for communities;
- Water treatment;
- Sanitation;
- Telemedicine facilities;
- School transportation.

These alternatives should initially be planned based on business plan to define the best way to be performed and promote the success of the activity.

In order that the resources invested in the activities proposed in this PDD reach results in a positive way to the benefit described, all resources and proposed activities will undergo through the Project Management Council. This council is outlined in section 3.2.

The Management Council will collectively make all the investments through the analysis of technical advice, business plans and technical consulting. For the invested resources in the proposed activities of this project, and to achieve results in a positive way to the described benefit, all resources and activities proposed and supported by the Management Council will be processed transparently. There will be provision for complaints and disputes, and this corresponds with the process for complaints and disputes outlined in section 3.6.

The Project will make all the investments through the analysis of technical advice, business plans and technical consulting.

3.9   Review of the Benefit Distribution Mechanism

To generate meaningful and sustainable opportunities and improvements for the communities of the project area, the project has outlined a number of potential benefits that will be implemented through the project activities in this section. The success of implementation will be reviewed annually as part of the annual reporting requirement of the NFS. This will be carried out by way of community meetings, continual project awareness, application of project programs and projects through the Benefit Distribution Mechanism and the participation of the project area inhabitants of the monitoring of the project area.

The outcomes of proposed projects and programs plus itemising the projects supported, will be presented in the Annual Reports. This council will hold a meeting of the Project Management Council, plus any representatives of the communities that would like to attend. The decisions and activities supported, or otherwise will be transparently administered. The effectiveness of the benefits distribution mechanism will be subject to

review to ensure its effectiveness, both in respect of implementation as well as appropriateness.

During the annual review, the project will take into consideration the following assessment categories:

1. Relevance – ensuring the Benefit Distribution Mechanism is providing resources that are relevant to the local needs and compatible with the objectives of the project itself.
2. Effectiveness – ensuring the benefits materialised and that the deliverables were satisfactory, suitable and appropriate for the requirements of the participants.
3. Efficiency – is the Benefit Distribution Mechanism operating as efficiently as possible and does it require any amendments.

3.10   Biodiversity Impact Evaluation

By its very nature as a REDD project, it is the likelihood that the project will prove to be positive for biodiversity owing to the reduction in loss of forest area and condition and the assumption and objective of the Trocano Araretama Conservation Project is for there to be no net loss of biodiversity in the project area, as the implementation of project activities are designed to mitigate this occurrence.

Where projects, programs or benefits occurring as part of the project implementation are deemed to have a potentially negative effect on the biodiversity of the project, the project will seek to ensure that the effect on biodiversity is minimised and sustainable practices are followed.

As part of the benefit distribution approval process, the PMC will carry out a desktop evaluation to ascertain if there is any possibility of a potentially negative effect on biodiversity through the implementation of the proposed activity, program or project. Where it is identified that this could be the case, a biodiversity impact assessment will be carried out. This will be included in the activities of the on-the-ground monitoring teams, as described in section 4.6.2. The project will look to implement any necessary on-the-ground sampling measures by way of an Environmental Impact Assessment. This will include the assessment and evaluation of any impacts the improvements to the project area have on the biodiversity within the project area, and will include:

- Establishment of biodiversity starting conditions of the project site prior to implementation;
- Indicators of pressures or threats;
- Identification, location and evaluation of biodiversity at risk;
- Demarcation of monitoring and control plots;
- Monitoring, evaluation and quantification of findings.

The initial Eco-floristic zone analysis (see section 9.7) has identified the habitat zones of the project area and this will be used to establish and identify the starting conditions of the project. For each project, program or benefit that is established as having potential threats to the biodiversity within the project area, the monitoring teams will carry out evaluation activities to assess the impact on biodiversity, specifically where it is anticipated that a large inflow of resources will be entering the project area and therefore could result in a potential significant negative impact on the biodiversity within the project area.

It is recognised that aggregating biodiversity impact assessment with carbon stock monitoring as a useful method of initial implementation, as the extent of forest is a good indicator of the state of biodiversity, so this will also be used as monitoring data for the areas in question. On-the-ground monitoring is an important factor of evaluating the impacts and this will be implemented where it is felt to be of significant importance and effect on the project area biodiversity, and local community-based monitoring of this will be an effective, practical and interactive way of communities taking responsibility for the effects their habitat improvements could potentially have on their habitat.

Through monitoring and reporting activities, the Normative Biodiversity Metric will be reviewed periodically, and this will also act as an indicator of the level of impact on the project area biodiversity (see section 9.11) and any negative impact will be reported.

3.11 Measures to Protect Existing Biodiversity within the Project Area

Forest protection is seen as the most straightforward and effective tool for ensuring biodiversity conservation. Implementation of protection and conservation systems allows maintenance of key habitats and ecosystems which provides native species with stable and maintained conditions. The project area, being tropical forest, has an extremely high level of biodiversity, with a high density of endemic species (see section 9.0). To safeguard the biodiversity attributes of the project area, the planned project activities will provide protection to the existing biodiversity of the project area, and create stable habitats for the native species within.

Section 9 gives specific details regarding the biodiversity within the project area, the threats it faces and the process by which the Normative Biodiversity Metric assessment is carried out. Using this information together with the NBM mechanism will provide the project with the necessary information on which to base the important biodiversity maintenance activities. By understanding the presence and importance of the biodiversity within the project area gives basis to the maintenance and conservation measures the project will carry out.

As the project aims to achieve no net loss of biodiversity, this will principally be carried out through the deforestation mitigation measures described in section 2.1, as the activity of natural forest protection and conservation carries the correlative co-benefit of conserving and maintaining the biodiversity, forest plants and the animal species within them.

The following measures will be essential to the maintenance of the existing biodiversity of the project area:

- Establishing the starting conditions of the project area through the NBM (see section 9.4 to 9.10);
- Understanding the pressures and threats to biodiversity in the project area (see section 9.1);
- Ensuring no net loss of biodiversity arises through the implementation of project activities, projects or programs (see section 3.10);
- Providing education and training to project inhabitants to understand the importance of protecting the biodiversity within their habitat;
- Providing capacity building and training of project inhabitants to undertake biodiversity data collection and monitoring activities;
- Monitoring the biodiversity of the project area (see section 9.10);
- Monitoring land use changes and vegetation cover (see section 4.5);
- Ensuring invasive species are not introduced to the project area(see section 9.2)
- Ensuring hunting activities are controlled and/or reduced (see section 9.3);
- Ensuring displacement of activities does not occur (see section 8.2 and 8.3);
- Creating robust project governance structures to ensure permanence of these measures.

Sustainable land management and land use practices will provide protection measures to the existing biodiversity within the project area, and will ensure that current ecosystem conditions are conserved providing maintenance of habitat for native species and the high conservation value of the project area. Through the successful implementation the project activities of deforestation mitigation and the protection and conservation of the natural forest of the project area, and promoting local participation this will have a significant positive impact on the maintenance of the biodiversity within the project area.

Through the on-the-ground monitoring team activities, the participation of the local communities and the creation of protection measures as part of the project objectives and activities, it will be possible for the project to ensure that the current biodiversity within the project area is maintained through raising awareness among community members about the relevance of monitoring and conserving the natural forest and resources and training community members in the project area to operate as monitors of biodiversity.

Identifying areas at risk using the ACEU Risk model, and its criteria of being Accessible, Cultivable, Extractable and Unprotected, it can be seen where the higher risk areas of deforestation have been identified, correlating to these being potential high-risk areas for biodiversity. These areas will be targeted as high-risk areas and monitored accordingly (see section 4.6), including regular visits to be made to areas deemed at risk.

Photographic and geo-referencing records taken as part of the monitoring activities will provide information on the progression or regression of the conservation status of these

areas and provide important indicators of adequacy of the biodiversity protection measures in place, which will be assessed as part of the project annual review process.

SECTION 4 – MONITORING PLAN

4.0   Overview

The monitoring of the Trocano Araretama Conservation Project consists of 3 areas of monitoring:

- Monitoring of emissions from deforestation
- Monitoring of carbon sequestration
- Monitoring of leakage zones

The monitoring of the project, covering all three areas will mainly be carried out by using a combination of remote-sensing and satellite images. There will also be a team of on-the-ground rangers who will constantly be patrolling and monitoring the areas, making regular visits to the known high-risk areas, patrols of the project boundaries where possible, and along access points such as roads, rivers and existing forest paths. The teams will also have a schedule of visits for the accessible areas of the whole project area. Given the size, vastness and separation of the project areas, sole use of on-the-ground monitoring is not possible, effective or efficient use of resources.

Given separation of the 3 project zones, there will be sub-teams based in all 3 project zones, with the overall co-ordination of the on-the-ground teams being carried out by the Project Management Council. Municipal Rangers and Police from the Borba Municipality, together with the project sub-teams consisting of trained rangers and local community members will be responsible for carrying out and implementing monitoring and protection measures.

Developing this monitoring plan will ensure the project is able to act at the earliest opportunity to any occurrence of deforestation plus by patrolling the area, will ensure there is a real on-the-ground presence throughout the project. Monitoring will be combined with forest protection measures to actively respond and close down unauthorised deforestation activities as part of project processes.

4.1   Project Monitoring Reporting

The implementation of the project activities will be monitored by the PMC, based on annual reports that will be completed in accordance with the requirements of the Natural Forest Standard, as identified in section 3.7. Any emissions of CO_2 from any deforestation within the project area will be mapped and quantified on an annual basis for the duration of the project, using the Geospatial Platform.   The impacts on local communities and the biodiversity will also be monitored and reported annually.

4.2   Monitoring of Carbon Stocks

In principle, the estimated average carbon stocks should not be significantly changed during the crediting period, as the Geospatial Platform uses a credible estimation adequate for the project area. However, the project will continue to maintain the relevance of the data, through a continuing update of data as and when new and updated carbon stock data

become available from the sources used in the Geospatial Platform. This updated data will be used to re-assess the baseline calculations, on a 5-yearly basis, in line with the recommendation of the NFS of a 5-yearly re-verification of the project.

4.3   Identifying Risk of Deforestation

The identification of risk to the project areas has been established using the ACEU data layer within the Geospatial Platform, and this categorises the risk of deforestation to the project area, into 5 categories (as described in Section 6). The resulting risk map is able to identify areas that require specific targeting for monitoring and project activity implementation and shows the areas expected to be most at risk from deforestation. These areas will be the initially targeted areas for specific monitoring and where response teams will be deployed.
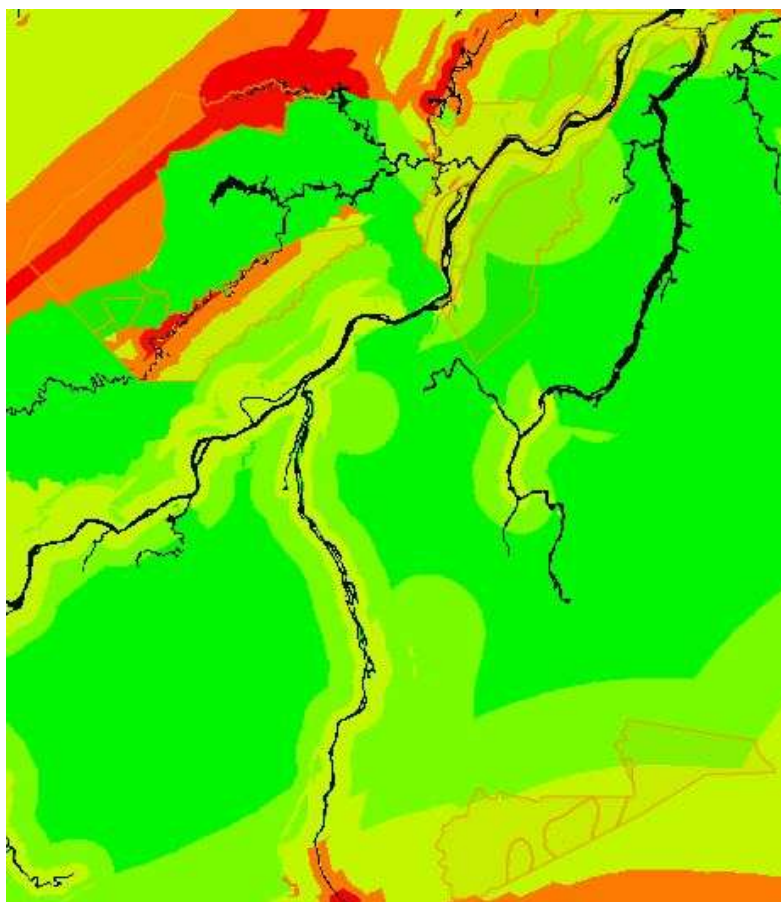
Map 8 - Project area shown with ACEU Risk categories applied
Source: CGV Geospatial Platform 11th December 2012

From this data layer, it can be seen that the West Zone of the project area has the highest risk of deforestation.

The possibilities of deforestation identified during the preparation stage of the project are related to the needs of timber resources and creating pasture area and the occurrence of

activities that promote deforestation have motivation arising mainly around the basic needs of the locals communities (riverine) and economic pressures.

The direct and indirect agents of deforestation have been identified as follows:

Direct agents of deforestation:
a. Timber accessing:
b. Small-scale farmers
c. Residents of traditional communities (riparian)
d. New developments of urban occupations

Indirect agents of deforestation:
a. Dealers who work in communities and in the town
b. Distributors of products coming from big cities like Manaus, Porto Velho and Santarém.
c. Small service providers, such as bakeries and small furniture factories and other wood products of this genre.

The expansion of cattle ranching in the Municipality of Borba has generated high rate of carbon emissions into the atmosphere, affecting the balance of local ecosystems. Thus, it is essential to seek alternatives, in order to prevent further deforestation for the cultivation of grass for grazing. Due to the increase in meat prices from the second half of the decade, as well as soybeans and oil, production continued without consideration of the environmental liabilities as a result of extensive marketability these products.

The Caboclos and indigenous people use the cutting and the burning to clean soil. However, these subsistence activities generate a smaller impact in relation to deforestation caused by cattle owners and illegal loggers.

Addressing the underlying deforestation drivers e.g. providing alternatives to local community member, is relevant to achieving the objective of the project, which is to reduce emissions from avoided deforestation, by reducing the communities dependence on the forest resources through sustainable practices and education about the effects of deforestation and the benefits of protecting their habitat.

The local communities will also be trained to spot where there is evidence of deforestation or potential deforestation in their specific areas and an effective communication system will be applied to report of this activity.

4.4 Description of the Monitoring Plan

The main goal of the monitoring plan is to adequately monitor the project area to prevent any deforestation occurring in the project area. Any detection that deforestation has occurred in the project area will be reported and acted upon appropriately.

The monitoring plan will be in permanent implementation and allows for the identification of areas subject to risk of deforestation and allows deforestation mitigation measures to be implemented. The project area will be constantly monitored for evidence of deforestation through satellite imagery, via road and river access and through the implementation of project area aerial surveillance when possible (see 4.5.5).

Monitoring of deforestation will result in reductions being achieved as activities will provide an early detection of any agents or sources of deforestation, while enabling the project proponents to identify specific drivers of deforestation also, and to implement appropriate actions to mitigate such deforestation occurring, and the subsequent release of carbon stock.

4.4.1 Intervention Practices

Where deforestation activities are identified as being in contravention of the objectives of the project, they can be classified as two different types. The first one is regarding activities that do not break the environmental legislation but however are not in accordance to the conservation objectives of the project. Those activities are classified as *Legal Irregularities*, and can be something such as clearings made in the forest for family agriculture (families are allowed to clear up to 20% of the properties). The second type refers to activities that interfere in the conservation objectives of the project, and also do not respect the environmental legislation. These are classified as *Illegal Irregularities*. Examples of this type of irregularities are predatory hunting of wildlife, deforestation of riparian forests and irregular occupations not described by the local by-law.

Legal Irregularities

In the case of the legal irregularities, the on-the-ground team should take pictures of the activities and mark the co-ordinates. The information should then be sent to the Project Coordinators, to the Project Management Council and the Municipality.

The co-ordinators of the project will analyse the situation and generate the necessary information on how to contact the responsible ones for the irregularity. The information will include a suitable proposal on how the negotiation process should be with the parties involved, and will follow the dispute resolution mechanism identified in section 3.6. All the landowners and people living in the project were part of the free, prior and informed consent process. The people involved in the irregularity will receive a business plan to help them to get involved with the activities of the project, and they will be guided by the project team responsible for the development of the activity chosen.

If the people involved in the irregularity do not agree with correcting or changing their degrading activity for a sustainable one, the case will be taken to the conflict resolutions system as described in the section 3.6.

Illegal Irregularities

Illegal Irregularities might be identified by the OTG teams, since the State and Federal regulators currently do not carry out on the ground monitoring activities, taking action only when they wither receive a report about an illegal activity or through the State and Federal programs for diagnostic geo-processing. When the OTG team identify an irregularity, they should take pictures of the scene, write down or record the co-ordinates for the area and send them to the project co-ordinators so that can make a formal report to the official institutions, according to the following descriptions:

- **IBAMA** (from the Portuguese name *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis*, which means Brazilian Institute for the Environment and Renewable Natural Resources). This is the main federal government institution for monitoring activities and environmental control. Irregularity reports, information and abuse reports about aggressions to the environment (hunting and trading wildlife; air, water, and soil pollution) should be made through the "Green Line" (Linha Verde)[10] which is an ombudsman service from IBAMA that will receive this type of report, or through the website[11]. After receiving the complaint, the institution has a deadline of 30 days to release a statement about the case.

- **IPAAM** (*Instituto de Proteção Ambiental do Amazonas*, which means Institute for Environmental Protection of Amazonas) promotes preventive and corrective actions in the localities or activities that are considered as being effective or potential polluters, or in activities that might cause pollution/contamination/environmental degradation, taking into account the legal regulations that are applicable to the case. IPAAM's main activities are to monitor enterprises/activities that do not have a valid license according to the complaints received by IPAAM, the Public Ministry/Judiciary and IBAMA; to monitor areas that have been critically deforested or burnt, detected by the geo-processing laboratory through multispectral sensors; and monitoring Conservation Units under the State Administration. Complaints or requests can be made directly to the institution office[12], through the telephone numbers of IPAAM[13], their Green Line[14]; or through the institution's website[15].

4.5   Monitoring of Emissions from Deforestation

Forest cover change due to deforestation will be monitored through periodic assessment of satellite imagery covering the project and leakage areas. The NFS AM001.0 approved methodology describes the proposed methods and calculations for the monitoring of any emissions from deforestation that occur from the project (see Annex 9); quantification of

---

[10] Green Line is an ombudsman service telephone number to call to report illegal activities (+55 (0) 800 618080)

[11] http://servicos.ibama.gov.br/ctf/formulario_solicitacao_auxilio.php

[12] Rua Mário Ypiranga Monteiro, 3280 – Parque Dez de Novembro - CEP 69050-030, Manaus, AM

[13] +55 92 21236715, +55 92 21236729

[14] Green Line telephone number +55 (0) 800 2808283

[15] www.ipaam.am.gov.br

emissions from any human-induced deforestation within the project area will be carried out using these approved methods.

Monitoring of emissions will be carried out using a combination of remote sensing and ground-based monitoring and data collection methods in both the project and leakage areas, as discussed in this section and in section 8.4, and in accordance with the approved NFS methodology.

The project boundary, as shown in the Geospatial Platform, and for reference below, will be the scope of the monitoring area, plus the specified 10km buffer that will be monitored for leakage (see section 8). The initial carbon and vegetation layers within the project provide the initial forest cover baseline information for the start date of the project, against which changes in forest cover and emissions from any deforestation that occurs will be assessed. For each reporting interval, assessment will be carried out against previous records and data for reference and comparison.

Map 9 - Basic Outline of Project Boundary
Source: CGV Geospatial Platform 8th January 2013

To estimate the change of forest cover within the project area, the benchmark baseline data generated via the carbon and vegetation layer data in the Geospatial Platform will be compared with a newly-generated forest cover map for the monitoring period.

The data that is included in the Geospatial Platform that is discussed in sections 5-7 establishes the baseline for the project. There will be monitoring layers incorporated into the Geospatial Platform, which will be updated as data becomes available to provide the

remote-sensing element for monitoring the project area. The monitoring of the project area will use the following sources:

- Annual monitoring using remote sensing;
- Medium and high resolution mapping of high-risk areas;
- Near-real time alerts;
- Ground-based monitoring via roads and boats.

4.5.1 Annual Monitoring using Remote Sensing

The project will use the approved maps within the NFS approved methodology AM001.0 within the Geospatial Platform for the remote sensing. The data sources are described within the methodology (see Annex 9).

The PRODES INPE program that is implemented by the Brazilian Space Agency provides reasonably accurate annual assessments of deforestation. This will be incorporated into the monitoring layer of the Geospatial Platform, to give year-on-year analysis of changes within the project area. The Geospatial Platform will include monitoring layers that will receive annual updated data from PRODES INPE and updated data from NASA JPL Pan-tropical carbon maps, when available, to identify and determine any changes in land-use or land cover. The Geospatial Platform will be updated with new data as required by NFS AM001.0 for monitoring purposes and subsequent amendments.

4.5.1.1 Accuracy of Remote Sensing Data

The data used in the platform consists of data and maps specified in the NFS AM001.0 approved methodology, which are deemed to be accurate. Each data-set has different ground-truthing and comparison approaches that have been used.

PRODES Deforestation Detection

The Brazilian PRODES program for monitoring deforestation is widely regarded as a benchmark for accuracy[16] (Hammer et al. 2009). The program began accuracy assessments in 2010 and is known to be able to accurately detect deforestation events >6.5 ha in extent with >95% accuracy. The system uses skilled visual interpretation rather than automated processes.

NASA-JPL Pan-Tropical Carbon Map

The ground plot data used to parameterise the map are described in Saatchi et al, 2011[17]. The mapping exercise used a combination of data from 4,079 in situ inventory plots and satellite light detection and ranging (Lidar) samples of forest structure to estimate carbon storage, plus optical and microwave imagery (1-km resolution) to extrapolate over the landscape. Analysis of errors on project areas >1,000,000 ha was estimated at circa 1%.

---

[16] http://dspace.cigilibrary.org/jspui/bitstream/123456789/27924/1/WP%20192%20-%20FORMA.pdf?1
[17] Saatchi et al. (2011). Benchmark map of forest carbon stocks in tropical regions across three continents. PNAS, doi: 10.1073/pnas.1019576108

4.5.2 Medium and High Resolution Mapping of Identified High-Risk Areas

Areas of the project that are identified as high-risk areas, initially using the ACEU data layer in the Geospatial Platform, plus any areas that are identified by the on-the-ground teams will be subject to higher resolution mapping on an annual basis to give more detailed data for these high-risk areas. Medium resolution satellite data is in the range of 20m to 100m and high resolution satellite data is deemed to be <20m pixel size.

Expert visual interpretation of good quality medium resolution Landsat (25m pixel) data should be able to detect deforestation of areas (patches) >10 ha with 100% accuracy, however, accuracy falls the smaller the area, so it is difficult to accurately detect changes on areas below 5 ha.

High resolution data, such as Spot Image at 5 m can give 100% accurate detection of deforestation down to 0.5 ha. You can even detect degradation (selective logging) with multiple images but this is quite expensive and less than 100% accurate.

High resolution data is more expensive, both in terms of the cost of data and also processing and interpretation per unit area coverage, so it is appropriate to use high resolutions selectively in areas where patchy, small-scale deforestation activity is suspected. These areas can be identified from a combination of medium resolution data and local knowledge.

4.5.3 Near Real-time Alerts

The project plans to supplement the other mentioned monitoring activities and sources with employ an automated deforestation detection program using MODIS NDVI which can be developed into the Geospatial Platform over time, which will recognise changes in pixels within the project area on a frequent basis.

Coarse resolution data such as MODIS, combined with automated processing, can yield information on where deforestation may be occurring within a few weeks/2 months. This can then indicate to the OTG teams where their monitoring resources are required. As MODIS NDVI data is frequent but somewhat coarse resolution data (250m pixels), it is intended for use in detecting land use change in near-real time but as it is known to be less accurate (overall accuracy in the range of 70%-90%), the proposed use of supplementary high resolution and ground-based checks will be adopted in conjunction with this monitoring source, as specified in NFS AM001.0.

4.5.4 Ground-based Monitoring via Road and Boat

Ground-based monitoring will be carried out by the projects on-the-ground teams, and will initially focus on the areas identified as accessible within the project area. There will be a continuous patrol of these areas following an appropriate schedule that will be ascertained through the local knowledge of the project participants.

Where any evidence of deforestation is detected, the location of this will be recorded using GPS and reported to the monitoring team co-ordinator, who will carry out cross-checking

assessments to confirm the suspected activity. This can then be the basis for identifying where any medium or high resolution imagery is required. Visual auditing of these areas using the medium/high resolution images will be carried out to confirm any instances of deforestation having occurred. Further discussion of the on-the-ground team activities can be found in section 4.6 below.

4.5.5 Aerial Monitoring

From income achieved through the issuance and sale of carbon credits from the project, the project will also be looking to implement aerial monitoring via microlight trike or fixed-wing aircraft, which will be a far more efficient way of covering a wider area in a much quicker time. The air vehicle will also be used to transport rangers to identified hotspots quickly. The Municipality of Borba is ideally suited for the deployment of air vehicles as it has a year-round airport with good landing facilities.

4.6 On-the-ground Monitoring Teams

Field staff activities will be focused on monitoring and responding to deforestation activities or potential threats. They will also carry out checking and ground-truthing activities where possible deforestation is detected by PRODES, MODIS or reported by local people. A field manual, training manual and records of activities will be developed during the course of the project.

The on-the-ground (OTG) teams will consist of trained rangers as well as participants from the local communities and Municipal Police and Rangers; these teams will be sufficiently and adequately trained for carrying out the monitoring activities including training on GPS referencing and patrol procedures. The local participants will be trained to identify evidence of deforestation or potential deforestation and how to communicate this efficiently and effectively to the project co-ordination team. There will be on-going training for the members of the monitoring teams, to ensure that the most effective monitoring for the project area is being carried out. By providing capacity-building education and training about the importance of protecting their habitat and for discovering more sustainable use of natural resources for the local communities will prove to be an effective deforestation mitigation exercise in itself.

The main tasks for the teams will be the identifying and mapping of threatened areas, identifying the risks they are exposed to and identifying which risks are the most aggressive plus any deforestation that occurs under the canopy level that would not be picked up on any remote sensing/satellites.

This information will then be assessed and acted upon using the implementation of control measures by the trained rangers to guarantee the control and protection of these areas, with the support and co-ordination of the Project Management Council. The OTG teams will be provided with GPS units to combine with their local knowledge to be able to accurately map and plot any areas that are at threat of deforestation or evidence of such activity. This can then be fed back to the monitoring implementation team to compile into a database,

and for uploading to the Geospatial Platform and for response teams to be deployed. This information can also be used to mark specific spots for any aerial monitoring that may occur (see section 4.5.5).

The monitoring teams will record observations, document meetings of the sub-teams and input this data into a monitoring template, which can then be entered into a shared database for the project co-ordinators to facilitate. The monitoring template will include:

- Name of Monitor
- Name of Sub Group
- Date of Monitor
- Location of deforestation
- Date of deforestation (if known)
- Responsible agent of deforestation
- Observations of area affected by deforestation
- Biodiversity observed
- Other notes relating to the project

Through the annual review processes that are in place for the project, the monitoring team activities will be reported and reviewed for appropriateness, accuracy and efficiency.

Municipality Master Plan (By-Laws)
Currently, the Municipality of Borba are re-writing the Master Plan of the Municipality of Borba (see section 2.3) to ensure that the objectives of the project are written into the local laws, which will mean that the Municipality will be able to act quickly if any deforestation occurs. The fact that the project is being recognised in the Master Plan of the Municipality will act as a deterrent to illegal deforestation in itself, as a less viable opportunity for those who would consider acting in this way.

The OTG teams will be instructed to use non-confrontational procedures for dealing with any agents of deforestation. Any legal actions that are required to be implemented against any individuals, groups or organisations will be the responsibility of the Municipality and the Municipal Police, who will be trained in the appropriate Environmental Laws, with links between the Municipal Police and IBAMA being put in place.

4.6.1   Schedule of visits
Given the vastness of the project area, and the inaccessibility of the very low risk areas within the project, it is the intension of the project to have a schedule of visits to the most at-risk areas of the project as the main focus of the OTG team. However, this schedule will include visits to less-accessible areas where and when appropriate and possible. For further discussion on and identification of where these most at-risk areas are, please see sections 6.2 and 8.4.

Whilst making their scheduled visits around the project area, the teams will be provided GPS handhelds to enable them to accurately track, monitor and record any data they collect on their monitoring visits.

Patrols of the potential deforestation sites have been carried out since the project start date, and initial measures to mitigate deforestation pressures have been implemented through communication with the communities during these visits, encouraging their engagement and participation in the project and providing information on the planned activities, programs, projects and benefits that will be available through participative actions (see section 2.4.3 for further information on deforestation mitigation measures).

4.6.2   On-the-ground Activities

As part of the on-going project activities, the project will look to implement on-the-ground sampling measures, by way of an Environmental Impact Assessment. This will be based on forest inventory diagnosis (volume and biomass) of the area of the project, where communities directly involved in the activities will be enlisted by Instituto Amazônia Livre (IAL), as they have the relevant expertise, skills and experience in the various activities involved. IAL will be responsible for the technical monitoring plan. The GIS team from IAL will indicate where the sampling regions for the first flora and fauna inventories will be made. During project development of these activities, there will be the transfer of technical and administrative responsibilities in part to the community.

Monitoring will be an innovative and promising activity for the community. They will learn through training and specific courses on the sustainable use of forest resources and mitigating actions exploitation of natural products, resulting in the aggregation of expected economic value to products, and integrated regional development by stimulating and encouraging the sustainable development of communities. During the execution of the project will be a selection of local experts in order to quantify, train and allocate the residents who will do this monitoring.

The planned actions to effect the proposal are:

- Survey of soil and water, flora and fauna, especially in areas of commercial value;
- Special program developed for species at risk;
- Demarcation of plots;
- Identification, location and evaluation of trees, rivers, soils and specific ecosystems;
- Identification of the presence of water courses, cipoatics areas and demographic changes are also observed during the monitoring, the composition of the population inventoried include native and non-native species, diameter at breast height (dbh)> 20 cm.

In Brazil, the AER is known as "Avaliação Ecológica Rápida"(Rapid Ecology Evaluation - REE), it will usually be two sampling should be conducted, one during the dry season and another during the rainy season, thus leading the duration lasts about a year. It is indicated for large

areas. Generally, this model requires greater participation of persons of recognized local expertise.

With both methods described here, is possible to generate monitorable indicators on scales of up to details. Furthermore, from these processes it is intended to characterize sub-areas of High Conservation Value and will include the monitoring of any impacts on biodiversity that result from project activities and benefits to the communities being implemented. With the field procedures for the selected areas, which will be under major threat of deforestation, it will be possible to monitor the evolution of the carbon stocks in those areas, the influence of the access to the project area's biodiversity, and to update data about the forest dynamics, with the classification of the types of forest.

4.6.3 Monitoring of Operational Emissions

The Trocano Araretama Conservation project will utilise the 'Our Impacts' GHG accounting platform[18] to accurately monitor and report operational GHG emissions. Scope 1 and 2 emissions for the project will be accounted for on an annual basis, and will be submitted as part of the annual reporting process. The Our Impacts GHG accounting platform is compliant with the WBCSD/WRI GHG Protocol.

4.7   Monitoring of Carbon Sequestration

As the project does not currently include any areas identified for restoration, the monitoring of carbon sequestration is not required at this time, therefore the estimated average carbon stocks should not be significantly changed during the crediting period. The project will consider mapping areas of degradation with a view to increasing carbon stocks as part of future improvements to the project.

4.8   Leakage Area Monitoring

A leakage buffer of 10km around the boundary of the project area has been identified for the monitoring of leakage that can be attributed to agents of deforestation that would otherwise have been carried out within the project area. The north boundary of the Central Zone of the project is bordered by the Madeirinhas Conservation Project (a separate Celestial Green Ventures project), which acts as a buffer to this section. The leakage buffer identified within the Geospatial Platform is therefore located around the boundary of the two project areas combined. This is shown on the map below:

---

[18] http://ecometrica.com/products/our-impacts/

Map 10 - Leakage buffer monitoring zone including CGV Madeirinhas Conservation Project
Source: CGV Geospatial Platform 8th January 2013

Leakage will be monitored bi-annually via satellite and remote-sensing from PRODES and MODIS, with visits from the OTG team where appropriate. Although leakage is not expected with the project implementation, any areas of deforestation identified within the leakage buffer of =>20 ha will be investigated to determine whether they are attributed to agents of deforestation from within the project area re-locating to outside the project area to carry out the deforestation. Any deforestation displacement that is deemed direct leakage from the project area will then be mapped, recorded and reported as part of the annual review process.

The process of the OTG teams investigating any potential leakage will follow the same procedures as described for the monitoring of the project area. When the overall monitoring of the project area is carried out, any evidence of displaced deforestation in the leakage buffer zone will be investigated and appropriately dealt with.

See Section 8 for more detail and discussion on Leakage, and See Annex 9 for detail on the NFS AM001.0 methodology for monitoring emissions from leakage.

SECTION 5 – INITIAL CARBON STOCKS

5.0   Introduction

The CGV Geospatial Platform enables the project to gather multiple layers of environmental data and the software utilizes collated research resources from the NASA Jet Propulsion Laboratory, ESA Globcover, PRODES INPE, MODIS and CGV project data. This platform illustrates the risk of deforestation using the ACEU analysis tool, and applies this rule to any given or drawn area within the Legal Amazon on a five-point intensity scale. The platform also demonstrates existing carbon stocks & biomass density, vegetation types, historic deforestation for the years 2006-2010 and past fire events for 2005-2010. In addition, the use of our Geospatial Platform will enable a more time-efficient process for the Carbon Stock calculations plus the application of the approved NFS AM001.0 methodology (see Annex 9) to the project areas.

CGV is responsible for maintaining up to date data from monitoring systems. Reports generated on the Platform are included in the annex of this document, and made available as required through the Geospatial Platform.

The scope of the platform covers the legal Amazon area and shows protected areas, carbon stocks in forests, areas of past deforestation and risk of future deforestation. It also identifies and maps the project areas and automatically assesses the potential carbon savings from the project. It is also possible to draw random and unrelated polygons anywhere in the region to generate independent samples of information and data.

5.1   Mapping of the Project and Leakage Areas

The platform is used to accurately map the project area and spatial data on the project boundaries, carbon stocks, vegetation and risks is maintained. The platform automates the calculations of NFC's produced from the project area using the approved methodology NFS AM001.0 and associated supporting data and maps, (See Annex 9) and has been produced in line with the Standard requirements and guidelines of the Natural Forest Standard, where it states that Tier 2 Regional carbon data sets are to be used for the quantification of carbon stocks. Whilst other maps were available for the area, they were not suitable for a risk-based GHG baseline construction. The maps provided in AM001.0 were approved as best available evidence.

As stated in sections 2.1 and 2.4.7, there are currently no planned restoration activities for the project. As a result of this, and in accordance of the AM001.0 methodology, there is no requirement to address degradation in the context of quantifying emission reductions for the forest conservation activities of the Trocano project. The following justification is taken from the approved methodology (see Annex 9):

"The method addresses emissions associated with deforestation but does not include potential emissions from degradation (in the case of Amazonia, degradation occurs mainly in

the form of illegal selective logging). The reasons for not including degradation in this method are as follows:

- *Carbon emissions associated with selective logging are not accurately known, and likely to be highly variable as the proportion of logged wood within any given area will vary depending on the attractiveness of the species.*
- *Areas subject to selective logging may either gradually recover their carbon stocks or may be subject to increased disturbance leading to conversion to agriculture / ranching. In the case of recovery the emissions are not permanent, and in the second case, conversion will be considered within the deforestation baseline.*
- *There may be mid-cases where the nature of disturbance produces a permanently reduced carbon stock (while still maintaining forest cover), however, there is little information as to the extent of such disturbance."*

The project will consider mapping areas of degradation with a view to increasing carbon stocks as part of future improvements to the project.

5.2 Carbon Layer of the Geospatial Platform

There are a number of data layers within the platform, with each one providing illustrative information for specific datasets. The carbon layer is detailed below. Further explanation of the other data layers can be found in

Carbon Layer

The carbon density (in tC/ha) estimated as ~50% of above-ground biomass and below-ground biomass at 1km resolution, derived from a variety of remote sensing products and in-situ forest plots. The layer represents carbon density in approximately the year of 2003. The source of this data is the NASA Jet Propulsion Laboratory and the extent of the data layer is the Legal Amazon and areas around it. The Input data is from Saatchi et al (2011) Benchmark map of forest carbon stocks in tropical regions across three continents. PNAS, doi: 10.1073/pnas.1019576108. Corresponding author e-mail: saatchi@jpl.nasa.gov.

5.3 Demonstrating Initial Carbon Stocks within the Geospatial Platform

Within the Geospatial Platform, for ease of use and for the calculations to be manageable due to the large total project area plus for reasons discussed in the note below, the 3 project zones have been split into a total of 13 areas. Each of these 13 areas has analysis data attached, and can be viewed within the platform by choosing an area from the index, or clicking on a specific area on the map (see Map 8, page 88). The data analysis includes detailed information for the following categories:

- o Total Biomass and Carbon
- o Average Biomass and Carbon Density (where >0tC/ha)
- o Vegetation
- o Past Deforestation (if present)

o   Past Fire Events
o   Risk of Deforestation – SimAmazonia
o   Risk of Deforestation – ACEU Deforestation Risk

These 7 categories generate detailed information under each of these headings specific to the area chosen. A downloadable Application report can be generated individually for each of these 13 project areas, providing the analysis as shown on the platform itself in report format.

As stated in section 2.4.7, there are currently no planned restoration activities for the project, the project has not yet developed plans for forest restoration as part of the project activities, and as

5.3.1   Analysis Notes Relevant to Carbon Stocks Data within the Geospatial Platform

Total Biomass & Carbon
Calculations of the total Above-Ground Biomass (AGB), Below-Ground Biomass (BGB) and Carbon Stock (roughly 50% of AGB=BGB) in the drawn area of interest.

Average Biomass & Carbon Density (where >0 tC/ha)
Calculations of the average Above-Ground Biomass (AGB), Below-Ground Biomass (BGB) and carbon Stock (roughly 50% of AGB+BGB) per hectare of land area, in the drawn area of interest. Note the water bodies within the drawn area of interest are included in calculating total land area. Thus, average values may be lower in areas including large portions of water compared to other tabs.

Vegetation
Classifications of the drawn area of interest into vegetation types and calculations of the carbon present per vegetation category. Note that differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs described above). Water bodies are identified with greater accuracy using the higher resolution vegetation map and are then assigned a carbon value of 0t/ha.

Initial carbon stocks of the Trocano project can be viewed within the Geospatial Platform using the login and password provided.

5.3.2 Important information regarding the data provided in the Geospatial Platform

Differences in the Project Land Areas reported[19]

These differences are caused by two reasons, explained below. In most cases the discrepancy will be relatively small and will only be caused by reasons explained in point 1, but in some cases characteristics of data layers as described in point 2 will also play a role.

1. **Different system for retrieving area sizes (vector v's raster-based):** The area retrieved that is given in the "Land Area" is estimated on-the-fly by the Geospatial Platform using the outlines of the area drawn. In GIS terms, the area is retrieved using vector-based methods (i.e. using the outlines of the area of interest polygon). Because the method used gives a fast on-the-fly area estimate, it is not 100% accurate and therefore the word "Approximately" appears in front of the given area size in hectares.

   The areas reported under the query tabs are based on a raster-based method, i.e. the method uses the pixels of the data layers that are located inside the area of interest. In this process, the pixels that occur on the edges of query areas will either be included in the query results or excluded. The rule is that pixels will be included if their centre point is located inside the query area and excluded if their centre point is located outside the query area. The figure shows an example – pixels containing a cross are excluded from the query.
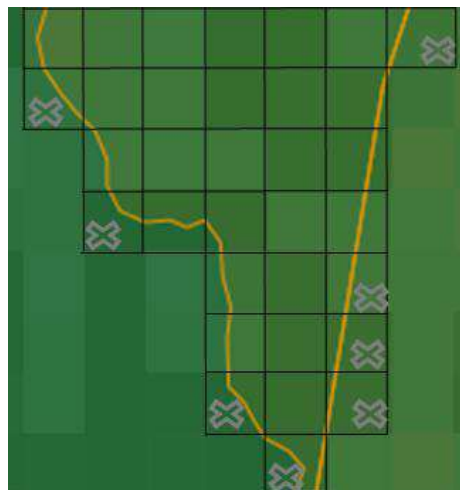
Figure 11 - Example of area drawn and pixels
Source: Ecometrica 8th January 2013

   The data layers have a known resolution or pixel size. To obtain area estimates, the system counts the number of pixels that are included in the query area and

---

[19] Ecometrica 8th January 2013. This document can be found in Annex 11.

multiplies it with the pixel size. Since some pixels on the edges of the query area are included and others excluded in the area calculation, this method will normally return good estimates of the actual query area.

However, larger discrepancies will occur for data layers with larger pixels and/or for query areas that are more detailed and complex ('wavy').

2. **Characteristics of a data layer (overlap with 'No data' areas):** When you look at the data layers as they are displayed in the risk map section of the Geospatial Platform, some pixels have not been assigned a category colour (e.g. in the ACEU risk map, the rivers and water bodies have black pixels). Since these areas were identified as water areas, they have not been assigned a deforestation risk category (i.e. in GIS terms we assigned 'NoData' values to these pixels). The fact that they don't belong to a specific risk category, means that these pixels are not taken into account if they occur within a query area for a "risk of deforestation" query. Therefore, if a query area overlaps a water area (as shown in the figure below, e.g. Borba- Area 12), the total area added up under the risk tab will be smaller than expected as the pixels with a "No Data" value are not reported as a risk category in the output table.
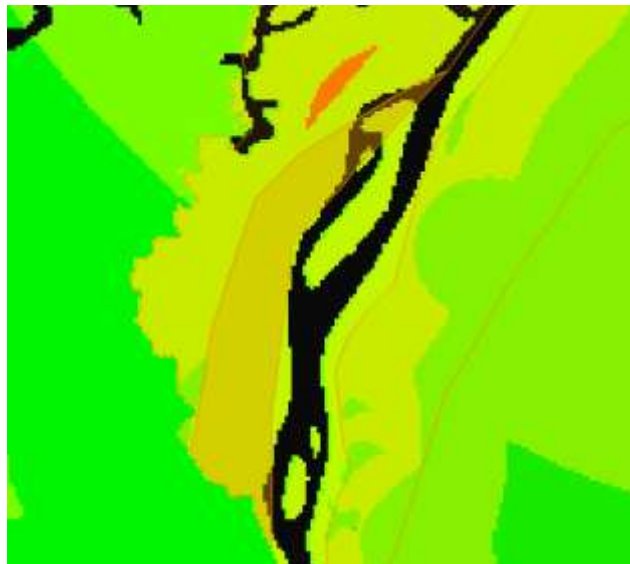
Figure 12 - Example of overlap taken from Area 12
Source: CGV Geospatial Platform 8th January 2013

5.3.3 Additional Notes:
Note A: On the 'Total Biomass and Carbon' tab, areas of water bodies (with 0tC) have not been excluded. Total Carbon reported is based entirely on JPL NASA Carbon maps. The coarse map resolution implies that the reported carbon values may be higher than those reported in other tabs.

Note B: On the 'Average Biomass and Carbon Density (where >0 tC/ha)' tab, areas of water (with 0tC) have not been excluded. Average carbon reported in this tab thus includes areas with no carbon, giving a lower result than in other tabs.

Note C: Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in the 'Vegetation' tab is slightly different from that reported for the carbon maps used for the 'Total Biomass and Carbon' and 'Average Biomass and Carbon Density' tabs. Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Note D: There are a few small disconnected areas within the project area that are along the river between the West and Central Zones. It was felt that although these areas will be included within the project activities and are included in the total project area, they were excluded from the carbon calculations within the Geospatial Platform as the fragmented pixels within these small areas was giving inconsistent results.

5.3.4 Summary

The total actual project area is **1,346,541 ha**; the mapping within the Geospatial Platform, when taking into consideration the explanations above, under-calculates the project areas and results in the total area submitted for project calculations, carbon calculations and baseline estimations being less than the total project area. The below table gives an overview of the calculations, taking into consideration the Vector-Based, Raster-Based and ACEU Risk Map calculations.

Area Number	Project Land Areas as calculated in the Geospatial Platform		
	Vector-Based Land Calculations in hectares as described as 'Land Area' for use in PDD*	Raster-Based Land Calculations in hectares as used wtihin Query layers e.g. vegetation*	ACEU risk map Land Area Calculations in hectares omitting the 'no-data' areas*
1	25,408	25,260	25,260
2	12,033	12,148	12,148
3	10,498	10,547	10,547
4	102,631	102,719	102,719
5	1,442	1,486	1,485
6	192,965	193,285	186,989
7	111,861	111,916	111,915
8	161,462	161,620	154,385
9	23,122	23,193	21,293
10	51,502	51,399	50,917
11	225,118	225,468	222,638
12	13,027	12,634	11,740
13	277,708	277,777	275,130
Totals	1,208,777	1,208,707	1,187,166

*As explained above

Table 9 - Land areas calculated within the Geospatial Platform
Source: CGV Geospatial Platform 8th January 2013

Calculated Percentages of Project Area in the Geospatial Platform			
Calculation Types	Actual Project Area (ha)	Calculated Project Area (ha)	Percentage of Actual Project Area (ha)
Vector-Based	1,346,541	1,208,777	**89.77%**
Raster-Based	1,346,541	1,208,707	**89.76%**
ACEU Risk Map	1,346,541	1,187,166	**88.16%**

Table 10 - Calculated percentages of Actual Project Area
Source: CGV Geospatial Platform 8th January 2013

For the purposes of all calculations in the PDD, where the term 'Area Size' is quoted, this is referring to the Vector-Based project land areas.

5.4   Data Outputs from the Geospatial Platform

Application reports have been generated for each of the 13 areas for the purpose of collating this PDD document on 11th December 2012, but can be freely downloaded again at any time through the Geospatial Platform. These reports generated on the 11th December 2012 are available within the Annex of this document. For reference, the below map provides the numbered project areas within the Platform.
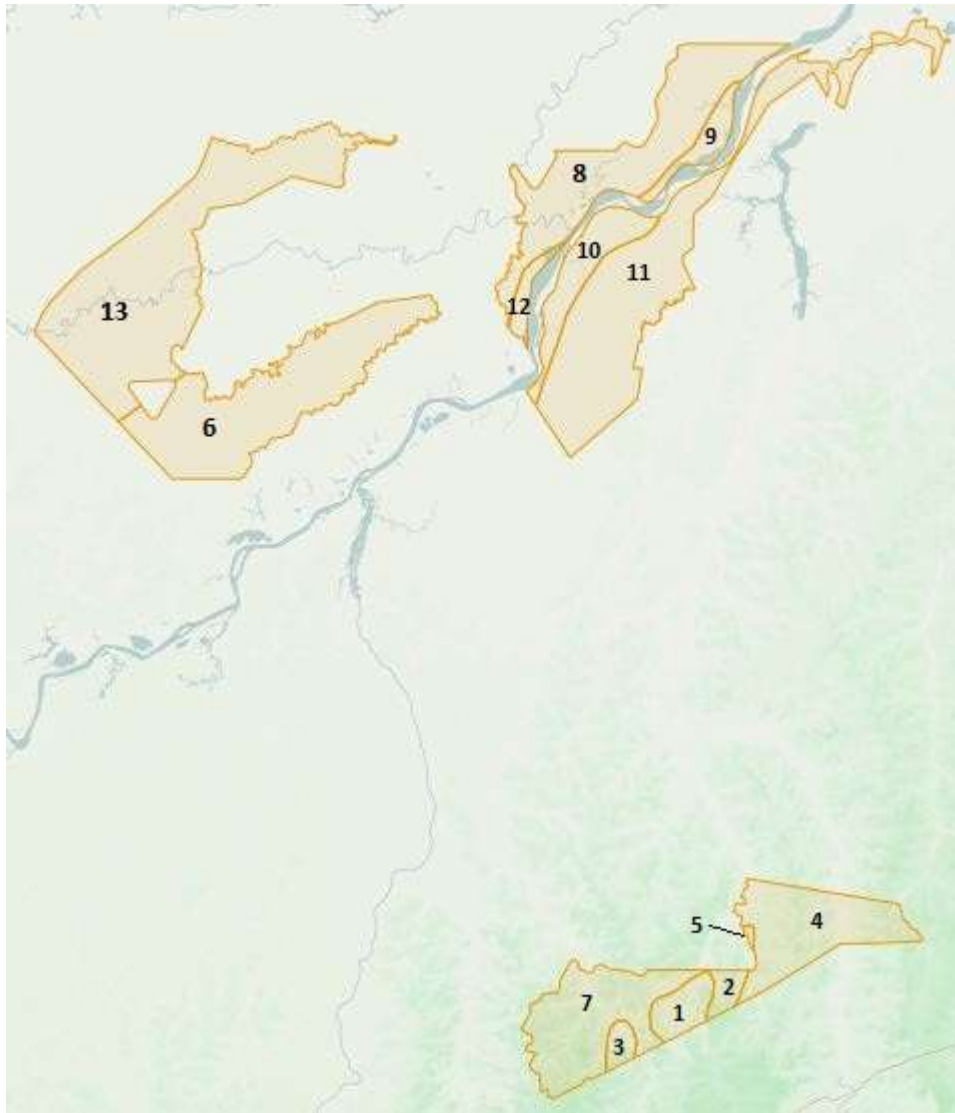
Map 11 – Project Areas and assigned area numbers within the Geospatial Platform
Source: CGV Geospatial Platform

For the purposes of demonstrating the Initial Carbon Stocks for the PDD, the data outputs of these reports are the source of the summaries below:

Area 1 (South Zone)
Land Area: ~25,408 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 5,895,623 t
  Below Ground Biomass: 1,582,589 t
  Carbon Stock: 3,739,329 ± 1,097,036 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 233 t/ha
  Average Below-Ground Biomass Density: 62 t/ha
  Average Carbon Density: 148 ± 43 tC/ha

- Vegetation

Area   Total Carbon

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	25,260	100	3,739,329	148
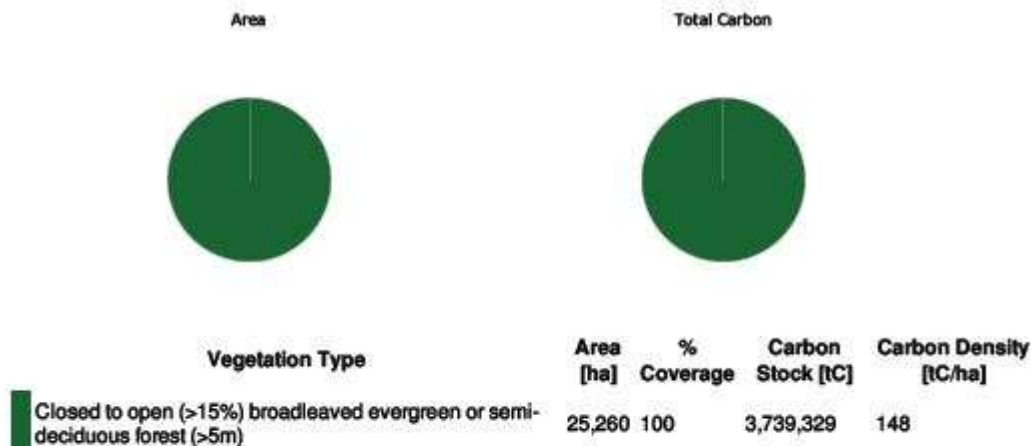
**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 13 - Vegetation Types for Area 1
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8a for full report.

Area 2 (South Zone)

Land Area: ~12,033 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 2,848,482 t
  Below Ground Biomass: 763,639 t
  Carbon Stock: 1,800,600 ± 530,591 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 234 t/ha
  Average Below-Ground Biomass Density: 62 t/ha
  Average Carbon Density: 148 ± 43 tC/ha

- Vegetation

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	12,148	100	1,800,600	148

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 14 - Vegetation Types for Area 2
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8b for full report.

Area 3 (South Zone)
Land Area: ~10,498 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 2,330,345 t
  Below Ground Biomass: 628,222 t
  Carbon Stock: 1,482,440 ± 439,922 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 220 t/ha
  Average Below-Ground Biomass Density: 59 t/ha
  Average Carbon Density: 140 ± 41 tC/ha

- Vegetation

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	10,547	100	1,482,440	140

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 15 - Vegetation Types for Area 3
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8c for full report.

Area 4 (South Zone)

Land Area: ~102,631 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 23,452,103 t
  Below Ground Biomass: 6,309,582 t
  Carbon Stock: 14,888,294 ± 4,385,665 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 228 t/ha
  Average Below-Ground Biomass Density: 61 t/ha
  Average Carbon Density: 144 ± 42 tC/ha

- Vegetation

Area   Total Carbon

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	102,422	99	14,844,887	144
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	297	0.29	43,406	146

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 16 - Vegetation Types for Area 4
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8d for full report.

Area 5 (South Zone)

Land Area: ~1,442 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 331,970 t
  Below Ground Biomass: 89,486 t
  Carbon Stock: 209,260 ± 64,959 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 223 t/ha
  Average Below-Ground Biomass Density: 60 t/ha
  Average Carbon Density: 140 ± 43 tC/ha

- Vegetation

Area   Total Carbon

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	1,486	100	209,260	140

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 17 - Vegetation Types for Area 5
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8e for full report.

Area 6 (West Zone)

Land Area: ~192,965 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 43,184,882 t
  Below Ground Biomass: 11,601,219 t
  Carbon Stock: 27,347,075 ± 8,460,356 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 230 t/ha
  Average Below-Ground Biomass Density: 61 t/ha
  Average Carbon Density: 141 ± 45 tC/ha

- Vegetation

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	223	0.12	33,307	149
Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	37	0.019	5,961	160
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	188,631	97	26,880,694	142
Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichens/mosses)	223	0.12	28,017	125
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	260	0.13	25,073	96
Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	1,639	0.85	183,787	112
Water bodies **	2,272	1.2	0	0

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 18 - Vegetation Types for Area 6
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8f for full report.

Area 7 (South Zone)

Land Area: ~111,861 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 24,978,950 t
  Below Ground Biomass: 6,735,301 t
  Carbon Stock: 15,879,301 ± 4,726,875 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 223 t/ha
  Average Below-Ground Biomass Density: 60 t/ha
  Average Carbon Density: 141 ± 42 tC/ha

- Vegetation

Area   Total Carbon

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	37	0.033	6,017	162
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	111,620	99	15,835,433	141
Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)	37	0.033	2,377	64
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	222	0.20	35,473	159

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 19 - Vegetation Types for Area 7
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8g for full report.

Area 8 (Central Zone)

Land Area: ~161,462 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 35,734,692 t
  Below Ground Biomass: 9,592,278 t
  Carbon Stock: 22,499,067 ± 7,104,746 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 229 t/ha
  Average Below-Ground Biomass Density: 61 t/ha
  Average Carbon Density: 139 ± 45 tC/ha

- Vegetation

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	37	0.023	1,939	52
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	155,543	96	21,930,371	140
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	3,654	2.3	445,372	121
Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	410	0.25	35,464	86
Water bodies **	1,976	1.2	0	0

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 20 - Vegetation Types for Area 8
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8h for full report.

Area 9 (Central Zone)

Land Area: ~23,122 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 4,047,766 t
  Below Ground Biomass: 1,111,327 t
  Carbon Stock: 2,513,948 ± 853,857 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 179 t/ha
  Average Below-Ground Biomass Density: 49 t/ha
  Average Carbon Density: 108 ± 37 tC/ha

- Vegetation

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	111	0.48	8,540	76
Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	37	0.16	1,118	30
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	18,348	79	2,136,805	116
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	2,237	9.6	220,363	98
Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	335	1.4	30,654	91
Water bodies **	2,125	9.2	0	0

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 21 - Vegetation Types for Area 9
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8i for full report.

Area 10 (Central Zone)

Land Area: ~51,502 hectares

- Total Biomass & Carbon

Above Ground Biomass:	9,831,608 t
Below Ground Biomass:	2,677,545 t
Carbon Stock:	6,312,577 ± 1,915,866 tC

- Average Biomass and Carbon Density (where >0 tC/ha)

Average above-Ground Biomass Density:	197 t/ha
Average Below-Ground Biomass Density:	53 t/ha
Average Carbon Density:	122 ± 38 tC/ha

- Vegetation

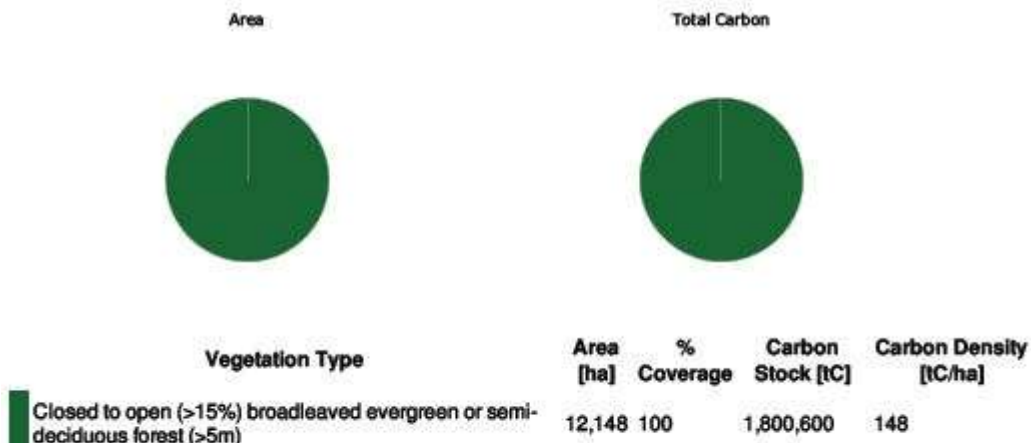| Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	372	0.73	21,992	59
Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	37	0.073	149	4.0
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	48,681	94	6,081,471	124
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	1,975	3.8	203,783	103
Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	74	0.15	2,199	29
Water bodies **	260	0.51	0	0

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 22 - Vegetation Types for Area 10
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8j for full report.

Area 11 (Central Zone)

Land Area: ~225,118 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 50,547,952 t
  Below Ground Biomass: 13,587,882 t
  Carbon Stock: 32,247,262 ± 9,647,322 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 226 t/ha
  Average Below-Ground Biomass Density: 60 t/ha
  Average Carbon Density: 143 ± 43 tC/ha
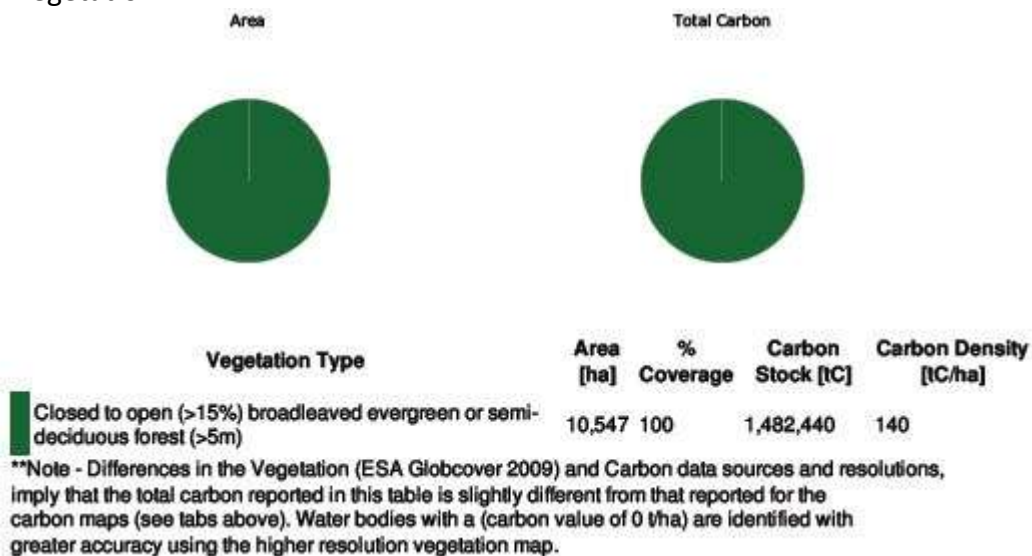
- Vegetation

Area   Total Carbon

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	521	0.23	54,904	105
Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	74	0.033	9,132	122
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	212,873	94	30,905,836	145
Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)	74	0.033	5,143	69
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	8,833	3.9	1,070,479	121
Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	745	0.33	62,322	83
Water bodies **	2,348	1.0	0	0

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 23 - Vegetation Types for Area 11
Source: CGV Geospatial Platform Application Report 11th December 2012.
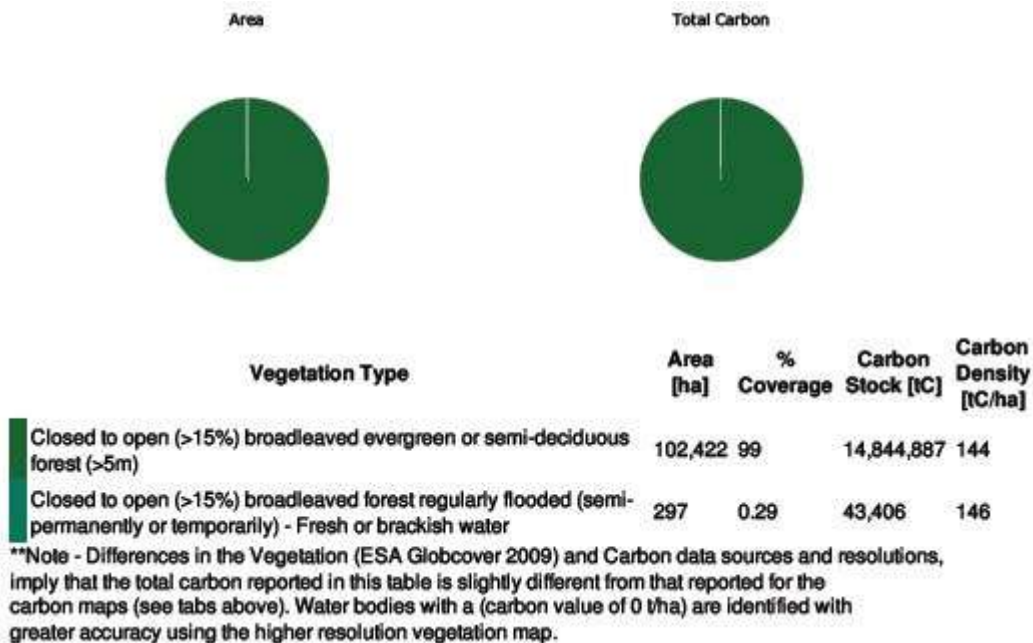**See Annex 8k for full report.**

Area 12 (Central Zone)

Land Area: ~13,027 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 2,167,476 t
  Below Ground Biomass: 592,512 t
  Carbon Stock: 1,370,862 ± 465,191 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 186 t/ha
  Average Below-Ground Biomass Density: 50 t/ha
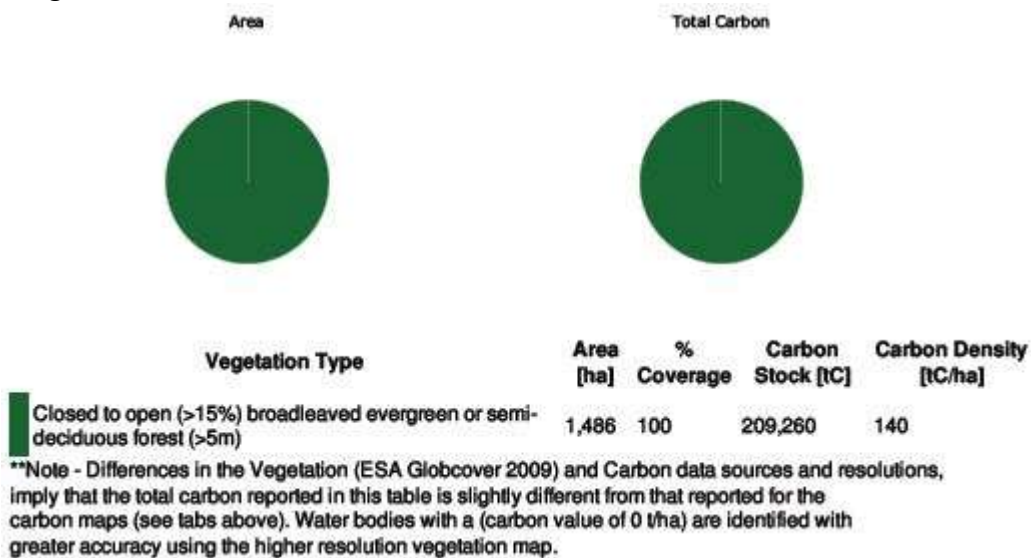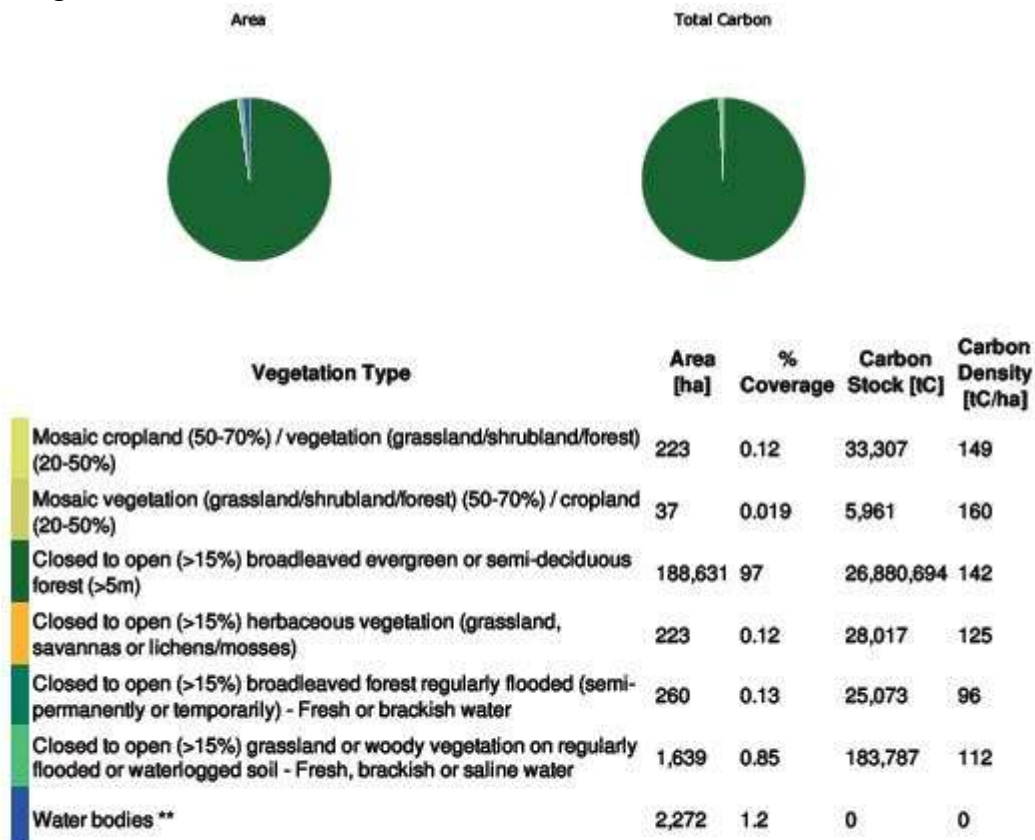 Average Carbon Density: 108 ± 40 tC/ha

- Vegetation

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	10,287	81	1,209,810	117
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	1,602	12	149,572	93
Water bodies **	745	5.9	0	0

**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.

Figure 24 - Vegetation Types for Area 12
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8l for full report.

Area 13 (West Zone)

Land Area: ~277,708 hectares

- Total Biomass & Carbon
  Above Ground Biomass: 61,457,675 t
  Below Ground Biomass: 16,560,129 t
  Carbon Stock: 39,030,839 ± 11,992,181 tC

- Average Biomass and Carbon Density (where >0 tC/ha)
  Average above-Ground Biomass Density: 223 t/ha
  Average Below-Ground Biomass Density: 60 t/ha
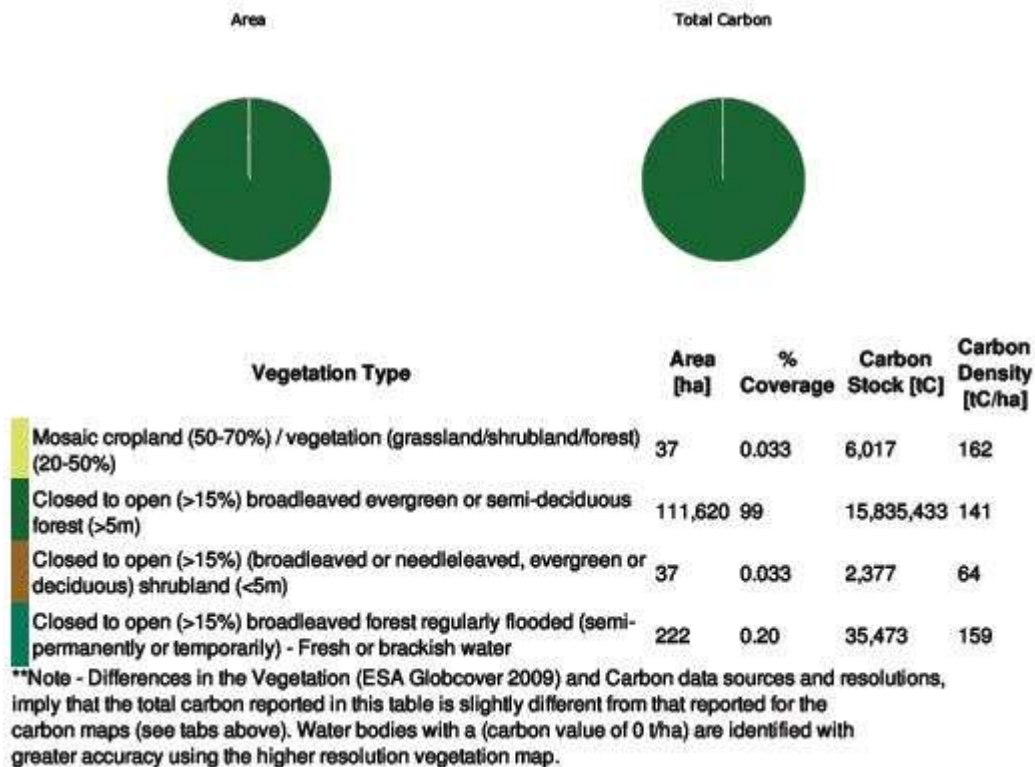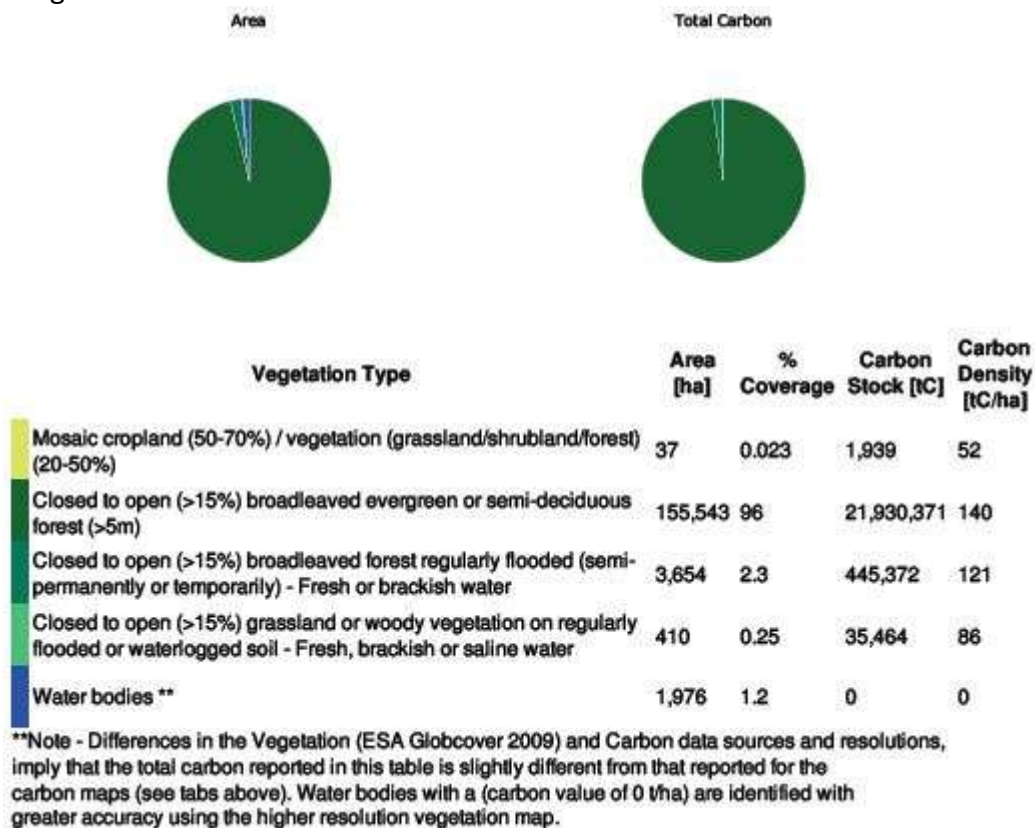 Average Carbon Density: 140 ± 43 tC/ha

- Vegetation

Area   Total Carbon

Vegetation Type	Area [ha]	% Coverage	Carbon Stock [tC]	Carbon Density [tC/ha]
Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	149	0.054	20,017	134
Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	261,377	94	37,309,932	142
Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichens/mosses)	74	0.027	8,275	111
Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	6,896	2.5	829,719	120
Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	5,740	2.1	556,115	96
Water bodies **	3,541	1.3	0	0
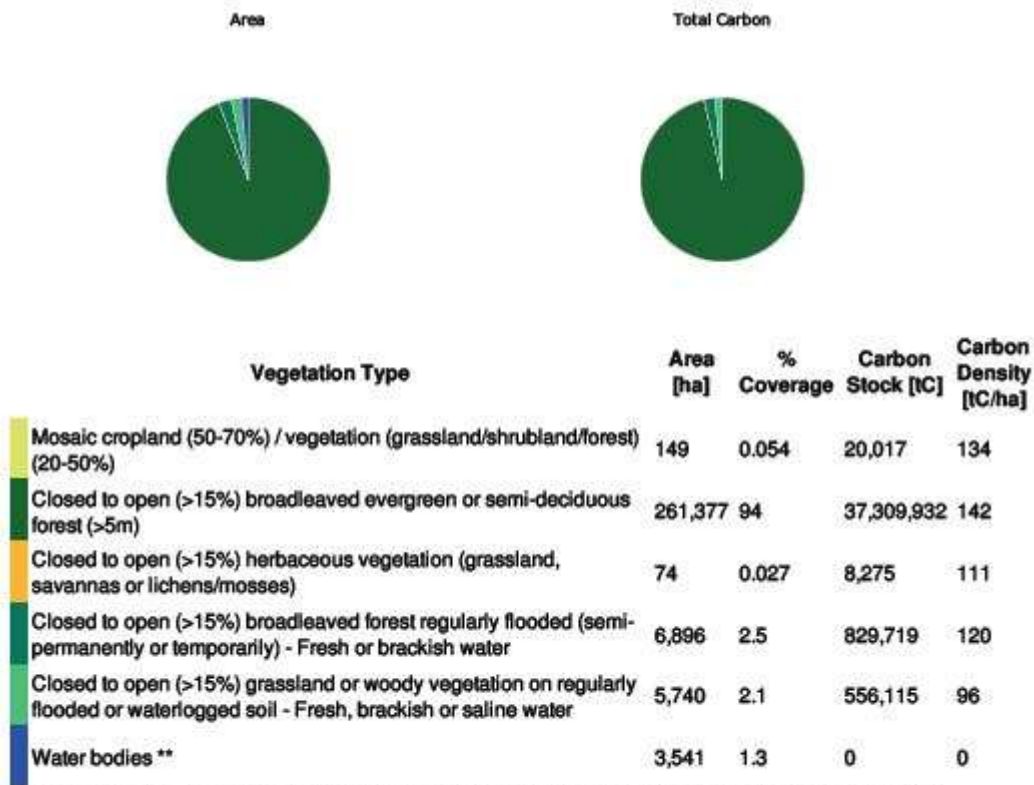
**Note - Differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions, imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies with a (carbon value of 0 t/ha) are identified with greater accuracy using the higher resolution vegetation map.
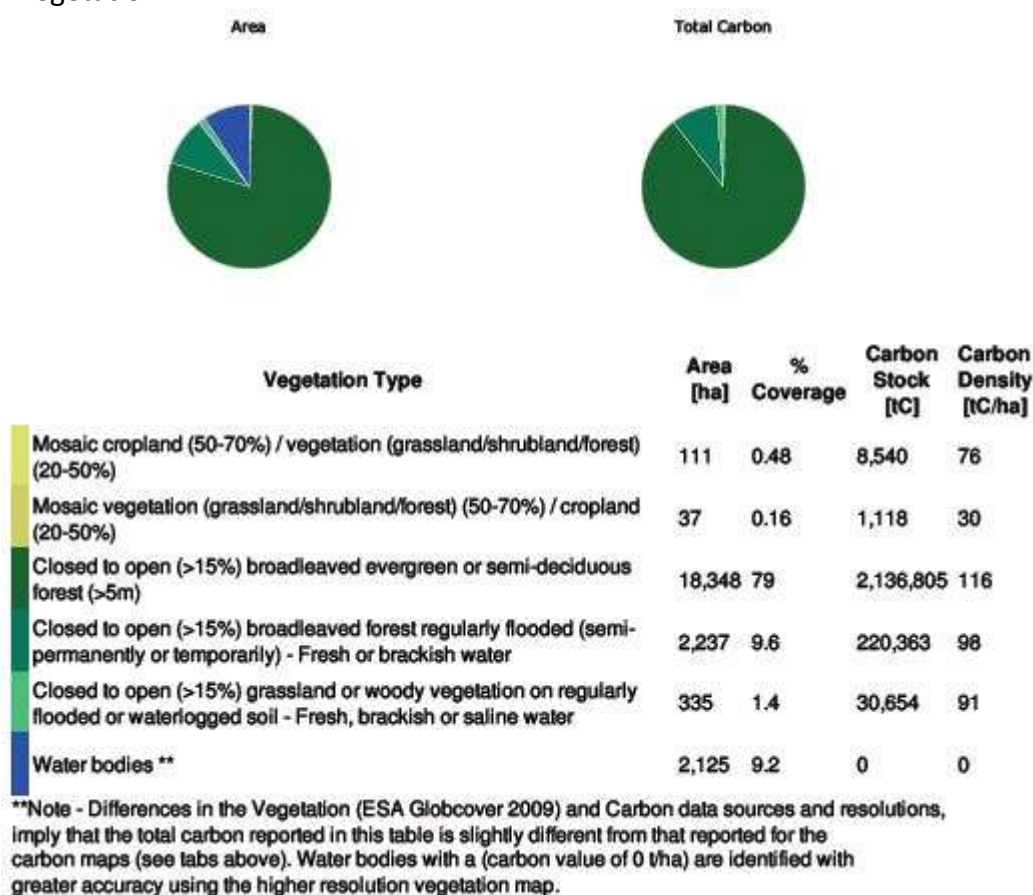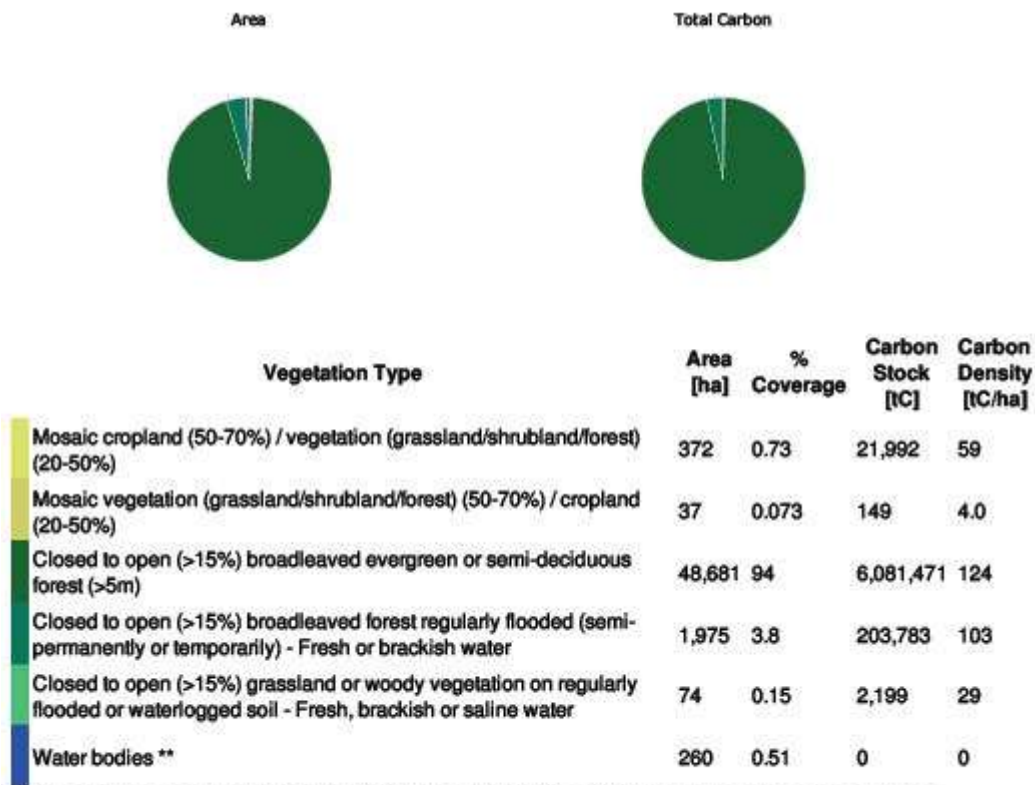
Figure 25 - Vegetation Types for Area 13
Source: CGV Geospatial Platform Application Report 11th December 2012.
See Annex 8m for full report.

5.5 Initial Carbon Stocks Data Information

There are small discrepancies in the total carbon stocks depending on which data layer and retrieval process the results are generated through. This is due to the data used for each layer calculated in different ways, as described in section 5.3.2.

The carbon totals in the vegetation tab do not take into account carbon map pixels that occur in areas that are identified as water in the vegetation map. In the same way, the carbon totals in the ACEU risk tab do not take into account carbon map pixels that occur in areas identified as water in the ACEU risk map and therefore result in 'No Data' areas.

If all the project areas are viewed within the Geospatial Platform, with the carbon map and the ACEU map in the background, it can be seen that Areas 1-5 as well as 7 are not close to water areas and all the other areas overlap to various degrees with water areas in both maps. Discrepancies are also due to differences in resolution of the data layers.

The vegetation map and the ACEU risk map have slight differences in their delineation of water areas. This is because these maps were created using different input data and methods and were therefore created at different resolutions. The ACEU map has water areas delineated at the higher resolution.

The total carbon reported in the Vegetation and ACEU tab is dependent on both, the carbon layer by JPL and the Vegetation layer or ACEU layer, respectively. The JPL Carbon map has a coarse resolution, 1 sq.km, so sometimes pixels overlap water bodies, sometimes mud-banks are wrongly shown to have carbon etc. When queried with the Vegetation or ACEU layer, these pixels are corrected to equal 0 tC/ha, because water bodies are identified with better accuracy in these higher resolution layers.

The ACEU layer was made using the original Brazil Government Shape Files of rivers and water bodies (and small streams etc.) at a reasonably high resolution. The water bodies in the Vegetation layer are derived from other global data sources at a coarser resolution (see GLOBCOVER 2009 info). The bottom line is that when different data are compared geo-spatially, you have to consider the differences in sources, resolutions, dates, etc. The numbers will never be exactly the same.

The ACEU layer is a risk map rather than a map of physical attributes, and as a result of this it is not possible to use ground-truthing. The map was compared with output from SimAmazonia (Soares-Filho, 2006[20]) and was found to be conservative.

---

[20] Soares-Filho B. S.A., Nepstad, D., Curran, L., Voll, E., Cerqueira,G., Garcia, R. A., Ramos, C. A., Mcdonald, A., Lefebvre, P., Schlesinger, P. (2006). Modeling conservation in the Amazon basin. Nature, London, v. 440, pp. 520-523.

5.5.1 Qualifying Statement

A thorough quantitative QA process on the site has been carried out, running every single query and area of interest on ArcGIS, as well as within the platform itself, to compare differences. Differences in carbon in the ArcGIS and Geospatial Platform outputs were mostly within the range of 1-2%, as was expected. Areas with large water bodies showed higher differences, mostly because ArcGIS has no way of querying 2 layers at once, and cannot mask out water bodies identified in the better resolution ACEU or Vegetation layer. In summary, all results within the Geospatial Platform are correct and accurate and can still carry an assurance that this is a conservative application of the differences being applied in the project.

For the purpose of conservativeness in our calculations, where there is a discrepancy in figures, we have based all Initial Carbon Stocks quantification within this PDD on the lower figure that is produced, regardless of which layer it appears on. This will be identified in the notes of each section and both sets of data will be displayed for transparency.

5.6   Total Initial Carbon Stocks

The below table shows a summary of the Carbon Stocks as identified within the Vegetation Data Layer provided from the Geospatial Platform:

Project Area Number	Land Area (ha) with available carbon data*	Total Carbon Stock per Area(tC)
1	~25,408	3,739,329
2	~12,033	1,800,600
3	~10,498	1,482,440
4	~102,631	14,888,293
5	~1,442	209,260
6	~192,965	27,156,839
7	~111,861	15,879,300
8	~161,462	22,413,146
9	~23,122	2,397,480
10	~51,502	6,309,594
11	~225,118	32,107,816
12	~13,027	1,359,382
13	~277,708	38,724,058
Total Land Area	**~1,208,777**	
Total Carbon Stock		**168,467,537**

Table 11 – Total Initial Carbon Stocks for the Project Area using the Vegetation Layer Data
Source: CGV Geospatial Platform 11th December 2012

* The carbon layer has areas designated as "NoData", which are essentially water bodies. The vegetation layer has areas designated as "water", which essentially have 0 tC. Where the Geospatial Platform reads "NoData" in the Carbon Layer, it does not include those areas in the total area calculation, because it simply assumes there is no data there.

Average Carbon Stock using Vegetation Layer Data	
Average carbon density (Total carbon Stock / Total Land Area)	139.37

Table 12 - Average Carbon Stock for the Project Area using the Vegetation Layer Data
Source: CGV Geospatial Platform 11th December 2012

The below table shows a summary of the Carbon stocks as identified within the ACEU deforestation risk layer:

Project Area Number	Land Area (ha) with available carbon data*	Total Carbon Stock per Area(tC)
1	~25,408	3,739,329
2	~12,033	1,800,600
3	~10,498	1,482,440
4	~102,631	14,888,293
5	~1,442	209,260
6	~192,965	26,937,508
7	~111,861	15,879,299
8	~161,462	22,192,529
9	~23,122	2,438,504
10	~51,502	6,305,941
11	~225,118	32,060,926
12	~13,027	1,350,996
13	~277,708	38,939,848
Total Land Area	**~1,208,777**	
Total Carbon Stock		**168,225,473**

Table 13 – Total Initial Carbon Stocks for the Project Area using the ACEU Deforestation Risk Layer Data
Source: CGV Geospatial Platform 11th December 2012

* The carbon layer has areas designated as "NoData", which are essentially water bodies. The vegetation layer has areas designated as "water", which essentially have 0 tC. Where the Geospatial Platform reads "NoData" in the Carbon Layer, it does not include those areas in the total area calculation, because it simply assumes there is no data there.

Average Carbon Stock using ACEU Risk Map Data	
Average carbon density (Total carbon Stock / Total Land Area)	139.17

Table 14 - Average Carbon Stock for the project area using the ACEU Deforestation Risk Layer Data
Source: CGV Geospatial Platform 11th December 2012

5.7 Carbon Pools

From the data included in the Carbon Layer of the Geospatial Platform, based entirely on JPL NASA carbon maps, the following carbon pools below have been identified:

Project Area Number	Above Ground Biomass (t)	Below Ground Biomass (t)
1	5,895,623	1,582,589
2	2,848,482	763,639
3	2,330,345	628,222
4	23,452,103	6,309,582
5	331,970	89,486
6	43,184,882	11,601,219
7	24,978,950	6,735,301
8	35,734,692	9,592,278
9	4,047,766	1,111,327
10	9,831,608	2,677,545
11	50,547,952	13,587,882
12	2,167,476	592,512
13	61,457,675	16,560,129
Totals	266,809,524	71,831,711

Table 15 – Carbon Pools of the Project Area
Source: CGV Geospatial Platform 11th December 2012

5.8 Initial Carbon Stock of the Identified Leakage Buffer

The leakage monitoring buffer for the project has been established in accordance with the NFS AM001.0 approved methodology. This has resulted in the project identifying and mapping a leakage buffer of 10km from the boundaries of the project area and this can be viewed in the Geospatial Platform. This 10km leakage buffer zone has been estimated to total approximately 1,800,000 ha.

As the Natural Forest Standard only requires an estimation of the Initial Carbon Stock for the leakage area, this has been calculated using the overall average carbon stock of the project area using the ACEU layer data which is the more conservative figure plus the figure used for quantification of baseline data.

Average Carbon Stock of Leakage Buffer using ACEU Risk Layer Data		
	(ha)	(tC)
Average carbon density (tC)		139.17
Total Leakage Buffer (ha)	1,800,000	
Initial Carbon Stock of Leakage Buffer (tC)		250,506,000

Table 16 - Average Carbon Stock for the Leakage Buffer using the ACEU Deforestation Risk Layer Data
Source: CGV Geospatial Platform 11th December 2012

For further information on Leakage, please see section 8.

SECTION 6 - BASELINE CALCULATIONS

6.0   Introduction

In accordance with the Natural Forest Standard requirements, a risk-based methodology has been used for the baseline calculations of the Trocano Araretama Conservation project. The methodology that is provided by the Natural Forest Standard is included in the Annex of this document (Annex 9) and gives the full analysis of the methodology, which has been applied in this PDD.

This methodology does not provide a prediction of future forest loss but assigns relative risk values, based on the ACEU criteria (i.e. land that is Accessible, Cultivable, has Extractive value and is Unprotected is likely to be deforested unless conserved; Grace et al., 2010). It is assumed that within Amazonia the majority of land has cultivable and exploitive value since few areas are unsuitable for timber extraction or extensive cattle grazing (the main drivers of land use change). Risk was therefore assessed using indicators of accessibility and the protection status of areas.

Using a risk-based method for the calculations provides a much more conservative and credible baseline as it is based on actual risk, rather than predicted loss. There is no exact science in prediction, but using statistics and risk categories much like insurance companies do, enables project areas to be categorised according to their level of risk of deforestation, based on actual deforestation and degradation that has already occurred and factor this into the calculations.

The output of the method for calculating the baseline is an estimation of emissions avoided by protecting the project area against deforestation over the lifetime of the crediting period (20 years). It does not include the following:

- prediction of land use changes at specific locations and specific dates
- potential emissions from degradation

The calculation used for the quantification is provided on page 2 of the methodology provided in Annex 9.

6.1   Presence of Threats to the Project Area

The possibilities of deforestation identified during the preparation stage of the project are related to the needs of timber resources and creating pasture area with the occurrence of activities that promote deforestation have motivation arising mainly around the basic needs of the locals communities (riverine) and economic pressures.   The main deforestation agents in the project area are therefore identified as follows:

1. Producer family and small landowners, who despite being small in number, have a reasonable influence on the political status of city. Livestock farming is an observed activity that puts pressure on the existing primary forest layer. These owners move slowly on the forest and its spatial evolution is not as significant in the total volume

of degraded areas that are currently being observed in the city (9% in total). In the municipality of Borba limit of 20% of deforestation allowed by Brazilian legislation has not yet been reached on most properties where there is extensive cattle ranching, deforestation leading to a minimal level of governance that meets only the law and with little change in a horizon of five years.

2. In the south of Borba, the risk agents are large loggers, squatters and settlers who, from deliberate actions with bullies (gunmen) and system-based in threats to the integrity of the locals, take ownership of the land for exploration in large scale. Plates are placed by settlers mainly from the State of Mato Grosso, that use violent practices, supported by big business, to promote the acquisition of land, even make use of threats to small farmers. In Borba, rivers Canumã, Sucunduri and Acari serve as an outlet for the timber is transported to the BR-230 (Trans) and access via the AM-174 (New Road Aripuanã / Apuí). Big buyers of what is explored in the forest, which comes from New Apuí and Aripuanã, municipalities around Borba, lease logs and turns the situation into a structured trades for irregularities, illegalities and crimes. Without generating any return to traditional communities and shifting cultivators, such withdrawal hinders the development and ends with the natural ecosystem.

The following can be identified as indirect agents of deforestation:
1. The entire population of residents of the county seat to buy products without timber certification is an indirect agent of deforestation. The resident population of the town of Borba is active in the service sector (70%), industry (15%) and agriculture (15%), maintaining the traditional characteristics and tend to use products that are less industrialized, but at the same time, keep direct link to large retailers that operate in urban centers.
2. Retailers who work in communities and in the town
3. Distributors of products coming from big cities like Manaus, Porto Velho and Santarém.
4. Small service providers, such as bakeries and small factories of wood products.

The main consequence of the traditional practice of cultivating the land on the scope of the project is the clearing of hundreds of hectares of virgin forests which results in the issuance of hundreds of tons of carbon into the atmosphere, creating low productivity because soils are poor in nutrients. As local people are unaware of other forms of land use and natural resources of the place, the tendency is that the devastation continues to increase in Borba.

6.1.1 Accessibility
The risks of deforestation are from the access to forest areas. Thus, the key to all parts of the project are:

a) The road AM 174 is an outlet for timber extraction from forests adjacent access through your cities to New Aripuanã and Apuí, as the case of the area south of the project.

b) Being extremely important for the transport of cargo and soybeans between the cities of Porto Velho (RO), Itacoatiara (AM) and Santarém (PA), the Madeira River is the main access of people of Manipur seat, Humaitá. It is also an important outlet for soybean production in the Midwest of the country for consumer markets abroad, as well as the Amazon region itself, and of vital importance for regional development due to its strategic position.

c) The BR 230 is the main passageway of charcoal from logging of natural forests in the region, home to the south.

d) There is enormous pressure areas located in areas of roads, such as the BR 319, showing the "herringbone effect" (opening of roads in small and medium businesses along the margin of BR-319) is felt broadly in these regions.

Studies show that areas bordering roads, as is the case of the western portion of the municipality of Borba (adjacent to the BR-319), are the most under pressure for being close to areas of runoff. This means that there is enormous pressure on Borba forest areas located in areas of roads, as the "fishbone effect" (opening of roads in small and medium businesses along the margin of BR-319) is felt broadly in these regions.

In perspective of economic development, the understanding of institutions shows the pressures on land use as follows:

The restoration work of the BR-319 is designed to integrate road through the capitals of the states of Amazon (Manaus) and Rondonia (Porto Velho). Besides the capital, the highway will integrate the municipalities directly intercepted by the road, among them we highlight Tapauá, Canutama, Humaitá and Manipur, Careiro, Careiro Lowland, Beruri, Borba and Manaquiri. In addition, the municipalities Apuí and Lábrea, being located in the BR-230 (Trans) that crosses the highway BR-319 in de same level of the city of Humaita, will also be integrated by road.

In the social sphere restoration work of the BR-319 and the storage of parts in good condition, will be essential in forming an axis of integration and thus combat the isolation of major cities in the state of Amazon and Porto Velho. Among these municipalities highlight Tapauá, Canutama, Humaitá and Manipur in the state of Amazon that comprise the area of direct influence of the study, located on the stretch between km 370 and 655 and the cities of Manaus, Careiro Castanho, Careiro Lowland, Beruri, Borba and Manaquiri in the state of Amazon and Porto Velho, capital of Rondonia state, are part of the area of indirect influence of this study.

The transport system of the BR-319 is a vital component to the solution of basic problems of health and education in the municipalities, because it will facilitate people's access to education and health centres, in addition to the conditions of access for health professionals and education that may provide services to the population, in rural areas, will allow the placement of the means of cultural dissemination, technical, professional and health needed to improve working conditions and productivity of these populations that are

isolated from large urban centres and only depend on the waterway system to access, it takes days and weeks to receive any assistance.

From the viewpoint of economics, the transport system via highway BR-319 will be vital for internal and external trade, particularly the municipalities of their surroundings enable the fixing of costs of goods and services, the breakdown of prices, stabilize the markets, land use and urbanization. "Moreover, it may be an alternative pathway to accelerate the disposal of electronic products generated in the Industrial Pole of Manaus, which now depend exclusively on the waterway." Thus, it is important to plan activities to mitigate the consequences of deforestation of the facilities offered by the paving of this road.

6.1.2 Analysis of Risks Associated with Roads

Among the main factors to encourage deforestation in the project area, the relation of accessibility to resources is directly linked to loss of forest biomass. Ferreira (2001) presented results of a study conducted with the time course for the southern region of Para, which showed high susceptibility to deforestation for cattle ranching, showing the variation in the percentage of loss of vegetation cover as a function of distance from the road.
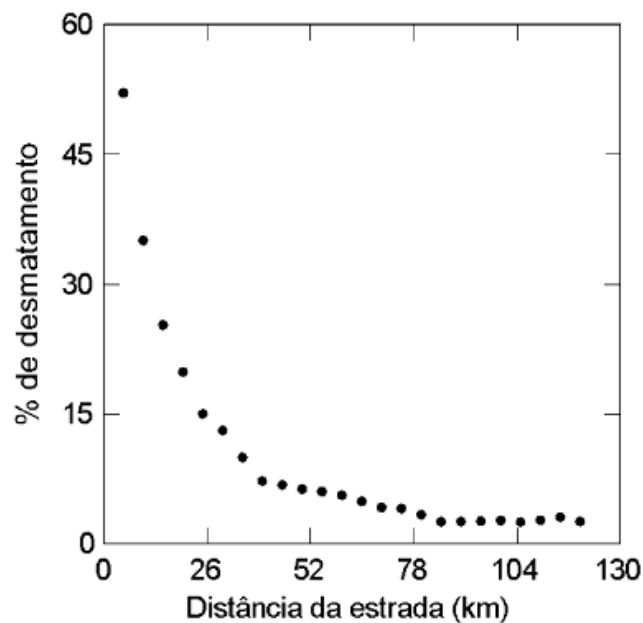
Figure 26 - Proportion of the deforestation correlated to distance from roads. [21]

The graph in the figure above shows a study conducted on roads in the south of Pará - Brazil, located in the Amazon, for 8 years. From this chart you can make an assignment to establish criteria of deforestation on the distance to the axis of the road. Whereas the intensity of deforestation in Pará is higher than in Borba, it is estimated that in 20 years, the

---

[21]FERREIRA, L. V. "Identification of priority areas for biodiversity conservation through the representation of protected vegetation types and eco-regions in the Brazilian Amazon", in Capobianco, J. P. R. (ed.). Biodiversity in Brazilian Amazonia: evaluation and priority actions for conservation, sustain-able use and benefit sharing. Sao Paulo, Socio-Environmental Institute, 2001, p. 268-286.

rate of deforestation is double compared to deforestation estimated for eight years presented in the study. According to this study the picture of the risks of deforestation Borba would be like this.

This criterion provides satisfactory description for the evolution of logging roads with its branches near the project area, south of Borba, with boundaries to the municipalities of Novo Aripuanã and Apuí (AM-174 and BR-230).

Considering the risk in the AM-174, as a consequence of herringbone effect, can be said that in 2012 there deforestation and forest degradation of gravity too high. For this reason, we expect the risk of deforestation as the main branches that can be seen in Google Earth aerial photograph, dated 2011.

Image 1 - Image of the road AM 174 showing the extensions of the "fishbone" effect near the South Zone
Source: Google Earth, 2011

For the BR-230 (Trans-road) in the southern part of Borba the fishbone effect is still small for now. This road is used for the transportation of wood from rivers Sucunduri, Acari and Camaiua.

6.1.3   Analysis of Associated Risk to Water Network

Another aspect to consider is the risk of loss of biomass by the flow of wood through rivers. In the case of Borba will be differentiated from the southern rivers (Sucunduri, Acari and Camaiua or Canumã) the other navigable rivers of the west (river Luna, Black River and the Acu-Igarapé Tupana) and central zone of the municipality of Borba and its main river (Madeira). The difference is that the southern rivers are affected by the flow that occurs through the BR-230 road. This highway is a major drainer of wood for charcoal production coming from natural forests in Brazil.

For the West and Central Zones, timber cutting is selective. There is no literature on these areas to justify what is the estimated loss of biomass. But based on consultation with a specialist in the region, will be considered a biomass loss of 30% in balance for the period of twenty years. This estimate is based on two locally observed factors.

1. The first factor is the decrease of volume occupied by the transformation of plant species in forests of the Tertiary forests.
2. The second factor is the decrease in height of canopy to remove the larger trees, often followed by burning or mowing to facilitate the removal of individuals. This also causes a negative balance of biomass over the twenty years.

In the rivers accessibility is limited because the wood is removed without mechanical means. For this reason we consider only the first 15 km accessible from the river banks. However, the range over demand is the one closest to the river. This allows us to consider the first two kilometres and increasing demand.

In the area south of Borba, the areas considered likely to deforestation are those accessible by its use for charcoal across the road, so its range is up to 15 km, but in areas west and central range is up to 3 km because these areas is selective withdrawal.

6.2   Method used for Mapping Risk of Deforestation in the Project Area

The Risk Analysis being used for the purposes of this project is the ACEU rule, as identified in the introduction to this section. This is felt to be a much more conservative and accurate appropriation of risk, as it is based on actual risk of deforestation without trying to predict where and when the deforestation is likely to occur, as is the case with the SimAmazonia predictive model. It was therefore concluded that the ACEU risk analysis would be the basis for all calculations provided and associated with the Trocano Araretama Conservation Project.

The ACEU methodology being used does not provide a prediction of future forest loss but assigns relative risk values (using the ACEU rule). It is assumed within the Amazon region that the majority of land has cultivable and exploitive value since few areas are unsuitable for timber extraction or extensive cattle grazing, which are the main drivers of land use change. The risk is therefore assessed using indicators of accessibility plus the protection status of any areas. The output of the maps is intended to be used as an input to the calculations of credits.

The risk mapping for this project has been developed within the Geospatial Platform, which has taken each aspect of the methodology and applied it to the maps that are provided within the platform. The platform is also used for the quantification of carbon benefits and baseline calculations for the project area, and these details can be independently generated through the platform, or they can be viewed in the generated reports that are found in Annex 8 (a-m) within this document.

6.2.1 Risk Factors

Risk of deforestation associated with access by Road and Rail

Proximity to roads and railways access was considered to be the most important factor in accessibility. A map displaying accessibility via road and rail was created by: sourcing an official road map of Brazil (PNLT, 2008), and creating a continuous map displaying 'distance from road' going up to a maximum distance of 100 km (based on local expertise on the distance up to which roads/railways pose a threat to forests). The 100 km buffer was then divided into 32 risk classes/values (each class was 3.125 km wide and 32 classes best represented the continuous field of risk from roads and rail), with areas closest to the road/railway given highest risk (=32) and areas furthest away given lowest risk (=1).

Risk of deforestation associated with access by rivers

Accessibility to forested areas by rivers (PNLT, 2008) also increases the risk of deforestation. However, river access was given a lower weighting than road access because of the logistical effort of transferring goods and livestock between boat and truck (through communications with Amazon Livre). A continuous map of 'distance from navigable rivers' up to a maximum distance of 15 km was created on the distance up to which rivers pose a threat to forests). As with the risk from roads and railways, the 15 km buffer was divided into 3.125 km wide buffers, and given risk classes/values from 1 to 16 (half of the maximum assigned to roads/railways), with areas closest to the river given highest risk (=16) and areas furthest away given lowest risk (=1).

Risk due to Proximity to Previous Sites of Deforestation

Areas where deforestation has occurred in the past indicate higher risk of future deforestation, since these areas have been accessed previously and any controlling agencies have not prevented land use change, previous deforestation indicates accessibility, lack of protection and some degree of economic attraction. A density map of deforestation events that occurred between 2005 and 2011 (Soares-Filho et al., 2006) was created. The map was then divided into 32 classes based on the density values – i.e. group of highest density values were given highest risk value (=32) and the group of lowest density values were given lowest risk value (=1).

Protected Indigenous Areas

The legal protection of areas in the Brazilian Amazon is a method of enforcing conservation of forest resources and biodiversity (Verissimo, 2011). Approximately 1.6 million km2 of indigenous lands and protected areas (under federal protection and state protection) can be identified in the region of interest (PNLT, 2008). In the calculation of risk, areas that are designated with "indigenous protection" are considered to be at low risk of deforestation as it is assumed that these areas have some protection status.

6.2.2 Risk of Deforestation – Methods and Calculations

The total threat of deforestation in forests of the Amazon was derived using the four input maps described above.

- First, risks from roads/railways and rivers were added, resulting in a map where risk values ranged from 2 to 48.
- On this map, risk values in areas that were protected (indigenous lands, and those under federal and state protection) were re-assigned to lowest risk (i.e. risk value 2).
- Risk due to past deforestation (derived from the density map, Fig.3) was then added, resulting in a map with risk values ranging from 3 to 62 (Fig.5). Past deforestation was considered as a risk to both protected and non-protected areas, since recent deforestation is an indicator of the limited effectiveness of protection.
- Finally, risk on all water bodies (rivers, lakes) in the region, which obtain untrue risk values due to the buffering and density method described above were re-assigned to 'no risk areas'.

These methods and calculations can be viewed within the Geospatial Platform using the following layers:

- **ACEU Deforestation Risk Layer (Continuous)**
This demonstrates the risk of deforestation derived by Ecometrica's ACEU method (i.e. land that is Accessible, Cultivable, has Extractive value and is Unprotected, will be deforested unless conserved). It is assumed that within Amazonia the majority of land has cultivable and exploitive value only, since few areas are unsuitable for timber extraction or extensive cattle grazing (the main drivers of land use change). Risk was therefore assigned based on indicators of accessibility (by road/rail/river) and the protection status of areas (federal protection and state protection). High risk areas are represented in red, and low risk areas in green. The source of this data is from Ecometrica, and the extent and coverage of the data is the Legal Brazilian Amazon Forest.

- **Past Deforestation Layer**
This layer shows areas where deforestation has occurred in the past year 2006 to 2010. The source of this data is PRODES INPE Brazil and extends to cover the Brazilian Amazon. The input data is Landsat Imagery. Reference: http://www.obt.inpe.br/prodes.

- **Indigenous Lands and Protected Areas Layer**
This layer shows the protected and indigenous areas over the extent of the Brazilian Amazon. This includes areas that are not officially ratified by the Brazilian Government and that are in proposal stages. The source of this data is the Plano Nacional de Logística e Transportes (2008). Reference: http://mapas.mma.gov.br/i3geo/datadownload.htm

6.2.3   Outputs and Classification
The output shown on the ACEU Deforestation Risk Layer (continuous) shows a continuous field of risk of deforestation. Risk values are further classified into risk categories, as described in the NFS methodology. The classification is done by dividing the dataset into quintiles, i.e. equal-areas data subsets, with the group of highest values being assigned 'very

high risk' and the group of lowest risk values being assigned 'very low risk'. Water bodies are still classified as 'no risk'.

Risk indices were then assigned to the risk categories, assuming that not all carbon in the categories are lost equally and this can be viewed in the Geospatial Platform via the following layer:

- **ACEU Deforestation Risk Layer (Discrete)**

This layer demonstrates the risk of deforestation derived from the above ACEU risk map (continuous), by dividing risk into classes ranging from very low (green) to very high (red). To calculate the carbon risk, Risk Indices were assigned to each risk category. A Risk Index (RI) is the fraction of biomass estimated to be at risk, since it cannot be said with certainty that 100% of biomass will be lost in the area. Risk Indices area at equal intervals from 0% - 100%, with lower risk categories having higher uncertainty and thus lower Risk indices. The RI's are as follows:

Very High Risk   (Risk Index = 0.8)
High Risk   (Risk Index = 0.6)
Medium Risk   (Risk Index = 0.4)
Low Risk   (Risk Index = 0.2)
Very Low Risk   (Risk Index = 0)

The source of this data is Ecometrica and the extent and coverage of the data is the Legal Brazilian Amazon Forest.

6.2.4   Additional Data – Past Fire Events

Additional data that is important to be included in the Geospatial Platform is for Past Fire Events. Fire events of the past are recorded by the MODIS instrument on board NASA Terra (EOS AM) Satellite. A density map (no. of events/sq.km) was created from recorded fire events in each year (2005-2010).

Although this data is not displayed as an individual layer within the platform, this data is generated and displayed within each query result, for the project areas and also for any polygon query that is generated on the platform within the Legal Amazon Forest.

6.3   Geospatial Platform Baseline Calculations

From the methodology developed, as discussed above, and for the purposes of producing conservative, credible baseline calculations for the Trocano Araretama Conservation Project in accordance with the Natural Forest Standard requirements, the data layers have been developed and integrated into the Geospatial Platform, resulting in the risk maps presented within the platform. By incorporating a Standard Deviation element into the calculations provides a further level of conservativeness to the calculations.

6.4 Results of Applying the Risk Model to the Project Area for Baseline Calculations

Applying the methodology within the Geospatial Platform and therefore resulting in the given risk maps, it is possible to demonstrate the 'without project' scenario in the following data taken from the Geospatial Platform reports generated on 11th December 2012 and included in the Annex of this document (Annex 8a-m).

Using the Risk indices derived from the ACEU risk maps, the 13 project areas fall into the following categories:

ACEU Deforestation Risk Map Data						
Land Areas (ha) within each risk categories						
Project Area	~ Area Size*	Very Low	Low	Medium	High	Very High
1	25,408	-	-	25,260	-	-
2	12,033	-	-	12,148	-	-
3	10,498	-	-	10,547	-	-
4	102,631	-	59,238	43,481	-	-
5	1,442	-	631	854	-	-
6	192,965	16,355	12,257	89,975	53,910	14,492
7	111,861	-	2,265	108,165	1,485	-
8	161,462	37	49,150	101,917	3,207	74
9	23,122	-	5,258	16,035	-	-
10	51,502	-	21,768	29,149	-	-
11	225,118	57,402	119,203	36,715	9,318	-
12	13,027	-	74	11,666	-	-
13	277,708	26,540	-	782	159,167	88,641
TOTALS	1,208,777	100,334	269,844	486,694	227,087	103,207

*as calculated within the Geospatial Platform
Also, please refer to notes given in 5.3.2 about area sizes.

Table 17 – Land areas (in hectares) that fall within each risk category
Source: CGV Geospatial Platform 11th December 2012

This can also be illustrated in terms of Project Zones, as shown in tables below:

West Zone	ACEU Defroestation Risk Map Data					
	Land Areas (ha) within each risk category, per Zone					
Area Number	~Area Size*	Very Low	Low	Medium	High	Very High
6	192,965	16,355	12,257	89,975	53,910	14,492
13	277,708	26,540	0	782	159,167	88,641

*as calculated within the Geospatial Platform
Also, please refer to notes given in 5.3.2 about area sizes.

Table 18 – Land areas (in hectares) that fall within each risk category in the West Zone
Source: CGV Geospatial Platform 11th December 2012

South Zone

		ACEU Defroestation Risk Map Data				
		Land Areas (ha) within each risk category, per Zone				
Area Number	~Area Size*	Very Low	Low	Medium	High	Very High
1	25,408	-	-	25,260	-	-
2	12,033	-	-	12,148	-	-
3	10,498	-	-	10,547	-	-
4	102,631	-	59,238	43,481	-	-
5	1,442	-	631	854	-	-
7	111,861	-	2,265	108,165	1,485	-

*as calculated within the Geospatial Platform
Also, please refer to notes given in 5.3.2 about area sizes.

Table 19 – Land areas (in hectares) that fall within each risk category in the South Zone
Source: CGV Geospatial Platform 11th December 2012

Central Zone

		ACEU Defroestation Risk Map Data				
		Land Areas (ha) within each risk category, per Zone				
Area Number	~Area Size*	Very Low	Low	Medium	High	Very High
8	161,462	37	49,150	101,917	3,207	74
9	23,122	-	5,258	16,035	-	-
10	51,502	-	21,768	29,149	-	-
11	225,118	57,402	119,203	36,715	9,318	-
12	13,027	-	74	11,666	-	-

*as calculated within the Geospatial Platform
Also, please refer to notes given in 5.3.2 about area sizes.

Table 20 – Land areas (in hectares) that fall within each risk category in the Central Zone
Source: CGV Geospatial Platform 11th December 2012

6.4.1 Anomalies in Calculated Land Areas

As addressed in section 5.3.2, there are differences in the project areas when calculated using the different layers of the Geospatial Platform. This is apparent in the data presented above. The differences are outlined in the table below:

Differences in Area Size calculations when comparing and calculating data			
Area Number	Vector-Based Area Size (ha)	ACEU-based Total Area Size (ha)	Difference (ha)	ACEU % of Vector-Based land area
1	25,408	25,260	- 148	99.42%
2	12,033	12,148	115	100.96%
3	10,498	10,547	49	100.47%
4	102,631	102,719	88	100.09%
5	1,442	1,485	43	102.98%
6	192,965	186,989	- 5,976	96.90%
7	111,861	111,915	54	100.05%
8	161,462	154,385	- 7,077	95.62%
9	23,122	21,293	- 1,829	92.09%
10	51,502	50,917	- 585	98.86%
11	225,118	222,638	- 2,480	98.90%
12	13,027	11,740	- 1,287	90.12%
13	277,708	275,130	- 2,578	99.07%
Totals	**1,208,777**	**1,187,166**	**- 21,611**	**98.21%**

Table 21 - Differences in Area Size compared to ACEU Land Areas
Source: CGV Geospatial Platform 8ᵗʰ January 2013

6.4.2 Qualifying Statement

Although it can be seen that there are differences in the area sizes, the actual differences are only very minimal and as a percentage of the overall project area, this can be seen as non-significant. Where the difference is showing a higher number than the given 'Area Size', this only totals a very low number of hectares (349ha) and percentage of the Vector-Based figures (0.259%) and can still carry an assurance that this is a conservative application of the differences being applied in the project.

Given the overall percentages of the total project area, as given in Table 12 and Table 16 above, the overall calculations used for the project are still considered conservative and therefore where there appears to be slightly elevated figures, this is only due to the anomalies described above and not seen to be providing incorrect, or indeed exaggerated calculations.

6.5 Estimated Carbon Loss in the 'Without Project' Scenario

Using the ACEU deforestation Risk Map carbon figures, as these are the more conservative Initial Carbon Stock figures that are generated from the Geospatial Platform, plus applying the risk indices that are provided in the methodology into the ACEU Deforestation Risk map, the baseline estimations of carbon loss without the project being implemented are as follows:

Project Area	ACEU Deforestation Risk Layer Carbon Stocks — Carbon Stocks for each area (tC) taken from ACEU Deforestation Risk map						Calculated Carbon (tC) at risk — Calculated Carbon (tC) at risk (Carbon stock divided by risk indices)					
	Very Low	Low	Medium	High	Very High	Total (tC)	Very Low	Low	Medium	High	Very High	Total (tC)
1	-	-	3,739,329	-	-	3,739,329	-	-	1,495,732	-	-	1,495,732
2	-	-	1,800,600	-	-	1,800,600	-	-	720,240	-	-	720,240
3	-	-	1,482,440	-	-	1,482,440	-	-	592,976	-	-	592,976
4	-	8,568,491	6,319,802	-	-	14,888,293	-	1,713,698	2,527,921	-	-	4,241,619
5	-	88,855	120,405			209,260	-	17,771	48,162	-	-	65,933
6	2,289,544	1,880,128	13,474,381	7,579,716	1,713,739	26,937,508	-	376,026	5,389,752	4,547,830	1,370,991	11,684,599
7	-	302,953	15,364,621	211,725	-	15,879,299	-	60,591	6,145,848	127,035	-	6,333,474
8	4,885	7,257,940	14,487,576	442,128	-	22,192,529	-	1,451,588	5,795,030	265,277	-	7,511,895
9	-	670,674	1,767,830	-	-	2,438,504	-	134,135	707,132	-	-	841,267
10	-	2,937,837	3,368,104	-	-	6,305,941	-	587,567	1,347,242	-	-	1,934,809
11	8,463,231	17,745,452	4,693,387	1,158,856	-	32,060,926	-	3,549,090	1,877,355	695,314	-	6,121,759
12	-	5,702	1,345,294	-	-	1,350,996	-	1,140	538,118	-	-	539,258
13	3,728,835	-	112,087	22,496,989	12,601,937	38,939,848	-	-	44,835	13,498,193	10,081,550	23,624,578
TOTALS						168,225,473						65,708,138

Please note: the total calculated carbon stock at risk does not include the 'Very Low' category as there is 0 calculated risk to this category

Table 22 – Carbon Stocks for each area and calculated carbon stocks at risk in each project area
Source: CGV Geospatial Platform 11th December 2012

The baseline estimations of carbon loss without the project being implemented, as presented by Project Zone are as follows:

West Zone	ACEU Deforestation Risk Layer Carbon Stocks						Calculated Carbon (tC) at risk					
	Carbon Stocks for each area (tC) taken from ACEU Deforestation Risk map						Calculated Carbon (tC) at risk (Carbon stock divided by risk indices)					
Area Number	Very Low	Low	Medium	High	Very High	Total (tC)	Very Low	Low	Medium	High	Very High	Total (tC)
6	2,289,544	1,880,128	13,474,381	7,579,716	1,713,739	**26,937,508**	-	376,026	5,389,752	4,547,830	1,370,991	**11,684,599**
13	3,728,835	-	112,087	22,496,989	12,601,937	**38,939,848**	-	-	44,835	13,498,193	10,081,550	**23,624,578**
					TOTAL	**65,877,356**					**TOTAL**	**35,309,177**

Please note: the total calculated carbon stock at risk does not include the 'Very Low' category as there is 0 calculated risk to this category

Table 23 – Carbon Stocks and calculated carbon stocks at risk in the West Zone
Source: CGV Geospatial Platform 11th December 2012

South Zone	ACEU Deforestation Risk Layer Carbon Stocks						Calculated Carbon (tC) at risk					
	Carbon Stocks for each area (tC) taken from ACEU Deforestation Risk map						Calculated Carbon (tC) at risk (Carbon stock divided by risk indices)					
Area Number	Very Low	Low	Medium	High	Very High	Total (tC)	Very Low	Low	Medium	High	Very High	Total (tC)
1	-	-	3,739,329	-	-	**3,739,329**	-	-	1,495,732	-	-	**1,495,732**
2	-	-	1,800,600	-	-	**1,800,600**	-	-	720,240	-	-	**720,240**
3	-	-	1,482,440	-	-	**1,482,440**	-	-	592,976	-	-	**592,976**
4	-	8,568,491	6,319,802	-	-	**14,888,293**	-	1,713,698	2,527,921	-	-	**4,241,619**
5	-	88,855	120,405			**209,260**	-	17,771	48,162	-	-	**65,933**
7	-	302,953	15,364,621	211,725	-	**15,879,299**	-	60,591	6,145,848	127,035	-	**6,333,474**
					TOTAL	**37,999,221**					**TOTAL**	**13,449,974**

Please note: the total calculated carbon stock at risk does not include the 'Very Low' category as there is 0 calculated risk to this category

Table 24 – Carbon Stocks and calculated carbon stocks at risk in the South Zone
Source: CGV Geospatial Platform 11th December 2012

Central Zone	ACEU Deforestation Risk Layer Carbon Stocks						Calculated Carbon (tC) at risk					
	Carbon Stocks for each area (tC) taken from ACEU Deforestation Risk map						Calculated Carbon (tC) at risk (Carbon stock divided by risk indices)					
Area Number	Very Low	Low	Medium	High	Very High	Total (tC)	Very Low	Low	Medium	High	Very High	Total (tC)
8	4,885	7,257,940	14,487,576	442,128	-	22,192,529	-	1,451,588	5,795,030	265,277	-	7,511,895
9	-	670,674	1,767,830	-	-	2,438,504	-	134,135	707,132	-	-	841,267
10	-	2,937,837	3,368,104	-	-	6,305,941	-	587,567	1,347,242	-	-	1,934,809
11	8,463,231	17,745,452	4,693,387	1,158,856	-	32,060,926	-	3,549,090	1,877,355	695,314	-	6,121,759
12	-	5,702	1,345,294	-	-	1,350,996	-	1,140	538,118	-	-	539,258
					TOTAL	64,348,896					TOTAL	16,948,988

Please note: the total calculated carbon stock at risk does not include the 'Very Low' category as there is 0 calculated risk to this category

Table 25 – Carbon Stocks and calculated carbon stocks at risk in the Central Zone
Source: CGV Geospatial Platform 11th December 2012

From the data shown in the tables above, generated from the ACEU Deforestation Risk Map of the Geospatial Platform, the project activities over 20 years will result in a reduction in emissions of **65,708,138 tC** from the 10th June 2011, which is the start date of the project.

The baseline, underlying data and assumptions will be fully reviewed every 5 years.

SECTION 7 – QUANTIFICATION OF CARBON BENEFITS

7.0 Introduction

The quantification of carbon benefits for the Trocano Araretama Conservation project has been calculated using the data layers available within the Geospatial Platform, and specifically the ACEU risk layer, developed by the specialist team at Ecometrica to quantify the carbon benefits of the project in accordance with the NFS AM001.0 methodology. The platform has been developed to be able to quantify the figures accurately, conservatively and reliably and these data outputs have been used herewith to show the quantification of carbon benefits of the project. Where data has been drawn from the platform for quantification purposes, the specific dates have been referenced accordingly with each dataset presented.

As discussed in previous chapters of this PDD, the Geospatial Platform data has been collated from a number of sources, including the JPL NASA Carbon maps, ESA Globcover 2009 and PRODES INPE Brazil.

Applying the NFS AM001.0 methodology [A Risk Based Methodology for Quantifying Natural Capital Credits Issued to Projects Operating under the Natural Forest Standard, with application in Amazonia] (Annex 9) within the Geospatial Platform, the quantification of carbon benefits is an automated process that can be viewed within the platform, and from the reports that are present in Annex 8a-m, or that can be run independently through the platform itself.

The methods, assumptions and data sources used to quantify the carbon benefits are provided in this PDD, the approved Methodology NFS AM001.0 and the Geospatial Platform. As the mapping and methods used are Tier 2 (as approved through the methodology and as stipulated by the Standard as appropriate), field staff are not required to, and will not be carrying out, biomass inventories (Tier 3 mapping). The quantification of carbon benefits has been carried out using the Geospatial Platform and for transparency, ease of analysis and the purposes of this PDD, the data that has been generated through the Geospatial Platform can be found below, in section 7.2 showing the quantification data.

7.1 Analysis of Data within the Geospatial Platform

Each layer within the Geospatial Platform shows different analysis of each given project area, and indeed the Legal Brazilian Amazon as a whole. The analysis and quantification calculations are detailed as follows:

7.1.1 Total Biomass and Carbon

Calculations of the total Above-Ground Biomass (AGB), Below-Ground Biomass (BGB) and Carbon Stock (roughly 50% of AGB + BGB) in the drawn area of interest. AGB, BGB and Carbon values, as well as the error estimate on carbon, are all products of the JPL NASA Carbon maps.

7.1.2 Average Biomass and Carbon Density (where >0 tC/ha)

Calculations of the average AGB, BGB and Carbon Stock (roughly 50% of AGB + BGB), per hectare of land area, in the drawn area of interest. Note that water bodies within the draw area of interest are included in calculating total land area. Thus, average values maybe lower in areas including large portions of water.

7.1.3 Vegetation

Classifications of the drawn area of interest into vegetation types and calculations of the carbon present per vegetation category. Note that differences in the Vegetation (ESA Globcover 2009) and Carbon data sources and resolutions imply that the total carbon reported in this table is slightly different from that reported for the carbon maps (see tabs above). Water bodies are identified with greater accuracy using the higher resolution vegetation map and are then assigned a carbon value of 0 t/ha.

7.1.4 Past Deforestation (if present)

Events of past deforestation and the areas affected by year. Note that carbon values derived from the Carbon (2003) layer, for the areas affected are also reported, but do not necessarily equal the carbon lost from deforestation.

7.1.5 Past Fire Events

Estimated number of fires recorded in the drawn area of interest. Fire events of the past are recorded by the MODIS instrument on board NASA Terra (EOS AM) Satellite. A density map (no. of events/sq.km) was created from recorded fire events in each year (2005-2010), from which an estimate of number of fires is derived.

7.1.6 Risk of Deforestation – ACEU Deforestation Risk

This is the layer that is being used to quantify the carbon benefits for the Trocano project. Risk of deforestation in the drawn area of interest, based on Ecometrica's ACEU risk mapping method. Risk values run on a 5 point scale from very low (green) to very high (red). Carbon stock and density in the areas under different risk are also reported. Calculations for Potential Carbon Credits Earning are done as follows:

AvgCredits = {[AvgC – (2xStdDevC)] x VulC} + SoilC
where,
AvgC = Average carbon density [tC/ha] StdDevC = Carbon Standard Deviation [tC/ha]
VulC = Vulnerable component of carbon [=0.9]
SoilC = Soil carbon [8tC/ha]

Credit Potential = AvgCredits x RI x CO2f/Years where,
RI = Risk Index for that risk category (see below)
CO2f = 3.6667 (Carbon to CO2)
Years = 20 years

Risk Indices

Very High Risk:	Risk Index = 0.8
High Risk:	Risk Index = 0.6
Medium Risk:	Risk Index = 0.4
Low Risk:	Risk Index = 0.2
Very Low Risk:	Risk Index = 0.0

7.2   Calculating Potential Credit Earning

To calculate the carbon risk, Risk Indices were assigned to each risk category. The Risk Index (RI) is the fraction of biomass estimated to be at risk, since it cannot be said with certainty that 100% of biomass will be lost in the area. Risk Indices area at equal intervals from 0% - 100%, with lower risk categories having higher uncertainty and thus lower Risk indices. The RI's are as above and

The calculations for analysis into the platform to quantify the carbon benefits, taking the NFS AM001.0 methodology into account are as shown above in 7.1.6.

7.2.1   Detailed Analysis of Potential Credit Earning for each Project Area

The following data is showing the breakdown of data for each project area, detailing the risk categories and credit potential per risk category, per area.

Area 1 (South Zone)

Total Land Area: ~25,408 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Medium	25,260	3,739,329	148	10	225,446

Table 26 – Detailed analysis of Potential Credit Earning for Project Area 1
Source: see Annex 8a

Area 2 (South Zone)

Total Land Area: ~12,033 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Medium	12,148	1,800,600	148	14	102,732

Table 27 – Detailed analysis of Potential Credit Earning for Project Area 2
Source: see Annex 8b

Area 3 (South Zone)

Total Land Area: ~10,498 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Medium	10,547	1,482,440	140	9.0	91,464

Table 28 – Detailed analysis of Potential Credit Earning for Project Area 3
Source: see Annex 8c

Area 4 (South Zone)

Total Land Area: ~102,631 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Low	59,238	8,568,491	144	9.6	262,722
Medium	43,481	6,319,802	145	11	377,156

Table 29 – Detailed analysis of Potential Credit Earning for Project Area 4
Source: see Annex 8d

Area 5 (South Zone)

Total Land Area: ~1,442 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Low	631	88,855	140	5.0	2,910
Medium	854	120,405	140	6.0	7,772

Table 30 – Detailed analysis of Potential Credit Earning for Project Area 5
Source: see Annex 8e

Area 6 (West Zone)

Total Land Area: ~192,965 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Very Low	16,355	2,289,544	139	18	0
Low	12,257	1,880,128	153	13	55,012
Medium	89,975	13,474,381	149	21	692,687
High	53,910	7,579,716	140	27	504,145
Very High	14,492	1,713,739	118	41	84,605

Table 31 – Detailed analysis of Potential Credit Earning for Project Area 6
Source: see Annex 8f

Area 7 (South Zone)

Total Land Area: ~111,861 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Low	2,265	302,953	133	10	9,156
Medium	108,165	15,364,621	142	13	891,499
High	1,485	211,725	142	7.5	20,052

Table 32 – Detailed analysis of Potential Credit Earning for Project Area 7
Source: see Annex 8g

Area 8 (Central Zone)

Total Land Area: ~161,462 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Very Low	37	4,885	131	0	0
Low	49,150	7,257,940	147	27	165,285
Medium	101,917	14,487,576	142	30	609,934
High	3,207	442,128	137	35	24,074
Very High	74	0	0	0	87

Table 33 – Detailed analysis of Potential Credit Earning for Project Area 8
Source: see Annex 8h

Area 9 (Central Zone)

Total Land Area: ~23,122 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Low	5,258	670,674	127	24	15,251
Medium	16,035	1,767,830	110	36	47,811

Table 34 – Detailed analysis of Potential Credit Earning for Project Area 9
Source: see Annex 8i

Area 10 (Central Zone)

Total Land Area: ~51,502 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Low	21,768	2,937,837	134	28	62,838
Medium	29,149	3,368,104	115	36	100,221

Table 35 – Detailed analysis of Potential Credit Earning for Project Area 10
Source: see Annex 8j

Area 11 (Central Zone)

Total Land Area: ~225,118 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Very Low	57,402	8,463,231	147	16	0
Low	119,203	17,745,452	148	17	485,235
Medium	36,715	4,693,387	127	38	144,185
High	9,318	1,158,856	124	37	53,932

Table 36 – Detailed analysis of Potential Credit Earning for Project Area 11
Source: see Annex 8k

Area 12 (Central Zone)

Total Land Area: ~13,027 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Low*	74	5,702	76	76	0
Medium	11,666	1,345,294	115	40	34,010

*Note: In the area, "Low" risk occupies a small portion (74 ha), which means the standard deviation of carbon was quite high (in fact, equal to the average carbon density in the area). Thus subtracting twice standard deviation from the mean carbon gave a value 0.

Table 37 – Detailed analysis of Potential Credit Earning for Project Area 12
Source: see Annex 8l

Area 13 (West Zone)

Total Land Area: ~277,708 hectares

Risk Category	Area (ha)	Carbon Stock (tC)	Carbon Density (tC/ha)	Carbon Std. Dev. (tC/ha)	Credit Potential (tCO2/yr)
Very Low	26,540	3,728,835	140	19	0
Medium	782	112,087	143	6.1	7,229
High	159,167	22,496,989	141	20	1,721,092
Very High	88,641	12,601,937	142	21	1,261,096

Table 38 – Detailed analysis of Potential Credit Earning for Project Area 13
Source: see Annex 8m

7.2.2 Analysis of Potential Credit Earning consolidated into the Project Zones

The below tables give an overview of the quantification of carbon benefits per project zone, presenting the data provided above in a zone-categorised format:

West Zone

Area Number	~Area Size (ha)	Very Low	Low	Medium	High	Very High	Total
		ACEU Defroestation Risk Map Data					
		Credit Potential tCO2/yr					
6	192,965	-	55,012	692,687	504,145	84,605	**1,336,449**
13	277,708	-	-	7,229	1,721,092	1,261,096	**2,989,417**
						TOTAL	**4,325,866**

Table 39 – Analysis of Potential Credit Earning for the West Zone
Source: see Annex 8a-m

South Zone

Area Number	~Area Size (ha)	Very Low	Low	Medium	High	Very High	Total
		ACEU Defroestation Risk Map Data					
		Credit Potential tCO2/yr					
1	25,408	-	-	225,446	-	-	**225,446**
2	12,033	-	-	102,732	-	-	**102,732**
3	10,498	-	-	91,464	-	-	**91,464**
4	102,631	-	262,722	377,156	-	-	**639,878**
5	1,442	-	2,910	7,772	-	-	**10,682**
7	111,861	-	9,156	891,499	20,052	-	**920,707**
						TOTAL	**1,990,909**

Table 40 – Analysis of Potential Credit Earning for the South Zone
Source: see Annex 8a-m

Central Zone

Area Number	~Area Size (ha)	Very Low	Low	Medium	High	Very High	Total
		ACEU Defroestation Risk Map Data					
		Credit Potential tCO2/yr					
8	161,462	-	165,285	609,934	24,074	87	**799,380**
9	23,122	-	15,251	47,811	-	-	**63,062**
10	51,502	-	62,838	100,221	-	-	**163,059**
11	225,118	-	485,235	144,185	53,932	-	**683,352**
12	13,027	-	-	34,010	-	-	**34,010**
						TOTAL	**1,742,863**

Table 41 – Analysis of Potential Credit Earning for the Central Zone
Source: see Annex 8a-m

7.2.3 Summary of Potential Credit Earnings

Following the calculations provided above, the below table shows a summary of the potential credit earnings for the project areas. For reference, table 17 in section 6.4 "Land areas (in hectares) that fall within each risk category" shows the total land area of each sub-area of the project, and the categorised risk of each area, based on the ACEU Deforestation Risk data.

Project Area No	~ Area Size (ha)	ACEU Deforestation Risk Potential Credit Earnings tCO2/yr					
		Very Low	Low	Medium	High	Very High	Total per area
1	25,408	-	-	225,446	-	-	225,446
2	12,033	-	-	102,732	-	-	102,732
3	10,498	-	-	91,464	-	-	91,464
4	102,631	-	262,722	377,156	-	-	639,878
5	1,442	-	2,910	7,772	-	-	10,682
6	192,965	-	55,012	692,687	504,145	84,605	1,336,449
7	111,861	-	9,156	891,499	20,052	-	920,707
8	161,462	-	165,285	609,934	24,074	87	799,380
9	23,122	-	15,251	47,811	-	-	63,062
10	51,502	-	62,838	100,221	-	-	163,059
11	225,118	-	485,235	144,185	53,932	-	683,352
12	13,027	-	-	34,010	-	-	34,010
13	277,708	-	-	7,229	1,721,092	1,261,096	2,989,417
Total per risk category			1,058,409	3,332,146	2,323,295	1,345,788	
					TOTAL CARBON BENEFIT PER YEAR		8,059,638

Table 42 - Summary of Carbon Benefits per year for the Trocano Araretama Project
Source: CGV Geospatial Platform 11th December 2012

This figure given in Table 42 above shows the gross total carbon benefit for the project per year. A negotiated risk-buffer percentage of these credits will be placed in a buffer account to cover any leakage and non-permanence factors of the project. This is discussed in further detail in section 8. It is estimated that this buffer will be between 10 and 25% of the total carbon benefits, so the credit earnings would be as follows, given in increments of 5:

Net Carbon Benefits taking Risk Buffer into Account			
	Gross Total Carbon Benefits per year	Risk Buffer Credits	Net Total Carbon Benefits per year
If Risk Buffer set at 10%	8,059,638	805,964	7,253,674
If Risk Buffer set at 15%	8,059,638	1,208,946	6,850,692
If Risk Buffer set at 20%	8,059,638	1,611,928	6,447,710
If Risk Buffer set at 25%	8,059,638	2,014,910	6,044,729

Table 43 - Net Carbon Benefits taking the Risk Buffer into Account
Source: CGV Geospatial Platform 11th December 2012

SECTION 8 – LEAKAGE AND NON-PERMANENCE

8.0   Introduction
The Natural Forest Standard requires the project to identify and map potential leakage zones outside of the project area where land-use activities of communities or individuals may be displaced as a result of the planned project activities. The NFS does not require the project to estimate the potential impacts of project activities on a national or international scale.

The leakage monitoring buffer for the project has been established in accordance with the NFS AM001.0 approved methodology. This has resulted in the project identifying and mapping a leakage buffer of 10km from the boundaries of the project area and this can be viewed in the Geospatial Platform. This 10km leakage buffer zone has been estimated to total approximately 1,800,000 ha. As the Natural Forest Standard only requires an estimation of the Initial Carbon Stock for the leakage area, this has been calculated using the overall average carbon stock of the project area using the ACEU layer data which is the more conservative figure plus the figure used for quantification of baseline data.

8.1   Leakage Area Mapping
The leakage buffer of 10km surrounding the project area is identified below in map 13. The north boundary of the Central Zone of the project is bordered by the Madeirinhas Conservation Project (a separate Celestial Green Ventures project), which acts as a buffer to this section of the project. This project is currently underway, and deforestation mitigation and monitoring measures are already being implemented.

The leakage buffer identified within the Geospatial Platform is therefore located around the boundary of the two project areas combined. This is illustrated on the maps below:

Map 12 - Project Area including CGV Madeirinhas Conservation Project for illustration purposes
Source: CGV Geospatial Platform 8th January 2013.

Map 13 - Leakage Buffer Zone for the Project Area
Source: CGV Geospatial Platform 8th January 2013

This leakage buffer will be monitored for displaced activities of leakage that can be attributed to agents of deforestation that would otherwise have been carried out within the project area.

Specific threats were not incorporated into ascertaining this leakage buffer, as the approved NFS methodology AM001.0 states it is sufficient to have a leakage monitoring zone of 10km from the boundaries of the project area. However, using the ACEU Risk layer, and its criteria of being Accessible, Cultivable, Extractable and Unprotected, it can be seen where the higher risk areas of deforestation have been identified, correlating to these being potential high-risk leakage areas.   These areas will be targeted as high-risk leakage areas and monitored accordingly. Please see section 8.4 for further information.

8.2   Assessment of Potential Sources of Leakage from Local Activity Shifting

The possibilities of deforestation identified during the preparation stage of the project are related to the needs of timber resources and creating pasture area and in the survey conducted during the preparation of this PDD, various social indicators were identified (see Annex 7 for samples of the questionnaires). The occurrence of activities that promote

deforestation have motivation arising mainly around the basic needs of the locals communities (riverine) and economic pressures.

However through the successful implementation of the project activities that are identified in section 2.4.3, it is expected that the project will not generate any offsite decreases in carbon stocks. In fact, the implementation of the project and its activities described, which offer sustainable and comparable alternatives to the inhabitants of the project area, would not result in the inhabitants having to displace any negative activities outside the project and are able to continue their usual way of life in a more sustainable way, with the project itself acting as a barrier and incentive to areas outside the project to adopt similar mechanisms.

The benefits distribution mechanism has been designed to ensure that only activities, programs and projects that are in compliance with the objectives of the project and the contract signed with the Municipality will be accepted and implemented by the participants of the project.

In a study carried out by IPAAM et al in 2009, it is stated that one of the most promising mechanisms with which to interrupt destruction of the Amazon has been to implement large blocks of protected areas. These areas have a role in not only protecting the forests and the biodiversity within them, but also in providing economic alternatives to the local populations. With the implantation of effective management of the protected areas it has been found that deforestation rates within these areas are significantly lower when compared to areas that are not protected and areas in the vicinities of the protected areas. This difference can be attributed to efficacy of the mechanism for the reduction of forest destruction, especially when these protection mechanisms are efficiently and properly implemented, and in particular when integrated with local social groups.

It is essential to the success of the project and indeed to the success of avoiding any leakage activity, that the inhabitants of the project area are engaged, involved and aware of the project and its benefits, which is an integral feature of the Trocano Araretama Conservation project.

The ACEU risk layer in the Geospatial Platform, not only highlights the areas most at risk of deforestation, but also maps the accessibility to the project area. This in turn shows where any leakage could possibly occur, as these would be the easiest routes for agents of deforestation to displace their activities. Therefore, these areas will be targeted within the project and leakage monitoring schedules.

Leakage monitoring and reporting will occur annually as part of the Annual Reporting process of the project.

8.3   Activities for Minimising Leakage

Project implementation focuses on activities that are intended to mitigate deforestation, such as local capacity-building for sustainable land use and participation in the project. Leakage will be mitigated through these project activities being conducted in the project area as the activities focus on educating and engaging the local communities and inhabitants in the protection and conservation of the natural forests and building local capacity for sustainable land-use practices and improving the quality of life in the project area.

Through these deforestation mitigation activities and by providing the project area inhabitants with the opportunity to benefit from protecting their habitat through adopting sustainable and alternative ways of utilising their natural resources, it is the implementation of the project itself that will act as an activity for minimising leakage. The project should have a positive impact on the areas adjacent to the project area, due to the significant reduction in deforestation that is associated with implementing forest protection mechanisms.

It is fundamental to the planned intervention of the threats to deforestation in the project area that activities that will be direct leakage mitigation actions are implemented and this is essential to the success of the project. The activities listed below are actions directly related to the mitigation of deforestation and project area leakage. These actions include the following:

- Development and implementation of effective management plan;
- Provide viable sustainable and economic alternative practices to project area inhabitants;
- Strengthening of Local Forest Protection;
- Incentivise local communities to adapt their current behaviour;
- Incentivise and reward changes in behaviour;
- Capacity-building and environmental awareness;
- Participation in project implementation, through monitoring, management, conservation and other activities;
- Participation in project-related training;
- Environmental Education Programme;
- Raising civic pride of the natural forest.

These activities are specifically identifying the core actions that are required for the successful implementation of deforestation mitigation. By engaging the local community, educating and communicating with them about the importance of the project to their habitat and indeed their quality of life, will address the immediate deforestation threats. Through engagement in the project and the incentive of benefitting from the benefit distribution mechanism available, local participation and awareness is the key to minimising leakage.

As local inhabitants are generally unaware of other forms of land use and the value of the natural resources of the place, the tendency is that the devastation continues to increase in the project area. Addressing the underlying deforestation drivers and providing education on sustainable and economic alternatives to local community members, is relevant to achieving the objective of the project, which is to reduce emissions from avoided deforestation, by reducing the communities dependence on the forest resources through sustainable practices and education about the effects of deforestation and the benefits of protecting their habitat.

Some alternative and sustainable activities that promote the mitigation of deforestation and reduce the possibility of leakage from displaced activities have been identified as follows:

i. Training in appropriate regional practices;
ii. Course in basic guide tourism, with courses in basic English, French and Spanish;
iii. Incentive production with home-gardens;
iv. Encouraging the practice of actions with emphasis on economic sustainability and maintenance of the cultural characteristics of societies in the municipality;
v. Training of the communities residents involved to act as forestry and environmental agents, developing inventory and monitoring activities;
vi. Training course on existing environmental legislation.

With reference to managing leakage it will be important to ensure that project participants and inhabitants are fully aware of the project, its activities and benefits. It will important to ensure that any identification of leakage is investigated and the following information is known:

a) Origin of the community – whether rural or urban;
b) Education level of the project within the community;
c) Socioeconomic context in the areas covered by the project;
d) Participation of the active population project, and
e) Weakening of infrastructure for production, such as the existence and condition of roads for production transportation, availability of water for agricultural activities and household supplies, access to electricity and housing.

After characterising the causes, mitigation of these actions will be reduced through improved project management, ensuring that all mechanisms in place are working efficiently and effectively and through communication and education ensure that the project activities are understood and agents are engaged. Minimised leakage tends to occur with improved communication and engagement with the project and its objectives plus the incentives for participants, which can include access to social services in health and education, the structure of production, access to financing, the expansion of agricultural income and outside the agricultural production system.

All identified agents of deforestation within the project area, described by survey work and field activities in this project, will be encouraged to participate in the project activities presented to them and involved in the programs and plans of actions described herein. Thus, through the implementation of the project activities, and effective communication with these groups, providing them with the information, education and incentives to participate in the project, it is intended a schedule change in regional production chains of economic activity that comes degrading local ecosystems, reducing the risks of leakage.

Through successful implementation of the project activities, the project expects there to be no local activity shifting from within the project area. Any displaced activities that are detected will be quickly identified through the project monitoring activities and immediate measures will be put in place to control the situation. Effective communication and conflict resolution will be required in these situations. The Project Management Council will develop effective communication channels and methods with these groups, using the methods discussed in section 3.5 and dispute resolution will follow the same procedures to that of dispute resolution mechanism outlined in section 3.6.

## 8.4 Description of Activities for Monitoring Leakage

For the purposes of monitoring any potential leakage from the project area, the project will follow the same procedures as the monitoring activities of the main project area (see section 4). This will include a combination of remote-sensing via PRODES and MODIS and on-the-ground monitoring. In accordance with the approved methodology NFS AM001.0, where any indicators of deforestation are detected within the leakage buffer that are => 20 ha, using any of the monitoring sources available, they will be investigated quickly and it will be determined whether they are attributed to actors from within the project area that have relocated their activity to outside the project area.

Any areas that are deemed as leakage directly attributed to the project (displaced activity from within the project area), will be mapped using the Geospatial Platform, and accounted for within the annual reports and the overall emission reductions of the project as a whole, using the calculation specified in the NFS AM001.0 methodology (see Annex 9). The carbon stocks of the leakage area will be calculated using the carbon layer within the Geospatial Platform.

If any local activity shifting is detected, the Project Management Council will investigate the cause and negotiation to reduce or minimise these activities will be carried out. It will also be ensured that the project management structure is reviewed to ensure that all possible opportunities are available for the project participants and inhabitants to mitigate the need to carry out destructive activities, either within the project area or the buffer zone.

Using the ACEU Risk layer in the Geospatial Platform, and its criteria of being Accessible, Cultivable, Extractable and Unprotected, it can be seen where the higher risk areas of deforestation have been identified, correlating to these being potential high-risk leakage

areas. These areas will be targeted as high-risk leakage areas and monitored accordingly through periodic visits. The risk categories are demonstrated in the map below:
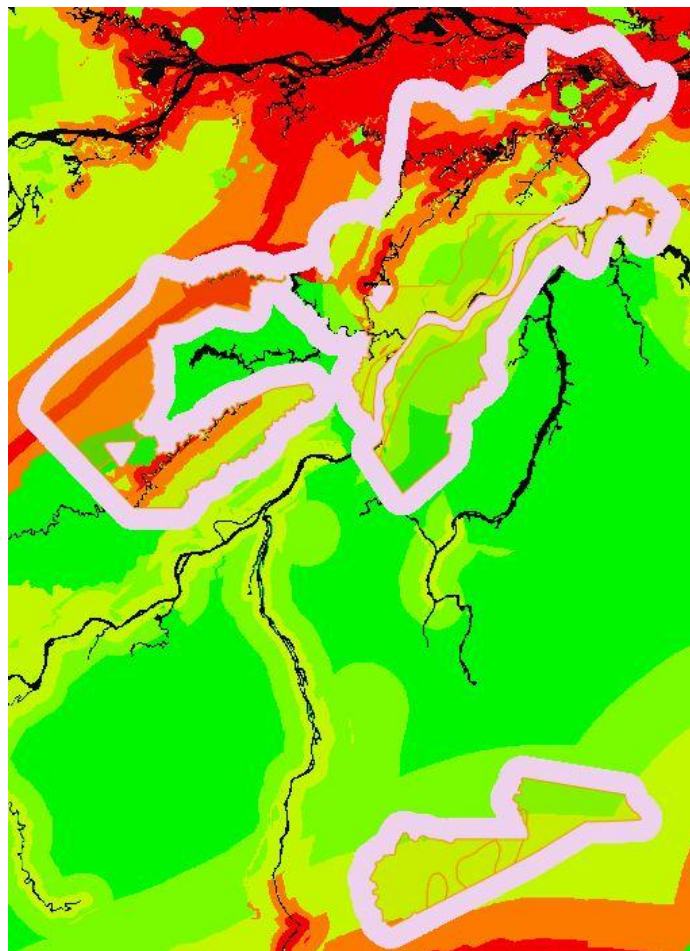
Map 14 - Leakage Buffer and corresponding ACEU Risk categories
Source: CGV Geospatial Platform 28th January 2013

By using the ACEU map layer within the Geospatial Platform, it identifies where the monitoring teams should focus their initial leakage monitoring both via remote-sensing and on-the-ground visits.

Any instances where leakage mitigation actions are required to be enforced and managed, the conflict resolution mechanism identified in section 3.6 will be adopted for satisfactory settlement of any disputes that may arise.

Any identified leakage or any actions taken to reduce or address the occurrence of leakage are submitted through reports from data provided from the direct monitoring of the OTG teams and the project co-ordination throughout the multiple communities. These reports

will focus on descriptions regarding mitigation actions based on the following guiding variables:

a) Environmental Education
b) Restructuring economic communities
c) Self-Management and participation of communities

Analysis of the reports will occur periodically and will provide the basis of any necessary actions required, so that the expected results of avoided displacement of activity from the project area through improved project management are achieved.

Those who are not directly involved in the project, such as land grabbers in Southern Borba, will be under the action of the protection system of the State and Federal Governments, through its surveillance institutions with the support of Municipal Rangers of Borba.

8.5 Assessment of Non-permanence Risk

The assessment of non-permanence risk for the project will be ascertained by the NFS Risk Panel. There will be a full analysis of the project to assess its ability to provide permanent emission reductions through the effective implementation of the project, for the duration of the crediting period, the duration of the signed agreement and beyond.

The NFS Risk Panel will require the project to hold a sufficient reserve of issued credits in a buffer account to cover risks of non-permanence in the project area. This will be applied through an agreed percentage of issued credits being set aside year on year as credit issuance occurs, and held in case of overall project emissions occurring. During the annual reporting of the project, any evidence of reduction in carbon stocks will be recorded and the equivalent total will be removed from the risk buffer of credits.

The actual percentage of credits to be held in the risk buffer will be subject to negotiation on the specific merits and liabilities of the project itself, and the considered level of non-permanence risk the NFS Risk Panel perceives the project to hold to ensure the permanence of emission reductions achieved by the project. Although the final figure of credits to be held in the buffer is yet to be negotiated, it is estimated at being between 10 and 25% of the total issued credits.

Through the effective implementation of the project, its activities and its mechanisms the risk of non-permanence of the project is expected to be minimal.

8.5.1 Fire risk

The Geospatial Platform includes data of past fire events, using data from MODIS up to and including 2010. This data will be annually updated to give the most relevant and current data for the project area.

From the data available currently, the risk of fire in the project areas can be seen as low risk, with the exception of areas 7 and 8 which could be considered to have high risk of fire events. These areas will be particularly monitored for this occurring, and will be closely inspected using the monitoring practices described previously.

8.6 Description of Activities for Ensuring Permanence, Including Buffers

The project has included mechanisms to ensure that the implementation of the project is a long-term mechanism and not a short-term fix to avoid deforestation.

With the total lifespan of the project being 30 years, this will provide the area with an opportunity to make long-term, permanent changes to the way the forest is viewed and how its resources can be used in a sustainable way. Through education, community participation, shared responsibility for the forests protection and maintenance, together with the effective implementation of the project by the proponents and management, this will ensure a fundamental change in the way the forests are viewed, valued and protected as a whole.

Project activities have been designed to mitigate risk of deforestation, as discussed in section 2.4.3. These activities that have been described throughout this document and focus on the providing sustainable mechanisms for avoiding deforestation through increasing socio-economic well-being of the inhabitants of the project area, while reducing internal, external and natural non-permanence risk. Through annual reporting and assessment, project will provide on-going analysis of the effectiveness of the project activities and its ability to provide permanent emission reductions.

Through the application of the risk buffer of credits described above in section 8.5, this will ensure that any emissions that inadvertently occur within the project area, or leakage buffer where appropriate, will mitigate any fluctuations that do occur.

8.7 Permanence

The Trocano Araretama Conservation Project is designed to be implemented for the long-term benefit of the natural forests of the project area beyond the lifespan of the project and the signed agreement. It is the intention to provide permanent improvements and avoided emissions through robust implementation, conservation and governance. The project discusses the following measures it will include to ensure the emissions reductions will be permanent.

8.7.1 Understanding the Nature of the Threats

The threats present in the project area have been identified and discussed in section 6.1. The primary motive for deforestation activities in the project area arise mainly around the basic needs of the local communities and economic pressures and are related to the needs of timber resources and creating pasture area.

The planned protection measures of the project are designed to bring long-term solutions to the threats that are present and the mitigation of deforestation. This will be achieved through the project activities being implemented effectively and through capacity-building exercises on individual, community and Municipality levels. By understanding the nature of the threats within the project area will ensure that the approach taken to ensure enduring change and improvement will be achieved, through educating and informing these groups of the benefits of adopting forest protection measures and positive behavioural changes.

It is also important to ensure and provide economically viable incentives and benefits for successfully implementing alternative and sustainable practices are recognised by and available to the inhabitants of the project area for their changes in attitude and behaviour. This will be achieved through the fixed funding to the Municipality and through the benefit Distribution Mechanism that, by avoiding deforestation and protecting and conserving the natural forests, will ensure their improved quality of life in the long-term.

8.7.2 Strengthening of Legal Frameworks Protecting the Natural Forests

The inclusion of the project in the Municipality Master Plan (by-laws), will ensure the longevity of the project objectives into the overall way of thinking of the Municipality. This will not just be for the project agreement duration, but will result in a permanent change in attitude and behaviour of the members of the Municipality as a whole.

The project mechanisms aims and objectives will be included in the Municipality's long-term strategy for the protection of the existing forests both in the project area and the Municipality as a whole. This strengthens the permanence of the project as it is not only focusing on the project area, but its surroundings also.

By having the backing of the Municipal Government to such an extent as to make amendments to their Master Plan, provides a real opportunity for the activities of the project to deliver long-term, permanent changes within the project areas.

8.7.3 Sustainable Financial Models for Implementation

Through the implementation of the Trocano project, the long-term requirements for continuous monitoring and enforcing protection measures will be established.

Over time, and through the annual reviews and 5-yearly assessments, the project will be compiling important funding data for the implementation of the project. From this information it will be possible to ascertain the required income required to successfully implement the monitoring and protection measures of the project to ensure permanence of the emission reductions generated through the project. Sustainable funding models will then be able to be created to ensure the actions of monitoring and protection of the natural forests can continue beyond the duration of the project, through strategic and financial planning, long-term commitment and effective management.

Through inclusion of the project in the Municipality by-laws it is likely that there will be provision made in the Municipality budget for the protection of the project areas beyond the lifespan of the project, and this will be included in the strategic and financial planning during the course of the project and will enable the monitoring and protection of the project area to continue long-term. The PMC will work closely with all involved to develop a strategic and sustainable financial plan that is stable, suitable and sufficient to the income stream required for the continuation of protection and conservation of the project area.

To promote permanence through financing, the project will ensure that sustainable funding and financial models are developed and implemented on individual, community and Municipality levels. This will be incorporated into the capacity building, education, training and learning-by-doing activities that are included in the projects objectives. Implementing such enterprises as eco-tourism, sustainable agriculture and other income-generating streams originating from the activities, opportunities and benefits that the project will bring, to result in a long-term view of ensuring income streams are strategically positioned and sustainable for long-term application.

8.7.4   Effective, Durable Governance Structures

As discussed in section 3.2, the governance structure of the project has been based on the essential principles of good governance, including willing participation from the communities being achieved and that the project and all its structures and activities are dealt with transparently and in adherence to the appropriate laws.

The Project Management Council will be responsible for ensuring that the governance structures outlined in this management plan and initially put in place will be adopted by all project participants. As the project proceeds, the governance structures will be monitored and reviewed periodically as to the appropriateness, effectiveness and suitability and will be adapted, adjusted and developed over the duration of the project to become an efficient and effective management of natural, human and financial resources, with a fair and equitable allocation of resources and benefits, that will be designed to continue beyond the lifespan of the project for sustainable long-term appropriation.

8.7.5   Alignment of Conservation with Economic Development

To fight poverty in the project area, it is necessary to link policies to stimulate economic growth and better income distribution to ensure both qualitative and quantitative changes are made to the standard of living and economic health of the project area. For this, the project should emerge as an alternative mechanism for generating social gains among the population of the Trocano project area through the implementation of conservation and mitigation of deforestation of the natural forests.

All funds that are made available to the Municipality and its inhabitants, through the sale of carbon credits achieved from the project, will be appropriately attributed to activities, programs, projects and benefits in alignment with both the project objectives and the

economic needs of the project area and Municipality. The funds made available will enable the Municipality to implement the much needed economic and infrastructural benefits to the project area and the Municipality as a whole, whilst observing the project objectives and parameters.

All activities of the project applied through the mechanism will be subject to evaluation and approval by the PMC, who will ascertain both the appropriateness of the proposed program, project or activity for compliance with the project objectives as well as ensuring the economic viability and appropriateness to the needs of the Municipality and inhabitants are met, such as improved quality and access to social services in health and education, the structure of production, access to financing, the expansion of agricultural income and outside the agricultural production system.

Through regular review, monitoring and assessment, with the involvement of the communities, the project will ensure that the economic development needs of the project area participants are appropriately met through the benefit mechanism and project activities to generate meaningful, sustainable and long-term opportunities and improvements for the communities of the project area.

SECTION 9 - BIODIVERSITY

9.0   Overview of the Biodiversity within the Project Area

The project area is significant in terms of biodiversity value. As it is located in the tropical forest eco-region (see section 9.5) it can be assumed there is a high level of biodiversity present in the project area and has high ecological significance.

Besides being rich in fauna and flora to the Madeira River region, which is where the project area is situated, acts as zoogeographical divider separating opposing margins in different taxa, but phylogenetically close. This fact has been observed in primates, which have high biological diversity, including new species (Roosmalen et al. 1998), and birds with geographic distributions also bounded by the river. Furthermore, the region is also noted in several areas endemic cover (Cohn-Haft 2000). Recently, as a result of work Roosmalen et al. (1999), four new species of primates in the region have been described (Mico manicorensis, M. acariensis, Callibella humilis, Callicebus bernhardi) and much information has been generated, and further suggested that seven species of primates found along the Aripuanã river are new to science. Also a kind of Erethizontidae, coming of the Madeira-Aripuanã region, was recently described (Voss and Smith, 2001). However, it is not possible to assess its generality in relation to other groups of vertebrates, particularly from land mammals, due to incipient knowledge about this fauna, although in recent years small mammals in the region of Madeira will be studied more systematically (Bantel 2006). The degree of threat and ecological importance of land mammals of small, medium and large size show the need to search for information on inventories and environmental diagnostics for this region.

Research on "The Medium and Large Mammals of Madeira River" (Mamiferos de Medio e Grande Porte) authored by Fabio Röhe (2006) detected endemic species of mammals found in the region near the project area and its surroundings (see section 9.8 below).

The biodiversity of the region represents a considerable reserve of food plants as well as medicinal plants. Research suggests that around 70% of modern medicines are derived from rainforest plants, particularly in oncology. Among the medicinal plants found in the project area are guaraná (Paullinia cupana Kunth), with properties invigorating, rejuvenating and aphrodisiac; copaiba (Copaifera langsdorffii) which is a tree typical of upland regions, from which it is possible to extract an oil with anti-inflammatory and healing properties; the crajiru (Arrabidaea verlot chica), used to treat intestinal colic, and annatto (Bixa orellana), with properties that enhance the pigmentation of adipose tissue, which is also used as a natural dye in cooking.

There are many fruit species in the project area. Among the best known are the cupuassu (Theobroma grandiflorum), the soursop (Annona muricata), buriti (Mauritia flexuosa), one of the largest palm in the Amazon, and Brazil nuts (Bertholletia excelsa), a product of trees that can reach 50 meters.
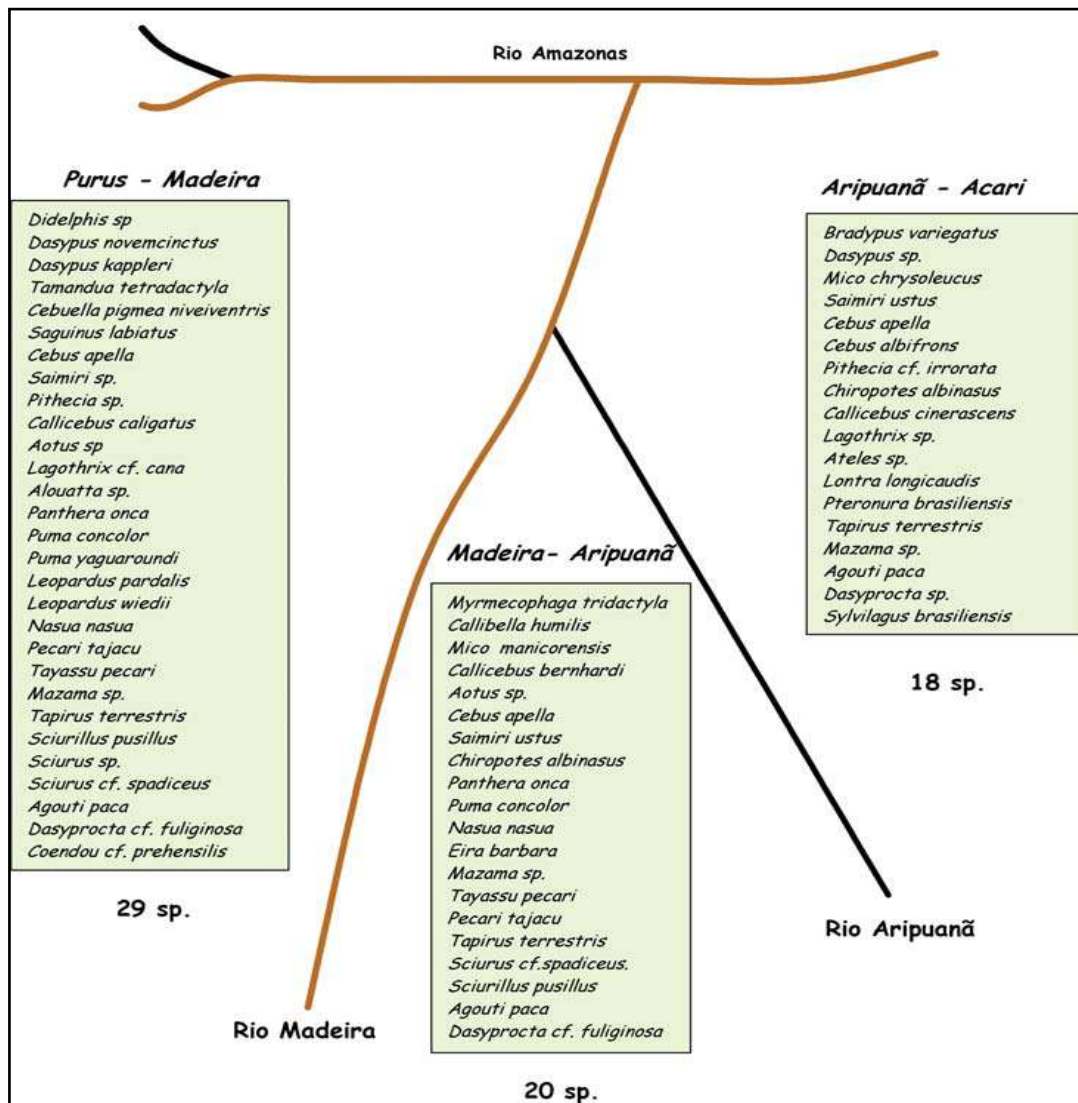
Rio Amazonas

Purus - Madeira

Didelphis sp
Dasypus novemcinctus
Dasypus kappleri
Tamandua tetradactyla
Cebuella pigmea niveiventris
Saguinus labiatus
Cebus apella
Saimiri sp.
Pithecia sp.
Callicebus caligatus
Aotus sp
Lagothrix cf. cana
Alouatta sp.
Panthera onca
Puma concolor
Puma yaguaroundi
Leopardus pardalis
Leopardus wiedii
Nasua nasua
Pecari tajacu
Tayassu pecari
Mazama sp.
Tapirus terrestris
Sciurillus pusillus
Sciurus sp.
Sciurus cf. spadiceus
Agouti paca
Dasyprocta cf. fuliginosa
Coendou cf. prehensilis

29 sp.

Rio Madeira

Aripuanã - Acari

Bradypus variegatus
Dasypus sp.
Mico chrysoleucus
Saimiri ustus
Cebus apella
Cebus albifrons
Pithecia cf. irrorata
Chiropotes albinasus
Callicebus cinerascens
Lagothrix sp.
Ateles sp.
Lontra longicaudis
Pteronura brasiliensis
Tapirus terrestris
Mazama sp.
Agouti paca
Dasyprocta sp.
Sylvilagus brasiliensis

18 sp.

Rio Aripuanã

Madeira- Aripuanã

Myrmecophaga tridactyla
Callibella humilis
Mico manicorensis
Callicebus bernhardi
Aotus sp.
Cebus apella
Saimiri ustus
Chiropotes albinasus
Panthera onca
Puma concolor
Nasua nasua
Eira barbara
Mazama sp.
Tayassu pecari
Pecari tajacu
Tapirus terrestris
Sciurus cf.spadiceus.
Sciurillus pusillus
Agouti paca
Dasyprocta cf. fuliginosa

20 sp.

Figure 27 - List of endemic species to the Madeira River region and its interfluve
Source: Röhe, 2006.

9.1   Threats to biodiversity

Even with its high environmental integrity, the project area is threatened by the advance of deforestation for cattle ranching, mechanized agriculture, logging imminent and the environmental licensing of the rebuilding of the BR-319 road. This road connects Porto Velho (RO) to Manaus (AM), which will impact an important region with dense fauna and flora, and the project to build two dams on the high Aripuanã (MT) that will have a profound impact on biota and landscape.

Despite the wide variety of animals and plants of this ecosystem, ecosystems in the micro-region of Borba are extremely sensitive to human interference, resulting in the loss of countless species before their discovery. From this premise the risk of loss of biodiversity in the project area are described below:

- Deforestation and reduction of natural habitats;
- Over-exploitation of plant and animal species;
- Hunting and fishing illegal and predatory;
- Bio-piracy;
- Pollution of soil and waste water and sewage of the city and communities;
- Construction projects of great impact.

Deforestation is a major risk to biodiversity. It causes impacts on both the fauna and flora of the region of the project area causing the decline of natural habitats resulting in the elimination of several species of animals and plants, some not yet even discovered by science.

Deforestation also creates access to the overexploitation of plant and animal species. The selective logging and hunting from this activity and uncontrolled exploitation of native species of high commercial value, leads to the interior forest problems that disrupt the local ecosystem and promotes bio-piracy activities in the project area.

In addition to the direct risks to the forest, there are also risks to soil and water from human occupation in the project area. Communities living on the banks of rivers and lakes in the project area do not use any type of sewage treatment. Therefore waste is discharged directly into water or in pits dug for this purpose, contributing to the contamination of soil and groundwater, and rivers and lakes where numerous species of aquatic fauna and fish fauna live. The waste produced is disposed of in these communities, in many cases, in the forest or in nearby communities offering direct risk to the animals in search of food.

Overfishing is also a major problem that affects rivers and lakes. It is responsible for the imbalance and the disappearance of aquatic species that provide food for birds and mammals that inhabit the ecosystems of the project area.

The activities proposed by Trocano Araretama Conservation project create alternatives for the reduction of human pressure on ecosystems in the project area. Among them are:

- Create an inventory of fauna and flora of the region to assist the planning of actions to be developed successfully.
- Create alternatives for the inhabitants of the project area and surrounding areas for the development of extraction of forest products.
- Reduction of human pressure on rivers and lakes of the area around PDD and with reduced extraction predatory fish, especially species of great economic value, encouraging captive breeding techniques using fish farming and aquaculture.
- Implement conservation services, in a systemic way, as a means of economically favourable activity, contributing to the conservation culture.

9.2 Invasive Species

Invasive species represent a problem to the balance of the Amazonian ecosystems. The lack of inspection, the growth of the trading of animals and plants and the invasion of exotic species tend to happen once these activities generate profit to illegal wholesalers and bio-pirates. These might not always be people from outside the community, but also people from inside the community, who seeks monetary gain from illegal activities. It is important, therefore, to raise awareness of the illegality of these activities among the local population, so that they do not happen, and the ones who do it may not be able to make money from irregular commerce.

In relation to the Trocano project area, according to research carried out on the Global Invasive Species Database[22], there is only 1 Alien Species (species that have been introduced to that location) in the Amazonia region of Brazil, which is the Columba livia (bird), however the invasiveness is 'not specified' and there are no management notes for this location for this invasive species.

However, as stated in section 4.6.2, during the on-the-ground activities (which includes a survey of fauna and flora in the project area to be carried out over time as part of the project) it will be identified whether non-native individuals exist or not, and if it is found any indication of invasive species, these species will be monitored for later control and eradication. The project will follow the 3 management stages of the Global Invasive Species Programme, as identified in the Natural Forest Standard Guidance, which are:

- Prevent the release and spread of non-native animal and plant species into areas where they can cause damage to native species and habitats and to economic interests;
- Ensure rapid response to new populations will be undertaken;
- Ensure effective control and eradication measures will be carried out if/when problem situations arise.

The Trocano Araretama Project will not introduce or encourage the introduction of non-native species of animals and plants to the area of the project in order to meet Article 4º, Law 5.197/67[23]. However, the activities to be developed within the project area will seek the mitigation of possible impacts caused by invasive species.

The process of Invasive Species management will be incorporated into the project in the following ways:

- Fauna and Flora surveys, as described in section 4.6.2;
- Environmental Education Program (see section 2.1.);
- Meeting and Lectures to raise awareness within the communities;

---

[22] http://www.issg.org/database/welcome/
[23] http://www.planalto.gov.br/ccivil_03/leis/L5197.htm

- Awareness Campaign against bio-piracy;
- Form part of the monitoring plan for control and eradication of invasive species.

9.3   Hunting and Bushmeat

In general, hunting activities in the project area occur as a tool for subsistence, feeding and making sure that families have an appropriated intake of protein especially for families who live in isolated areas. However, during the initial surveys undertaken in Borba for the Trocano project, evidences of the hunting of Pacas *(Cuniculus paca)* were found. That shows non-conformity with the national legislation and the lack of monitoring systems for the hunting activities in isolated areas of Borba.

The Hunting Code described in the Law Number 5.197/67[24] regulates hunting activities in the national territory and protects the animals from any species, in any stage of their development and that live naturally outdoors, not under captivity, and that are part of the wildlife; as well as their nests, shelters and natural breeding. Those animals are property of the State and it is prohibited to use them, chase them, destroy them, hunt them or catch them.

To contribute to the national environmental legislation, as well as providing social tools that will contribute for the application of the Hunting Code plus result in no net loss of biodiversity within the project area, the Trocano Araretama Conservation Project proposes the following activities to mitigate the impact of hunting activities on the existing biodiversity in project area:

- **Educational and awareness campaigns in schools:**

Environmental education is nowadays one of the most important activities to be fomented within the Amazonas biome. Our goal is to provide technical courses about environmental education to train multipliers[25] who will be able to make a difference in communities where poor governance and activities of land grabbers and squatters are notorious.

- **Meetings with the communities to raise awareness:**

The frequency of the meetings will be defined together with the community, taking into account the availability of the members. It will be crucial that the head of the family takes part at the meetings, to make sure that this person is going to repeat the information to the other members and will help bringing awareness to the social-environmental needs of the communities.

---

[24] http://www.planalto.gov.br/ccivil_03/leis/L5197.htm
[25] Definition – Multipliers: An individual or group of individuals who will be trained to disseminate environmental education to the communities.

- **Monitoring of the hunting activities of the families registered in the project area**

The idea is not to punish the inhabitants that make strategic use of the hunting activities, since the needs of the poor population from the Amazonas region are responsible for the maintenance of those activities. However, the objective of the project is to present alternatives to those activities, introducing new models for food production without degrading the existing biodiversity and provide activities to encourage the practice of actions with an emphasis on economic sustainability plus cultural maintenance of the societies in the project area.

- **Cultural activities to promote wildlife preservation and protection:**

Cultural workshops to help bringing funds to the population from sustainable tourism activities will be organized, in order to spread more information and reach the consolidation of the preservation activities in the project area.

- **Family agriculture activities:**

Family agriculture in the Amazon is currently something that needs to be reached in order to guarantee food production to the populations who live and work within the area. To facilitate those activities is a real and tangible alternative that will allow people to maintain their families within the project area, such as the implementation of home-gardens, as identified under the benefit distribution mechanism in section 3.8.4.

It is important to highlight that reducing the amount of hunting activities of wildlife in the project area will not affect the way of life of the riverine and rural people who inhabit the area. Their main nutritional sources are fish and cassava flour, as well as fruits that can be found in the woods or planted at home gardens in the forest. Those items, together with the poultry activities, are all traditional activities that over time have helped keeping the inhabitants away from problems deriving from a poor nutrition. The process of free, prior and informed consent will be implemented where any alternative livelihood activities are found to be required.

The project proposes to reduce hunting activities without changing the diet of the rural and riverine populations. With more green space available to plant, harvesting tends to be more robust. The project also aims to encourage the implementation of home gardens within the project area, which will allow a larger food production in direct correlation to the maintenance of the natural forest.

9.4 Biodiversity Assessment of the Project Area

To quantify the biodiversity impacts of the project, as required in the Natural Forest Standard the Normative Biodiversity Metric (NBM) has been applied to the project area and a full desktop assessment has been carried out. The specialist GIS team of project staff carried out the biodiversity quantification activities; this team comprises of the geographer Jenifer Pereira Castilho Marques, the technician Rodrigo Pimenta Cézar, and the GIS engineer Cibele Lopes Bastos.

The Eco-floristic maps in section 9.7 were generated during the period of the 18th of June 2012 to the 14th of September 2012 by the GIS team.

This assessment has not been implemented using the Geospatial Platform, as there is no Normative Biodiversity Metric layer for the platform currently available. This however is planned to be developed, implemented and applied within the Geospatial Platform in the near future. Due to the Geospatial Platform not being utilised for this analysis, the area sizes calculated differ from those referenced in the majority of the PDD. This is not felt to be of concern, as the overall NBM score is given as an average for the project area as a whole and slight fluctuation in the land area calculated will not create significant differences in the calculated NBM score.

Where vegetation types for the project have been identified using the Geospatial Platform this has been referenced appropriately.

9.5   Step 1: Identifying Eco-Floristic Zone

The Trocano Araretama Conservation Project lies within the Amazon Basin. The FAO eco-floristic zone definition of this area is 'Tropical Rainforest' (TAr) and falls into the IIa Ecofloristic zone[26]. The WWF habitat type is 'Tropical and Subtropical moist broadleaf forest' and the ecoregion category Neo-tropical, Northern South America: Northern Central Brazil[27].

This classification would suggest that the project area can be considered 'pristine' for the purposes of the Normative Biodiversity Metric assessment.

In preparing the eco-floristic zone maps, shown below in section 9.7, which were made from images obtained from LandSat specifically for the project areas, a classification method was used to generate vector layers with characteristic classes of the human influence, which is represented in the maps shown herewith. See section 9.7 for more detail.

9.6   Step 2: Defining the NBM Scale

The pristineness scale is dependent on the eco-region that the project area falls into. Tropical rainforest is identified as pristine land cover, and so predominantly falls into category 5. However, the findings from the project area have been applied using the generic descriptors of each category, as defined below:

---

[26] ftp://ftp.fao.org/docrep/fao/006/ad652e/ad652e00.pdf
[27] http://worldwildlife.org/ecoregions/nt0141

Category	Generic Descriptors	Likely occurrences in Tropical Rainforest Eco-floristic Zone
5 - Pristine	Land is inaccessible, no roads or navigable rivers. Can be small, indigenous communities present.	**Tropical Rainforest** Areas of primary rainforest where there are only small indigenous communities present. The inaccessibility of the forest precludes the possibility of access from loggers or commercial hunters, or tourists. The indigenous communities may use forest resources but species populations are stable.
4 - Minimal Use	Original habitat and species distributions mostly intact; however, the area is subject to minor human activity which has a small impact on ecosystem functions.	**Disturbed Rainforest** Areas of primary rainforest which have been impacted on in relatively minor ways by human activity. Hunting, harvesting of non-timber forest products, evidence of selective logging, or high levels of tourist activity in the area.
3 - Impacted	These areas are notionally still natural areas, but degraded such that many indigenous species are not present.	**Rainforest fragments, degraded forest** In vicinities or roads and towns, strips of original forest will remain, but cut-off from main areas of habitat. Areas subject to high levels of hunting, such that many species and ecological functions are absent.
2 - Converted	Areas of habitat which have been converted to a different type of land cover. Gardens, parklands, grazing areas, low-intensive farmlands for example.	**Low secondary vegetation** Secondary vegetation such as scrub, thicket, brush which occurs when the original rainforest is removed/burned/destroyed and the soil does not recover its potential for regrowth of the rainforest. **Grazing grasslands** Former rainforest land now bearing grasses and possibly undergoing periodic burning and grazing, e.g. Imperata grasslands. Some of these grasslands provide useful environmental functions such as maintaining water regimes and soil stability, but only provide habitat for a small number of generalist species.
1 - Monoculture	High intensity production of one crop which causes the homogenisation of large areas of landscape.	**Monocultures** Intensive agriculture areas, normally soybean production in the Amazon. These areas do not provide natural habitat for any species. Other monoculture plantations common in converted Amazon land include eucalyptus, sugar cane and corn. **Barren unused land** Barren land devoid of plants or vegetation which can provide habitiat for indigenous species. Following the closure of a mine, or the abandonment of some man-made structure, this is the first step in the process of rehabilitation and natural reclamation of land.
0 - Artificial	Areas which have been developed, built up areas, or areas where no organic vegetation remains.	**Roads** Tarmac roads which have been constructed through the rainforest. **Active mines** Open-cast mines currently in operation.

Table 44 - Generic Descriptors and Likely Occurrences in the Eco-floristic Zone of the Project Area
Source: Natural Forest Standard Guidance v1.1

Water bodies are not included in the NBM calculations as the NFS guidance states that it is only land within the project that needs to be assessed. These habitat categories are applied in the following step.

9.7   Step 3: Classifying Habitat Zones

The Eco-floristic maps were generated during the period of the 18th June 2012 to 14th of September 2012 by the GIS team identified in section 9.4. From this data, defined by GOFC-GOLD as being of medium resolution needed for this type of project, it is possible to describe the procedures used to identify regions with anthropogenic influence. Those procedures will also be updated annually, in order to update the NBM.

An historic series of images from the satellite TM/LANDSAT-5 was purchased (see table*** below). This is a cartographic database with information about the municipal boundaries and hydrography made available by the Geological Service of Brazil ("*Serviço Geológico do Brasil*").

LandSat Images used for Eco-Floristic Maps			
Year	Sensor	Orbit/Point	Date
1998	TM-LANDSAT – 5	229/063	15/07/1999
1998	TM-LANDSAT – 5	229/064	16/08/1999
1998	TM-LANDSAT – 5	230/063	01/08/1997
1998	TM-LANDSAT – 5	230/064	16/07/1997
1998	TM-LANDSAT – 5	230/065	03/07/1998
1998	TM-LANDSAT – 5	231/063	07/07/1997
2008	TM-LANDSAT – 5	229/063	07/07/2008
2008	TM-LANDSAT – 5	229/064	23/07/2008
2008	TM-LANDSAT – 5	230/063	14/07/2008
2008	TM-LANDSAT – 5	230/064	15/08/2008
2008	TM-LANDSAT – 5	230/065	15/08/2008
2008	TM-LANDSAT – 5	231/063	21/07/2008

Table 45 - LandSat Images purchased to generate Eco-Floristic Zone Maps
Source: IAL 2012

Processing and Analysis of Satellite Data

The scenes were adjusted from an "image to image" register, in order to geometrically adjust rows and columns, generating a "mosaic to image". The registration was made by selecting ten control points in common between two images from places of notorious reference, intersection of extensions of land and watercourses. From the moment when the control points were defined, the resampling method called "Nearest Neighbour" was applied, using a 1st degree polynomial for the coordinates' transformation.

The supervised classification method applied was MaxVer, which considers the distances among averages of the digital levels of classes, using statistical parameters. With that

procedure, it was possible to generate vectors layers with classes of characteristic of the human influence presented in the Eco-floristic maps.

Each image was then tested with threshold values of similarity and area, and the combined results were categorised into the generic pristineness categories, as per table 44 in section 9.6, and as shown in maps 15 to 18. From this analysis of the project area, the habitat classification was found to be related to areas where communities are located, and also to accessibility, appearing correlative to the risk categorisation identified within the Geospatial Platform.

For classification of the eco-floristic zones, it was identified where there are lands within the project areas that have been converted into fields or pastures, where communities are present within the project area (these areas were classified as minimal use) and where accessibility points such as roads and access areas, and rivers and lakes used for navigation and/or fishing are located.

With regards the classification of monoculture in the project area, the proportion of occurrence of this category in the project area is not possible to represent, as the occurrence of this is found to be minimal.
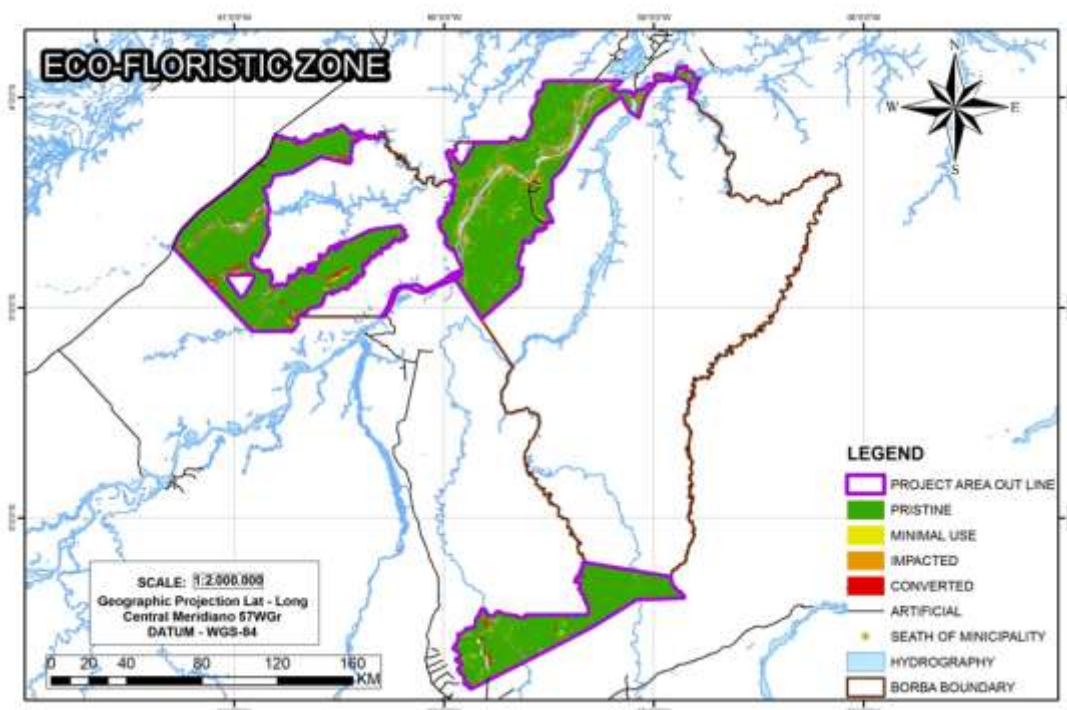
Map 15 - Eco-floristic habitat zones for the overall project area
Source: IAL 2012
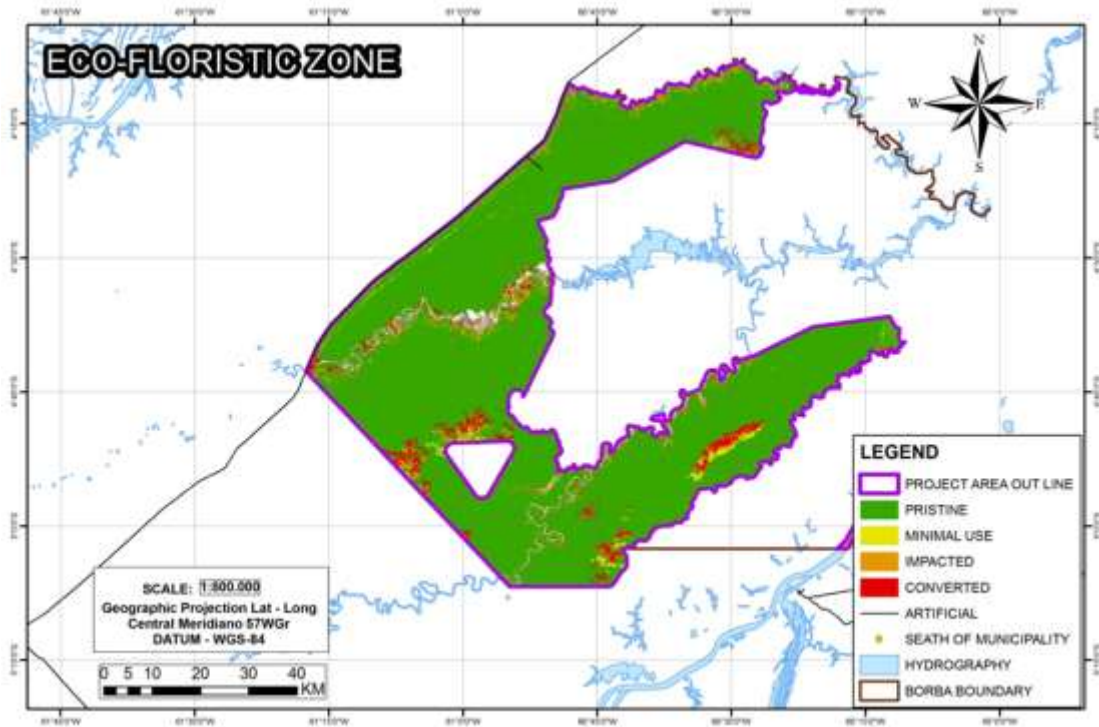
Map 16 - Eco-floristic Habitat for the West Project Zone
Source: IAL 2012

The West Zone classification was observed, referring to the surrounding BR319 road. In addition to maps and images of the area, we used the specific understanding of the biome in relation to the occurrence of the effect "fishbone" in the surrounding areas. In effect fishbone occupation is by small openings from roads.
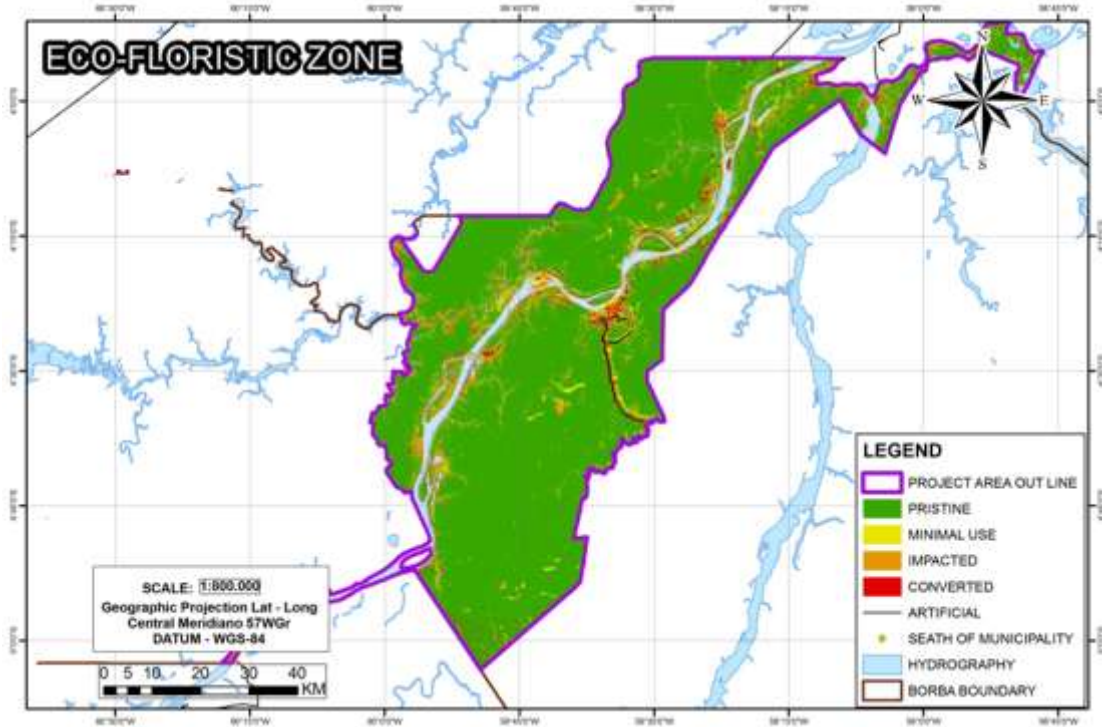
Map 17 - Eco-floristic Habitat for the Central Project Zone
Source: IAL 2012

In this Central Zone analysis, five different classifications were made. This is an area where human pressure is perceived both by means of evaluation of recent images and maps of land use, and by local knowledge.
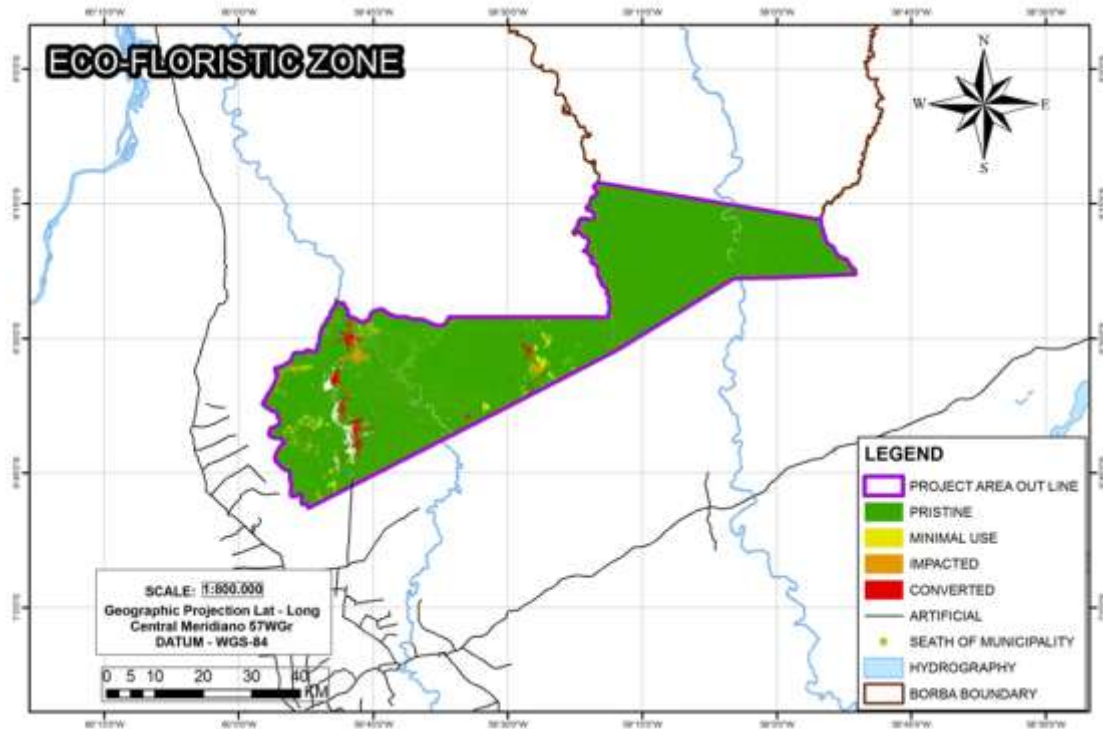
Map 18 - Eco-floristic Habitat for the South Project Zone
Source: IAL 2012

In the southern zone, an area of selective logging was detected, but was not confirmed for its pressure on the biodiversity. However an area was detected of high pressure on the biodiversity in the vicinity of the Juma River waterway and a risk of selective logging.

Following on from this desk-based analysis, during the duration of the project and its activities, ground-truthing exercises will be implemented and carried out whereby surveys of the areas which are identified as having a high degree of ecosystem intactness to establish whether there are any signs of hunting or resource harvesting in the area, which has fundamentally affected the ecosystem function. This will be carried out during the early stages of the project. See Step 6 for further information regarding monitoring and ground-truthing.

When calculating the vegetation types and coverage within the project areas, the data has been compared to the ESA Globcover 2009 data included within the Geospatial Platform.

A summary of the data is presented in the table below, and the Vegetation Types referenced in the table are as below:

Vegetation types according to the categories shown on the Vegetation layer of the Geospatial Platofrm	
Type 1	Mosaic cropland (50-70%)/vegetation (grass/shrub/forest) (20-50%)
Type 2	Mosaic vegetation (grass/shrub/forest) (50-70%)/cropland (20-50%)
Type 3	Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)
Type 4	Closed to open (>15%) (broadleaved or needleleaved, evergreen or deciduous) shrubland (<5m)
Type 5	Closed to open (>15%) herbaceous vegetation (grass/savannas or lichen/mosses)
Type 6	Closed to open (>15%) broadleaved forest regularly flooded (semi-permanently or temporarily) – Fresh or brackish water
Type 7	Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil – Fresh, brackish or saline water
Type 8	Water bodies

Table 46 - Vegetation Classifications for Table 47
Source: CGV Geospatial Platform 14th January 2013

|		Vegetation Types in each project area in hectares and in % of area							
Area Number	Type 1*	Type 2*	Type 3*	Type 4*	Type 5*	Type 6*	Type 7*	Type 8*	Totals ha/%
Area 1									
ha	-	-	25,260	-	-	-	-	-	25,260
%	-	-	100.00	-	-	-	-	-	100.00
Area 2									
ha	-	-	12,148	-	-	-	-	-	12,148
%	-	-	100.00	-	-	-	-	-	100.00
Area 3									
ha	-	-	10,547	-	-	-	-	-	10,547
%	-	-	100.00	-	-	-	-	-	100.00
Area 4									
ha	-	-	102,422	-	-	297	-	-	102,719
%	-	-	99.00	-	-	0.29	-	-	99.29
Area 5									
ha	-	-	1,486	-	-	-	-	-	1,486
%	-	-	100.00	-	-	-	-	-	100.00
Area 6									
ha	223	37	188,631	-	223	260	1,639	2,272	193,285
%	0.120	0.019	97.000	-	0.120	0.130	0.850	1.200	99.439
Area 7									
ha	37	-	111,620	37	-	222	-	-	111,916
%	0.033	-	99.000	0.033	-	0.200	-	-	99.266
Area 8									
ha	37	-	155,543	-	-	3,654	410	1,976	161,620
%	0.023	-	96.000	-	-	2.300	0.250	1.200	99.773
Area 9									
ha	111	37	18,348	-	-	2,237	335	2,125	23,193
%	0.48	0.16	79.00	-	-	9.60	1.40	9.20	99.84
Area 10									
ha	372	37	48,681			1,975	74	260	51,399
%	0.730	0.073	94.000			3.800	0.150	0.510	99.263
Area 11									
ha	521	74	212,873	74	-	8,833	745.00	2,348	225,468
%	0.230	0.033	94.000	0.033	-	3.900	0.330	0.790	99.316
Area12									
ha	-	-	10,287			1,602		745	12,634
%	-	-	81.00			12.00		5.90	98.90
Area 13									
ha	149	-	261,377	-	74	6,896	5,740	3,541	277,777
%	0.054	-	94.000	-	0.027	2.500	2.100	1.300	99.98
Total per type in Hectares	1,450.00	185.00	1,159,223.00	111.00	297.00	25,976.00	8,198.00	13,267.00	1,208,707.00
Total per type in % of project area	0.12	0.02	95.91	0.01	0.02	2.15	0.68	1.10	100.00

*Vegetation Types, as referenced in Table 46

Table 47 – Vegetation Types in each project area   Source: CGV Geospatial Platform 11th December 2012

As can be seen in the table above, the predominant vegetation type is 'Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)', covering 95.91% of the project area, which is consistent with the data that considers a majority of the project area 'pristine' for the purposes of the calculations within the Normative Biodiversity Metric. This is consistent with the ecoregion classifications given above.

9.8   Step 4: Endangered Species Presence

Research by Fabio Röhe in 2006 entitled "The Medium and Large Mammals of Madeira River" (Mamiferos de Medio e Grande Porte) detected endemic species of mammals found in the region near the project area and its surroundings. This study can be found in Annex 12.

As is shown in figure 27 in section 9.0, there are 29 endemic species recorded in the Purus-Madeira interfluve from the sampled data and 20 endemic species recorded in the Madeira-Aripuanã interfluve the sampled data. Of these identified species, some are found in both interfluves; this results in 26 individual species being identified in the area. The below map shows these interfluves and areas in relation to the project area:
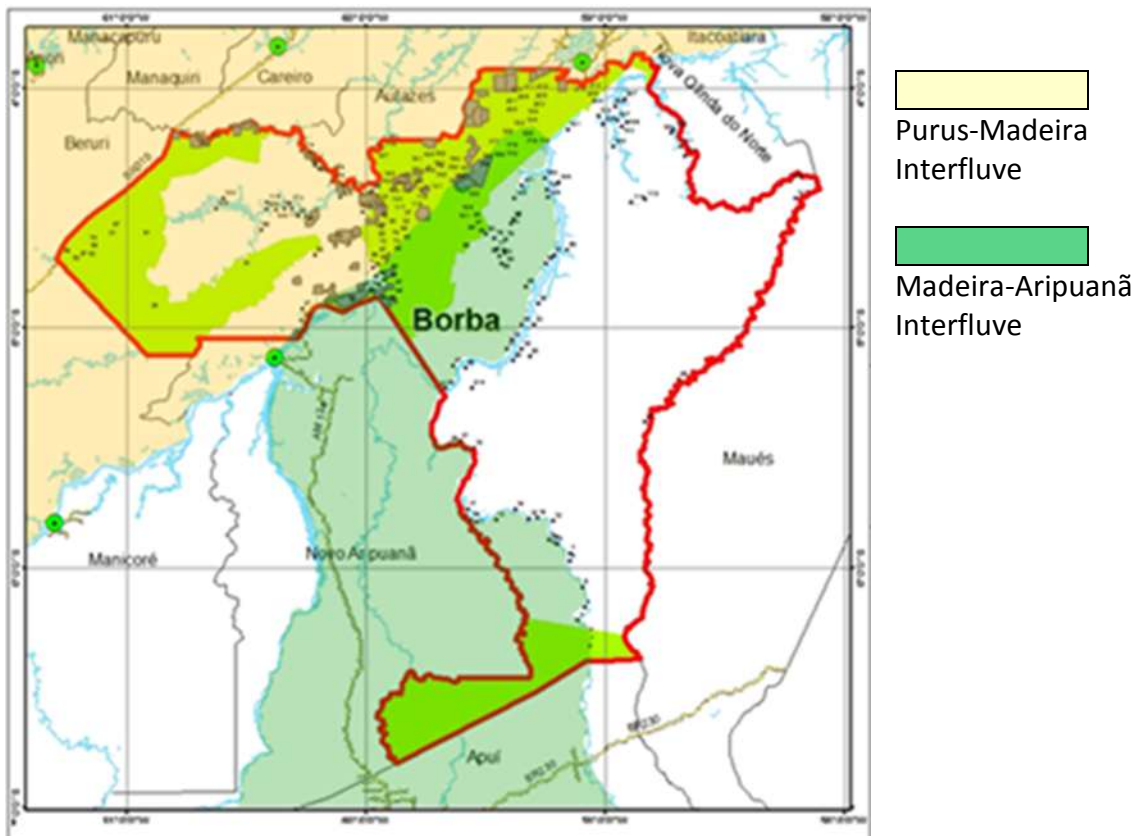
Map 19 - Interfluves of Röhe study applied to the project area
Source: IAL 2012

Of the species identified in these records, there is one that appears on the IUCN Red list as Endangered; this is shown in the table below:

Species recorded in Rohe study relevant to the project area		
Endemic Species	IUCN Red List status	Trend
1 Didelphis sp	Not listed	-
2 Dasypus novemcinctus	Least Concern	Increase
3 Dasypus kappleri	Least Concern	Unknown
4 Tamandua tetradactyla	Least Concern	Unknown
5 Cebuella pigmea niveiventris	Not listed	-
6 Saguinus labiatus	Least Concern	Stable
7 Cebus apella	Least Concern	Decrease
8 Saimiri sp	Not listed	-
9 Pithecia sp	Not listed	-
10 Callicebus caligatus	Least Concern	Unknown
11 Aotus sp	Not listed	-
12 Lagothrix cf. cana	Not listed	-
13 Alouatta sp	Not listed	-
14 Panthera onca	Near Threatened	Decrease
15 Puma concolor	Least Concern	Decrease
16 Puma yaguaroundi	Not listed	Decrease
17 Leopardus pardalis	Least Concern	Decrease
18 Leopardus wiedii	Near Threatened	Decrease
19 Nasua nasua	Least Concern	Decrease
20 Pecari tajacu	Least Concern	Stable
21 Tayassu pecari	Near Threatened	Decrease
22 Mazama sp	Vulnerable	Decrease
23 Tapirus terrestris	Vulnerable	Decrease
24 Sciurillus pusillus	Deficient data	Unknown
25 Sciurus sp	Not listed	-
26 Sciurus cf spadiceus	Not listed	-
27 Agouti paca	Least Concern	Stable
28 Dasyprocta cf fuliginosa	Not listed	-
29 Coendou cf prehensilis	Not listed	-
30 Myrmecophaga tridactyla	Vulnerable	Decrease
31 Callibella humilis	Vulnerable	Stable
32 Mico manicorensis	Least Concern	Unknown
33 Callicebus bernhardi	Least Concern	Unknown
34 Saimiri ustus	Near Threatened	Decrease
35 Chiropotes albinasus	**Endangered**	**Decrease**
36 Eira Barbara	Less Concerning	Decrease

Table 48 - Species recorded in Röhe study relevant to the project area as identified in the IUCN Red List Sources: IUCN 2012; Röhe 2006

This data is considered reliably verified through the Röhe study, and has been used to finalise the NBM score of the Trocano project.

There is an exhaustive list given in Annex 1 of the Röhe study that identifies all species recorded in the region during the Madeira River study. Through the duration of the project, further research will be undertaken to identify any of these additional species within the project area; upon identification of any species being identified in the project area that are included on the IUCN list as endangered will be incorporated into the NBM score of the project through the annual review process as appropriate (see section 9.11).

9.9 Step 5: Finalising the NBM Score

The NBM score has been calculated using the data collected and analysed as detailed in Steps 1 to 3. The score has been calculated using the datasets collected and analysed by IAL to create the eco-floristic zone maps identified in section 9.7, The calculation of the NBM is shown below:

Category	Habitat	Land Metaclass	IUCN Endangered Mammal adjustment	Area (ha)	Contribution	Overall NBM Score for Project
5 - Pristine	Pristine areas of rainforest protected as part of project; inaccessible	5	1 Endangered Species present = +0.5*	1,156,305	6,359,678	
4 - Minimal Use	Minimal hunting and deforestation; original habitat and species distribution mostly intact	4		40,963	163,852	
3 - Moderate Impact	Natural forest areas but degraded	3		51,047	153,141	
2 - Converted /Degraded	Converted land	2		34,642	69,284	
1 - Monoculture	High Intensity Cropland	1		-	-	
0 - Artificial	Paved/tarmacked roads	0		764	-	
Totals				1,283,721	6,745,955	5.3

Table 49 – Normative Biodiversity Metric Calculation using IAL data
Source: IAL 2012

*It is not specifically identified which land cover category the endangered species is included in; the endangered species adjustment has been applied to the Pristine category, as this is the most likely land cover category the species would inhabit.

A score of 5.3 has been calculated for the Trocano Araretama Conservation project.

9.10 Step 6: Monitoring the Biodiversity

The desktop assessment for the NBM will be validated over time and the duration of the project. The on the ground teams will carry out ground truthing exercises throughout the duration of the project, and every year upon annual reporting will provide detailed information of the data they have gathered. This can then be added to the NBM data that was initially calculated and year on year the NBM can be updated and adjusted according to the data collected.

There is currently being developed a data layer for the NBM for the Geospatial Platform. This will automatically generate the NBM score for any given area. This can then obviously be adjusted according to OTG data collection. This layer would be updated as and when current data is released, so will keep the NBM score current. When available, the NBM score for the project area will be calculated within the Geospatial Platform for consistency and completeness of the project processes.

The monitoring of biodiversity within the project area will be carried out as part of the implementation of the project and integrated into the monitoring schedule of the project area. Teams will be trained in the effective monitoring of species and data will be collected by trained members of the communities. The data will be collected on data sheets provided by the PMC and will allow the standardisation of information collation and storage. The monitoring teams chosen to be trained and to act in the on-the-ground activities will be selected; people living in the project area will be prioritised.

Biodiversity monitoring in the project area will have different dimensions for every identified and classified region, from the description in the biodiversity maps presented in section 9.7. Thus, it has been initially identified that three main teams are needed, one for each zone. The responsible person for training and preparing these teams is the field coordinator from IAL, engineer Cibele Lopes Bastos, who will use the coordinates from the GIS team to create a strategic plan for the activities of data collection. The GIS team from IAL should indicate where the sampling regions, for the first flora and fauna inventories will be made.

Assuming that the project will protect and conserve the species within the area, by keeping and conserving their natural habitats, these data lists will be periodically revised and, when necessary, updated. In this manner, it will be possible to know if the forest conservation is providing real benefits for the biodiversity by protecting the species that were already threatened and avoiding the addition of new species to the list. The biodiversity performance in sensitive areas over time can be identified through monitoring and data collection activities and over the duration of the project will give a good understanding of the progress, impact and significance of the implementation of the project.

The assumption of the Trocano Araretama Conservation Project is that there is to be no net loss of biodiversity in the project area, as the implementation of project activities are designed to mitigate this occurrence. Through the successful monitoring and data collection

activities incorporated into the project will, over time, lead to creating a valuable knowledge and data base of species within the area. This will assist in educating the local communities in the importance of conserving, protecting and where possible, enhancing their natural habitats.

9.11   Normative Biodiversity Metric Review

The NBM will be reviewed on an annual basis as part of the Annual Reporting requirement of the Natural Forest Standard, which is incorporated into the project. Any areas known to have been affected by deforestation or degradation that are identified as part of the overall project monitoring will be recorded and applied to the review of the NBM calculation.

The creation and implementation of the Trocano Araretama Conservation Project will protect the forests and biodiversity of the area, enhance the quality of life for the local inhabitants and make a contribution to the overall mitigation of climate change.