FUNDAÇÃO
AMAZONAS
SUSTENTÁVEL

THE RIO MADEIRA SUSTAINABLE DEVELOPMENT RESERVE REDD+ PROJECT

AMAZONAS, BRAZIL

THE RIO MADEIRA SUSTAINABLE DEVELOPMENT RESERVE REDD+ PROJECT

SUMMARY

TYPE OF ACTIVITIES

REDD+ (**Reducing emissions from deforestation** and forest **degradation** and the role of **conservation**, sustainable management of forests and enhancement of forest carbon stocks in **developing** countries)

GREENHOUSE GASES TARGETED

Carbon Dioxide (CO_2)

LOCATION

Novo Aripunã municipality, State of Amazonas, Brazil

PROJECT AREA

Rio Madeira Sustainable Development Reserve
283,117 hectares (**ha**)

APPLICABLE CARBON STANDARDS

Verified Carbon Standard (VCS) and Climate, Community and Biodivesity Standard (CCBS)

METHODOLOGY

Verified Carbon Standard's (VCS) approved methodology entitled "Methodology for Avoided Unplanned Deforestation (VM0015)"

PROJECT DURATION

25 years

PROJECT START DATE: 2006

Crediting period: 2006-2020[1]

EXPECTED DEFORESTATION IN THE BASELINE SCENARIO (2011-2020):
16,548.97 ha

EXPECTED NET EMISSIONS REDUCTIONS FROM THE PROJECT (2006-2020):
4,232,891 TONNES OF CARBON DIOXIDE EQUIVALENT (**tCO2e**)

BUFFER CREDITS (2006-2009):
1,128,771 tCO2e

EXPECTED VERS TO BE ISSUED (BUFFER PRESERVED):
3,104,120 tCO2e

DIRECTLY BENEFITED COMMUNITIES (2015[2])

3,694	1,028	55
PEOPLE	FAMILIES	COMMUNITIES

PARTNERS

Bradesco · Governo do Estado do Amazonas · Fundo Amazônia / BNDES · Coca-Cola Brasil · ICCO Cooperación

1 Crediting period will be extended according to the National Policy on Climate Changes and will comply with VCS' minimum crediting period

2 Data monthly updated and available at http://fas-amazonas.org/transparencia

PROJECT PROPONENT

FUNDAÇÃO AMAZONAS SUSTENTÁVEL

The Fundação Amazonas Sustentável was created in 2008 through a partnership of Bradesco and the State Government of Amazonas with the mission to promote sustainable development within State Protected Areas of the Amazonas state, focusing on environmental conservation and in improving the life quality of traditional populations. Through the mechanisms of Payment for Environmental Services (PES) and REDD+, FAS focus it actions on reducing deforestation, eradicating poverty, supporting social organizations, improving social indicators, generating income based on sustainable activities and implementing social-environmental monitoring. Its core program is the Bolsa Floresta Program, which serve as the basic structure for the Juma Reserve REDD+ Project (Borner *et al.*, 2013; Nhantumbo, 2012; Viana, 2010; Viana *et al.*, 2010; Viana *et al.*, 2008).

FAS has developed innovative partnerships with private companies non governmental organizations and governmental institutions that are interested in collaborating on sustainable development and management of protected areas in Amazonas, offering different opportunities to support socio-environmental responsibility actions within protected areas. FAS also works to develop a market for environmental services and products, applying the resources acquired for implementing its programs. FAS has a strong focus on participatory planning and action as well as transparency. All financial statements have been audited by PwC. Strategic planning is supported by Bain & Co and management supported by SAP – all on a pro-bono basis.

The Madeira Reserve REDD+ Project provides investors and donors with a guarantee that the execution and completion of the project is done in a manner that complies with all of the relevant legal, governmental and regulatory structures. The project was designed through a transparent process involving participatory workshops and political consultations in order to guarantee the involvement and commitment of all the local stakeholders. Its implementation is based on co-creation of local solutions and participatory processes.

FUNDAÇÃO
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EXECUTIVE SUMMARY

HISTORICAL CONTEXT

The Brazilian Amazon is under great pressure. An estimated 19% of the original forest cover has already been lost (INPE, 2015; Santos *et al.*, 2013). From 1988 to 2014, more than 407,670 km² of the region's forests were destroyed, an area equal to 8.13% of the total area of the Legal Amazon (INPE, 2015). In contrast, during this same period, the State of Amazonas, the largest Brazilian State[3], lost only 21,651 km² of forested areas. Historically, Amazonas has always had the lowest deforestation rate in the Brazilian Amazon with more than 96% of the State's original forest cover still pristine (INPE, 2015).

However, due to historic deforestation in other Amazonian States (e.g., Acre, Mato Grosso, Pará, and Rondônia) population migration has driven towards the central region of the Amazon, primarily in the State of Amazonas (Fearnside, 2009). The agriculture and cattle production opportunities have made this population flux even more attractive. The scenario going forward is clear: if deforestation historical trends in the Amazon continue, millions of hectares in Amazonas will be replaced by unsustainable pasture lands and agricultural crops.

In Brazil the largest greenhouse gas (GHG) emissions come from the land cover and land-use change sector in 2013: 62% of national GHG emissions – the majority (70%) comes from the deforestation of the Amazon forests (Brandão Jr. *et al.*, 2015).

Based on this scenario, the Government of Amazonas has established a master plan to curb deforestation and foster the sustainable development statewide. The Green Free-Trade Zone (Zona Franca Verde, ZFV), created in 2003, aims at reducing deforestation by promoting local development within Amazonas' forests following the concept of payment for environmental services (Braga & Viana, 2003). Under this concept, REDD+ activities can provide financial resources and positive incentives to encourage forest conservation and global climate change mitigation.

Historically, Amazonas has been always in the vanguard position. In 2007 (Amazonas, 2008a), it created one of the most innovative State Policy on Climate Change Law (PEMC-AM) and the State System of Protected Areas (SEUC-AM). This provided an enabling environment to be created, also in 2007, the Bolsa Floresta Program (PBF), i.e. a PES-scheme that fosters State protected areas' development by social investments, financial support to sustainable income generation, empowerment and capacity building. Compounded by four components (Figure 1), PBF is the first Brazilian internationally certified initiative to reward locals for maintenance of environmental services[4]. In 2008, FAS, the Government of Amazonas and other partners developed the first REDD project in the Amazon gold-level certifed under the Climate, Community and Biodiversity Standard (CCBS).

In 2012, FAS, the Institute for the Conservation, Sustainable Development of Amazonas (IDESAM), and the Amazonas State Centre for Climate Change (CECLIMA) developed a proposal[5] for the emission reduction allocation under the expected Brazilian National REDD+ System for the State of Amazonas.

More recently, the State of Amazonas is discussing the State Law on Environmental Services that will provide further basis on REDD-based projects.

3 1.56 million square kilometers

4 Further information, access http://www.fas-amazonas.org

5 Based on "Study on Opportunities for REDD+ Initiatives in the South/Southeast of Amazonas State", developed by Idesam, Forest Trends and Carbon Decisions International in partnership with the Amazonas State Centre for Climate Change

THE RIO MADEIRA SUSTAINABLE DEVELOPMENT RESERVE REDD+ PROJECT

The Rio Madeira Sustainable Development Reserve Project for Reducing Greenhouse Gas Emissions from Deforestation and Forest Degradation ("Madeira Reserve REDD+ Project") aims to curb deforestation and its GHG emissions within a region with a great land use pressure in the State of Amazonas by encouraging the implementation of socio-economic activities for the sustainable development of the resident and neighboring population.

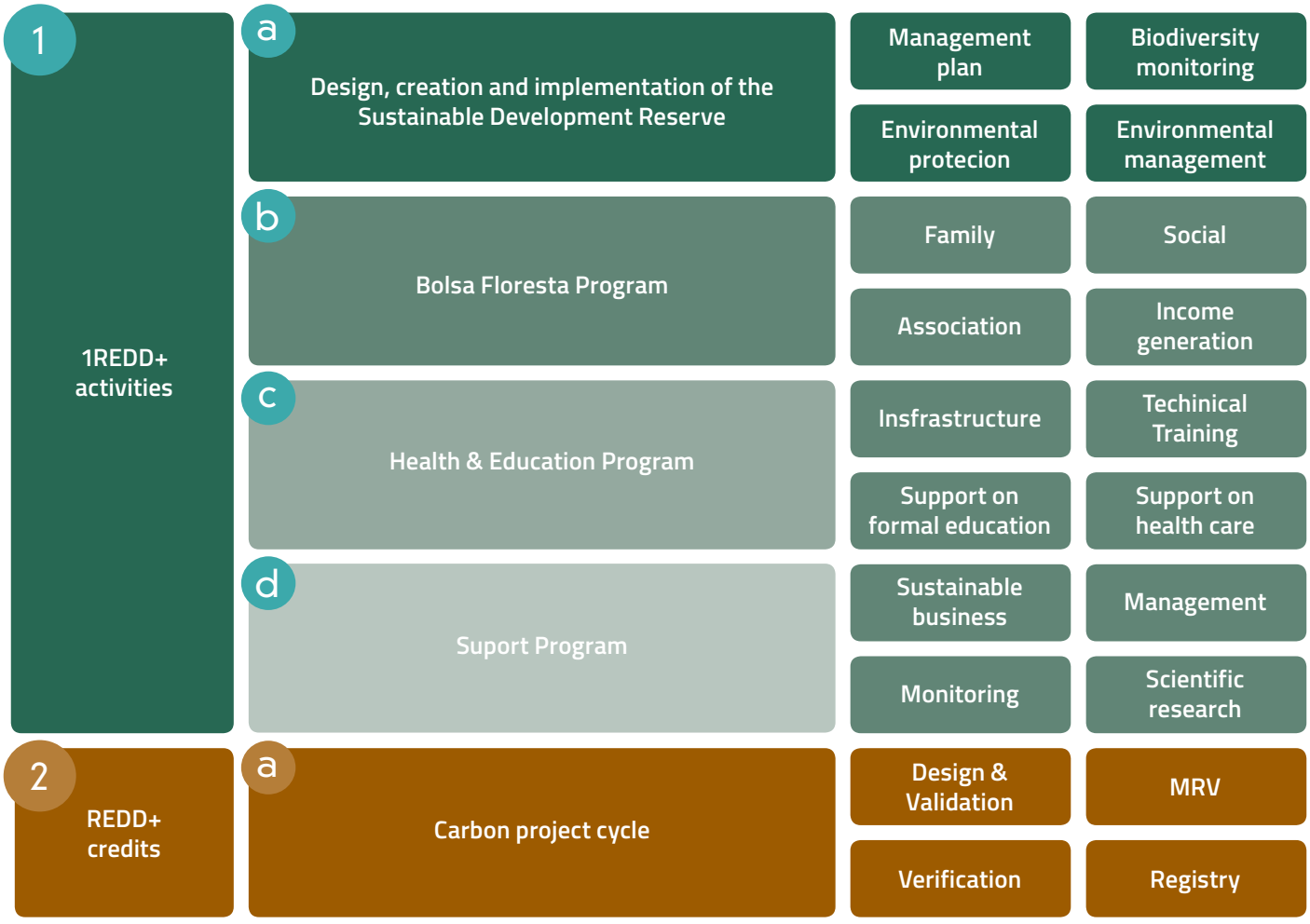
The Madeira Reserve REDD+ Project will be the second project to be implemented under the Amazonas Government broader strategy already ongoing since 2003 through the REDD+ framework (Braga & Viana, 2003; Amazonas, 2002).

The region would be partially deforested under the "business as usual" scenario for 2020 if the current land use practices in the Amazon region prevail and several drives including the paving highways (BR-319 and AM-174) will result in losses of pristine forests (Soares-Filho *et al.*, 2006; Soares Filho, 2010).

To curb this trend in the region, the Madeira Reserve REDD+ Project established, in 2006, a State protected area for sustainable use with 283,117 hectares. This project seeks to protect species in risk of extinction while also supporting the increment of hundreds families' welfare living inside and nearby the project area.

Financial resources raised with the commercialization of the project's verified emission reductions will enable both FAS and Amazonas Government to implement activities and projects to conserve the forests and improve locals' welfare following project's investment axes (Figure 1).

FIGURE 1. GENERAL SCHEME OF PROJECT'S ACTIVITIES



All carbon figures were estimated following (i) the proposed National REDD+ System strategy, (ii) a **stock-flow approach**[6], and (iii) deforestation projection following FAS, Idesam and Amazonas (2012)[7].

According to this proposal, the project area expects to prevent the deforestation of about **16,548.97 hectares** of tropical forests that would release over **4.2 million tons of CO_2e from 2009 to 2020**. Considering that buffer credits will not be commercialized, the projects expect to issue **3,104,120 tCO_2e of VERs.**

The project has already been able to reduce deforestation rate from 0.55%/yr (1997[8]-2005) to 0.02%/yr (2006-2014). The accumulated deforestation (1997-2014) has reached 11,653 hectares. From the total forest loss, 97% of the deforestation occurred before the creation of the Reserve (1997-2005), while the remaining 2.8% occurred from 2006-2014 (INPE, 2015).

In addition to the climate change mitigation benefits associated, the project also intends to generate a variety of social and environmental benefits in the project area by the activities aforementioned (Figure 1) for more than 3 thousand riverine people within 55 isolated communities.

The Madeira Reserve REDD+ Project is implemented by FAS in partnership with the Amazonas Government (by its State Secretary of the Environment, SEMA), which insures to partners the proper execution of project's activities. In addition, this project was designed and has been implemented through a transparent process involving participatory workshops and consultations for all involved stakeholders. Its implementation is based on co-creation of local solutions and participatory processes.

The cost per VER, preserving the buffer credits was estimated to be BRL 22.01/tCO_2 (USD 6.38/tCO_2). In case the buffer is released as result of a positive verification process, the cost per VER drops to BRL 16.14/tCO_2 (USD 4.68/tCO_2).

The annual cost per hectare is BRL 13.54/yr (USD 3.93/yr), and the total cost per hectare during project lifetime was estimated to be BRL 270.76 (USD 78.52/ha), which leads to the total project cost of **BRL 76.65 million (USD 22.23 million)**. FAS and other partners have already committed 10.9% (BRL 8.32 million; USD 2.41 million) of the total cost, thus the funding gap estimated is **BRL 68.33 million (USD 19.81 million)** (Figure 10; Table 10)**.**

A Transition Fund, with the potential to receive **USD 16.5 million**, will be set in place to reinvest resources from VER commercialization, as a strategy for long-term project financial sustainability. Considering that buffer credits will be preserved and a carbon price of **USD 6.5/tCO_2**, the total project revenue estimated is **BRL 94.49 million (USD 27.40 million)**. From this, the revenues from the commercialization of **3.1 million tons of VERs** represents **73.6% (BRL 69.58 million; USD 20.18 million)**, and interests from the Transition Fund other **26.4% (BRL 24.92 million; USD 7.23 million).**

6 This approach considers emission reductions from the historic deforestation pressure ("flow") and the carbon stocks ("stock") within each Amazon State, and follows Cattaneo (2008) and from IPAM (2011).

7 For this study, it was adopted a 50-50 division for stock and flow.

8 The methodology used by PRODES consider the accumulated deforestation values from 1988 to 1997.

1. THE MADEIRA SUSTAINABLE DEVELOPMENT RESERVE

1.1 PROJECT LOCATION

The Madeira Reserve encompasses 283,117 hectares in the municipalities of Novo Aripuanã, Borba, and Manicoré, in the southeastern region of the Brazilian State of Amazonas (Figure 2). The Reserve is located 227.8 km south of the city of Manaus. The urban area of the city of Novo Aripuanã is found about 10 km east of the northern boundary of the Reserve, which runs along the right bank of the mouth of the Aripuanã river.

1.2 TYPES AND CONDITION OF VEGETATION

The forest in the project area remains mostly pristine and well-preserved. According to RADAMBRASIL (1978) in association with Bispo*et al.* (2009), there are six forest formations within the project region, as follow: (i) emergent canopy alluvial ombrophyllous dense forest, (ii) uniform canopy alluvial ombrophyllous dense forest, (iii) emergent canopy lowland ombrophyllous dense, (iv) fluvial and lacustrine pioneer formation (shrubby with palm trees), (v) fluvial and lacustrine pioneer formation (herbaceous), and (vi) grassy-woody savanna without riparian forest (Table 1; Figure 3).

The project region has been deforested for several years due to land clearing for small-scale subsistence agriculture of the local populations as well as illegal land owners who have caused medium to high deforestation in order to expand their pasturelands and to commercialize timber illegally (Maldonado*et al.*, 2009).

As per the Brazilian official monitoring system (PRODES), developed by INPE (Brazilian National Institute for Space Research), the project area lost **11,652.75 hectares from 1997 to 2014** (about 5.1% of original forest cover in 1997) of its pristine forests (Figure 3). And following the deforestation projection applied, it may lose more **9,929.38 hectares (4.35%) from 2015 to 2020**.

FIGURE 2. LOCATION OF THE MADEIRA RESERVE REDD PROJECT

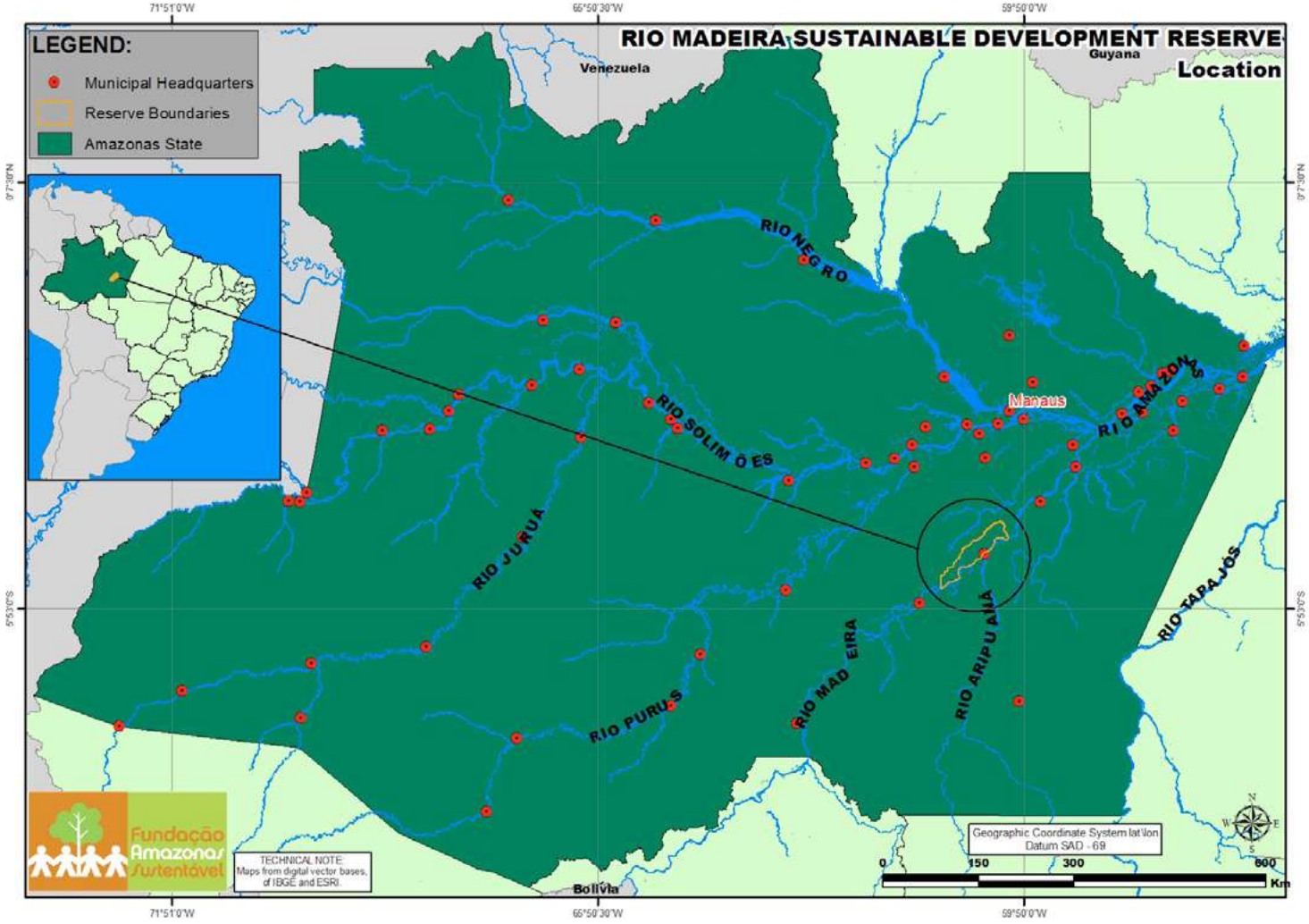
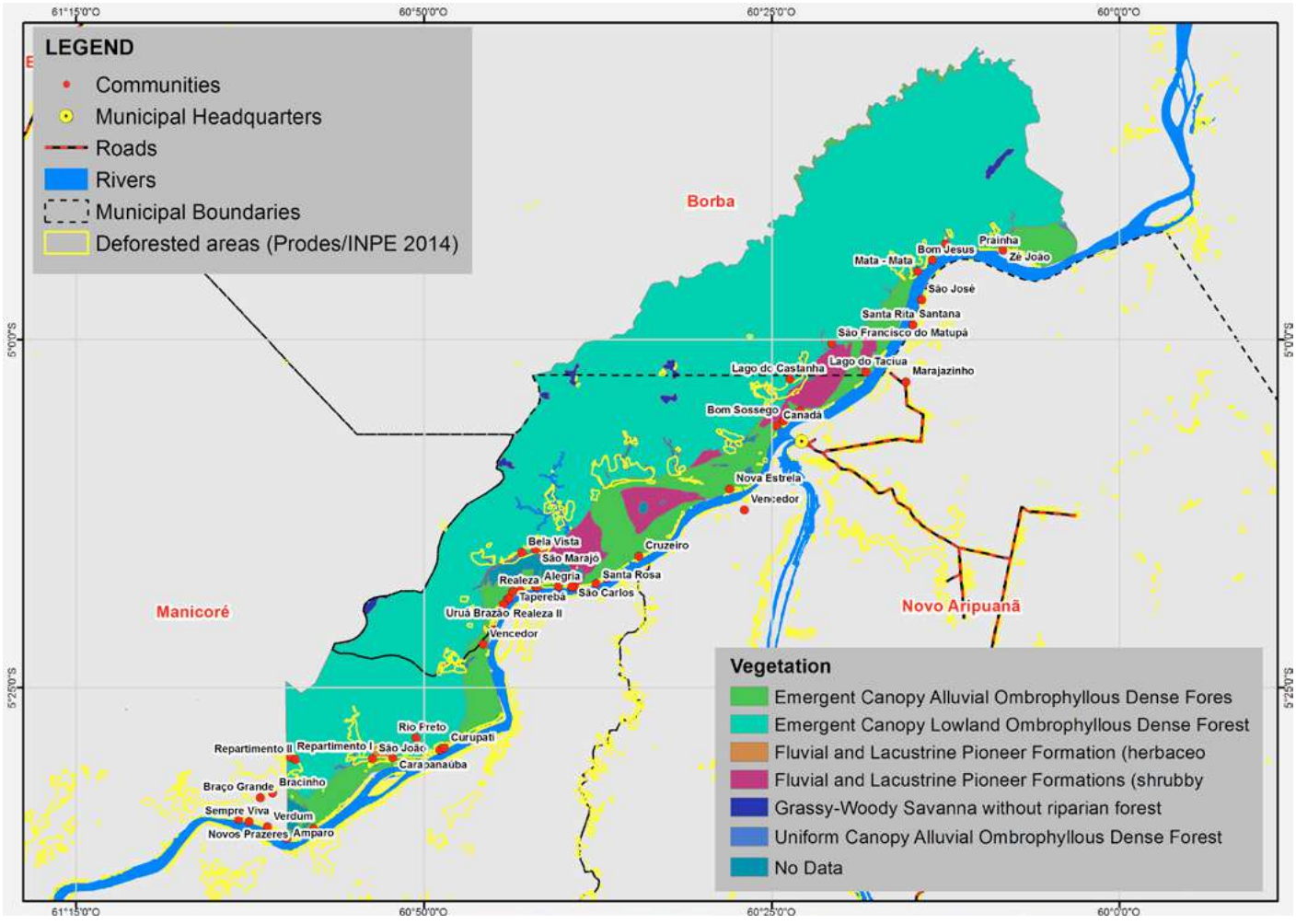


TABLE 1. VEGETATION FORMATIONS AND THEIR AREA WITHIN THE RESERVE.

VEGETATION FORMATION NAME	AREA (%) CONSIDERING THE RDS RIO MADEIRA	VEGETARED AREA (ha)
Emergent Canopy Lowland Ombrophyllous Dense Forest	78.14	218,530.80
Emergent Canopy Alluvial Ombrophyllous Dense Forest	13.79	38,573.12
Fluvial and Lacustrine Pioneer Formations (shrubby with palm trees)	4.62	12,928.68
Grassy-Woody Savanna without riparian forest	0.58	1,629.89
Fluvial and Lacustrine Pioneer Formation (herbaceous)	0.09	252.03
Uniform Canopy Alluvial Ombrophyllous Dense Forest	0.02	73.68
No Data	2.73	7,643.31
Total	100	279,631.50

FIGURE 3. CLASSIFICATION OF THE VEGETATION TYPES, THE SPATIALIZATION OF DEFORESTED AREAS (INPE, 2015) AND THE LOCATION COMMUNITIES LIVING INSIDE AND AROUND THE MADEIRA RESERVE REDD+



1.3 CARBON STOCKS AND CALCULATION

The carbon stocks within the project area were defined following the National Policy on Climate Change (NPCC)[9] that defined the emission factor for the Amazon Biome as **132.3 tC per hectare (485.1 tCO_2e/ha)**. It is clear such figures underestimate the carbon stock within the project area since they come from simple averages of different Amazonian ecosystems.

Considering the variety of the Amazon Biome, other studies (e.g. Nogueira, 2008; Fearnside*et al.*, 2007) have also considered primary data (i.e., wood volume) in order to adjust such biomass estimates (deviation between direct measure approach and the indirect one). Moreover, field measurements in the project area were carried out in 2012 to provide more precise values.

For the most representative forest type in the project area (Emergent Canopy Lowland Ombrophyllous Dense Forest) the carbon stock has a range between **587.10 tons of CO_2e per hectare** (MCT, 2006)[10] to **683.77 tons of CO_2e per hectare** (Nogueira*et al.*, 2008; Nogueira *et al.*,2008a; Nogueira *et al.*, 2008b). The second most representative forest type (Emergent Canopy Alluvial Ombrophyllous Dense Forest) has a range between **511.46 tons of CO_2e per hectare** (MCT, 2006) to **641.62 tons of CO_2e per hectare** (Nogueira *et al.*, 2008; Nogueira *et al.*,2008a; Nogueira *et al.*, 2008b).

Thus, as many other studies have provided in situ data regarding the actual vegetation formation in the project area, it should be taken in consideration a mean average from both sources to represent a conservative scenario for this project.

1.4 COMMUNITIES INSIDE AND AROUND THE PROJECT AREA

The residents living inside the Madeira Reserve are carachterized by traditional population (as the National Policy for the Sustainable Development of People and Traditional Communities, 2007)[11]. According to the latest social inventory (FAS, 2015) taken in September 2015 as part of the Bolsa Floresta Program database, it totalizes in 3,694 local people that belongs to 1,029 families, distributed in 55 communities inside and in the surrounding areas of the Reserve (Figure 3) – an average of 3.6 persons per family and 18.7 families per community.

The majority of family heads were born in the communities inside the Reserve, while the remaining came from surrounding communities and from other municipalities and other states. There are no reports of conflicts with residents of communities located within the protected area.

1.4.1 HOUSING AND SEWAGE

The riverine population living in the Madeira Reserve do not have land titles but most of them have personal documentation. Houses are generally made of wood with roofs made of asbestos panels or palm thatch. Very few communities have a basic sanitation system and none of them have trash collection. Organic trash is deposited naturally on the ground surrounding the residences. Non-organic trash is usually burnt (Costa *et al.*, 2014).

The communities mentioned several problems caused by poor management of solid waste, among the main ones are: pollution; accidents with broken bottles and tin cans, mainly involving children; disease vectors appearance: rats, cockroaches, flies, and other insects; contamination of groundwater; diseases such as diarrhea and verminosis (Costa *et al.*, 2014).

No community has public service water supply. To meet their water needs for drinking and domestic use, most of the communities captures water directly from the river, lakes and streams near their houses. The remaining supplies with rainwater, springs, artesian well, cistern and water holes.

1.4.2 ENERGY

Near a third of the families is excluded from the electricity supply (Costa *et al.*, 2014). Most of the communities uses diesel generator and the municipalities provide diesel for the operation of schools and the night lighting. Generators work by combined period in each community, usually on special occasions, and daily for three to five hours (usually between 6pm and 10pm). The ones without a generator depends on kerosene, candles and flashlight for illumination. Recently, the Federal Program called "Luz para Todos" has reached the region linking some communities with the eletrecticity grid, but the service has been yet inconstant.

1.4.3 SUBSISTENCE

All of the communities depend on subsistence agriculture (e.g., manioc and fruit production) and extractive activities, such as fruit and nut collection, fishing and hunting to supplement their diets. Fish is the major source of protein.

The plantations are made following the slash-and-burn technique and the areas ranges from 0.25 to 2 hectares per family. These areas are harvested from 1 to 3 years, and then left resting from 5 to 20 years. This type of agriculture does not cause major environmental disturbances due to its size, variety of cultures, low intervention after sowing, and almost no need of exterior agricultural inputs (Kleinmana *et al.,* 1995). The formation of orchards in the

9 Federal Decree 7,390/2010.

10 The presented values from MCT have already the addition off 21% for belowground biomass (MCT, 2006).

11 This is a group defined by its own habits with particular social organization and natural resource management under their own ancestral culture.

Figure 4. Some of the local students from the Madeira Reserve and its area of influence.

vicinity of residences is also an important form of agriculture and represents the main source of vitamins for the local population. The poultry is quite common and few families raise pigs.

1.4.4 EDUCATION

There are 23 municipal schools in the Reserve – almost one school for each two communities (Figure 4). The students from the communities without school uses the nearest infrastructure inside the Reserve or in the nearest Municipality center (Borba, Manicoré or Novo Aripuanã). According to Costa *et al.* (2014) the reserve has 53 teachers and 985 students. Eighteen (78%) of the existing schools run from the first to the fourth year, three (13%) have completed elementary school (1st to 9th year), High School and Youth and Adult Complementary Education (EJA) night classes, one (4%) has from the first to the eighth year, and another one (4%) from the fifth to the ninth year plus the EJA night classes.

Education quality and conditions in these schools are quite precarious: poor access to proper learning materials, students' meals are deficient and irregular, the majority of the classrooms has bad infrastrucute, and only 11% communities relies on regular boat transportation.

Students excluded from this public service are carried by relatives in boats, bicycles and small canoes coupled to one tail motor. Worst situation for those who study at night: sailing with poor visibility.

With many challenges to overcome, the educational deficit in the Madeira Reserve is quite expressive. As for the level of education of the residents, 15% have no schooling, 55% have not finished elementary school, 11% have completed elementary school, 11% completed secondary school, 5% completed high school, 0.29% have incomplete higher education, 1% completed higher education and 0.39% have some vocational technical course (Costa *et al.*, 2014).

1.4.5 HEALTH

Despite the efforts made so far (figure 5), the health care to residents of Madeira Reserve is precarious, and it is considered one of the biggest concerns among residents. It lacks infrastructure, equipment and health agents to meet local demands. The access to emergency medical service is obtained only in Novo Aripuanã and Manicoré – which cannot provide adequate assistance in some cases.

Communitarian health agents, hired by the municipalities, are responsible for preventive health care (e.g., follow the hypertensive ones, pregnant women, malnourished children and diabetics). These services are held at home and the frequency of the visit is twice a month or as needed. Only two communities have health posts and there are 6 ambulance boats provided by the Bolsa Floresta Program (FAS, 2014), but the fuel provided by the municipalities is usually insuficient to meet locals' needs.

Medical care in the Reserve is held annually by teams of Manicoré municipality and by the Brazilian Navy. To overcome the

Figure 5. An example of community workshop provided by FAS to educate local members on early childhood development.

deficiency of allopathic medicines, residents use medicinal plants and traditional knowledge in the treatment of diseases (Costa *et al.*, 2014).

The most common health problems and illnesses are malaria, diarrhea, verminosis, tuberculosis, malnutrition, flu, asthma, and hypertension (Costa *et al.*, 2014).

1.4.6 COMMUNITY ORGANIZATION

Most communities in the Madeira Reserve are formed by groups of people with family relationship. Thus, the main structure of social organization within community-level is informal and regulate work organization, production distribution leisure, religiosity and interaction with external agents.

Religion is an important factor within social organization. In the Reserve there are 11 churches – i.e., spaces that are sometimes used for other purposes such as community meetings and traditional parties.

Another important institution is the reserve's association. At the Madeira reserve is the the Association of Agroproducers of the Madeira Reserve (APRAMAD). Created in 2009, the association is compounded by 800 members[12] and its election every two years. With support from FAS, Amazonas Government and other partners, APRAMAD has its well-equiped headquarter in the municipality of Manicoré.

In addition, the reserve also has its deliberative council, created in 2010[13], which it is compounded by local communities, authorities and civil society – following SEUC[14 15]. It is its responsibility decide upon major issues concerning the reserve's strategic activities within a consultative and participatory rationale.

1.4.7 ECONOMY AND INCOME

The most important source of incoime is low-impact agriculture (72.2%). Other sources come from: social benefits (11.7%), paid work (4.5%), fishing (4.1%), retirement benefits (3.4%), extraction and logging (2.3%), flour production and commercialization (1.1%), livestock (0.4%), crafts (1%) (FAS, 2015a).

The main traded products are bananas, manioc flour, cocoa, watermelon, pumpkin, hot peppers, chives, nuts, açaí and fish. In the surrounding area, also benefited by the Madeira Reserve REDD+ Project, rubber tree latex market is well developed. Local producers are organized in the Associação Agroextrativista de Novos Prazeres, which has over a 100 registered tappers and an annual production of 47 tons (Costa*et al.*, 2014). The average income of families living the Madeira Reserve is BRL 543.3 per month (USD 157.5[16]) (FAS, 2015a).

12 Unpublished data from the Bolsa Floresta database (August, 2015).

13 Portaria SDS/GS – no. 016/2010.

14 Assembléia Legislativa do Estado do Amazonas, 2007.

15 Article 5, Paragraph III of Chapter V of Law No. 53 of June 5, 2007.

16 conversion rate BRL-USD 0,26.

1.4.8 TRANSPORT

The transportation of people and goods is made by small wooden boats with sterndrive and aluminium fastboats with gasoline-powered engines. Regarding the transportation to municipality centers, the communities have regular regional boats that travel across the Madeira river.

1.5 BIODIVERSITY INFORMATION

The area where the Madeira Reserve was created has been identified as an extremely important area for biodiversity, especially for reptiles, amphibians and mammals. The region is also considered of high biodiversity importance due to its aquatic flora and fauna (Capobianco*Et al.,* 2001), it has been identified as one of the areas of greatest interest for biodiversity conservation in the Amazon (SDS, 2007), and one of the least studied areas in the Amazon (Oren & Albuquerque, 1991).

One of the most relevant characteristics of the region of the Reserve is the high degree of species richness due to the high heterogeneity of habitats – one of the world's richest regions in bird species diversity (Cohn-Haft*et al.,* 2007). In recent years, new species have been described, with a high degree of endemism along the Madeira riverbanks and some patches of unique vegetation.

The Madeira River that borders the entire East side of the Reserve is widely known by the Ornithology as one of the most important spots in the Amazon due to its influence on bird ecology (Haffer 1974 *apud* Cohn-Haft*et al.* 2007), promoting endemism and amazing species diversity (Cracraft, 1985). The area belongs to an Important Bird Area (IBA) (BR022) (BirdLife International, 2015) and regional surveys have pointed out as one of the major bird ecosystems in the world with around 800 described species – almost the half of the Brazilian population of birds (Cohn-Haft*et al.,* 2007).

The Madeira River is widely known by its mammal diversity, since 1849, thanks to Alfred Russell Wallace. Many other studies have pointed out the great importance of the Madeira River as a zoogeographic frontier, recognizing the area by its endemic sites – including also brand new species (da Silva*et al.*, 2005).

There are 12 species of marsupial (belonging to 7 Genres) and 6 species of rodent (8 Genres) (da Silva*et al.*, 2005). Concerning then medium and big mammals, the project region has 62 species (belonging to 25 Families) – being that, 9 species of Primates (Rohe, 2007). Finally, there are sparsely data on 5 species of aquatic mammals belonging to Mustelidae, Sirenia, and Cetacea. Within the project region, it was found around 450 species and 44 Families (Rapp Py-Daniel*et al.*, 2007). This figure means **over than 60% of all known Families in the Neotropics (**Reis*et al.,* 2003)

Besides the lack of scientific data for amphibians, the Brazilian Amazon is known as one of the biggest hotspots in the world. Surveys using specialized pitfalls, nets, bailer and traps have shown great absolute number of amphibians (42 species) and reptiles (28 species) (Vogt*et al.*, 2007).

The high plant diversity rate in the project region comes from the several soil characteristics, relief types, and also due to the Madeira River and its influence on the biota (Cohn-Haft*et al.*, 1997). Consequently, studies have testified this impressive diversity within the project region by listing a large amount of plant Families, such as *Chrysobalanaceae, Leguminosae, Sapotaceae, Moraceae, Burseraceae*, *Lecythidaceae* among others (Costa*et al.*, 2014; Cohn-Haft*et al.*, 1997).

1.5.1 THREATS TO REGIONAL BIODIVERSITY

Regarding all the Neotropic forests, the major threat is the illegal and unplanned logging in order to expanding agricultural frontiers (by both big and small farmers) as well as population growth pressure (Mittemeier*et al.*, 2003; Fearnside, 2001)

As in the project region there are several ecosystems deeply interconnected composing various particular landscapes (Rapp Py-Daniel*et al.*, 2007), if anything dislocated this balance somehow, all the connected ecosystems and their components (i.e. plants and animals) will suffer severe consequences (Mahli*et al.*, 2008). As being an endemic region, the project region has several animals in which may be considered as threatened.

Within the project region, the major agent of deforestation is the illegal logging for mining, land grabbing for agriculture and cattle ranching (Chaplin-Kramer*et al.*, 2015; Viana, 2010; Soares-Filho*et al.*, 2006; Laurance*et al.*, 2004), followed by the unsustainable fishing.

Moreover, the most important driver of this deforestation profile is the national plan for paving the roads which will enable an easier access to the project area (Governo do Brasil, 2010).

This driver is historically known in the Brazilian Amazon (Viana, 2010; Laurance*et al.*, 2004; Nepstad*et al.*, 2001) and also its impact on the local biodiversity (Lopes & Ferrari, 2000).

2. DESIGN

2.1 SECTORAL SCOPE AND PROJECT TYPE

The Madeira Reserve REDD+ Project belongs to the scope of the AFOLU sector (Agriculture, Forestry and Other Land Use), more specific in the category of REDD+ (Reducing Emissions from Deforestation and Degradation, Sustainable Development and Conservation).

2.2 PROJECT START DATE

The starting date of the Madeira Reserve REDD+ project as well as the beginning of the project crediting period is the day the Reserve was created (July 3, 2006).

2.3 PROJECT CREDITING PERIOD

START OF THE CREDITING PERIOD: July 3, 2006

JUSTIFICATION: The crediting period starts on the same date of the project as the first action was the creation of the Reserve.

END DATE FOR THE CREDITING PERIOD: December, 2020.

JUSTIFICATION: This is the end date for the baseline based on the NPCC.

Following the 2020 National GHG emissions estimates, the National Policy for Climate Change (PNMC, in Portuguese) created the Brazilian national target for GHG emissions. The goal is to reduce emissions in Brazil from 38.9% to 36.1% by 2020.

Total number of years[17]**:** 15 years

Throughout the crediting period there will be periodic certifications performed by an accredited CCB/VCS certifying organization. These certifications will verify that the carbon remaining in the Reserve is in keeping with the values expected at the start of the project. These certifications will be performed one year after obtaining the initial validation and every two years thereafter, as shown on Table 2.

TABLE 2. SCHEDULE OF THE PERIODIC CERTIFICATIONS WITHIN THE MADEIRA RESERVE REDD+ PROJECT CREDITING PERIOD.

CERTIFICATION	NO. YEAR
01	2016
02	2018
03	2020

BUFFER: From 2006 to 2009

The buffer period for the project will be created from the emission reductions from 2006 to 2009. This is due 2006 was the creation of the Reserve and the beginning of the National reference scenario within PNMC. In addition, 2009 was the approval of the National Policy for Climate Change[18], which sets the National emission reductions requirements.

2.4 DESCRIPTION OF THE PROJECT ACTIVITY

The success of this project depends on activities and measures developed in two major axes (Figure 6):

1 REDD+ activities and 2 REDD+ credits.

Those axes branch out in five major areas:

a. The development and implementation of the Reserve and its Management Plan;

b. The implementation of the Payment for Environmental Services program, i.e. Bolsa Floresta

c. The implementation of the Education and Health Program (PES);

d. The implementation of the Support Programs (SP) and;

a. The generation of funds from verified emission reductions.

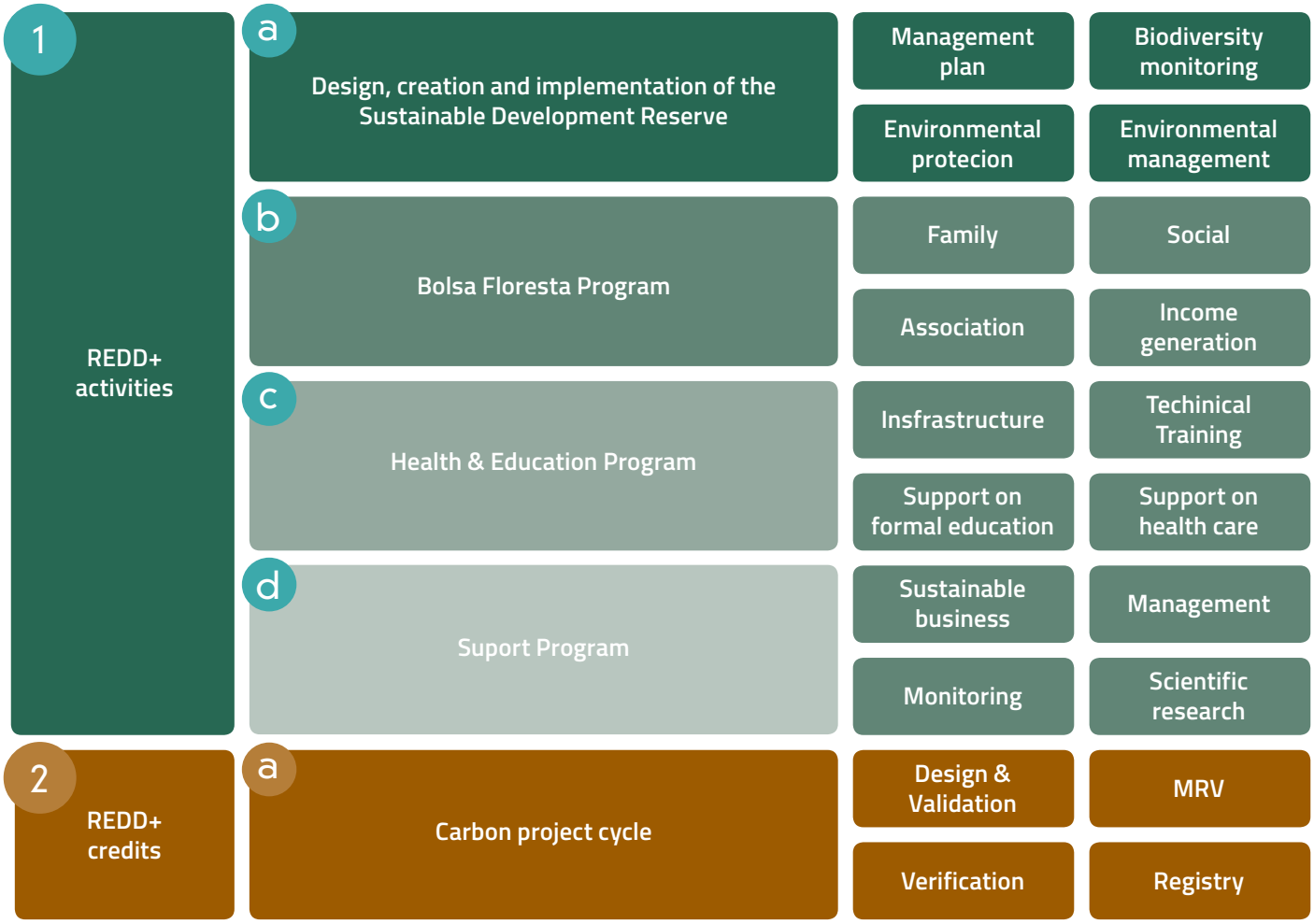
17 Crediting period will be extended according to the National Policy on Climate Changes and will comply with VCS' minimum crediting period.

18 See the decree in Portuguese at http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7390.htm.

19 SDS, IPAAM, ITEAM, INPA and UFAM.

20 Decree 26.009/2006.

FIGURE 6. GENERAL SCHEME OF PROJECT'S ACTIVITIES



1a **The design and creation of the Madeira Sustainable Development Reserve** was the first step of this project. This process began with several studies in the Project area conducted by different institutions[19] in 2005 with the goal of diagnosing biological and socio-economic aspects, the ethno-characterization of the landscape and the mapping of natural resources, archeological sites and land tenure surveys. Public consultation meetings followed these studies with local stakeholders and the publication of the Decree of the Creation of the Madeira Sustainable Development Reserve in July 2006 (Annex I)[20].

The development and implementation of the Reserve Management Plan includes community engagement to identify demands and to implement all the necessary measures to promote the conservation of natural resources and biodiversity and to promote sustainable development within the limits of the Reserve. The Management Plan development process began in 2009 and it was launched in July 2014 (Costa *et al.*, 2014). Amongst all activities in the plan, it is worth to mention the actions on environmental protection, monitoring and management combined with surveillance.

21 BRL-USD 0.29.

22 All legalized activities, which do not result in deforestation and smoke generation, are eligible.

1b **Payment for Environmental Services (Bolsa Floresta Program)** A share of the Project's financial resources will be allocated to direct payments for environmental services to traditional communities that live in the Madeira Reserve using the PES-based Bolsa Floresta (see its components below).

i. **Family:** It consists on the payment of a monthly grant of BRL 50 (BRL 600; USD 174 per year[21]), to the mothers of each family benefited by the Program and committed with environmental conservation and sustainable development. It is an important way to get the population involved in deforestation combat activities. This component is not intended to be the main source of income for these families. It is just an income complement, granted as a reward for forest conservation, and a first-commitment guarantee with the locals. In 2015, this resource represents an investment of BRL 577,800 (USD 176,562) in the reserve.

ii. **Social:** Ofering BRL 350 (USD 101.50) per family per year, this component is destined at improving education, sanitation, health conditions, communication and transportation, i.e., crucial aspects for building better welfare for the forest keepers. The actions take place with the participation of the responsible government bodies and collaborating institutions. In 2015, it represents an investment of BRL 359,800 (USD 104,342).

iii. **Association:** Forwarded to the associations of people living in the Amazonas state protected area, it corresponds to 10% of all the Bolsa Floresta Family granted at the protected area. Its purpose is to empower the organization its affiliates. This is one of the most important programs in the history of the Amazon in terms of strengthening communitarian organizations. In 2015, it represents an investment of BRL 64,521 (USD 18,711).

iv. **Income Generation:** It corresponds to BRL 395 (USD 114.55) per family per year, and it aims at supporting sustainable production, e.g., fish, vegetal oil, fruits, native honey, among others[22]. The application of this resource is decided through participatory process within the local communities and executed by FAS. In 2015, it represents an investment of BRL 406,060 (USD 117,757).

1c **Health & Education Program** Provide health support to local communities in order to improving the local welfare. Communities will receive direct benefits for their contributions to conservation, such as access to clean water, provide training and support to health agents, and productive activities for other improvements in their quality of life.

1d **Support Program** Concerning the Support Programs, they are crucial in order to provide social and economic sustainability of both Bolsa Floresta Program and REDD goals. Thus, it involves:

i. **Support on Sustainable Business:** community organization activities to support entrepreneurship in managing forest products, promotion and support of forest management, research and development of new technologies for product innovation and the development of markets for sustainable products and services, among others; thereby optimizing the entire forest production chain for the project's communities;

ii. **Support on Protected Area Management:** support the Reserve's Council with capacity building, logistics and infrascture;

iii. **Support on Scientific Research:** foster scientific development within project's region as well as bridge scientific data with traditional knowledge.

iv. **Support on Community Forest Monitoring:** monitor activities together with the communities and other crucial stakeholders.

2a **The Carbon project cycle and its systematic generation of resources resulting from the REDD+ verified emission reductions** depends on the implementation of actions to curb deforestation and to monitor carbon emissions. It also relies on parterning with both financial and technical supporters to create economic conditions of the project's implementation – such as constituting an endowment fund. Such mechanism will guarantee the longstanding application of needed and planned resources within the project: the Bolsa Floresta Program, the Health & Education and and the Support Programs (as described in the Figure 6).

The Table 3 above describes the timeline of the major activities implemented by the Madeira Reserve REDD+ Project.

TABLE 3. TIMELINE OF THE MAJOR ACTIVITIES WITHIN THE MADEIRA RESERVE REDD+ PROJECT.

PROJECT'S ACTIVITIES	PLANNED DATE (FREQUENCY)	STATUS
Creation of the Reserve	2006	Accomplished
Management of the Reserve	2006	Ongoing
Establishment of the Bolsa Floresta Program	2008	Ongoing
Elaboration of the Reserve Management Plan	2009-2014	Accomplished
Monitoring Activities (Climate)	2006 (yearly)	Ongoing
Monitoring Activities (Community)	2006 (yearly)	Ongoing
Monitoring Activities (Biodiversity)	2016 (yearly)	Ongoing
Development and Validation of the REDD+ Project Design Document (VCS/CCB)	2016	Expected
Verification of the VERs	2016; 2018; 2020	Expected
Commercialization of VERs	2016-2020	Expected

2.5 MANAGEMENT OF RISKS TO PROJECT BENEFITS

The major risks identified are divided into long- and short-term risks (Table 4) and its mitigation actions are also described below.

TABLE 4. RISKS TO THE MADEIRA RESERVE REDD+ PROJECT AND RISK MITIGATION PLAN.

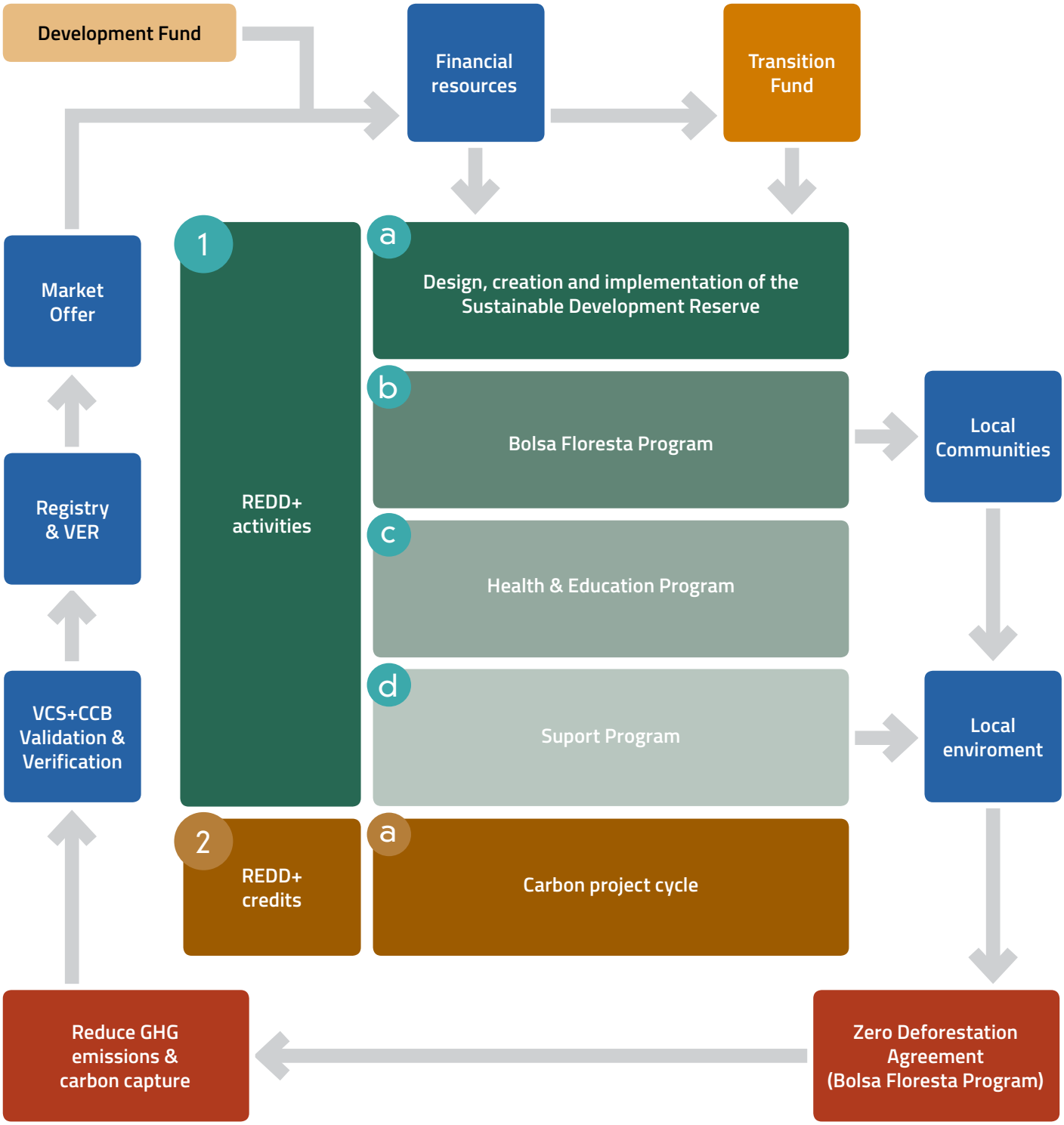
CATEGORY	PERIOD	THREAT	CONSEQUENCES	MITIGATION
Biodiversity	Medium-term	Increase of the deforestation rate	▪Impoverishment of the ecosystems; ▪Decrease of the carbon stock	▪Implement buffer zones around the project area and discounts on the overall carbon accounting, if necessary
Climate	Short-term		▪Decrease on biodiversity; ▪Climate instability; ▪Decrease on the locals' welfare; ▪Decrease on the carbon stock	▪Provide proper training to the local communities; ▪Capacity building encompassing related issues; ▪Enhance deforestation monitoring programs and activities
	Long-term	Extreme natural events	▪Susceptibility to firing on the forested areas; ▪Enhance the vulnerabilities on native species; ▪Microclimate instability	▪Invest on scientific research; ▪Monitor forest dynamics
Community			▪Instability on food supply (agriculture); ▪Instability on inner social relation in the communities	▪Invest on capacity building; ▪Provide training on sustainable forest practices; ▪Establish and offer proper market mechanisms to the locals' sustainable products
	Short-term	Disease dispersion	▪Tropical diseases dispersion due to climate and environmental instabilities	

2.6 PROJECT FINANCING

FAS, the Amazonas Government, and other partners, have already committed seed investments to develop and maintain structural investments to the Madeira Reserve REDD+ Project. From 2005 to 2014, it was invested BRL 8.3 million (USD 2.4 million). The designed financial mechanism – based on payments for environmental services and the creation of a Transition Fund – aims at the financial sustainability after the crediting period (Figure 6).

FAS' administrative board approves all strategic investment, and its sources, in the project – which drives the portfolio decisions and insures contracts with partners.

FIGURE 7. FINANCIAL MECHANISM ADOPTED BY THE MADEIRA RESERVE REDD+ PROJECT.



2.7 STAKEHOLDERS

The Madeira Reserve REDD+ Project was created to address different demands. Local communities demanded the creation of the Reserve as a way to protect their forests and to improve their welfare. Throughout the creation process, many participated formally (e.g., fishermen, extractivists, farmers, ranchers, artisans, teachers, representatives from the church, from the municipality, NGOs etc.).

Interviews were carried out, with key stakheholders, to obtain their perspectives on the social, economic and environmental context of the Reserve. Participatory workshops and public hearings throughout the Reserve were also organized in order to deeply discuss the *modus operandi* of a sustainable development reserve concept to local communities and other related stakeholders. This was an important input for establishing the dynamics of empowerment and participation within the reserve.

The reserve's council has played an important role as it is responsible for the major decisions concerning the project area and relies, mandatorily, on the consultation and participation of local stakeholders. Its decisions are insured by law [23].

23 Article 5, Paragraph III of Chapter V of Law No. 53 of June 5, 2007 (Assembléia Legislativa do Amazonas, 2007).

3. LEGAL STATUS

3.1 COMPLIANCE WITH LAWS, PRINCIPLES AND OTHER REGULATORY FRAMEWORKS

REDD has been moving forward within UNFCCC negotiations. In Warsaw, 2013 (COP19), it was agreed the Warsaw Framework for REDD+. This contributes to develop a results-based finance framework on REDD+ globally and the institutional articulation to support forested countries (UNFCCC, 2013). In Lima, 2014 (COP20), REDD got also important outcomes: the Green Climate Fund decided REDD as a priority activity, committed of the Parties to finance REDD schemes, and reiterated the support on conservation practices in forested countries (UNFCCC, 2014).

Besides Brazil has established a good law framework on climate and forest conservation (e.g., National Policy for Climate Change[24], National Plan for Climate Change[25], and the Plan of Prevention and Deforestation Control in the Brazilian Amazon[26]), it has not voted its national specific laws on REDD (i.e., law proposals 195[27] and 212[28], both from 2011). Additionally, Brazil has also designed a National Strategy for REDD+ -- its publication is scheduled for COP21, December 2015.

Following the 2020 National GHG emissions estimates, the National Policy for Climate Change created the Brazilian national target for GHG emissions: Brazil has to reduce its emissions from 38.9% to 36.1% by 2020 (Brazil, 2009). The federal decree 7,390, which regulates the National Policy, provides a projection of Amazonian deforestation rate and enables the REDD+ policy implementation by 2020[29]. The National Policy for Climate Change also created the National Plan for Climate Change. This Plan involves multisectorial actions and, regarding forestry, establishes a deforestation reduction plan in the Amazon that aims for an 80% reduction by the year 2020[30].

The most important regulations, both international and national, that the Madeira Reserve REDD+ Project follows are in Table 5.

TABLE 5. MAJOR REGULATIONS, PRINCIPLES AND FRAMEWORKS WHICH THIS PROJECT IS UNDER COMPLIANCE.

REGULATIONS/PRINCIPLES	DECLARATION	DATE
Brazilian Forestry Code[31]	Federal law regarding to preserve national forests, organizing and establishing ways of commercialize timber and non-wood products, and how to manage protected (public or private) forested areas.	September, 1965
Federal Law 6938 (Environmental National Policy)[32]	Governmental actions to maintain ecological balance, planning and controlling on natural resources, protection on threatened areas.	August, 1981
Brazilian Federal Constitution, article 225[33]	Preserve and restore the crucial ecological process, preserve the diversity and the integrity of the Brazilian genetic patrimony, protect fauna and flora.	1988
Rio-92 Declaration (UNEP)[34]	Environmental protection, conservation and recovery	January-June, 1992

CONTINUE

24 Law 12,187 from December 29th 2009. Available in Portuguese at http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l12187.htm.

25 Federal decree 6,263 from November 21st 2007. Available in Portuguese at http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2007/Decreto/D6263.htm.

26 Available in Portuguese at http://www.casacivil.gov.br/.arquivos/pasta.2010-08-02.3288787907/ppcdam_Parte1.pdf.

27 Available in Portuguese at http://www.camara.gov.br/proposicoesWeb/fichadetramitacao?idProposicao=491311.

28 Available in Portuguese at http://www.senado.gov.br/atividade/materia/detalhes.asp?p_cod_mate=100082.

29 This "reference level" was elaborated from the historical anual average from 1996 to 2005 (19,500 km² per year).

30 This target considers the annual deforestation rate averages from 1996 to 2005.

31 See the full Law, in Portuguese, at http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12727.htm

32 See the full Law, in Portuguese, at http://www.planalto.gov.br/ccivil_03/Leis/L6938compilada.htm

33 the full article, in Portuguese, at http://www.planalto.gov.br/ccivil_03/constituicao/ConstituicaoCompilado.htm

34 UNEP, 1992

CONTINUATION

REGULATIONS/PRINCIPLES	DECLARATION	DATE
United Nations Framework Convention on Climate Change (UNFCCC)[35]	Gather and share information on GHG emissions, assist the development of national strategies on GHG emission and adaptative mechanisms, work together with adaptation actions on climate change and its impacts	March, 1994
Brazil Proposal[36]	Set differentiated GHG reduction targets considering the countries' historical impact on climate change	May, 1997
Federal Law 9985 (National System of Protected Areas)[37]	Definition on protected areas and their roles within biodiversity preservation	July, 2000
Convention on Biological Diversity[38]	Achieve significant reduction on global biodiversity loss rate	April, 2002
Decision 2/CP.13[39] **(COP-11)**	Organize further supporting ongoing efforts, support capacity-building, identify options to address drivers of deforestation, mobilize resources to support mentioned actions.	December, 2005
Amazonas State Decree #26,009[40]	Created the Rio Madeira Sustainable Development Reserve	July, 2006
Amazonas State Law #3,135[41]	Created the State Policy on Climate Change	June, 2007
State System of Protected Areas (SEUC, in Portuguese)	Created the state system which is responsible to manages the protected areas in the Amazonas State	June, 2007
Amazonas Sustainable Foundation (FAS)[42]	Creation of FAS, a public-private institution which manages this projects	December, 2007
Validation of the Juma Reserve RED Project under the CCBS[43]	Validation of the Juma Project – the first REDD project in Brazil – under the CCBS with a gold-level award (again, the first of its kind)	September, 2008
National Policy for Climate Change	Among others, states the voluntary commitment of reducing Brazil's GHG emissions projected to 2020, in between 36.1% to 38.9%	December, 2009
Federal Decree #7,390	This Plan involves multisectorial actions and, regarding forestry, establishes a deforestation reduction plan in the Amazon that aims for an 80% reduction by the year 2020[44]	December, 2010
Law project # 192/2012[45]	This law will establish the certified emission reduction of REDD initiatives in Brazil	July, 2012 (ongoing)
Nagoya Protocol on Access and Benefit Sharing (Convention on Biological Diversity)	Is an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way.	October, 2014

35 See further information at http://unfccc.int/essential_background/convention/items/2627.php

36 UNFCCC, 1997

37 See the full Law, in Portuguese, at http://www.planalto.gov.br/ccivil_03/Leis/L9985.htm

38 UNDP, 1992

39 See the full Decision at http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=8

40 See Annex I

41 See the full Law, in Portuguese, at http://www.sefaz.am.gov.br/areas/opcaosistemas/silt/normas/legisla%E7%E3o%20estadual/lei%20estadual/Ano%202007/Arquivo/LE%203135%2007.htm

42 See further information at http://fas-amazonas.org/documentos/?lang=en

43 See further information at http://fas-amazonas.org/redd-publicacoes/ and http://www.climate-standards.org/projects/index.html

44 This target considers the annual deforestation rate averages from 1996 to 2005

45 See further information, in Portuguese, at http://www.camara.gov.br/internet/sileg/Prop_Detalhe.asp?id=441407

3.2 APPROVAL FROM APPROPRIATE AUTHORITIES

Key institutions that are involved in the approval of the activities proposed by the Madeira Reserve REDD+ Project are described in the Table 6.

TABLE 6. STATE-LEVEL INSTITUTIONS INVOLVED IN APPROVAL PROCESSES WITHIN THE MADEIRA RESERVE REDD+ PROJECT.

AGENCY/INSTITUTION	FUNCTION
State Secretariat of the Environment of Amazonas (SEMA)	Design and implementation of public policies for the environment and sustainable development
Amazonas State Institute for Environmental Protection of (IPAAM)	Law enforcement
Climate Change and Protected Area Management Departament (DEMUC)	Implementation of public policies and programs for climate change, development of mechanisms for payment of environmental services; Implementation and administration of the Reserves and related programs
Land Tenure & Enviromental Management Department (DEGAT)	Implementation of land titling activities in populated areas of Amazonas; licensing of environmental activities
Madeira Sustainable Development Reserve Deliberative Council	Take part on decisions and contribute with project planning and results

3.3 EVIDENCE OF RIGHT OF USE

The carbon credits belong to FAS as a result of the environmental services management, a right legally transferred to FAS through the Climate Changes Law 3,135 (Amazonas, 2007) and the Decree 27,600 (Amazonas, 2008b). The Article 6 of the Climate Changes Law authorized the participation of the Executive Power in a sole non-profit Private Foundation whose purpose and objective are the development and administration of Climate Change, Environmental Conservation, and Sustainable Development, as well as the management of environmental services and products. Through Decree 27,600, dated April 30, 2008 the Government of the State of Amazonas donates to FAS, as stipulated in Article 7 of Law 3,135, the amount of BRL 20 million, and it is authorized to participate with the purpose of encouraging the actions necessary for achieving the FAS institutional objectives, under the provisions of Article 6 of the Law.

The Madeira Reserve REDD+ Project is the second project of its kind to be implemented since the creation and approval of the Climate Change State Policy Law and the State System for Protected Areas. This legislation provides the entire legal framework necessary to implement these types of projects in Amazonas and seeks to guarantee a long-term commitment not subject to changes in governments policies.

4. APPLICATION OF METHODOLOGY

4.1 TITLE AND REFERENCE OF METHODOLOGY

The project will be validated under Verified Carbon Standard's (VCS) approved methodology entitled "Methodology for Avoided Unplanned Deforestation" (VM0015)[46].

4.2 BASELINE SCENARIO

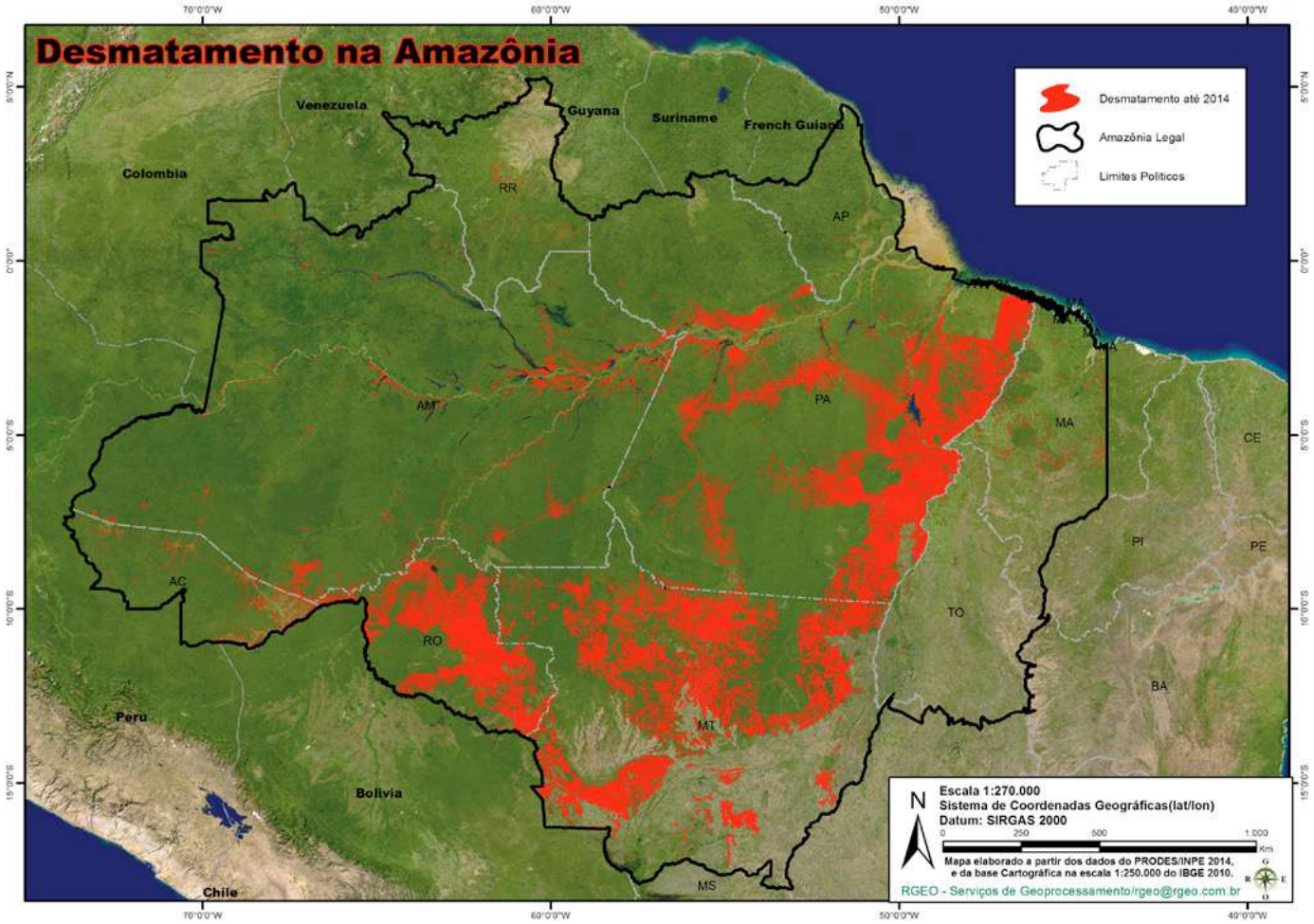
The dynamics of deforestation in the Amazon forest has been intensified since 1970, due to policy of national development, leading to migration of farmers in southern Brazil for the central Amazon and the construction of roads to give access to route to the economic occupation of forest areas, as an example the Transamazônica road. Over time, the technical issues were getting better and the forest resources exploration was becoming increasingly valued for the market as well as the interests in land ownership. These factors, associated with a lack of supervision and regulation of land, make the short-term scenario clear: if this historical trend continues, then millions of hectares in the Amazon will be cleared and replaced by large areas of pasturelands and crops without proper sustainable management. It is known that 40% of soils are suitable for sugar cane, palm, soybean and livestock in the Amazon (Stickler *et al.,* 2007), supporting the above said projection.

The illegal extractivist practices, the lack of proper economic incentive policies provided by governments, in order to give alternative income for local people as well as the efficient and proper supervision are the main factors leading to deforestation in the Brazilian Amazon (Viana, 2010; Stickler *et al.,* 2007). As a result, it remains about 80% of original area (INPE, 2015). However, today, the big question is not deforestation *per se*, but its speed and its perennial feature.

According to Fearnside (2008), historically, the majority of this deforestation activity has occurred in Pará, Mato Grosso, Rondônia, and Tocantins – which it has been called as the "Amazonian Arc of Deforestation" (Figure 8).

46 See http://www.v-c-s.org/methodologies/methodology-avoided-unplanned-deforestation-v11

FIGURE 8. DEFORESTATION IN THE BRAZILIAN AMAZON (2014), HIGHLIGHTING THE "ARC OF DEFORESTATION" (DEFORESTATION DATA FROM INPE, 2014).



The Amazonas State remained preserved because it had a strong industrial development located in the north. But the decrease in forest coverage and the shortage of land due to intense occupation in the region (e.g., arc of deforestation) are leading to a visible trend of migration, especially to the State Amazonas. The expansion of agriculture and livestock has become the main agents of deforestation in large forested areas with low human density. In addition, considering the implementation of new infrastructure initiatives planned by both Federal and State governments (e.g. paving roads), and due to its relation with historical trends of deforestation, Amazonas has been facing a great pressure by large pastures and crops (Chaplin-Kramer *et al.,* 2015; Soares-Filho *et al.*, 2006).

The project uses as a baseline scenario the data generated by the SimAmazonia II model (Soares-Filho *et al., 2010)* (Figure 9). Focusing on the project area, the modeling forecasts a deforestation of 16,548.97 hectares (7.25% of the orginal forest cover in 1997) from 2011 to 2020.

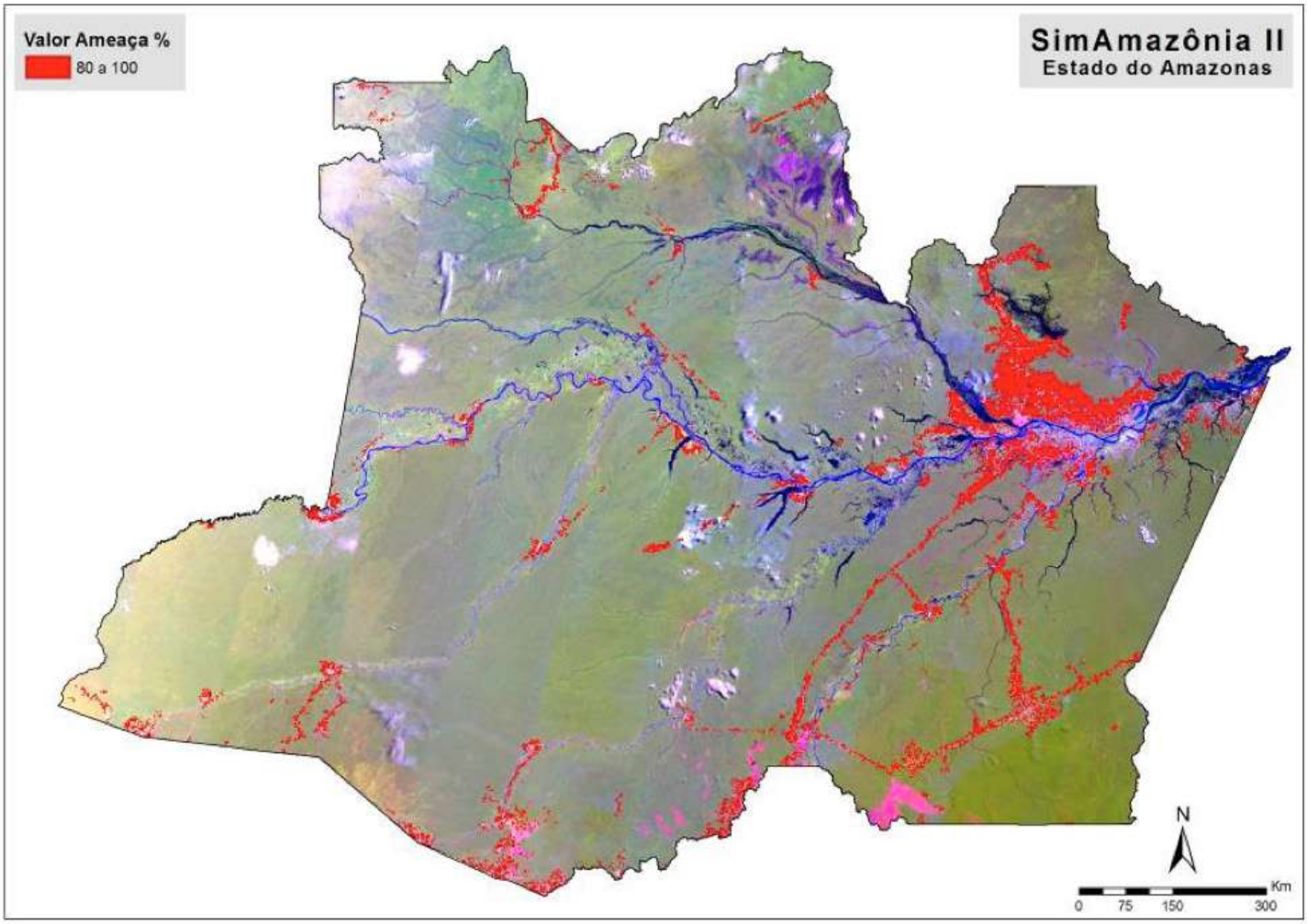
47 See the paper online at http://www.nature.com/nature/journal/v440/n7083/abs/nature04389.html

In short, this model combines two spatial structures, sub-regions defined by socioeconomic level, and cells of the matrix (i.e., *rasters*). In order to model patterns of deforestation in the study area, SimAmazonia II considers criteria such as: highway construction and paving, stated and proposed conservation areas, anthropogenic pressure, waterways and ports, historical deforestation trend, geographic and political boundaries among others. This model is known worldwide since its first version was properly published in one of the most important science journal in the world[47].

Concerning the project area, within the SimAmazonia II model, the municipality of Novo Aripuanã is severely vulnerable to deforestation in the short-run due to the paving of highways (e.g., BR-230 and BR-319) throughout the project region. In addition, as mentioned before, the deforestation pattern is migrating to the Amazonas state due to agriculture expansion, non-sustainable timber exploitation and cattle ranching.

In addition, the project area is within three municipalities, which configures in the state list of historical cumulated deforestation (1988-2014) as 5th, 12th and 21st position considering the 62 municipalities of Amazonas (INPE, 2015).

FIGURE 9. PROJECTION OF FUTURE DEFORESTATION IN THE STATE OF AMAZONAS BY THE YEAR 2020 ACCORDING TO SIMAMAZONIA II -- RED REPRESENTS AREAS UNDER RISK OF DEFORESTATION.



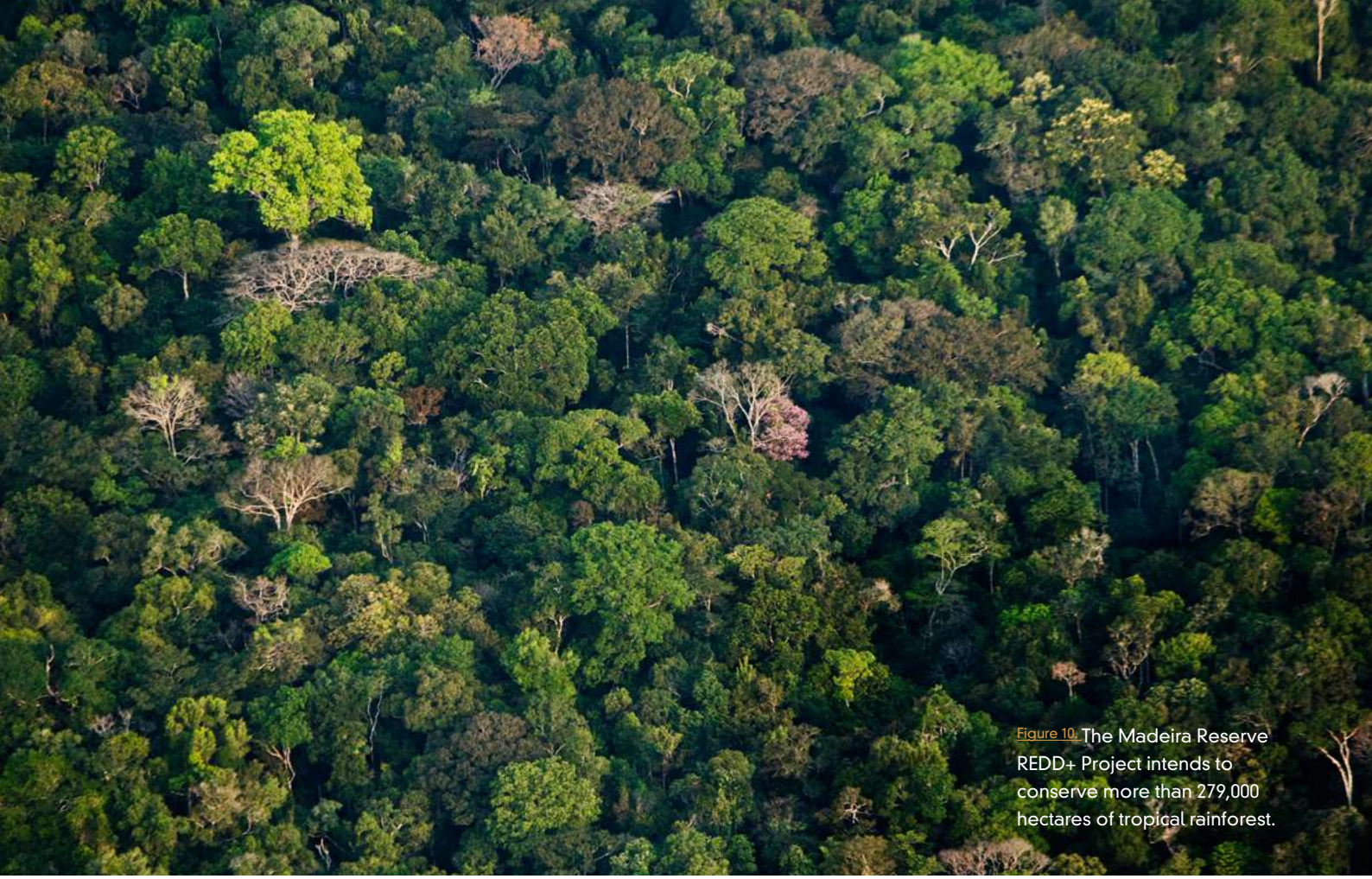


Figure 10. The Madeira Reserve REDD+ Project intends to conserve more than 279,000 hectares of tropical rainforest.

4.3 ADDITIONALITY

Until 2002, the "business as usual" scenario for land use in Amazonas was characterized by incentives to agriculture and cattle raising, instead of forest conservation (Viana et al., 2008). The deforestation rates at that time were escalating – for instance, the governor at that time used to distribute chainsaws in political campaigns to promote deforestation.

In January 2003, Eduardo Braga, governor, made an official commitment (Amazonas, 2002) in which it was defined the Green Free Trade Zone Program (ZFV) as a way to reduce deforestation and promote sustainable development in Ama- zonas by adding value to the environmental services within the state forests (Braga & Viana, 2003). Such sustainable development policies has provided positive impacts on the reduction of deforestation (Figure 10). However, they are costly and compete for very limited governmental resources. Given the huge demand for social program funding – mainly health and education – investing in activities directly aimed at reducing deforestation was a huge challenge with high political risks.

Governor Braga, at that time, took the risks and put in place a program for creating State Protected Areas as central focus at ZFV: a 133%-increase in the protected area in Amazonas[48] and the deforestation reduced by 53% (INPE, 2015). Such results and an intense process of political articulation both in national and international levels were the foundation of the first proposal of a compensation mechanism for ecosystem services provided by the Amazonas state[49]. This first proposal was presented by the Government of Amazonas at COP11 (2005), Montreal (Viana *et al.,* 2005). It was the first time REDD was discussed as an official agenda at COP.

The creation of the new protected areas in Amazonas was only possible with the perspective of implementation of the financial mechanism under construction through the activity of the Amazonas Initiative (Viana, 2006) -- presented in 2006 (COP12). The creation of the Rio Madeira and Juma Reserves (in 2006), followed by the elaboration of the Juma REDD Project (2008), shown the long-term commitment by Amazonas started in 2003. Therefore, the definition of the project crediting period considered when the project's boundaries were clearly delimited and the Madeira Reserve REDD+ Project started being implemented "on the ground", i.e. 2006.

There was no legal requirement or commitment for Amazonas to create the Rio Madeira Reserve and others. The most likely scenario for the land would be the creation of rural settlements for cattle ranching or agriculture, or its occupation by land-grabbers (Barona *et al.,* 2010; Mahli *et al.*, 2008). This situation can be confirmed as the business as usual scenario for land use observed in the other states of the Brazilian Amazon in recent years (Bowman *et atl.,* 2012; Laurance *et al.*, 2004).

48 Increasing from 7.4 million hectares (2003) to 17 million hectares in 2007.

49 This proposal was crafted during a workshop held in Manaus – organized by the state government and Institute for the Conservation and Sustainable Development of Amazonas (IDESAM) – with the presence of several governmental institutions, scientists, and NGOs.

The consideration of carbon finance in the decision of creating state reserves was always considered, as ZFV and PES envisioned by the Government of Amazonas in 2003 (Braga & Viana, 2003).

In 2003, there was no mechanism for compensating reduction of emissions from deforestation, nor in the perspective of the UNFCCC negotiations, nor in the global voluntary markets. The now so-called "REDD carbon benefits" were considered in the light of PES, e.g., Braga & Viana (2003) and in Amazonas (2002). Afterwards, Amazonas has been very active and it plays key role on influencing the whole process of the REDD agenda in the UNFCCC negotiations, and the actual promising development of REDD activities in the voluntary markets (Viana, 2006; Viana *et al.*, 2005).

4.3.1 FINANCIAL AND INVESTMENT ANALYSIS

This project intends to **conserve more than 279,000 hectares within the Amazon** – the most biodiverse spot in the world (Myers *et al.*, 2000). The required activities to achieve good levels of conservation are costly – the state government, FAS, and others have already spent a significant amount of money over the past few years.

Following Viana, Greig-Gran, Mea, and Ribenboim (2009), who analyzed the costs of the Juma REDD Project over the project lifetime (2005-2050), the total cost to avoid deforestation and enhance income and life quality of local population, discounted to 2009 is around USD 41 million[50]. At this scenario, the cost per ton of CO_2e can range up to USD 11.5. Therefore, the carbon credit revenues are crucial to proceed with these financial resources and then carrying on with forest conservation activities aforementioned.

Thus, in the absence of such project, the project area and its surroundings would follow SimAmazonia II model in the short-term.

4.3.2 PROJECT BENEFITS

Such aforementioned benefits, and project's goals, will be achieved only if the project is implemented. Considering a business as usual scenario, it is unlikely locals have their income increased within sustainable practices without the mentioned activities and initiatives carried on by the project.

Moreover, without the carbon credit revenue, a significant part of the proposed activities will be severely affected and most of them impractical.

4.3.3 LAWS AND REGULATIONS

Besides the current laws and regulations, deforestation scenarios and the actual scenario are not encouraged. The lack of controlling by both federal and state governments and the huge pressure made by the big farmers and illegal loggers have been crucial to the deforestation in the Amazon forest in the past decades. Moreover, even with the creation of protected areas (Ferreira *et al.,* 2005) the lack of official land tenure in the project region may result in illegal settlement, which would practice illegal logging (Rola & Salomão, 2011; Fearnside, 2008).

50 Discount rate of 2%.

5. PROJECT IMPACT

5.1 CLIMATE IMPACTS & QUANTIFICATON OF GHG EMISSION REDUCTIONS AND REMOVALS

The proper implementation of this project will enable the Amazonas State to curb deforestation activities within the Madeira Sustainable Development Reserve and its surrounding areas. Comparing with the baseline scenario, **this project intends to avoid the emission of 4,232,981 tons of CO_2e** into the atmosphere from 2006 to 2020 (Table 7). The crediting period will be extended according to the National Policy on Climate Changes and will comply with VCS' minimum crediting period.

5.1.1 LEAKAGE

The project does not expect any offsite GHG emission due to its implementation. In fact, the project implementation should reduce deforestation outside the project boundaries comparing with the baseline scenario (Fearnside, 2009). Moreover, the importance of the protected areas in order to protect their own surrounding is notorious (Soares-Filho *et al.*, 2008). Soares-Filho *et al.,* (2010) used remote sensing data from 1997 to 2010 to evaluate the effectiveness of 595 Brazilian Amazon Protected Areas. They found neither evidence of activity-shifting leakage by deforestation agents displaced by the protected areas, nor of leakage driven by migrant agents coming in from outside the area.

The project activities carried out outside the project area will address properly the well-known drives of deforestation and its dynamics (e.g., illegal logging, land grabbing, cattle rais-

TABLE 7. SUMMARY OF GHG EMISSION REDUCTION AND REMOVALS, BUFFER CREDITS AND VERS.

PROJECT YEAR		UREDD16 (tCO_2e)		BUFFER (tCO_2e)		VERS (tCO_2e)	
NR	YR	ANNUAL	ACCUMULATED	ANNUAL	ACCUMULATED	ANNUAL	ACCUMULATED
1	2006	282,193	282,193	282,193	282,193	0	0
2	2007	282,193	564,386	282,193	564,386	0	0
3	2008	282,193	846,578	282,193	846,578	0	0
4	2009	282,193	1,128,771	282,193	1,128,771	0	0
5	2010	282,193	1,410,964	0	0	282,193	282,193
6	2011	282,193	1,693,157	0	0	282,193	564,386
7	2012	282,193	1,975,349	0	0	282,193	846,578
8	2013	282,193	2,257,542	0	0	282,193	1,128,771
9	2014	282,193	2,539,735	0	0	282,193	1,410,964
10	2015	282,193	2,821,928	0	0	282,193	1,693,157
11	2016	282,193	3,104,120	0	0	282,193	1,975,349
12	2017	282,193	3,386,313	0	0	282,193	2,257,542
13	2018	282,193	3,668,506	0	0	282,193	2,539,735
14	2019	282,193	3,950,699	0	0	282,193	2,821,928
15	2020	282,193	4,232,891	0	0	282,193	3,104,120
TOTAL	15		4,232,891		1,128,771		3,104,120

51 Emission reduction allocations from the proposed Brazilian National REDD+ System.

ing etc.). If any of these activities cause any GHG emission, it cannot be attributable to the project since it is not a project activity and it would occur anyway. Thus, it is considered the Madeira Reserve REDD+ Project shall not result on offsite GHG emission, but rather, it will foster the "positive leakage" (Korhonen-Kurki *et al.,* 2013) once there will be emission reduction outside the project area.

As part of the monitoring plans, the surrounding areas will be well monitored concerning climate, community and biodiversity issues. Moreover, considering a conservative approach, the project has also accounted more than one-forth of its generated verified emission reductions as buffers.

5.2 NET POSITIVE COMMUNITY IMPACTS

The estimate of each net benefit change expected in the communities' wellbeing is presented in Table 8, illustrating how the project's operational plan affects the community, and which indicators will be used to measure it. The activities described were already planned within the program. It is important to point out that there will be a participative managing body to decide where to prioritize resource allocation depending on the communities' current needs. This group will be coumpoded by FAS, Amazonas government, reserve's council and other project's partners.

The project objective of creating the reserve is to protect the High Conservation Value (HCV) (Brown *et al.,* 2013) of the Madeira reserve. The reserve addresses both environmental and social aspects. That said, no HCV related to community well-being will be negatively affected.

5.2.1 RIVERINE ENTREPRENEURSHIP

As part of a broader partnership with Sebrae-AM, FAS mapped entrepreneurship initiatives in 9 PAs during 2015, including the Madeira Reserve, where 4 productive chains of agroforestry products were elected as the most promising for expansion: (i) cocoa nuts; (i) manioc flour; (iii) banana and; (iv) watermelon; in addition to local commerce initiatives.

TABLE 8. NET COMMUNITY IMPACTS BENEFITS.

AREA	SITUATION WITHOUT THE PROJECT	PROGRAM/ACTIVITY	NET BENEFITS
Education	The majority of schools covers only from the 1st to the 4th grades	**Health and Education Program** Construction and improvements of schools according to the communities' needs, development of pedagogic materials, and support for teachers	Access to more advanced schooling (5th to 8th grade), computers and pedagogic materials
Housing	Precarious houses	**Bolsa Floresta Program** The families will have more resources to invest in their houses	Good houses made with local and external materials and an indoor bathroom
Health	Limited access to basic health treatment	**Health and Education Program** Medical support, capacity building and support for health agents	Access to hospitals and specialized health treatment
Energy	Precarious access to energy	**Health and Education Program** Investment in solar energy system technology in the new schools	Access to clean energy
Water	No water treatment	**Health and Education Program** Infrastructure for rain water storage and treatment	Well with chlorine treatment
Personal Documentation	The minority of people have complete personal documentation	**Support Program** The Bolsa Floresta Program supports actions to provide the lacking personal documentation	People have complete documentation

CONTINUE

CONTINUATION

AREA	SITUATION WITHOUT THE PROJECT	PROGRAM/ACTIVITY	NET BENEFITS
Social Organization	Informal groups and community organizations	**Bolsa Floresta Program** The Program stimulates social organization	Empowered and formal community organization
Communication	Isolated	**Support Program** Creation of Communication Bases	Radio Communication System
Networking	Inter-communities networking	**Bolsa Floresta Program** Strengthening of grassroots organizations and cooperatives	Networking within the municipality
Lake Management	Lack of lake management rules	**Management Plan** Investment in community development, as well as biodiversity monitoring in lakes	Lake management rules formalized and monitored
Aquiculture	Practically inexistent aquiculture	**Bolsa Floresta Program** Fish farming kits	Aquiculture based on local products and linked with efficient production chains
Family-based Agriculture	Subsistence/Harvest surplus done with low level technologies	**Bolsa Floresta Program** Increase of productivity by developing new techniques, through technical assistance. Improve market access	Production with high level technology and access to market
Women and youth rights	Limited participation of women and young adults within reserve's boards of decisions	**Bolsa Floresta Program** Insure the participation of women within reserve's decisions and incentive the building capacity of young leaders	Proper engagement of gender and youth within the reserve
Land rights	Uncertainties on communities' land rights of use	**Bolsa Floresta Program** Fostering community-level empowerment, building capacity and increase reserve's leaders networking	Improve communities' knowledge of their duties and rights within a State reserve

These initiatives involves 81/84 local entrepreneurs and the calculated value of annual production and commercialization was estimated to be BRL 187,759 (USD 54,450), representing an important source of income for families within the Madeira Reserve (FAS, 2015b).

The top 4 agroforestry productions involves 79/84 local entrepreneurs, with an annual production of 127,181 kg -- an average of 3,604 kg per producer (Table 9; Figure 11). The annual income generated by these activities in 2014-2015 is BRL 177,059 (USD 51,437) (98.7% of total agroforestry products), an average of BRL 2,241 (USD 650) per producer.

There are many bottlenecks to be diminished in order to improve the production and commercialization processes, such as: (i) access to market; (ii) transportation; (iii) lack of infrastructure; (iv) lack of electricity; (v) lack of management capabilities; (vi) access to credit; (vii) unfair price paid by buyers; (viii) high operational costs; (ix) distance from consumer market and; (x) complexity of working with several stakeholders/producers.

The project investments in sustainable production through the Bolsa Floresta Program Income Generation component and the Support Program Sustainable Business component are expected to increase the production and commercialization by **8 to 10% per year.**

TABLE 9. TOP 4 PRODUCTIVE CHAINS WITHIN THE MADEIRA RESERVE.

PRODUCT	PRODUCERS	ANNUAL PRODUCTION (KG)	AVERAGE ANNUAL PRODUCTION PER PRODUCER (KG)	TOTAL INCOME PER YEAR (2015) (BRL)	TOTAL INCOME PER YEAR (2015) (USD)	AVERAGE INCOME PER PRODUCER (BRL)	AVERAGE INCOME PER PRODUCER (USD)
Cocoa	39	14,481	371	R$71,084	$20,614	R$1,823	$529
Manioc flour	12	23,000	1,917	R$45,910	$13,314	R$3,826	$1,109
Banana	21	7,200	343	R$30,065	$8,719	R$1,432	$415
Watermelon	7	82,500	11,786	R$30,000	$8,700	R$4,286	$1,243
TOTAL	79	**127,181**	3,604	**R$177,059**	$51,347	**R$2.241**	$650

Considering that the production will growth 8% per year, the total value of the top 4 productive chains can reach **BRL 5.37 million** (**USD 1.56 million**) **up to 2030**. This represents **BRL 2.54 million (USD 0.82 million)** of gross income of when comparing the without project scenario (growth of 90%) based on the 2015 projections without applying the annual growth rate (Table 10).

Thus, the project investments on sustainable agroforestry are strategical and may represent a valuable and solid opportunity to increase the income in the project region.

SHARE OF THE TOP 4 PRODUCTIVE CHAINS (2015' ANNUAL INCOME)

FIGURE 11. SHARE OF THE TOTAL ANNUAL INCOME OF THE TOP 4 PRODUCTIVE CHAINS IN THE MADEIRA RESERVE.

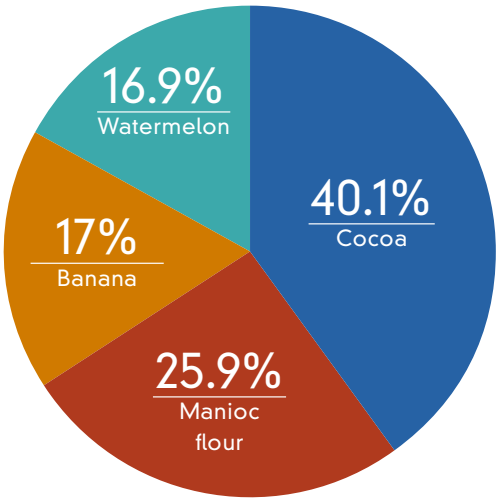


TABLE 10. VALUE OF PRODUCTION OF THE TOP 4 PRODUCTIVE CHAINS WITHIN THE MADEIRA RESERVE.

PRODUCT	2015 (BRL)	2015 (USD)	ACCUMULATED VALUE OF PRODUCTION 2015-2030 (BRL)	ACCUMULATED VALUE OF PRODUCTION 2015-2030 (USD)
Cocoa	R$71,084	$20,614	R$2,155,577	$625,117
Manioc flour	R$45,910	$13,314	R$1,392,188	$403,734
Banana	R$30,065	$8,719	R$911,700	$264,393
Watermelon	R$30,000	$8,700	R$909,728	$263,821
TOTAL	R$177,059	$51,347	R$5,369,193	$1,557,066

5.3 NET POSITIVE BIODIVERSITY IMPACTS

Under the "without project" scenario, **13% of the forest within the Madeira Reserve would be lost by 2020**. The loss of forest cover implies a loss of biodiversity and habitat for local flora and fauna, as well as the environmental services that the forest provides. This loss of forest also directly affects the conservation of the soils and disturbs the ecological processes on a larger scale (Pagiola *et al.,* 2004). The project is located in the center of endemism of Rondônia, which is defined by the Madeira River (to the left) and the Tapajós River (to the right) (Santos *et al.,* 2011). This area encompasses 475,000 km^2, of which 13% has already been deforested (da Silva *et al.,* 2005). This area contains a large number of endemic species, many of which occur in a very restricted area. These species will need more protected areas that are strategically located for them to be adequately represented in a biodiversity conservation system (Rodrigues & Gaston, 2001).

The "with project" scenario assumes that the resources required to guarantee conservation and sustainable development are available. Under this scenario, it is assumed that the intact forests in the project area will be protected and thus will promote great benefits in terms of biodiversity conservation when compared to the baseline scenario. In addition to these benefits, the project will make possible the establishment of a robust system for biodiversity monitoring and research of the natural resources in the Madeira Reserve area and its surroundings. This system is based on the "Biodiversity and Natural Resource Use Monitoring Program in State Protected Areas of Amazonas" (ProBUC) (Marinelli *et al.*, 2007), which has five main monitoring programs and has already been established. ProBUC, run by the State Government, follows that the involvement of communities living in the Reserve is a showcase on the importance of their role in maintaining the integrity of the ecosystem.

The main positive net impacts that the monitoring of the biodiversity will bring to the Project area are shown in the Table 11.

TABLE 11. NET POSITIVE IMPACTS ON THE BIODIVERSITY.

AREA
Biodiversity monitoring
SITUATION WITHOUT THE PROJECT
No monitoring of biodiversity
PROGRAM/ACTIVITY
ProBUC program involving communities in monitoring biodiversity
NET BENEFITS
Help with the prevention and identification of negative impacts on biodiversity and on the livelihood of the communities

5.3.1 VULNERABILITY AND IRREPLACEABILITY

Being a region with high endemism indexes, the project area is home to different rare and endemic species and is recognized as priority area for conservation (MMA, 2004; Oren & Albuquerque, 1991). Crossing the fauna and flora inventory of the Madeira Reserve (Costa *et al.,* 2014) with the Oficial List of Endangered Species in Brazil (MMA, 2014), there are 15 species (flora and mastofauna mainly) considered endangered with risk of extinction.

Despite the region being well known by its biological importance is yet scientifically understudied (Melo-Sampaio & Souza, 2010). Environmental conservation, legal protection, biodiversity monitoring, law enforcement and other project activities will ensure proper biodiversity conservation in niches with regular occurrence of a globally threatened and vulnerable species.

If proper measures to protect the environment are not implemented, endemic and rare species will not have opportunity to restabilhishes its population in other habitats and they will probably be extinguished from Earth.

6. MONITORING

6.1 BASELINE MONITORING

The baseline scenario will be monitored through an assessment of the driver variables and assumptions assumed by the SimAmazonia II, in order to assess project's deforestation baseline scenario. The model will be updated every 10 years based on the calculation of the verified *post facto* baseline deforestation in comparison with other location not affected directly by the project activities. If deforestation is verified as 10% lower or 10% higher than originally predicted, the *post facto* carbon baseline shall be re-adjusted using the observed values of the driver variables.

6.2 PROJECT MONITORING

6.2.1 MONITORING OF PROJECT IMPLEMENTATION

The implementation of the project's activities and programs will be monitored by FAS and the Government of Amazonas. FAS will elaborate annual reports and then make them available at FAS website, at the Government website and at reserve's association headquarter.

The elaboration and planning of the annual investment budgets will also be based on the project's annual reports, and will have to be approved by the council of the Rio Madeira Reserve.

6.2.2. MONITORING OF LAND-USE AND LAND-COVER CHANGE

The monitoring of land-use and land cover change will be made through the integration of (i) remote sensing analysis for identification of deforestation focus and pressures (based on PRODES), and (ii) *in situ* actions to enforce the law and prevent deforestation and illegal logging inside the project area. This activity will be led by FAS.

The plan for monitoring and control of deforestation "on the ground" will be based on the following strategy:

i. Monitoring of carbon stocks

The *ex ante* estimated average carbon densities and carbon stock changes should not be significantly different during the crediting period, as it was used a confident estimation adequate for the project area. However, when the carbon stock data are updated – either by a scientific study or by a forest investory –, a new estimation will be done. New estimatives shall be re-validated by an operational entity.

ii. Monitoring of large natural disturbances

The monitoring of natural disturbances will be made through the analysis of PRODES satellite images and also directly on the field, following the complete schedule of activities predicted for the project implementation explained before. If any natural disturbance is identified as impact on the project carbon stocks, the boundary of the polygons where such changes happened will be measured and the change in the carbon stock factored out.

iii. Leakage monitoring

Although it is not expected any leakage with the project implementation, deforestation will be monitored in all the surrounding area of the project (leakage belt).

iv. Calculation of ex post net anthropogenic GHG emission reductions

The calculation of *ex post* net anthropogenic GHG emission reductions is similar to the e*x ante* calculation. However, *ex ante* projected emissions and leakage are replaced by *ex post* emissions calculated. In case it is verified differences in the *post facto* adjusted carbon baseline, the *ex ante* estimated baseline will be replaced by a *post facto* baseline.

6.3 CLIMATE IMPACT MONITORING

The overall monitoring plan ensures no unplanned and unaccounted *in situ* offsite GHG emission attributable to the project. Regarding the carbon pools, the project will use the most recent data from PRODES to analyze the real figures of the deforestatioWtterns within the project region. In line with this, SimAmazonia II model will establish the baseline scenario which will be compared to the actual scenario. In addition to satellite monitoring approach, the project will use ground-gathered data involving both locals and researches. Thus, the overall monitoring strategy comprises the following four components:

i. Satellite monitoring by the National Institute for Space Research (INPE): developer of the most advanced deforestation monitoring system in the world.

Figure 12. An example of community workshop provided by FAS to educate local members on early childhood development.

ii. Carbon dynamic and forest carbon monitoring: partnership will continue to be established in order to develop analytical studies to quantify the carbon flux and carbon stocks of the different reservoirs within the forest (e.g., aboveground and belowground biomass, leaf litter, fine woody debris, coarse wood debris and soil carbon). The project will follow the methodology developed by Dr. Niro Higuchi[52] and his team, addopted by the Juma REDD+ Project (Viana *et al.,* 2008).

iii. Participatory Monitoring *in loco* (ProBUC): Amazonas government will implement ProBUC and it will involve locals within monitoring activities as a way to increase local conservation awareness and to make monitoring more efficient.

iv. Community Forest Monitoring Program: FAS and Imazon developed a methodology to include local communities in mapping the threatened areas, identifying risks which they are exposed to and which ones are the most aggressive (Valente *et al.*, 2015) (figure 12).

52 Dr. Higuchi is a member of the IPCC, with several papers and articles about the Amazon and its vegetational aspects. Dr. Higuchi is also professor at INPA (National Institute for Amazon Researches).

6.4 COMMUNITY IMPACT MONITORING

Regarding community impact, periodical surveys will be made as part of the Monitoring Plan. The database will be updated periodically by questionnaires and local consultations, setting a favorable scenario for reviewing measures to avoid negative social impacts.

7. FINANCIAL FEASIBILITY STUDY

7.1 PROJECT COST

For the cost estimatives, it was considered project investments and expenses from 2005 to 2030 within the five core areas: (i) Design, creation and implementation of the Madeira Sustainable Development Reserve; (ii) Bolsa Floresta Program; (iii) Health & Education Program; (iv) Support Program; and (v) Carbon project cycle.

The cost per VER preserving the buffer credits was estimated to be **BRL 22.01/tCO$_2$ (USD 6.38/tCO$_2$).** In case the buffer is released as result of a positive verification process, the cost per VER drops to **BRL 16.14/tCO$_2$ (USD 4.68/tCO$_2$)**.

The annual cost per hectare is BRL 13.54/yr (USD 3.93/yr), and the total cost per hectare during project lifetime was estimated to be BRL 270.76 (USD 78.52/ha), which leads to the total project cost of **BRL 76.65 million (USD 22.23 million)**. FAS and other partners have already committed 10.9% (BRL 8.32 million; USD 2.41 million), thus the funding gap from 2015 to 2030 estimated is **BRL 68.33 million (USD 19.81 million)** (Figure 13; Table 12)**.**

It was considered a 2%-rate to adjust the annual growth rate of families benefited by the project. The annual cost per family was adjusted using the expected inflation of 6.0%. The conversion factor between Brazilian Reais and US dollars was 0.29 (conversion rate of August, 2015).

7.2 PROJECT REVENUES

Considering that buffer credits will be preserved and a carbon price of **USD 6.5/tCO$_2$**, the total project revenue estimated is **BRL 94.49 million (USD 27.40 million)**. The revenues from the commercialization of 3.1 million tons of VERs (Table 7) represents 73.6% **(BRL 69.58 million; USD 20.18 million)** (Table 13), and interests from the Transition Fund other **26.4% (BRL 24.92 million; USD 7.23 million)**.

Table 13. Expected revenues from the commercialization of VERs and interest from the Transition Fund, considering an interest rate of 5% per year and an average carbon price of USD 6.50 per tCO$_2$e.

FUNDING SITUATION

FIGURE 13. MADEIRA RESERVE REDD+ PROJECT'S FUNDING SITUATION CONSIDERING 2005 TO 2030.

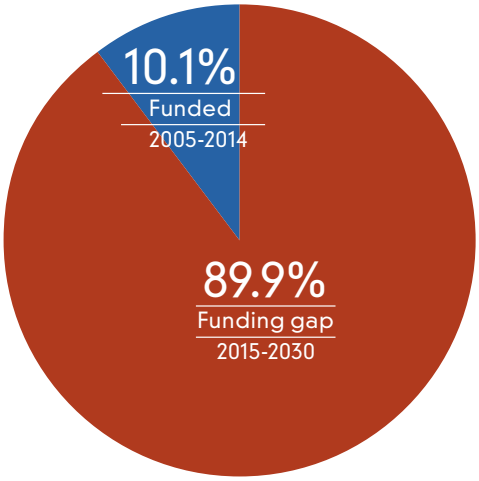


TABLE 12. PROJECT COSTS FROM 2005 TO 2030 AND FUNDING GAP FROM 2015 TO 2030.

AREAS	ACTIVITIES	TOTAL PROJECT COST		FUNDING GAP	
		2005-2030 (BRL)	2005-2030 (USD)	2015-2030 (BRL)	2015-2030 (USD)
1 REDD+ activities	a Design, creation and implementation of the Madeira Sustainable Development Reserve	R$3,581,168	$1,038,539	R$2,567,253	$744,503
	b Bolsa Floresta Program	R$60,712,319	$17,606,572	R$53,405,107	$15,487,481
	c Health & Education Program	R$5,710,983	$1,656,185	R$5,710,983	$1,656,185
	d Support Program	R$5,017,276	$1,455,010	R$5,017,276	$1,455,010
2 REDD+ credits	a Carbon project cycle	R$1,634,690	$474,060	R$1,634,690	$474,060
TOTAL		R$ 76,656,435	$22,230,366	R$ 68,335,308	$19,817,239

TABLE 14. EXPECTED REVENUES FROM THE COMMERCIALIZATION OF VERS AND INTEREST FROM THE TRANSITION FUND, CONSIDERING AN INTEREST RATE OF 5% PER YEAR AND AN AVERAGE CARBON PRICE OF USD 6.50 PER tCO_2e.

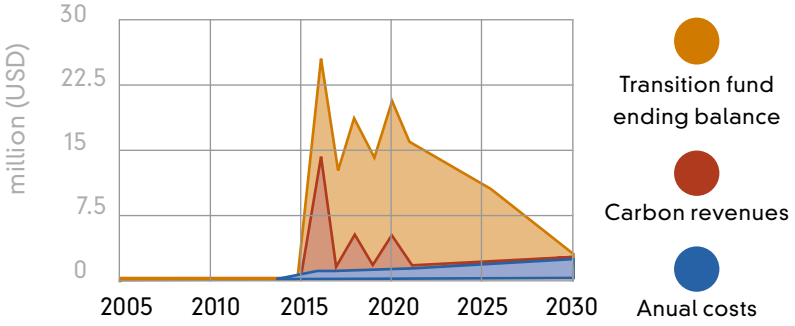
PROJECT YEAR		REVENUES (@USD 6.50/ tCO_2e)		TRANSITION FUND INTEREST (@5%/ YR)		TOTAL
NR	YR	ANNUAL	ACCUMULATED	ANNUAL	ACCUMULATED	
1	2006	$0	$0	$0	$0	
2	2007	$0	$0	$0	$0	
3	2008	$0	$0	$0	$0	
4	2009	$0	$0	$0	$0	
5	2010	$0	$0	$0	$0	
6	2011	$0	$0	$0	$0	
7	2012	$0	$0	$0	$0	
8	2013	$0	$0	$0	$0	
9	2014	$0	$0	$0	$0	
10	2015	$0	$0	$0	$0	
11	2016	$12,839,770	$12,839,770	$553,365	$553,365	
12	2017	$0	$12,839,770	$532,042	$1,085,406	
13	2018	$3,668,506	$16,508,276	$670,921	$1,756,327	
14	2019	$0	$16,508,276	$626,736	$2,383,063	
15	2020	$3,668,506	$20,176,782	$759,287	$3,142,350	
16	2021	$0	$0	$708,682	$3,851,032	
17	2022	$0	$0	$654,003	$4,505,035	
18	2023	$0	$0	$595,663	$5,100,698	
19	2024	$0	$0	$533,014	$5,633,712	
20	2025	$0	$0	$465,294	$6,099,006	
21	2026	$0	$0	$393,030	$6,492,036	
22	2027	$0	$0	$315,409	$6,807,445	
23	2028	$0	$0	$231,473	$7,038,918	
24	2029	$0	$0	$141,892	$7,180,810	
25	2030	$0	$0	$45,645	$7,226,455	
TOTAL	25		$20,176,782		$7,226,455	$27,403,237

7.3 TRANSITION FUND SIMULATION

The Transition Fund (Figure 14) has the main role of providing financial sustainability after the end of the crediting period. After that period, it is expected that the project generate funds for its actitivities.

The contributions to the Transition Fund (2016-2020) were estimated to be **USD 16.5 million**, with **USD 7.2 million at interest rate of 5**% from 2016 to 2030. Discounted the project cost for every year, the fund balance at the end of 2030 was estimated to be **USD 0.9 million**.

FIGURE 13. MADEIRA RESERVE REDD+ PROJECT'S FINANCIAL BALANCE FROM 2005 TO 2030.



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9. ANNEX

Pg 78: Bruna Kelly

DECRETO N.° 26.009 DE 03 DE JULHO DE 2006

CRIA a Reserva de Desenvolvimento Sustentável do Rio Madeira, nos Município de Novo Aripuanã e Manicoré, e dá outras providências.

O GOVERNADOR DO ESTADO DO AMAZONAS, no exercício da competência que lhe confere o artigo 54,IV da Constituição Estadual, e

CONSIDERANDO que *"todos têm direito ao meio ambiente ecologicamente equilibrado, bem de uso comum do povo e essencial à sadia qualidade de vida, impondo-se ao Poder Público o dever de defende-lo e preserva-lo para as presentes e futuras gerações"* na forma exigida pelo artigo 225, *caput*, da Constituição da República.

CONSIDERANDO que incumbe ao Poder Público *"definir espaços territoriais e seus*

Componentes a serem especialmente "protegidos", com o propósito de assegurar a efetividade do direito ao meio ambiente ecologicamente equilibrado, conforme preconiza o inciso III,& 1.°, do artigo 225, da Constituição Federal;

CONSIDERANDO o disposto no artigo 20 da Lei n.°9.985, de 18 de julho de 2.000,que institui o Sistema Nacional de Unidades de Conservação da Natureza –SNUC, e no Decreto Federal n°4.340,de22 de agosto de 2.002;

CONSIDERANDO a realização de estudos técnicos e de consulta pública pela Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável e Instituto de Proteção Ambiental do Amazonas, como exige o artigo 22 da LEI N° 9.985/2.000;

CONSIDERANDO o levantamento fundiário realizado pelo Instituto Terras do Amazonas juntamente com a Secretaria de Estado do Meio Ambiente e Desenvolvimento Sustentável eo Instituto de Proteção Ambiental do Amazonas;

CONSIDERANDO, por fim a manifestação da Procuradoria Geral do Estado, exarada às fls.251/256- **CASA CIVIL**, e o que mais consta do Processo n° 2.092/2.006-CASA CIVIL,

DECRETO:

ART. 1º Fica criada a reserva de desenvolvimento sustentável do Rio Madeira, localizada nos municípios do novo Aripuanã e Manicoré, com os objetivos de preservar a natureza, assegurar as condições e os meios necessários para a reprodução e a melhoria dos modos e da qualidade de vida e exploração dos recursos naturais das populações tradicionais,, valorizar, conservar e aperfeiçoar o conhecimento e as técnicas de manejo do meio ambiente desenvolvida pelas populações tradicionais, dentre outras.

ART.2° A reserva de desenvolvimento sustentável do Rio Madeira possui área aproximada de 283.117,00ha (duzentos e oitenta e três mil, cento e dezessete hectares), e perímetro de acordo com o seguinte memorial descritivo: inicia-se no ponto 1, de coordenadas geográficas 60°10°43°WGR 04°39°30°S localizado na confluência do rio Autaz-mirim com o igarapé do escondido e em confronto com o limite das terras indígenas cunhã sapucaia; deste segue em confrontação com os limites das terras indígenas cunha sapucaia, ate o ponto 2, de coordenadas geográficas 60°03°11°WGR e 04°53°46°, localizado a margem esquerda do Rio madeira deste segue a montante, margeando o leito do rio madeira ate o ponto 3, de coordenadas geográficas aproximadas 60°59°48° WGR e 05°36°11°S localizado a margem esquerda do rio madeira , deste segue a linha reta ate o

ponto 4, de coordenadas geográficas aproximadas 60°59°60°WGR e 05°24°26°S localizado no limite territorial do projeto de assentamento Agro extrativista; jenipapo deste segue em confrontação com o mesmo ate o ponto 5, de coordenadas geográficas aproximadas 60°59°48°WGR e 05°24°51° S localizado no limite territorial do projeto de assentamento agro-extrativista jenipapo deste segue pelo interfluvio das bacias do igarapé do repartimento com o igarapé preto ate o ponto 6, de coordenadas geográficas aproximadas 60°56´27.92WGR e 05°21°59.69S localizado nas divisas do município de manicoré e novo Aripuanã deste segue em confrontação com o limite territorial do município de novo Aripuanã ate o ponto 7, de coordenadas geográficas aproximadas 60°42°07.37WGR e 05°02´3191S localizado na cabeceira do igarapé altaz-mirim e na divida dos municípios de novo Aripuanã e Borba deste segue a jusante, margeando o leito do Rio Autaz-mirim ate o ponto inicial, ponto 1 de coordenadas geográficas 60°10´43WGR e 04°39´30S.

Parágrafo único. Fica excluída da reserva de desenvolvimento sustentável do rio madeira as áreas privadas cujas propriedades forem legalmente comprovadas as quais serão desapropriadas, na forma da lei, para inclusão definitiva a unidade de conservação.

ART. 3º Caberá a secretaria de meio ambiente e desenvolvimento sustentável, por intermédio do instituto de proteção ambiental do estado do Amazonas a gestão da reserva de desenvolvimento sustentável do rio madeira adotando as medidas necessárias a sua efetiva proteção e implantação.

§ 1º A reserva de desenvolvimento sustentável do rio madeira poderá ser gerida por outros órgãos ou entidades publicas ou por organizações da sociedade civil de interesse publico com os objetivos afins aos da unidade, mediante instrumento a ser firmado com o órgão responsável por sua gestão atendidos os pressupostos da lei n º 9.790 de 23 de marco de 1.999.

§ 2º A instituição gestora, na hipótese prevista no parágrafo anterior, devera encaminhar ao IPAAM ao final de cada semestre relatório circunstanciado das ações desenvolvidas assim como os planos de trabalho das atividades previstas para o ano seguinte.

ART. 4 º Caberá ao secretario de estado do meio ambiente e desenvolvimento sustentável fixar por ato próprio as diretrizes gerais para elaboração do plano de manejo da reserva e ao conselho deliberativo da reserva aprova-lo mediante resolução.

Parágrafo único – O plano de manejo devera ser elaborado no prazo Maximo de 5 (cinco) anos a contar da publicação deste decreto

ART. **5º** REVOGADAS AS DISPOSICOES EM CONTRARIO, ESTE DECRETO ENTRA EM VIGOR NA DATA DA SUA PUBLICACAO

GABINETE DO GOVERNADOR DO ESTADO DO AMAZONAS, em Manaus, 03 de junho de 2006

EDUARDO BRAGA
Governador do Estado

JOSE ALVES PACIFICO
Secretario de Estado Chefe da Casa Civil

VIRGILIO MAURICIO VIANA
Secretario de Estado do Meio Ambiente
e Desenvolvimento Sustentável

R. FRANIO DE ALMEIDA LIMA
Procurador Geral do Estado

THE RIO MADEIRA SUSTAINABLE DEVELOPMENT RESERVE REDD+ PROJECT

AMAZONAS, BRAZIL