DELEGATION OF THE EUROPEAN COMMISSION

MOZAMBIQUE

"Evaluation of N'hambita Pilot Project"

Contract n° 2009/210434

FWC BENEFICIARIES - LOT N° 6

Final Report

November 2009

This report was prepared with financial assistance from the European Agency for Reconstruction. The views expressed are those of the consultant and can in no way be taken to reflect the views of the European Union.

A project implemented by
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Evaluation of N'hambita Pilot Project

Region	**Mozambique, Sofala Province, Gorongosa National Park buffer zone, N'hambita community**
Beneficiary Country	**Mozambique**
Sector (as defined in CSP/NIP)	**Environment**
Project number and full title	**063241 - Miombo community land use and carbon management – N'hambita pilot project**

The present report was prepared within the framework of the "Evaluation of N'hambita Pilot Project in Mozambique (letter of contract nº 2009/210434). This mission was granted by the European Commission to the AGRECO consortium for the Framework Contract Europe Aid /119860/ C/ SV/Multi - Lot 6: Environment.

Final Report

By

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November 2009

TABLE OF CONTENTS

Annexes

Executive summary

This Report presents the main findings of the evaluation of the N'hambita Pilot Project. The EC financed the 'Miombo community land use and carbon management – N'hambita pilot project' from its 'Environment' budget line. The project was de-concentrated for management by the EC Delegation in 2003. The project beneficiary and grant manager was the University of Edinburgh's School of GeoScience that worked in partnership with a private company, Envirotrade UK. The total budget was €1,991,214, of which the EC contribution was €1,587,232, or 79,71% of the total. It ran for five years, from July 2003 until July 2008.

The aim of the project was ´to develop forestry and land use practices that promote sustainable rural livelihoods in participation with rural communities in a way that raises living standards and to assess the potential of these activities to generate verifiable carbon emission reductions´.

The evaluation of the project was intended to provide:

- An overall independent assessment about the performance of the project, paying particularly attention to the impacts of the project actions against its objectives;
- Key lessons and practical recommendations for follow-up actions, in particular for projects of similar nature.

The evaluation procedure was composed by a desk review of project documentation and a field mission. The desk review was carried out between 8–28 July 2009 while the field phase took place between 28 July and 12 August 2009. During the desk phase a comprehensive search of the numerous documents produced by the Project was carried out. The field phase was carried out first in Maputo, dedicated to meetings with persons representing institutions involved with the N'hambita Project development at various levels and stages. Finally, the second part of the field phase was conducted directly in the Project area in N'hambita (Gorongosa National Park buffer zone – Province of Sofala – Mozambique).

Comments on the mission

The Project produced a huge amount of documentation. The Final Report alone consists of 551 pages, and is complemented by numerous working documents, technical annexes and papers.
However the consultancy considers the Final Report somehow unsystematic, not always respecting a logical process, but representing more a set of guidelines. The examination of the documents, aimed at verifying the value of the actions was difficult and quantitative indicators of the most important activities were not always found. So, the consultancy had some difficulties to establish the validity of the implementation from the Desk phase only.
Despite this volume of reporting from the Project to the EU during the project period and correspondence between the Delegation and the University of Edinburgh, not all necessary information was available to the Delegation prior to the field phase. Significant relevant additional information was made available to the Consultancy during the field visit only.

Overall assessment

An overall evaluation of the N'hambita Pilot Project is not straightforward. The consultancy has observed some positive developments (e.g. agroforestry, socio-economic impact, fire control) together with some components insufficiently developed (e.g. forest inventory, carbon baselines and forest management). For simplicity, the main conclusions of the evaluation mission are summarized in the following table.

Element	Evaluation score	Comment
Project implementation and management	**Adequate / Good**	The quality of day-to-day management of the Project in the field is satisfactory. Project activities are carried out with competence and dedication. The administration of the project is carried out in correct manner, villagers are receiving their carbon offsets, respecting the plan for each agreement, and wages are regularly paid.
Agroforestry component	**Good**	In 2008 the villagers involved in the project were 1510 (around 70% of the residents) with 3527 hectares of invested surface. All farmers met by the consultancy during the field visit, showed satisfaction for their involvement in the project. This activity is expanding and active monitoring is being implemented. However the consultancy is strongly recommending to continue the periodical verification of the soil fertility, started in early 2009, considering that its maintenance is crucial to allow villagers to become residential. The satisfaction of beneficiaries might seem obvious given the amount of funds injected into the Project. However the social impact on the communities and the ongoing changes in the landscape due to the transition between shifting and sedentary agriculture are considered positive for a pilot Project
Micro-enterprises	**Adequate**	Regardless of the financial success of the Micro-business, these small enterprises have the advantage of creating small industries in a traditional agricultural field; besides, tendency to form associations has been established and new job opportunities are becoming available in the area.
Forest inventory and biomass estimates	**Insufficient**	Major drawbacks found by the consultancy include: – The absence of a statistically sound forest inventory – The lack of a detailed overall thematic cartography – Biomass equations are based on a small sample and Project estimates are derived from observations taken also outside the Project area.
Forest management and monitoring	**Insufficient / in progress**	The guidelines defined by the Project for forest management have not yet been fully implemented. It is understood that this issue is being tackled with a new partnership with Universidade Eduardo Mondlane, Maputo, however the MoU is still in the initial phases.
Carbon baselines and avoided deforestation	**Insufficient / in progress**	In view of the above, the baselines and projections for avoided deforestation still under development. See the corresponding chapter in the Report for more details.
Benefit sharing and Trust Fund Management	**Adequate**	The project through the Trust Fund (The Mozambique Carbon Livelihoods Trust (MCLT),

Element	Evaluation score	Comment
		branch of Envirotrade Ltd, is providing Carbon offsets from the reclamation of fallows, better management of farms and from the protection of forests. The carbon offsets from agroforestry are received directly by farmers, while the carbon offsets from the forest protection are received by the community, which uses this money for public services, as schools or sanitary centres. The total amount of carbon offsets is divided in three parts: one third is going to the agroforestry and to the community, one third to Envirotrade Ltda, which provides the management of the project and the last third to Envirotrade Ltd UK, as enterprise compensation. Between 2003-2008, the NPP was able to sell carbon credits totalling around 900,000 US$ on the voluntary carbon market. It must be pointed out that so far, carbon offsets have been mainly generated by agroforestry activities, while the major share of offsets mechanisms, expected from avoided deforestation, are still under technical revisions by NPP Management. Moreover it is a bit difficult to clearly distinguish the cash flow for the EC grant component separately as activities and carbon sales are still ongoing beyond the EC Project. For the EC Project component the following breakdown was given by NPP staff: 53% were required for the running costs, 21% funded agroforestry activities and 26% funded community based forest management.
Socio-economic impact	**Good**	The Project produced a substantial positive impact on the socio-economic development of the area, given the initial post-war conditions.

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Lessons learned and recommendations

The main lesson learned is that similar Projects are viable in Mozambique and probably in other African countries sharing similar conditions. As a pilot Project it can be considered interesting and innovative, at least for Mozambique. However the consultancy recommends a more solid approach to the forestry components should future projects of this nature be replicated elsewhere.
Another important issue to be considered deals with sustainability. In the NPP a private company, Envirotrade, provided a substantial amount of additional funds as investment for future revenues from carbon offsets. The financial records presented by Envirotrade indicate that the total investment in the Project was of 5.9 millions US$ of which 2.2 millions provided by EC (42%), 1.3 millions from Plan Vivo carbon sales (22%) and 2.1 millions US$ (36%) from Envirotrade UK. In general it was difficult to analyse the financial aspects of the Project since the EC grant was just used as kick off funding. Actually Envirotrade decided to invest on carbon offsets as a business and is considering its financial contribution as an initial investment that may provide revenues in the future. Moreover Envirotrade is providing financial details for its entire investment in carbon offsets in Mozambique, including Zambezi and Quirimbas Projects. Analyzing the data available for the NPP, during the first 5 years the revenues from carbon sales were not sufficient to cover the overall costs including Envirotrade Mozambique running costs and Envirotrade UK overheads. For the future, Envirotrade seems confident on the profitability of their carbon business and is expecting increasing revenues as detailed in the projections shown in this

report, especially from avoided deforestation. The consultancy recognizes the potential but it must be kept in mind that this is strongly linked to future carbon market conditions that are sincerely unpredictable at the moment.

In general, Projects related to carbon sequestration and avoided deforestation require a long-term vision, and a period of 5 years is the minimum duration for Project deployment and implementation. According to the NPP experience a partner willing to invest on the medium/long period is needed. Regarding the local partnership the NPP decided to implement the Project in close collaboration with the local communities, and this choice seems well justified. In fact, in the area, the main driver of deforestation is the demand for new agricultural land for subsistence crops, carried out by individuals or group of farmers. In other cases, where for instance deforestation could be caused by the expansion of cash-crops, a more direct strategic involvement of government authorities might be also be considered. In any case a substantial social component associated with sharing of carbon offsets sharing should always be present.

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LIST OF ACRONYMS

- **AAC** – Allowable Annual Cut
- **ACEU** – Accessible – Cultivable – Extractable – Unprotected
- **AIFM –** Avaliaçao Integrada da Florestas em Mozambique
- **ANOVA** – Analysis of Variance
- **CA -** Community Association
- **CAI** – Current Annual Increment
- **CBNRM –** Community Based Natural resources management
- **CCBA** _ Climate, Community and Biodiversity Alliance
- **CDM** – Clean Development Management
- **CR –** Chicare Regulado
- **DAC/OECD –**Development Assistance Committee of the Organisation Economic Cooperation and development
- **DFID** – UK Department for International Development
- **DUAT** – Direito de Uso e Aproveitamento da Terra
- **ECCM –** Edinburgh Centre for Carbon Management
- **FHI –** Food for Hungry
- **FRI** – Fire Return Interval
- **GDP –** Gross Domestic Production
- **GERFFA –** Mozambican Wildlife and Forest Resources Management Project
- **GNP –** Gorongosa national Park
- **GPG** - Good Practice Guidance
- **IFPRI –** International Food Policy Research Institute
- **IPCC** – Intercontinental Panel on Climate Change
- **ITCZ –** Intertropical convergence Zone
- **LULUCF** – Land Use-Land Use Change and Forestry
- **MAI** – Mean Annual Increment
- **MCLF –** Mozambique Carbon Livelihood Fund
- **NDVI** – Normalised Difference Vegetation Index
- **NPP** – N'hambita Pilot Project
- **NTFP –** Non Timber Forest Products
- **OLS** – Ordinary Least Square
- **ORAM** – Rural Association for Mutual Support (Associaçao de Rurale Mutua Asistencia)
- **PARPA** – Action Plan for reduction of Absolute Poverty
- **PDD –** Project Design Document
- **PES** – Payment Environmental Services
- **PRA –** Participatory Rural Appraisal
- **PRSP** – Poverty Reduction Strategy Paper
- **PV –** Plan Vivo
- **REDD** – Reduced Emission from Deforestation and Forest Degradation
- **SOP** – Standard Operating Procedures
- **SRL** – Sustainable Rural Livelihood
- **SSI –** Semistructural Interviews
- **TLU** – Tropical Livestock Unit
- **UNEP** – United Nations Environment Programme
- **UOE** – University of Edinburgh
- **VCMR** – Voluntary Carbon Market Registry
- **VCS** – Voluntary Carbon Standard
- **VER –** Voluntary Emission Reduction
- **WP-EFF** – Working Party on Aid Effectiveness and Donor Practices

Background

The EC financed the 'Miombo community land use and carbon management – N'hambita pilot project' from its 'Environment' budget line. The project was de-concentrated for management by the EC Delegation in 2003.
The project beneficiary and grant manager was the University of Edinburgh's School of GeoScience. Three partners were identified in the proposal: International Centre for Research into Agro Forestry (ICRAF), the Edinburgh Centre for Carbon Management (ECCM) and Envirotrade. ICRAF subsequently withdrew, and Envirotrade took over their tasks in the field.
The total budget was €1,991,214, of which the EC contribution was €1,587,232, or 79,71% of the total. It ran for five years, from July 2003 until July 2008. In addition to the co-financing, the project should also have given rise to carbon revenues totalling $200,000.
The aim of the project was ´to develop forestry and land use practices that promote sustainable rural livelihoods in participation with rural communities in a way that raises living standards and to assess the potential of these activities to generate verifiable carbon emission reductions´. The project worked with communities and small-scale farmers in the Gorongosa National Park buffer zone, the initial target group was the N'hambita community and the project aimed to extend the activities to other communities in the area.
The project had three main components:

1. The promotion of sustainable land use – N'hambita (Gorongosa Buffer zone)
Forest management composed of a sub set of activities amongst which establishment of the community forest association, forest inventory, forest management planning.
Timber utilisation activities,
Agroforestry
Non timber forest production

2. Trust Fund for Carbon offsets verification
Establishment of the institutional structure with the setting of the independent Trust fund to administer the registration and sale of carbon offsets generated by project activities; it will be responsible for assessing the land use plans by farmers and community,
Assessment and registration of carbon assets based on the technical specification developed by the research component. The assessment of management plan includes an assessment of the baseline and the long-term viability of the planned activities.
Monitoring and administration of carbon assets undertaken by the trust funds technicians and monitoring results recorded by the trust fund administration. A system will also record the carbon sales.

3. Regional carbon management research, including
- Biomass survey
- Regional baselines
- Carbon modelling
- Technical specifications

Description of the assignment

The beneficiary is the EC and the Government of Mozambique. The lessons learned will be shared by the EC Delegation with AIDCO, DG DEV and DG ENV, who will also be involved in the evaluation study as a reference group. The lessons learned will also be shared with the Government of Mozambique.

The Consultancy was asked to assess whether

The reports provide sufficient evidence that the project has implemented in full its proposal, with particular regard to the arrangements for sustainability.
The reports are based on sufficiently robust evidence to substantiate the project's impact, with particularly reference to the agro-forestry systems, reduction in shifting cultivation, increased yields, improved soil fertility, and the financial benefits of NTFPs (Non timber forest products).
The concerns raised in the previous evaluation report are well founded and, if so, whether the suggestions to address them in the course of project implementation have been taken in due account.

Particular attention should be given to:

- The quality of the forest inventory, biomass survey, baseline and management plans;
- The monitoring arrangements, and their implementation modalities after the conclusion of the project;
- The institutional framework set up by the project, and whether it provides, and is likely to continue providing, a sustainable and transparent platform for the management of carbon revenues and the delivery of offsets (both on-farm and avoided de-forestation).
- The transparency of the income of the Carbon Credits and its distribution between all stakeholders of the project.
- The claimed benefits to the community have materialised and are sustainable. In particular, assess whether the agricultural management practices promoted by the project have benefits in terms of increased yield or satisfaction of the beneficiaries; whether the NTFP incentives have led to reduce deforestation; whether the project has had positive social impacts

The evaluation of the project will provide:

a. An overall independent assessment about the performance of the project, paying particularly attention to the impacts of the project actions against its objectives;
b. Key lessons and practical recommendations for follow-up actions, in particular for projects of similar nature.

The evaluation approach / process
The evaluation procedure was divided into a desk review of project documentation and a field mission. The desk review was carried out between 8 –28 July 2009 while the field phase took place during 28 July and 12 August 2009. During the desk phase a comprehensive search of the numerous documents produced by the Project was carried out. The field phase was carried out first in Maputo, dedicated to meetings with persons representing institutions involved with the N'hambita Project development at various levels and stages (see list in Annex 1). Finally, the second part of the field phase was conducted directly in the Project area in N'hambita (Gorongosa National Park buffer zone – Province of Sofala – Mozambique).

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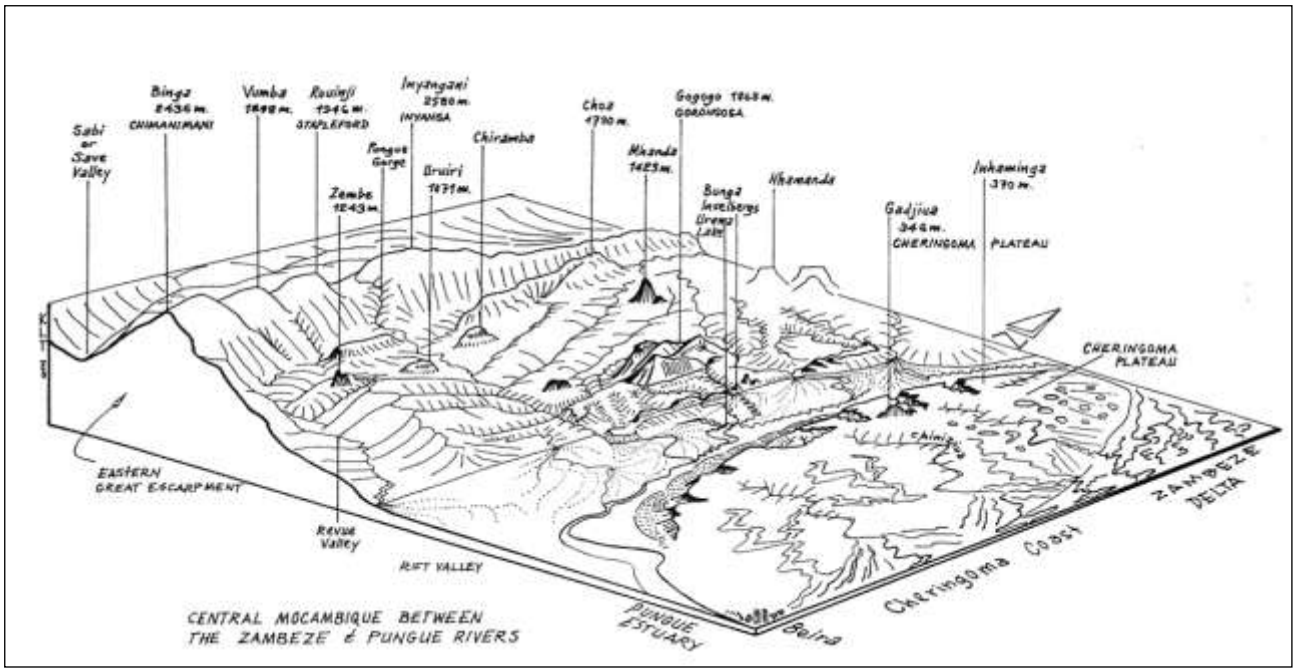
Project area

Location

The N'hambita community lands cover an area of 348 km^2, roughly divided into three sub-areas: a) protected area under Gorongosa National Park, b) the buffer zone and c) the community land in the same buffer zone. The N'hambita pilot project covers an area of approximately 20,000 hectares known as the *Chicale Regulado*

Geography

The project zone is part of the southern extension of the Great African Rift Valley; situated on the Barue plateau, west of the Cheringoma plateau. Geologically the land consists of eroded surfaces of granite and basaltic gneiss complex of Precambrian times. The landform is undulating to incised, with elevations rising from about 40 m.a.s.l. on the flank of the rift valley (on the eastern part of the project zone) to 400 m.a.s.l. and more towards the western part of the project zone (see following figure).



Soils

The crystalline bed rocks, low relief, moist climate and high temperature has produced a highly weathered soil which is often more than 3 m deep on the plateau[1]. Shallow stony soils also occur along escarpments. Loamy sand, sandy loam and sandy clay loam textures predominate, with a marked increase in clay with depth. The miombo ecosystems generally occur in soils which are predominantly alfisols, oxisols and ultisols; these are highly acidic, low in cation exchange capacity, low total exchangeable bases and low available phosphorus. These soils are formed by a catenary sequence of well-drained, deeply weathered soils on higher areas, a narrow zone of sandy soils along the foot slopes and poorly drained vertisols in the wet areas i.e. the 'dambos' (Desanker et al. 1995). Generally they have low levels of organic matter as a consequence of the abundant termite activities and frequent incidence of fire (Chidumayo, 1997).

Hydrology

The drainage within the project zone is closely spaced and assumes a typically dendritic pattern and is oriented to the West, South and East. The smaller streams are seasonal and fast running. The Pungue

[1] Page 130 EU final report. Miombo community land use and carbon management. N'hambita Pilot Project.

and Vunduzi Rivers (respectively in the south and west of the project area) are the only perennial rivers. Groundwater levels are generally very shallow and located either in the weathered regolith in valley bottoms or in fractures in the bedrock (Lynam et al, 2003; Tinley, 1969)[2].

Climate

The climate is typical of central Mozambique, sub-tropical with alternating cool-dry winters (April-October) and hot-wet summers (November-March). May-July is the coolest period (20-30 °C) and October is the hottest month (30-40 °C).

There are two distinct seasons. The dry season occurs between May to October, and the wet season occurs between Novembers to April. Most of the rain falls between November and March. The driest months are July to September. Based on weather data from ARA-Centro (The Mozambican water board) at Chitengo (in the Gorongosa National Park) over the past seven years mean annual precipitation is 749 mm distributed mainly between November to April, but with high inter-annual variability. The project zone lies within the rainfall isohyets of 600 and 800 mm/yr and is generally influenced by the orographic effect of the Gorongosa Mountain (in the west).

Vegetation types

In 2003 a Preliminary Inventory[3] was carried out, serving as general basis to obtain an initial impression of the vegetation. Based on the findings of this inventory, the vegetation in the project zone can be characterized by a woodland mosaic, which includes Miombo Woodlands, Combretum Woodlands, Combretum/Palm Woodlands and Riverine Woodland.

The most important vegetation type within the project zone refers to Miombo Woodlands. These are dominated by species such as *Brachystegia boehmii*, *B. spiciformis*, *Julbernardia globiflora*, *Diplorhynchus condylocarpon*, *Erythrophleum africanum* and *Burkea africana*. Miombo shrub layer is dominated by Bauhinia sp., *D. condylocarpon*, *Pterocarpus rotundifolius*, *B. boehmii* and, occasionally, *Pterocarpus angolensis*. Collectively these species account for over 70% of the basal area in the miombo woodlands.

The Combretum Woodlands are dominated by *Combretum apiculatum* (29% of basal area), *Commiphora mossambicensis* (15%) *and P. rotundifolius* (15%) in the tree layer, and by *C. apiculatum* (51%) and *P. rotundifolius* (36%) in the shrub layer. The Combretum/Palm Woodlands tree layer is dominated by Combretum apiculatum (29%), Commiphora mossambicensis (15%) and P. rotundifolius (15%), while C. apiculatum (51%) and P. rotundifolius (36%) dominate the shrub layer. Both the Combretum and Combretum /Palm Woodland classes are not widespread, if at all, within the project zone. Rather, they are found mainly in the GNP and, therefore, would normally fall out of the management jurisdiction of the N'hambita community. These woodlands are not of high biodiversity and forest value. The Riverine Woodlands tree layer is dominated by *Adansonia digitata* (26%), *Cleistochlamys kirkii* (10%), *A. nigrescens* (8%) and *Xeroderris stuhlmannii* (6%), while *C. apiculatum* (50%) *and Combretum molle* (24%) dominate the shrub layer. Even though Riverine Woodlands are not widespread within the project zone, given their fragile and vulnerable nature, they deserve closer attention in order to conserve them along all rivers.

Basic socio-economic and cultural information

The local communities of N'hambita, Bue Maria and Munhanganha (a sub zone under Bue Maria) are located in the buffer zone of the Gorongosa National Park. Like several other communities they have been relocated to the buffer zone after the establishment of the National Park in 1948. Communities are legally recognised in the Chicare Régulado, which also includes the communities of Pungue and Mbulawa. The total area of the Chicare Régulado covers about 48,600 ha.

During the colonial period, employment in the form of road construction and cotton farming for export was available. This ceased after independence in 1975. Shortly afterwards, the Gorongosa area became one of the most intense areas of conflict during the civil war (1976-1992). The civil war, landmines and a breakdown in infrastructure limited farming. Due to severe food shortages most of the population was displaced for many years before they were able to return in the mid-1990s.

[2] Page 8 EU final report. Miombo community land use and carbon management. N'hambita Pilot Project.

[3] The Preliminary Inventory of the Nhambita community forest (Mushove 2004) has been carried out in December 2003 at the outset of the project. Following a sampling design based on 15 transects, perpendicular to the road and track network inside the project area, 30 plots of 0.25 ha size have been inventoried on all living woody specimen. As a result, it was suggested to stratify the forests in the project zone into four main types of vegetation.

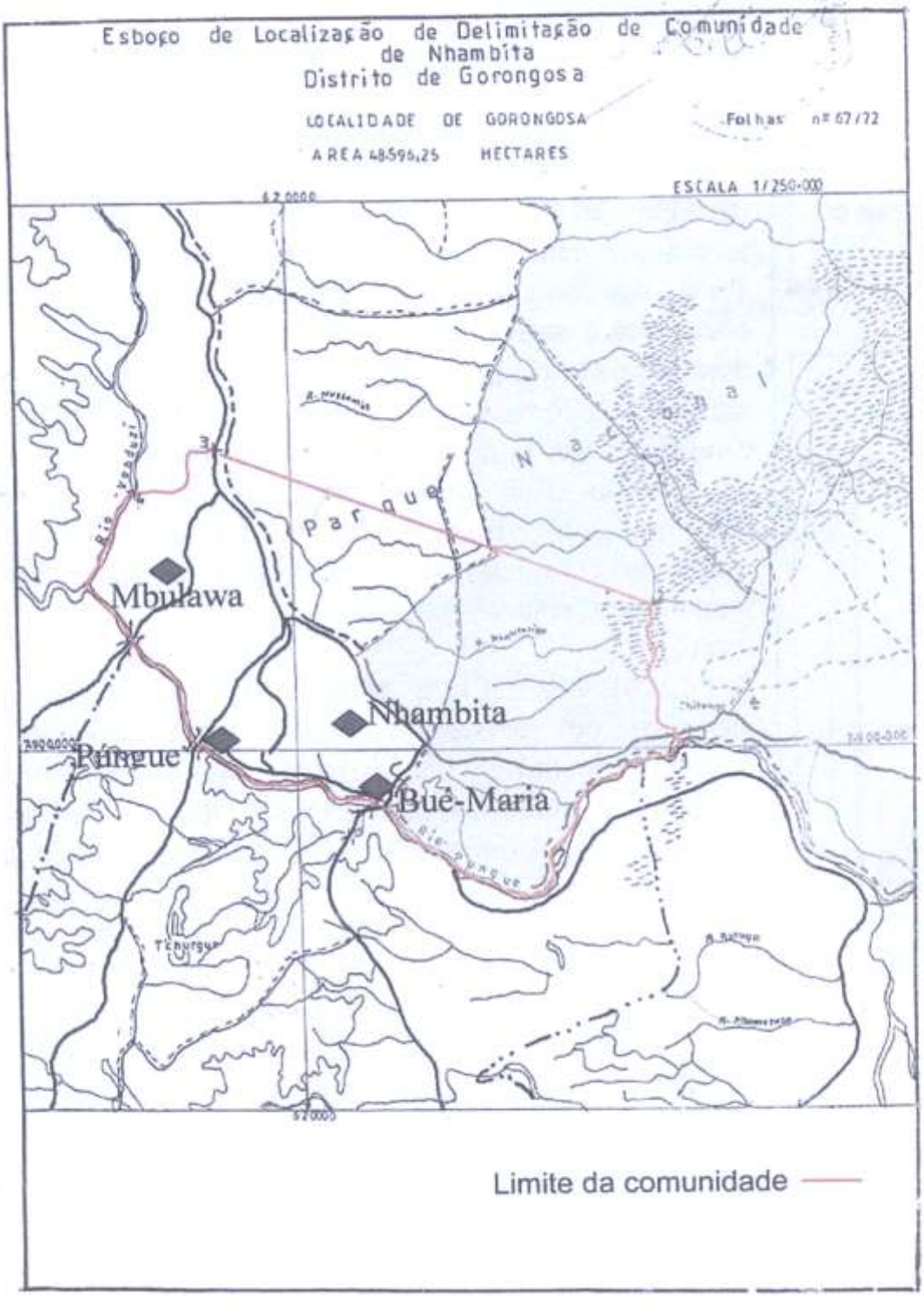
In the project zone, differences between people are not due to ethnicity. Rather, the word community denotes a geographical unit inhabited by a group of families. Thus, N'hambita, Bue Maria, Pungue and Mbulawa are only differentiated by the physical settlements within the Chicare Régulado. Today people in the old wards of Bue Maria, N'hambita and Pungue are mainly affiliated to the Catholic Church and those outside of the buffer zone in Mbulawa are affiliated to the African Apostolic Church. The most widely spoken language in the area is Sena, though many local people can understand Portuguese as well.
In N'hambita community families live in widely scattered homesteads, each with several buildings made of bamboo, grass and mud. Each family has some livestock (chicken, ducks, goats, pigs) and a few fruit trees (mango, banana, papaya) with a central area for cooking.

Population growth
The annual population growth, based on partial survey of the area, is estimated at 2.91% for total inhabitants and at 1.68% for the number of households between 2004 and 2009. However these estimates are not very consistent and the population actually surveyed is not clearly documented. A census carried out by Envirotrade in 2009 reports a total population of 6,449 inhabitants and 1092 households.

Description of agriculture
Most people in the project zone farm on two kinds of land – Machambas, which used to be forestland that has been cleared around homesteads, and Dimbas, which are flood plains of the various seasonal and perennial streams in the area. Usually Machambas are bigger than Dimbas; the average area of a Machambas is 0.94 ha, which is about twice as large as an average Dimba with an area of 0.49 ha.
Important food crops grown in the area include maize, sorghum, millet, cassava, sweet potato and pigeon pea. Most households also grow fruits and vegetables. The major problem in case of agriculture is low productivity, which is further exacerbated by frequent failure of crops in the dry season.
Most farmers still practice shifting cultivation using the slash and burn system, with no use of any manure or fertilisers. With no access to irrigation, most farmers do not produce enough from their farms and have to buy food.

Legal status
The Chicare Régulado applied for right over its land and the application was sanctioned by the Ministry of Agriculture in 2002. Since then the entire land in the Régulado belongs to the whole community as a common property resource while the Regulo and other local leaders have the power to allot small pieces of land to various families for subsistence farming. The N'hambita community now have legal certificate to land use, since the Project has worked closely with a Mozambique registered NGO ORAM and the community to register the communities legal status in terms of Mozambique land law.

COMUNIDADE DE NHAMBITA



Project history (based on information provided by Philip Powell of Envirotrade – Personal communication)

- Initial visit and contact with Roberto Zolho (Director) and Gorongosa National Park in 2000 by Robin Birley and Philip Powell. Discussions about the reconstruction of the park and possible assistance and involvement in economic development of the communities in this area.
- Roberto Zolho articulated the strategy and vision which the government had for the Gorongosa National Park and its reconstruction. Appeal for specific assistance – Buffer Zone and "Human Fence" idea to draw people out of the core protected area and reduce pressure on natural resources.
- Encroachment and resettlement of people had taken place during the Civil War with the collapse of infrastructure and management of the park and the fighting that took place in and around the GNP.
- Deforestation and unsustainable use of natural resources was threatening the natural resources. Illegal logging had already taken place in the N'hambita Regulado were high value species had been "high graded".
- Potential for short-term success for tourism was limited at this stage due to challenges in the GNP i.e. low animal stocks, infrastructure problems and recovery of Mozambique tourism industry.
- Robin Birley and Philip Powell began to search for possible solutions. Discussions with various people involved in conservation and ecology in the UK shaped thoughts on this.
- Investigations led to information about the successful and visionary Scol el Te carbon base project in the Chiapas state of Mexico.
- Birley and Powell established contact with the Edinburgh Centre of Carbon Management and through ECCM with the University of Edinburgh.
- Discussions with ECCM began in late 2000 about Chiapas and the possible application of some of the methods etc to Mozambique and Sofala.
- January 2001 – Joint ECCM/"Envirotrade" scoping study travelled to the GNP and buffer Zone Community and held consultations with stakeholders – this process was facilitated by the GNP. This scoping study was led by Philip Powell and Willie McGhee, Piet van Zyl, (was present as a consultant to Robin Birley) and Gus Hellier from ECCM . (This process was funded by Robin Birley and DFID).
- GNP management identified the Chicale Regulado (referred to incorrectly as N'hambita in all of the literature and studies) as community in need of direct assistance. Established contact with the people involved in the GTZ project which was ending and held discussions with community stakeholders
- Many problems in the community – NB see GEREFFA Study 1989 for detailed history of the community and its social and economic problems.
- Stakeholder consultations continued at various levels and community signed a letter of intent with us to develop a project proposal. .
- ECCM were commissioned to do a scoping study report and this was developed into a document that was shared with the University of Edinburgh. The idea was to roll out the DFID funded Plan Vivo methodology that was successfully working in Mexico to other countries including Uganda, India and now Mozambique.
- Worked with local consultant (Alan Shwarz) and GTZ to prepare the project design (Gilles Fressienel and Jan Kraft from GTZ). Had access to raw data of inventory carried out by Shwarz as part of the GEREFFA study.
- The project design process was commenced in earnest in the third quarter of 2002.
- Envirotrade registered as a UK based company 2002 around these and other initiatives.
- Envirotrade funded some trial activities in the community. Worked with a consultant and local stakeholders to start some demonstration and trial activities in the community
- Envirotrade registered first 60 farmers and mapped their *machambas* to set up Plan Vivo's (producer land use contracts) in N'hambita and surrounding wards in the Chicale Regulado.
- Seed collection programme began.
- GTZ and ORAM involved in the process of obtaining the DUAT and establishing the community association.
- Work closely with newly elected Community Association for Chicale Regulado.

- Start tree production in co-operation with the Forestry Department in Gorongosa. Some problems with an unreliable consultant and failure to deliver some trees. Moved to local production (Paulo Viage) and provided wages and basic tools as well as a small water tank for hand watering.
- Trial planting in the community commenced on a small scale.
- Stakeholder education process in the community about Plan Vivo and carbon concepts.
- Consultations with MICOA and Forestry Departments as well as with the Office of the Governor of Sofala (His Excellency Felicio Zacharias).
- Contact with University of Zimbabwe Miombo experts (Peter Frost) and with ICRAF through Professor Grace and ECCM
- Register Envirotrade Lda in Mozambique as local Mozambique project partner – non-profit operational entity for Mozambique.
- First sale of Carbon from the proto –Mozambique Plan Vivo project to Future Forests (UK based carbon retailer) in 2003/04. ECCM contracted by Envirotrade to do technical work for this transaction.
- EU project application by University of Edinburgh – prepared by ECCM and University become the principal project developer in the process.
- First contact with Telma Manjate (UNFCC Climate Change Focal Point in Ministry of Environment in 2003).
- First contact with Deputy Minister Dr Lidia Brito and World Bank Proto-Carbon Fund.
- Approval of the EU project application.

The EU funded phase started in 2003 and ran for five years, from July 2003 until July 2008. At present the Project is continuing to operate in the N'hambita community and has also expanded its activities in the neighbouring community of Mucumbeze. Currently the Project is funded by Envirotrade UK and by revenues from carbon offsets sales.

Technical analysis of Project activities and components

Agroforestry

The Project devoted most of its activity to the involvement of local communities in improving their agricultural system, halting the traditional use of the shifting cultivation (slash and burn) and increasing their livelihood.
In five years, a very short time for this ambitious program, the project team, represented by Envirotrade Lda, worked with encouraging results.
The consultancy visited many farms involved in the project, compatibly with the available time, and results were good, in fact, local villagers are generally respecting a discipline at single and at community level; the general impression was that their awareness has increased about the necessity of improving their farms, reclaiming the fallows and protecting the forest
One good point is that several technical specifications have been produced for different land use systems that farmers can opt to apply. Each farmer can adopt one or more system simultaneously or over time, thus adding flexibility.
In the present report the words 'technical specification' refer to the set of guidelines defined in the NPP Final Report. These are substantially derived from the Plan Vivo Guidelines and include.

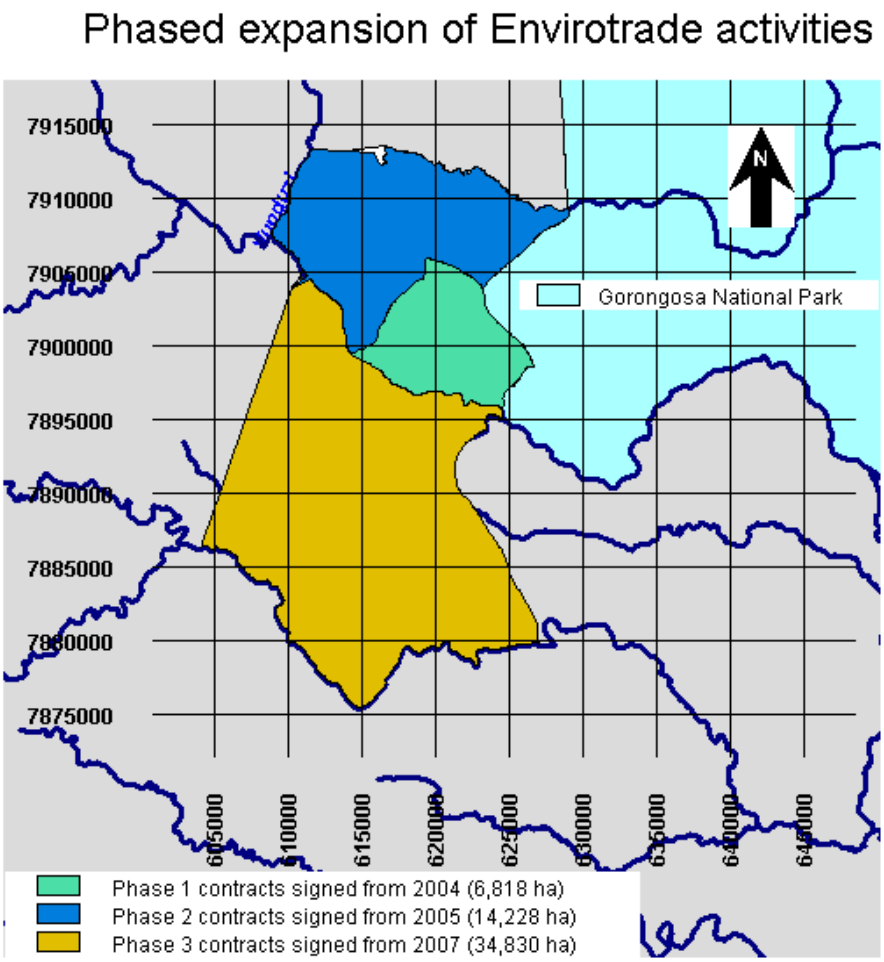
- Boundary planting
- Dispersed interpolating: *Faidherbia*
- Dispersed interplanting: *Gliricidia*
- Fruit orchard: Cashew
- Fruit orchard: Mango
- Homestead planting
- Woodlot

For Agroforestry, the Plan Vivo specifications have been basically adopted with a few exceptions (dispersed planting with *Gliricidia* has been discontinued) and a new module (avoided burning of the agricultural residuals) has been developed.

Technical specifications were also developed for avoided deforestation and forest management. The guidelines for the forest component are also derived from Plan Vivo, unless otherwise specified in this Report.

For each system, the NPP has also established quantitative indicators (area or perimeter planted, survival rates, growth rates, etc.) used for delivery of carbon compensation.

In 2008 the villagers involved in the project were 1,510 covering an area of 3,527 hectares and the Project has in fact expanded from the original area in N'hambita community into the neighbouring community of Mucumbeze.



Training of farmers

The participant farmers have been trained through training on the job on: seedling plantation and the systems of plant growing for boundaries, intercropping, forest enrichment etc.

Capacity building occurs through (i) short courses given by experts and (ii) training on the job. (Annex 9 Abstract of material for Training course related to re-forestation, boundary and intercropping plantation).

Some examples[4] include Agroforestry techniques such as:

- Tree planting
- Planning harvesting operations
- Drip irrigation
- Compost preparation
- Breeding guinea fowls
- Business training and bookkeeping

Propagation of seedlings, Vegetable gardens, Special nursery techniques

As already mentioned, 17 responsible and workers in the nurseries were trained in seedling rearing, soil mixing, seed collection: 4 in Mbulawa, 12 in N'hambita, 1 in Mr 'Papaya-man' nursery, 6 in Mucombeze, 6 in Ernesto's nursery.

Ten people have been trained in vegetable production techniques: irrigation systems (drip and pedal), conservation of products, compost production.

[4] Training materials and manuals in Portuguese available on site.

13 people coming from the above nurseries were trained in grafting: 3 trained at the beginning of the project in the South African mango farm (in Dombe/Rio Buze), became the trainers of other 10 skilled workers.
Training is given by extensionists funded by Envirotrade Mozambique

Intercropping
Intercropping has been carried out with Faidherbia and Gliricidia over around 400 ha, although planting of Gliricidia has now been discontinued for its exotic nature, the preference of Faidherbia is also for loosing its leaves during the crops growth season. Villagers who applied this technique of enrichment are satisfied, especially when they mixed these species with pigeon peas.
They prefer the intercropping with these species than using fruit-trees, because their most important production is coming from subsistence crops: millet, maize.

N'hambita Machamba reclaimed by intercropping with Faidherbia (2 years old)

Improved fallows, reforestation with fruit trees, planting of riverine areas,
Areas of fallows are under reclamation through plantation of fruit trees (Mango ha 666, Cashew ha 625); results are satisfying.
Villagers who planted fruit trees are showing their will to remain in the same area for long periods.
Besides, ha 625 of homesteads were planted with trees for timber or fruit trees and ha 100 have been planted along the boundaries.
Finally, ha 1111 became woodlots, planted with timber trees

Transformation of residual of cultivation in compost
An important new activity has been established for villagers producing maize and millet; normally farmers are burning the residual stems, but now 1357 villagers are convinced to reduce all residual from agriculture in compost.

Residuals of millet production will be used for compost

Participation analysis of results,

As already mentioned, all villagers and local authorities met by the consultancy, expressed their satisfaction for the activity of the project, showing also a good level of participation A Participatory Rural Appraisal started in 2007, aimed at verifying advantages and disadvantages of the agroforestry activities; the action should be followed by laboratory analysis on Nitrogen and other elements enriching the soil, at least during the first 3 years, on alternate year.

The gender participation to total agroforestry activities is the following: men 57%, women 42% and mixed groups 1%.

Extension techniques.

A team of 36 people is working in the project with the duty of extension, protection and support to all the project's activities; besides, 84 workers are practising seasonal labour

A program of training was applied and carried out following the different components of the project.

Special attention was given to the preparation of the technical and administrative group, which provided, by seeding system, to train all the project workers, and private farmers involved in project's activities.

Project personnel organisation:

17 extensionists community technicians trained, among others on: monitoring process, use of PC soft-ware to keep records, community negotiation, mapping process and correct use of the GPS, data processing, Plan Vivo technical specifications.

Fire management

Three people trained by GTZ on fire fighting, became the trainers of 12 skilled workers in fire fighting from Envirotrade technicians and 12 from the Community.

56 people were trained in firebreaks, early burning and patrolling.

Collaboration to the applied research

4 Technicians trained on: Tree identification, Biomass collection, Light sensing, Canopy cover, and leaf area index assessment (by hemispherical camera), Soil sampling, dendrometer reading

Nursery management

17 responsible and workers in the nurseries were trained in seedling rearing, soil mixing, seed collection: 4 in Mbulawa, 12 in N'hambita, 1 in Mr Papaya man nursery, 6 in Mucombeze, 6 in Ernesto's nursery.

All extensionists are currently employed by Envirotrade Mozambique, and their contribution is essential for Project activities. It is true that local community skills are improving but further assistance is needed in order to achieve self-sustainability.

Monitoring

For agroforestry a structured monitoring system is currently implemented, including frequent visits to farmers of Project's extensionists aimed at verifying the success rate of each activity (area planted, survival and growth rates). Carbon credits payments to individual farmers or groups are done in accordance with the quantitative indicators defined for each technical specification. All data for agroforestry are managed by Envirotrade Lda in the Project camp where a computer technician is using a well-structured spreadsheet that enables monitoring of the activities over time and the related carbon payments. Spatial representation of the activities has been slow but it is on going, using GPS coordinates recorded in the field.

Overall assessment of the agro-forestry component.

This component appears to have been carried out successfully. The efforts made for stabilizing farmers and to reduce the traditional practice of shifting cultivation were tangible during the field visit. If the effort is continued such activity may contribute to a substantial improvement in the socio-economic structure of the community and re-shaping of the landscape. However, the Consultancy pointed out that the major critical issue for the future agricultural dynamics is whether the intercropping with nitrogen plants and mulching are sufficient for the permanent maintenance of the soil fertility. During the field visit Prof. John Grace of University of Edinburgh presented some promising indications on the nitrogen content in improved machambas based on experimental plots. This research needs to be reinforced and continued.

It must be kept in mind that each soil needs two kind of fertilization: maintenance of the soil fertility, and fertilization devoted to the production of crops and fruits.

If one year the machamba is producing neither maize, nor millet, the family will abandon the farm for opening a new machamba, starting another time the process of shifting cultivation.

For this reason the consultancy is strongly recommending to continue the periodical verification of the soil fertility, started in early 2009, considering that its maintenance is crucial to allow villagers to become residential.

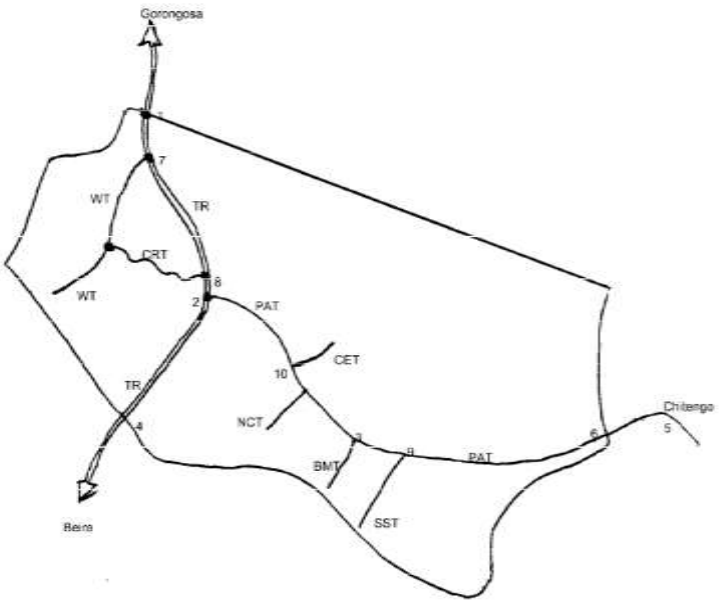
Forestry

Forest inventory

The following activity and actions were outlined in the Project Reports

Forest inventory will be carried out by community forest workers across the community forest area and will involve stratified random sample plotting to record species, basal areas, top heights and tree condition. The inventory will inform; timber utilisation through volume estimation and predicted yields, forest management through estimation of fire damage, seedling mortality and biodiversity loss and carbon conservation potential through tree volume data.

In practice a preliminary forest inventory was carried out in December 2003. Aim of the preliminary inventory was to characterize the forest resource in a broad sense and to establish a preliminary impression of the floristic composition. For this purpose 15 linear transects were established at right angles to various roads within the N'hambita community area road network. Transect were spaced at around 5 km distance.



In each transect a cluster with two squared plots of 0.25 ha (50 m x 50 m) were established, at a distance varying from 200 to 800 meters from each other. Field measurements included species identification (92 identified botanically), dbh, and height of 25% dominant trees.

Data processing and analysis produced
A forest classification into 6 classes, namely: Miombo (with 3 floristic sub-classes); Combretum woodland, Riverine woodland, and Combretum/Palm woodland.
Relative species dominance
Diameter / Height correlation
Basal area statistics

The following basal area statistics were computed

Forest type	n (No. of sample plots)	y_{mean} (mean basal area in m^2 ha^{-1})	SE (Standard Error in m^2 ha^{-1})	RSE (Relative Standard Error, %)	95% confidence interval
Total	30	8.2	0.852	10.4	(6.4, 9.9)
Group 1 (miombo)	7	7.4	0.653	8.8	(6.0, 8.7)
Group 2 (miombo)	6	8.5	0.703	8.3	(7.0, 9.9)
Group 3 (miombo)	6	9.9	0.925	9.3	(8.0, 11.8)
Group 4 (Combretum woodland)	4	3.8	1.319	34.7	(1.1, 6.5)
Group 5 (Riverine woodland)	5	10.5	4.43	42.2	(1.3, 19.6)
Group 6 (Combretum/ Palm woodland)	2	---	---	---	---

For some reasons the preliminary inventory did not produce volume estimations. Moreover, this activity is to be considered an explorative inventory and cannot fulfil the requirements of the Project in terms of timber sustainable production, biomass and carbon stocking baselines.
Successively the Project established 15 sample plots of one hectare each. These plots were located close to the locations selected in the Mushove inventory. PSP are constantly re-measured and contribute to research into miombo forests management issues.

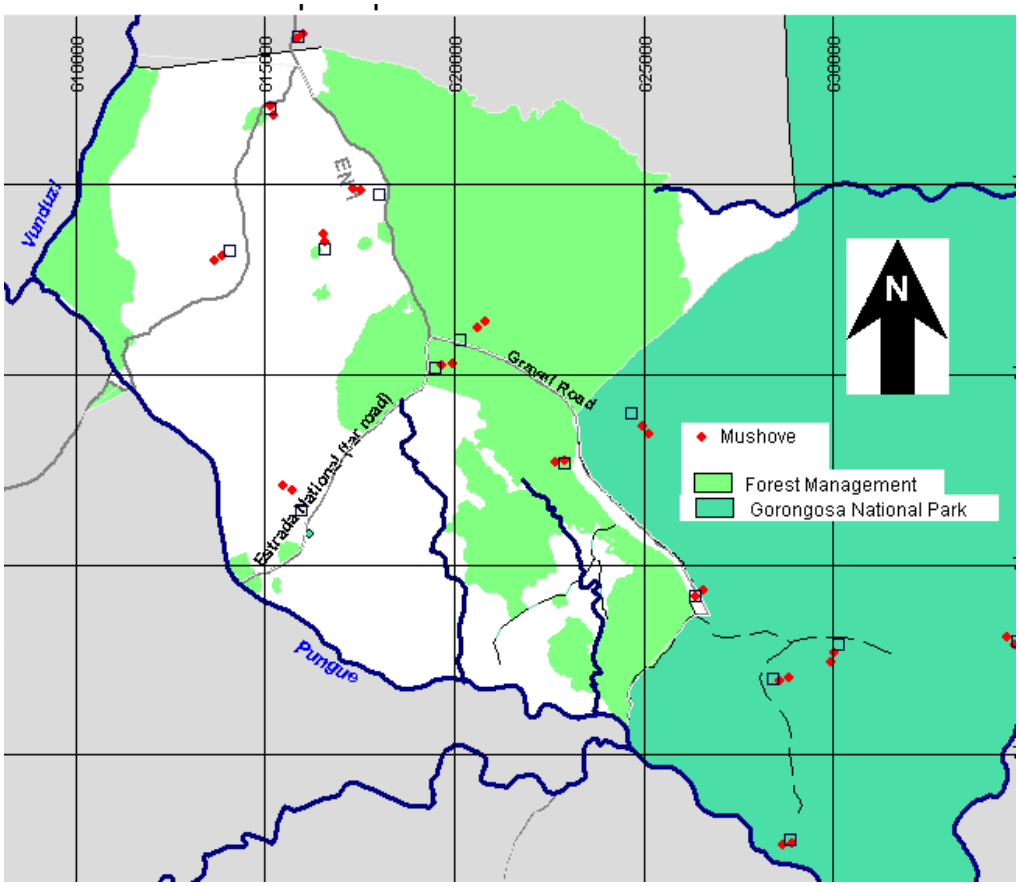
Successive inventories
In the Project final report (p. 151) the results of number of trees, basal area and carbon stocks per hectare are given, together with their statistical precision. However in the final report no indication is given about the source of data. During the field visit the evaluation team was made aware that the field data were not entirely measured in the project area, and that field observations were complemented with sample plots Zambeze delta and Parque Nacional of Quirimbas (Province of Cabo Delgado) where Envirotrade has undertaken similar projects.

Actually the forest inventory database is composed of the following observations:

Data source	Number of plots
Permanent sample plots	15
Marromeu	8
Qurimbas	6
Mushove	30
Machambas	1
Total	60

Comments: The sampling plots described above are not sufficiently representative of the Project area. The majority of samples (45 out of 60) are derived from Mushove and Permanent Sample Plots which basically share the same locations and are likely to be auto-correlated. Moreover the inclusion of data Marromeu and Quirimbas, located respectively nearly 200 km and 1,000 km North-East of N'hambita is

inappropriate. The claim that plots laid out in such area share similar ecological conditions of the N'hambita Project area is questionable for the biomass, carbon and biodiversity appraisal.



Location of 15 PSPs (squares).

Recently (June 2009) a new forest inventory was carried out by Prof. Falcão of University Eduardo Mondlane of Maputo. This new inventory was based on 50 sample plots using a stratified random sampling. Stratification was based on Saket vegetation map of 1994. However this inventory was mainly intended to estimate the timber production potential and Annual Allowable Cut for merchantable species. It seems to be incompatible (at least for the minimum diameter used) with the previous studies.

Overall assessment of forest inventory activities: The consultancy considers the forest inventory component of the Project too weak. The successive forest inventories carried out are unsystematic and the importance of a solid inventory for implementation of forest management, baselines and estimations of potentials for carbon offsets has been underestimated. Moreover it was surprising that in spite of the increased fieldwork undertaken by the Project staff for the forestry component, the technical specification given by the Project itself have not been applied. For instance the Final Report shows some statistical calculation of the variance and estimates that around 90 samples are needed to achieve a precision of 10%. The consultancy believe that, the execution of 100 plots of around 500 m^2, systematically distributed over the entire forest area would have been sufficient to produce sound inventory results. Given that the forest area of N'hambita is estimated at around 10,000 ha of forests, that would imply a sampling grid of 1x1 km approximately. A correct stratification would certainly improve the statistical precision of the results.

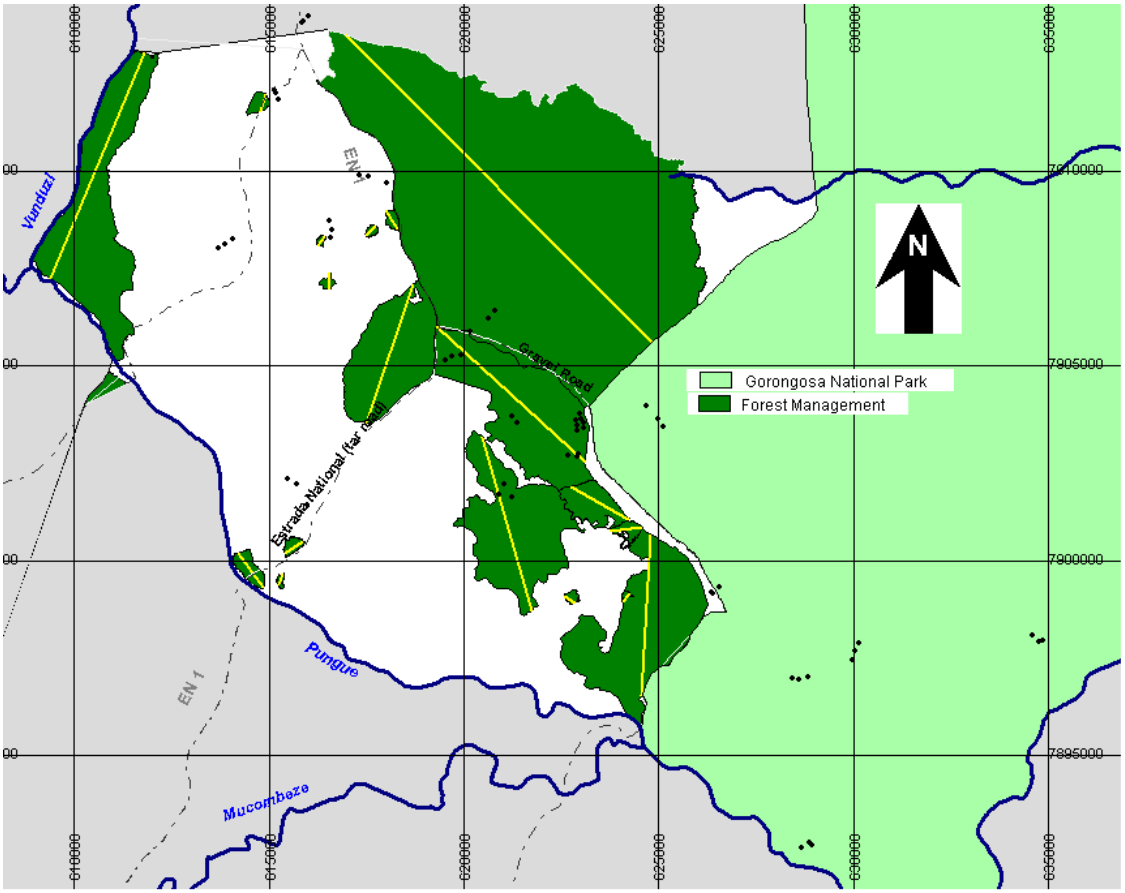
Land use and land cover mapping

The Projected attempted to produce a vegetation map of the area using Landsat imagery using unsupervised digital classification (Spadavecchia, 2004). However the technical results were considered

insufficient by the Project since they showed poor correlation with field data and the activity of forest mapping using remote sensing was discontinued. A document provided by Prof. John Grace [5] during the field mission explains the reasons as follows

- *The project decides to calculate carbon stocks with a classification methodology that does not use satellite imagery. This is for the following reasons:*
- *A simple method is needed that the community and Envirotrade can implement, without image processing and GIS resources*
- *Robust classification based on optical imagery seems to be unachievable. This view is reinforced by the work of Jaiteh (2008).*

As a result the Project decided to use ground-based stratification using point transects in the forest management areas. Ground transects were used to estimate the fractional cover of each land cover class in the area designated for avoided deforestation.



Map of ground transects for forest areas calculations

Comments: The Consultancy wishes to express its perplexity on the way area estimates and mapping were carried out by the Project. The claim that a robust land cover classification is unachievable with optical sensors satellite is not endorsed by the Consultancy. Visual image interpretation has been widely used in wet and dry tropical zone [6]. Specifically the AIFM Project (Integrated Assessment of Mozambican Forests 2005-07) produced a national land use / land cover map for the entire Mozambique, using visual

5 Timeline of work on the estimation of carbon stocks (additional document prepared for project evaluators, August 2009, Nhambita)

[6] FAO – Forestry Paper 130

interpretation of Landsat imageries [7]. The precision achieved by AIFM was between 87 and 86% for provincial and national level respectively. It is felt that such levels of precision could be achieved in N'hambita, working on very small areas (20,000 ha). In this case a nominal scale of 1:50,000 could have been used even with Landsat TM which is cheap. Use of more detailed satellites (SPOT, Quickbird, IKONOS, etc.) could have also been explored. For instance during the field visit the Consultancy produced in Maputo a false colour composite at 1:50,000 scale of N'hambita which was successfully used during our fieldwork.

The absence of a land use/land cover maps is likely to affect negatively not only the correct area estimates but also a proper synoptic vision of land use dynamics in the area both in space and time. The use of ground transects for area estimation is prone to errors and not statistically sound (risk of bias). A correct vegetation map is also the basis for a proper land use planning. The consultancy wishes to clarify that the technical comments are not intended to undermine the Project activities. They are rather made to identify critical issues and suggest solutions aimed at improving the overall efficiency.

Biomass and carbon estimates

Biomass survey

Proposed activity

Biomass surveys will be carried out to quantify the standing carbon stock of different land use systems in the project area and the rate of accumulation of carbon by these systems. Biomass surveys will measure biomass in various carbon pools such as timber, foliage, roots, soil carbon etc. The design of surveys will ensure that all carbon pools expected to change will be measured.

Carbon stocks for the main forest types were calculated using an allometric equation, specifically developed for this purpose. Samples of 29 trees of seven common species were measured and destructively harvested. The root systems were excavated. Biomass was oven dried. For above ground biomass, the following function was best suited to convert tree dbh into biomass:

$y = 0.0267d^{2.5996}$; R2 = 0.93; n = 29,

where d = diameter at 1.3 m above the ground is measured in cm, and y = the biomass in kg C.

A further study on the destructively sampled the trees in the area determined the root shoot ratio a ratio of 0.42 of the above ground biomass was determined. The carbon density of major species was determined by measuring the dry mass and fresh volume of a small sample (Willams, Ryan et al. 2008. Further information on density was obtained from Bunster (2006). Wood densities vary between 0.13 and 0.73.

The allometric equation above was used to calculate the carbon stocking of N'hambita and the results were as follows:
Estimated carbon stocks and Standard Deviation in above ground biomass of woodland areas in Sofala province (Grace et al. 2007).

Vegetation category	Mean values and ± Standard Deviations			
	Number of trees per ha (N)	Basal area per ha (m2/ha)	Carbon stock (tC per ha)	Number of samples
Miombo woodland	406 ± 253	10 ± 3.2	27 ± 13	26
Savanna	386 ± 275	5.8 ± 3.9	14 ± 10	10
Riverine forest	421 ± 167	13.8 ± 3.3	47 ± 18	6
Secondary woodland	561 ± 255	8.0 ± 2.0	13 ± 9	17
Machambas	38	2.4	2-8	1

[7] Jansen et al. 'Satellite image interpretation of land-cover types in Manica and Maputo at nominal scale of 1 :250,000 and at National level at nominal scale of 1 :1,000,000' – Agriconsulting, 2007)

Comments: The equation gives the total carbon stock tree (y) as a function of diameter at breast height (d). This procedure is a bit unusual as generally, in similar studies, carbon contents are derived from total above ground biomass, applying a conversion factor from biomass to carbon (generally equal to 0.5). However no specific objections are made on estimating directly carbon contents from allometric equations. What can be said is that the number of samples used (29) is low. The major drawbacks are the lack of reported calculations for total (or stem volume) and total above ground biomass, which could facilitate the comparison with other regional of national baselines.
In this respect, an attempt was made to compare the carbon estimates given in the N'hambita Pilot Project with the results of a national forest biomass survey carried out by the Availaçao Integrada das Florestas de Mozambique (AIFM) (Consolidation Phase – Wood Energy Component WISDOM Mozambique Final Report, Rudi Drigo 2008). Using AIFM results for samples carried out in Sofala and Manica provinces, and corresponding to miombo forests in similar ecological conditions, the following results were obtained for total above ground biomass

Stratum	Number of samples	Mean	Lower bound (95%)	Upper bound (95%)
Miombo dense	82	34.6	29.2	39.9
Miombo open	144	26.2	21.8	30.6

Assuming the conversion factor from biomass to carbon of 50%, the results of AIFM can be translated into carbon values of 14.6 – 20.0 TC per hectare for miombo dense, and of 10.9 – 15.3 TC per hectare for miombo open. These estimates are lower than the value the 27 TC per hectare used throughout the N'hambita report for miombo. However no conclusive evidence on the carbon contents in N'hambita project area can be derived. For the final carbon stock calculation of all 21 Protected Areas, the 95% confidence interval is estimated by the NPP at about 20% of the mean. For a conservative estimate it is advised to use the the lower confidence limit (80% of the mean).

Carbon baselines

Definition of baselines

A fundamental, and challenging, component of land use, land-use change, and forestry (LULUCF) projects is the determination of the extent to which project interventions lead to greenhouse gas (GHG) benefits that are "additional" to *business-as-usual* scenarios. This is a key step in the development of LULUCF projects, particularly under the Clean Development Mechanism (CDM), to ensure accurate crediting of their carbon impacts. Determination of "additionality" requires projection of realistic without-project baselines against which changes in carbon stocks resulting from project activities can be compared. A key issue therefore, is how to choose a baseline scenario that "reasonably represents" the net emissions without the project.

A baseline has two components: the present carbon stock and projected land-use or land-cover change and the corresponding carbon stocks.

Carbon stocks:
In the NPP carbon stocks for the main vegetation types were estimated using the methodology described above, where carbon stockings are calculated for each vegetation type. The NPP Final Report (p. 282) states:
Once the area of each land cover type has been determined for the management area, the total C stock can be determined by the following equation:

$$Ctotal = \Sigma Ai \times Ci$$

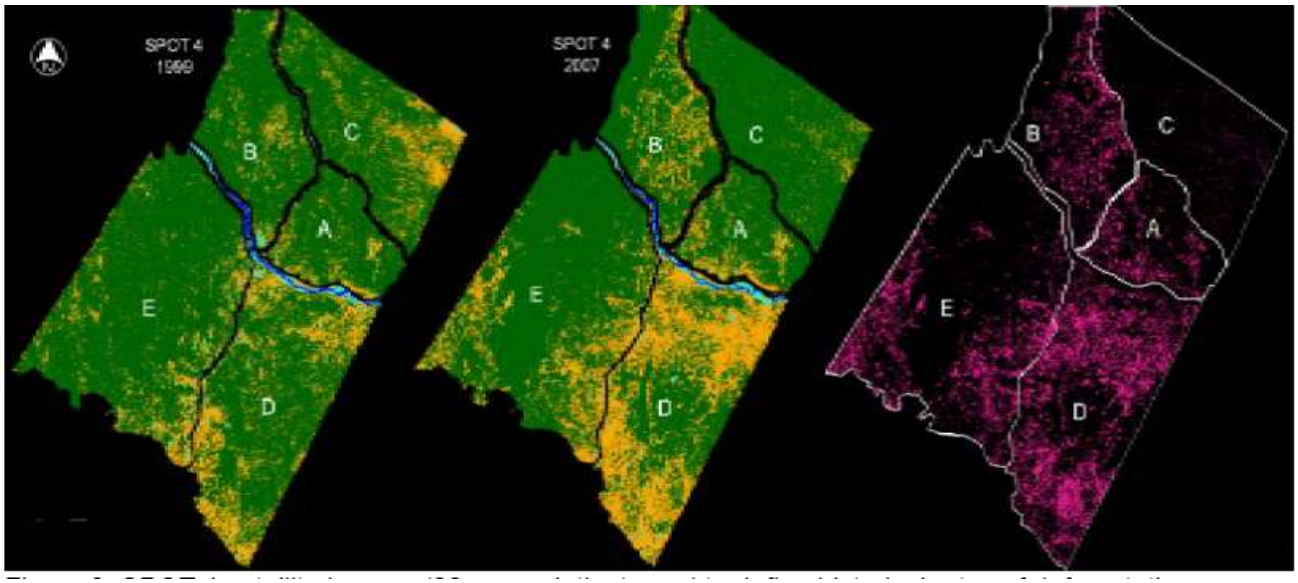
Where C_{total} is the total C for the management area (Tc), A_i is the area of the land cover type (ha, where i=1 to 5 vegetation strata,) and C_i I the mean C stock for land cover type i (tC ha^{-1})

In fact, carbon calculation described for Plan Vivo specifications, are based on a hypothetical surface with 75% of miombo, 20% of savanna and 5% of riverine forest. It is understood that Project research on this topic is on going and that calculations are being improved.

Projected land-use or land-cover change

Extracted from NPP (Final Report)

Future deforestation in the absence of project activities was estimated by projecting historical deforestation rates into the future. Depopulation occurred in the project reference area during the civil war in the 1980s and a process of re-population has been ongoing since the mid 1990s when the conflict ended. To avoid underestimating the rate of deforestation the timeline for analysis of historical land-use change was therefore restricted to the period from 1999 to 2007. The satellite images used to define the historical rate of deforestation in the project reference area are shown in the next figure.



SPOT 4 satellite images (20 m resolution) used to define historical rates of deforestation (Flaherty 2008). The zones are: A, N'hambita, Bue Maria and Posta Da Pungwe; B, Pavua and M'Bulawa; C, a buffer zone only sparsely inhabited, and south of the river Pungue; D, Mucombeze; and E, part Mucombeze and part Pinganganga (the latter falls into Manica province). The land area represented in each image is 67,754 ha. In the images, green represents woodland cover, yellow is non-woodland, and purple denotes areas that were woodland in 1999 but were non-woodland in 2007 (i.e. deforested areas).

Zone C was excluded from the analysis of historical land-use change and calculation of the baseline rate of deforestation because it falls largely within the legally protected area of the Gorongosa National Park and is therefore not subject to the same deforestation pressures as the unprotected areas of miombo woodland.

The total land area of zones A, B, D & E (the project (baseline) reference area) is 55,605 hectares. Of this area, 48,952 hectares supported woody vegetation in 1999. Remote sensing data and ground observations indicate the area of woodland in zones A, B, D & E was reduced to 39,473 hectares by 2007.
This represents a mean annual historical decrease in woodland area of 1,185 hectares, which equates to an annual loss of 2.4% of the woodland area that was present in 1999.

This annual loss of 2.4% of the initial area of woodland in a project area is therefore adopted as the likely rate of deforestation in the absence of project activity. This rate of deforestation would result in the complete loss of an area of woodland in 40 years. The assumption that the annual area deforested would remain at least as high as this in the absence of intervention is justified for the following reasons:

1. The demand for charcoal is a key driver of deforestation and is likely to increase with future growth in urban populations and increases of urban incomes.
2. Clearance for machambas is likely to increase as road networks improve and as the demand for food, and possibly biofuel continues to grow.
3. The expansion of charcoal production and agricultural activity is likely to increase the frequency of fires inhibiting the regrowth of miombo woodland.
4. The area continues to attract new settlement and this pattern is likely to be further encouraged by better amenities as the local economy improves.

Comments: The estimated annual rate of deforestation of –2.4% per year is used by NPP for defining the projected land cover change under the baseline scenario. The estimated rate is high, as it would lead to a complete destruction of forests in the area in around 40 years. It is difficult to judge if the figures presented are correct. Of the two components needed for baselines, the projections of changes in land use are the most uncertain. The projection of the past trends into the future is implicitly assuming that the current drivers of deforestation will remain the same both quantitatively and qualitatively. However this may not be the case as socio-economic variables such as demography, poverty etc. may change in future, especially when a long time span is considered.

Coming back to the analyses of SPOT satellite images presented above, the spatial progression of deforested area seems realistic, with deforestation taking place along major roads and rivers, due to expansion of subsistence agriculture and charcoal production. The estimated deforestation rate has been compared with the results produced by AIFM Project, where a special study on land cover and land use change for the entire Province of Manica. This study was carried out using inter-dependent interpretation of Landsat imageries of 1990 and 2004 and produced gross and net deforestation rates and change matrices (class to class transitions). For Manica, the net deforestation rates were –1.3 % per year for dense forests and of –0.32 % per year for open woodlands. Overall rate for forests and woodlands was –0.81 % per year. Such rate is considerably lower than the one estimated for N'hambita, however the two rates cannot be directly compared. The Manica study covered the entire Province, extending over 6.2 millions ha, of which 3.5 millions are forests. The study revealed considerable differences within the Province with areas relatively stable and other areas subject to rapid deforestation (hot spots). The area around N'hambita can be considered as a hot spot for deforestation due to rapid population growth and proximity to two National roads, thus the deforestation rates are expected to be higher than in Manica.

A spatial analysis should have taken place estimating where deforestation is expected in the future based on the drivers of such deforestation (provides indication of where threat is coming from--high to low threat). Several explicit models for such analyses exist in literature, and typically make use of different future scenarios, which can be adapted over time to different conditions.

The Project Final Report addresses the issue of spatial distribution of deforestation under the baseline scenario, stating (on page 270)

Although there is spatial variability in the drivers of deforestation, evidence from the N'hambita reference area indicates that the likely distribution of future deforestation can be determined by consideration of some simple criteria. Tracts of land that are Accessible, Cultivable and/or have Extractable value, and are effectively Unprotected (ACEU) are likely to be deforested over the next 40 years (Tipper 2008). The ACEU criteria as they apply to the project reference area are shown in the next table. These criteria should be used to determine whether the woodland in potential project areas would be likely to be deforested in the absence of project activities. If the area does not meet the ACEU criteria the threat of deforestation is relatively low, and it should not be included in the project.

Interpretation of ACEU criteria for woodland in the project reference area (Tipper 2008).

ACEU	*Criteria*	*Justification*
Accessibility	*< 8 km from road or track*	*Topography is relatively flat and the extent of deforestation in areas < 8km*

ACEU	*Criteria*	*Justification*
		from roads or tracks is significantly greater than in areas > 8 km from roads or tracks (Walentin 2006).
Cultivable or Extractable value	*All miombo woodland*	*Virtually all miombo woodland may be cultivated under machamba systems or converted to fuel wood or charcoal*
Unprotected	*Outside the core areas of Gorongosa or Marromeu National Parks.*	*Gorongosa National Park has effective conservation policies and little evidence of historic deforestation.*

The technical specifications described in the Final Report under avoided deforestation also define the following steps for quantifying expected emission reduction

Step	Description
Step 1.	Define the boundaries of the specific project area.
Step 2.	Determine the tracts of woodland within the project area that meet the ACEU criteria
Step 3.	Categorise the ACEU woodlands into the vegetation categories.
Step 4.	Estimate the carbon stock of the ACEU woodlands using the default carbon stock values for the vegetation categories.
Step 5.	Calculate the change in carbon stocks from deforestation based on an 85% reduction in carbon stocks on deforested land compared to woodland.
Step 6	Calculate the emissions that would be avoided if the project succeeded in reducing the area deforested to 75% of the baseline scenario.
Step 7.	Calculate the emission reductions eligible for crediting and payments as 90% of the emission reductions expected under the project scenario.

The Consultancy acknowledges that the ACEU approach, derived from Plan Vivo Specifications is in principle correct.

The main point is that those specifications were not fully implemented. In particular the ACEU / Forest management technical specifications dealing with

- Map of the Project area at 1:50,000 scale showing extent of vegetation categories within project area
- Location and extent of other vegetation types (outside carbon offsets areas)
- Delineation of compartments or divisions within the woodland where management for different purposes (e.g. sustainable charcoal production or strict conservation) are planned

During the field visit the NPP made available some sketch maps showing the location of the forest to be protected for avoided deforestation. However no spatial delineation or tabular statistics of overall

management units were made available to the Consultancy. Given the objectives of the Project a precise qualitative and quantitative definition of land management units is a priority.

The use of RADAR imagery was appreciated but seems quite in an experimental stage. The results presented show an attempt to calibrate RADAR response and ground vegetation. The research is ongoing and no conclusive statement can be expected from the Consultancy.

Not only biomass densities are needed but also land use / land cover definitions (forests, degraded forests, long fallows, short fallows, permanent agriculture, etc.) and their dynamics are crucial for carbon baselines definition and modelling.
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On-going Project activities and research on carbon management

During the field visit the consultancy had the opportunity to appreciate the several on-going activities aimed at improving the carbon management component, including the definition and delineation by GPS of boundary coordinates of the forest areas identified for avoided deforestation. This activity was carried out in consultation and with the participation of the local communities.
A total of 10,296 ha representing 6 blocks were mapped covering all wards of Chicare community.

Proposed community protected areas: Chicare Regulado

Block	**Wards**	**Size (ha)**
A	Vunduze	1,000
B	Mbulawa/Mudoda	6,201.81
C	Nhambita/Mucinha	733.02
D	Nhambita/BoeMaria	850.15
E	Mucinha/Munhanganha/Nhambita	713.48
F	Pungue	797.41
	Total	10,295.87

The area of protected community forest was determined by the amount of forest without habitation or agricultural production and varies between about 700 ha and 6,000 ha. Six forest blocks were mapped giving a total of 10,295.87 ha.

In addition to the community forest areas the Committee has also mapped other areas that fall outside of the core areas as required by the Technical Specification. These include the forest area around Project Offices which comes to 133.41 ha. Also various individuals in the community have agreed to set aside forested areas that fall within their *machamba* network for conservation purposes. This area in total is another 642.67 ha. The 12 individual/private blocks varies from 2 to about 500 ha. The strategy behind the incorporation of these individuals' areas into the plan is to encourage farmers to protect the forest adjacent to their croplands or home and contribute to sustainable resource management. By involving the individuals with their small blocks of land it is hoped they will begin to realize the benefit and incentives of their forest, this will minimize the possibility that they will sell the land for a short-term benefit to charcoal burners.

Below follow the areas mapped for individual and small private groups.

Chicare Protected Areas - Individuals			
Name	Area (ha)	Perimeter (m)	Ward
Castiano	22.14	1,894.03	Pavua
Serra	494.48	9,834.18	Mucinha Velho
Envirotrade camp area	133.41	5,409.76	N'hambita

Chicare Protected Areas - Individuals			
Telix	4.57	894.96	Pavua
Sakki	30.52	2993.15	N'hambita
Paulo Sozinho	3.71	940.97	N'hambita
Chico Joao	2.45	658.3	Mucinha Velho
Mario Chimuaza	2.18	671.64	Mucinha Velho
Neto Chimuaza	9.14	1,507.83	Mucinha Velho
Costa Pereira	43.20	2,876.38	Pungue
Raimundo	8.80	1.380.59	N'hambita
Luis Felix	4.93	1,098.83	Pungue
Ernesto Seda	16.55	1,915.55	Pungue
Total Forestry for Individuals	776.08	30,695.58	
Total Forestry for Chicare	11,071.95		

The community are still looking at other areas that possibly could be come part of the protected area.

Additional on-going or forecasted activities related to carbon stocks management

- Improvement of carbon stocking estimates using area information derived from the ground transects described above.
- Formalization of a Memorandum of Understanding between the Mozambique Carbon Livelihoods Trust (Envirotrade) and the University Eduardo Mondlane to annually monitor community forest management programme against a technical specification in designated areas (signed in June 2009)
- Research on the use of radar based imagery (Japanese ALOS data) for estimating forest biomass.

Comments: The Project activities for carbon management are still on going. It seems that the Project is trying to improve some of the critical issues identified in the past by independent reviewers like ODI (forest areas, carbon stocking, baselines). This is a good sign and it is expected that the major drawbacks identified will be resolved in the future. However, such corrections are very recent and took place after the EC Project termination and were not, to our best knowledge, included in the technical documentation submitted to the EC by the Project at the end of 2008

Forest management plan

The importance of a forest management plan is paramount in NPP. The Project has devoted 2 guidelines for its preparation as detailed in the Final Report, namely a) Plan Vivo technical specification – Reducing greenhouse gas emissions by avoiding deforestation of Miombo woodland in Central Mozambique (page 260/280), and b) Forest Management Plan (page 310/340). An updated version of the forest management plan document was obtained during the field visit 'Forest Management Plan – Gorongosa Project' A Serra, A MacCrimmon, P van Zyl , P Powell –Envirotrade, November 2008.

The Consultancy finds the guidelines presented are of good quality and in general appropriated for the nature of the NPP. However, the existing guidelines have not yet been fully implemented and a veritable Forest Management Plan (FMP) has not been correctly prepared, In the Consultancy opinion a Forest Management Plan should be comprehensive of the following elements..

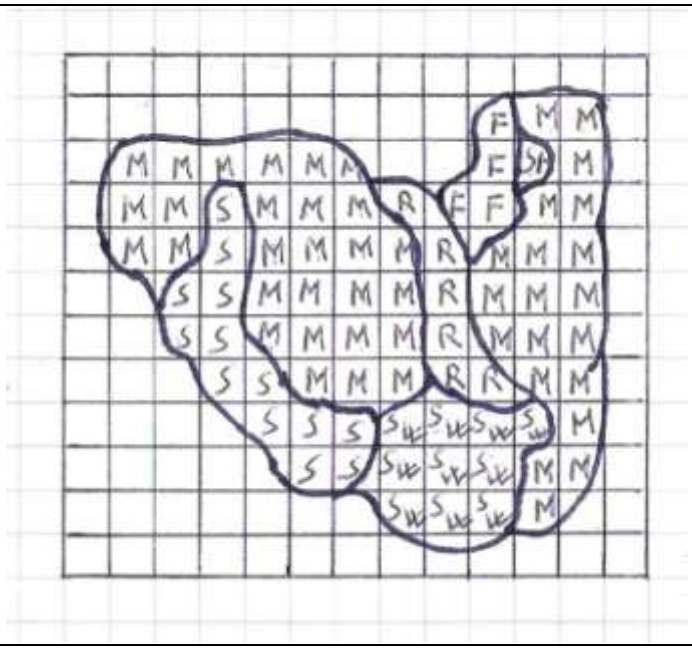
- Land cover
- Forest inventory, biomass and Carbon stocks
- Sustainable timber production
- Fuel wood and charcoal production

- Land use change and avoided deforestation
- Fire management
- Multiple uses of forests (tourism, recreation)
- Non Timber Forest Products
- (…)

And the main building blocks of the FMP are the following:

One map in scale, 1:50000 at least, should be prepared with the exact extension of the forests managed. This map can be prepared on site or in Maputo, in some professional organization or cooperation with the Unidade de Inventario Florestal. The consultancy provided a copy of a Landsat imagery (False Colour Composite 1:50,000) to the Project to encourage the start of this activity
The Forest Management Plan should include all the forestry area, not only the area under Carbon sequestration, because some activities of leakage could not be implemented outside of the protected areas (fires, encroachment, charcoal production first of all)
The first field activity should be the stratification, with related surface transferred in the map: different kind of forest (Miombo woodland, Savannah, Riverine Forest, Secondary woodland, Fallows to be reforested). The presence of other communities or private lands should also be put in evidence.
The next step is the division of forest in productive (High Forest and Coppice), and forest under protection (e.g. Forest for Carbon sequestration or areas protecting soil erosion, springs or groundwater table).
Considering the boundaries already marked, related to the first stratification, all the forest should be divided in homogeneous parcels[8].
Each parcel is considered as an independent forest, where carefully are studied the environment, the silvicultural activities, possible afforestation or enrichment, infrastructures including firebreaks, soil conservation, NTFP, possible Carbon sequestration etc.

Concerning the evaluation of the growing stock, today is preferable to proceed by sample plots (temporary or permanent, but always geo- referenced through GPS).
IPCC Good Practice Guidance for LULUCF (Chapter 2 Land areas page 2.13) is advising a good and simple system for establishing a correct stratification and a justified number of sample-plots-SP(scheme below)
Example: SCHEME FOR ESTABLISHING A NET OF SAMPLE PLOTS (the forestry map 1:50000 is divided in squares of 25ha = 1cm^2)



[8] Considering the vegetation of the area the average dimension of each parcel could be around 75Ha

M=Miombo woodland, S=Savannah, R=Riverine Forest, SW=Secondary woodland, F=Fallows, St=Settlement

It is better to choose small circular sample plots(500m^2 , radius=12.616cm= ~12.62cm.) than big sample plots more useful for scientific researches; besides, it should be better the systematic location than randomization of Sample Plots. In N'hambita area the intensity of Sample plots could be m ^{2}500 each 25 ha in forestry areas – Miombo and Riverine Forests, while could be m ^{2}500 each 50 ha in Savannah and Secondary woodland. However these indication are only tentative and should be drawn on a reliable vegetation map of the area.
Another important term to be established is the "Model or Normal Forest", the ideal climax model to be reached or at least to be approached.
A survey in the most isolated parts of the forest or in Gorongosa Park, should allow to find a portion of the less damaged forest to be examined at level of present species, number of stems, the growing stock, the current increment, the Carbon stored, above and underground and biodiversity indicators.
The establishment of the Normal Forest is also useful for the evaluation of the annual yield (or Allowable Annual Cut, AAC) to be harvested.
Partial Savings of the annual increment can allow to approach the Normal Forest.
Each action in the forest such as harvesting, reclamation, fire protection, damages, should be subject of monitoring
The advised duration of a FMP is 10 years with intermediate evaluation after 5 years. During the next 10 years of validity of the FMP some adjustments could be necessary.

Comments on forest management
All forested areas of N'hambita (and of other involved Communities, such as Mucumbeze) must be included in Forestry Management Plans.
This decision is aimed at avoiding problems of "Leakage" in areas not correctly managed, especially for charcoal production or for their illegal transformation in machambas
In view of future scenarios the production of timber from the forest should be divided between wood for charcoal production and saw-timber.
In conclusion, the sustainable timber extraction from a forest under FMP is represented by a portion of the forest growth, harvested following some silvicultural rules, as follows

- Big trees dominating groups of saplings or young regeneration
- Died wood or trees damaged by weather
- Trees of medium size, growing in high density
- Poles during silvicultural practice of thinning
- Shoots from coppices for charcoal production

The annual yield should be calculated as a percent of the annual increment; in fact the annual increment must be partially saved for the enrichment of the forest, while another part can be harvested, following the previous rules.
In N'hambita Project the current annual increment (CAI) was estimated between 1 and 3 m^3/ha/year).
Considering the potential (tropical deciduous forests, mainly of Miombo type), the previous increment seems a bit optimistic, calculating also some loss due to the periodical drought, fires, and tree theft.
The consultancy advises to apply the prudential annual increment calculated for Sofala by AIFM in 2008 (Avaliação Integrada das Florestas de Moçambique – Inventàrio Florestal Nacional) Annual Increment = $m^3$1.19/ha/year.
The consultancy advises the annual yield= 30% of the Annual increment=m^3 0.36/ha/year.
Considering a productive forest of ha 10,000, the total amount of annual yield= 3600m^3/year, including all species.
The main conclusion that can be drawn is that on the positive side, inventory work is still on going in N'hambita, but the negative side is that forest inventory activities, including the FMP, carried out by the Project are difficult to evaluate. The same time spent for PSPs and for transects could have given better results if employed in establishing a correct forest inventory and an effective Forest Management Plan.
It is important to remark that the FMP should be, to the extent possible, comprehensive of all aspects of forestry. It should form the basis of a sustainable land use planning, taking into account forest

conservation (and the related carbon offsets generation), together with the growing demand from local populations (demand for new area for machambas, charcoal production, etc). It is felt that a sustainable land-use management cannot be achieved only by prohibiting certain activities (deforestation, charcoal production, etc.) but these should rather be directed and organized keeping in mind the potentials of the land under management.

It is understood by the Consultancy that the preparation of a comprehensive forest management plan is demanding in terms of resources and time. It is also true that, from experience, in Mozambique the so-called 'forest management plan' are generally directed to sustainable logging and Annual Allowable Cut only, mainly for Forest Concession. Nevertheless, the Consultancy considers that a comprehensive forest management plan could represent a considerable advantage, also in terms of visibility, for a Pilot Project.

Timber production

From 2005-2007 all logs sawn were dead logs recently dead from fire wind or old age. The advantage is that timber and therefore boards were seasoned and have low moisture content and therefore are suitable for immediate use in the Carpentaria.

In 2008 a licence was obtained by the community to log Mbaua, Mbila and Panga Panga +/- 40m^3 logs were felled and +/- 8 m^3 await extraction from this licence. A new licence is currently being processed for 2009 and a logging plan is being prepared with assistance of University Eduardo Mondlane. All logs are sawn in the processed in the local sawmill. The annual capacity for the local sawmill is estimated at 75 m3/year.

Forest Fires control

The awareness of villagers has increased about the forest protection from fires. Besides, the project has trained a team of fire fighters who are protecting the forest, through the implementation of a net of firebreaks. Each year the technique of early or controlled fires is applied, with encouraging results.

Nevertheless the consultancy would like to underline the following important topics:

An effective monitoring of the fires could be carried out in collaboration with Unidade de Inventario Florestal (UIF), which has in its archives, the periodical observations (every 10 days over at least the last 5 years). The UIF is receiving regularly fire location data from the University of Maryland, based MODIS satellite thermal sensor. An agreement with UIF could be beneficial to integrate forest fire monitoring, and to obtain an independent assessment.

Early fires should be monitored about the possible damages to the young regeneration of all species of the forest.

An agreement should be found with the National Park of Gorongosa, because the early fires are frightening the wild animals, which are trying to leave some areas of repopulation

Charcoal production

An effective action was started by the project in 2007 (see Annex 4), aimed at preventing further damages caused by the illegal and irregular charcoal production. The following terms of reference were established (Sustainable Charcoal and Landscape Management Chicare Regulado):

An agreement has been established with the forestry authority, to prevent illegal licenses of charcoal production

The charcoal will be produced in the area by the residents only

A training and education process for stakeholders was supported by WWF Mozambique prior to 2007.

A strategy on charcoal production was established about the zoning, alternative technology, involvement of local Authorities, a Forest Management, a study prepared by the UoE, rehabilitation of the damaged areas.

Finally an association of charcoal producers was established with the aim of defining the correct annual yield to be assigned to the charcoal production

Adequate follow-up of the charcoal related proposal deserves attention. During the field visit the consultancy has not found signs of illegal charcoal production, which are instead visible in the neighbouring area of Mucumbeze (lots of charcoal bags sold along the road). However the issue of charcoal production should be clearly addressed in the Forest Management Plan with specific areas designated for charcoal production under sustainable management practices (high forests to be artificially regenerated or coppice crops).

Replanting and enrichment planting
The project is establishing some agreements with some villagers, responsible of forestry surface (see 5 - Annex Contract between the Project and a farmer, concerning the protection and enrichment of a portion of forest), about their enrichment or re-plantation, protection against fires and encroachment and patrolling
Similar contracts are established between the project and the communities (6 Annex Plan of forest protection)

Measurements of Permanent Sample Plots (PSP)
The NPP established 15 PSP of 1 ha each, scattered in the Project area. The distribution of the samples was mainly based on the preliminary forest inventory carried out by Mushove in 2004. As pointed out earlier, the distribution of the PSP is not statistically representative of the forest types existing in the Project area. For instance, according to the forest map provided by the Project only 3 PSP falls within the areas designated for forest protection and avoided deforestation. The rest of the plots are located either in the Gorongosa National Park or in other areas. The PSP are remeasured every year by local crews for determining dbh growth and some additional parameters (leaf phenology, soil moisture contents, grass biomass, etc.). Data of PSP are analyzed in conjunction with meteorological data and fire experiments. Most of the results are presented in Ph. D. thesis of Casey Ryan, under finalization. This activity is certainly useful for studying some aspects of the miombo forest ecology. However the major drawback is that the information gathered in the PSP is more oriented towards carbon science studies, and their importance for applied research and implementation of forest management is limited.

Forest protection and leakage
The extent of forest protection including avoided deforestation is difficult to assess, in absence a change analysis based on satellite images of successive dates. The consultancy suggested the analysis of SPOT images of 1997, 2002 and 2008. Their visual interpretation can provide conclusive evidence of the pre-project (1997-2002) and post-project (2002-2008). It is highly recommended that this activity is implemented as follow-up to the Project. However at present such information is not available. For this reason, the consultancy had to base an evaluation of ongoing deforestation on ocular inspections during the field visits. No massively deforested areas were encountered and the major forest blocks appear intact. The delineation of such blocks carried out by the Project in cooperation with local communities seems to reinforce this perception. However no quantitative evaluation was possible.
The major threat is represented by the demand of new land for agriculture. The Project reported an increase of total population of 2.91% per year and of 1.68% per year for number of households, between 2004 and 2009. This s likely to include natural population growth and immigration. Immigration is certainly decreasing after the peak in the late nineties but it is still present. It must be pointed out that the settlement of new individuals or families is not allowed in an anarchic way, but must be agreed with local authorities (Regulo) and government authorities. It was felt that the growing awareness on the importance of forest resources by the local community (also in monetary terms) is reducing the expansion of new settlements. However some expansion of the agricultural area seems unavoidable. The Project is basing the calculations of carbon offsets generated by the avoided deforestation assuming a reduction of 75% in the expected deforestation rates. In the consultancy opinion this issue should be more concretely addressed in the Forest Management Plan. For instance a proportion of the forested areas or woodlands should be set aside as buffer for agricultural development. These could include forests with less value in terms of biomass and biodiversity. The definition of such buffer zones for agricultural expansion could allow a more disciplined and integrated land use management.

Micro-enterprises and NTFP

Sawmill
The community timber utilisation and Saw Mill Association "Associação NFUMU IA N'HAMBITA – Serração", was founded in 2003 as activity of the project, with 6 workers trained and employed in the activity with the monthly wage.
In 2008 the workers established the Association "Associação NFUMU IA N'HAMBITA – Serração", and all machinery and equipment was transferred to the Association with the symbolic payment of one metical.

Carpentry
The project has followed the same strategy applied for the Saw-Mill, entrusting in 2008 the carpentry shop to an Association "Associação NFUMU IA N'HAMBITA – Carpintaria", composed by the same workers who started the activity in 2003, excluding 3 who abandoned the activity. Now the Association is composed by 11 workers. One trained carpenter has been recruited at the carpentry school. And other workers have been trained by this skilled worker. The training interested different techniques in furniture making, including designs.
Most part of the present activity is devoted to prepare beehives, furniture for schools and houses; also some special products like artistic handicrafts, tables and wood carving have been prepared The carpentry is preparing an annual independent budget.

Marketing of products.
The most important micro businesses are the products of the carpentry and the honey.
Other products are following such as weaving and pottery.
Concerning the carpentry the shop finds some difficulties due to the limited market in the area (where another carpentry is operating)
The profit of the sawmill from 2006 to 31/07/2009 has been MTN 143711.15 (€ 4355)
The unified profit of the Carpentry and Saw-mill in the same period has been MTN 253398.22 (€ 7679).
Verifying the document related to the "Combined cash-flow of Carpentry and Saw-mill (Annex 8), it is clear that the revenue from the sawmill is exceeding the revenue of the Carpentry which has more costs.
It should be noted, at the same times that the saw-mill has the Carpentry like fixed customer, and reduced processing of raw material and transformation, while the carpentry must always find customers on the market.
In the end, the combination Saw-mill Carpentry seems to be a good solution for local people employment, their capability increasing and improving, and the established system of small manufacture of local products in a traditional agricultural area.

Bee keeping
More than 25 beekeepers are members of an association and an expert is in charge to the project.
There is reluctance among the villagers to abandon the old system of beekeeping in Bark beehives, because is producing more honey (about 10 kilos) than the improved system adopted in Kenya (8/9Kg), while the production of propolis and wax is about the same. .At present the honey is produced in the area by 1000 traditional against 350 improved beehives
The problem is in the honey collection, because the traditional system is destroying the beehive and the swarm, during this phase. The involvement of more people in the honey production is reducing the risk of forest fires, in addition to the other source of revenue.
An agreement with "Food for the hungry" was aimed at helping the beekeepers of the project
The honey production has been 513 Kg from August 2008 to July 2009 with an average of 5.7 Kg each beehive. A market of the honey is not organized till now

Cane rat production and breeding guinea fowls, turkeys and ducks
The activity of cane rat production gave not encouraging results, in spite of many attempts.
The breeding of the Guinea Fowl, on the contrary is giving good results, also like system of spreading the activity among the villagers: breeding the Guinea Fowl, Turkeys and Ducks is starting from 50 fertile eggs of Guinea fowls or other bird, given to a farmer for chicks production.
When chicks are becoming adults and are producing eggs, 50 of these are given back to the project for helping other farmers and disseminating the process.

Marketing,
This activity has been focused on the honey and annexed products
220 kg have sold to a middleman with an average profit of US$ 16.79/hive. The project tries to help beekeepers looking for other markets, in Beira as well.
Part of the produced wax has been given to the carpentry
Poultry , crops and garden products start to be sold. A community market was established inside of a partially destroyed church, were some handicrafts, such as pottery, baskets and carved wood were sold to tourists.

Now the site is not available and the project is planning to create directly a small market for the villager's products.

Comments on financial benefits of micro-enterprise and NTFPs: It is clear that the project has invested a great deal of effort in promoting various NTFP commercialisation activities, particularly beekeeping and, to a lesser extent, various crafts (such as weaving and pottery) and woodcarving. Also included under the heading of 'NTFPs' are additional unplanned activities such as vegetable gardening and the farming of guinea fowl (instead of the proposed cane rat domestication). These activities are important because they provide faster returns to farmers than tree planting activities and, in some cases (like beekeeping) may add value to the forest in its natural state.
In general it seems that the various associations created (sawmill, carpentry, bee-keeping) are progressing slowly but steadily and have chances of becoming economically self-sustainable over time.

Trust fund for carbon offsets verification

The project is a collaborative effort between several different organisations, which hold the following roles and responsibilities:

Associação Envirotrade Carbon Livelihoods, a Mozambique not-for-profit Association, has the responsibility of Project Technical Operations, and full Project Administration after the Pilot Project phase. It administers the day-to-day running of the project through the employment of staff stationed at the Headquarters in N'hambita for the Gorongosa project and close to Inhamitanga for the Zambezi Delta project. Associação Envirotrade Carbon Livelihoods is in charge of managing the project, running the technical operations, employing local staff, and managing relations with the local communities involved.

Envirotrade Group, based in Mauritius, has the responsibility to market the carbon offsets generated by the projects, negotiate the sale of the carbon offsets, raise additional finance where necessary, carry out research and administration and develop new projects.

Mozambique Carbon Livelihoods Trust (MCLT) is a Mozambique trust fund to manage the proceeds of the carbon sales. Its board members include independent NGOs, the Community Association, Contabil (an auditing firm) and Associação Envirotrade Carbon Livelihoods.

The University of Edinburgh (UoE), a British academic institution, was responsible for the EU-funded project supporting the research Pilot Project phase. It will continue to be responsible for general research and carbon monitoring.

The **Edinburgh Centre for Carbon Management** (ECCM), a British commercial Organization, is in charge of providing Plan Vivo and related services, and administering Plan Vivo activities. Database management for Plan Vivo was initially manual, but an electronic database has been in use for three years. ECCM developed the technical specifications following the Plan Vivo System.

Liaison with related authorities.
The following Project related authorities have been contacted

Traditional authorities (Regulo). The relationships between the Project and the local authorities appear to be good. The Project seems to be well integrated in the Community and no specific conflicts were identified.

Gorongosa National Park : In this case the relationships were found to be tenser. In spite of the fact that both institutions (the Park and the Project) recognise the importance of a synergic approach between sustainable land management and biodiversity enhancement, so far no written agreement (MoU) was signed and some conflicts are in place. The reason for this impasse was not fully understood by the

Consultancy and recommendation is given to resolve areas of conflict with GNP management, and to work harmoniously in future.

Local Government Authorities.

During the field visit the following local authorities were interviewed:
Mr. Moreze Joaquim Caugande – Presidente Municipio Gorongosa
Mr. Azanios Wane Chauque
Chefe de Posto – Pungue

All government officers interviewed expressed a positive appraisal of the Project, both for land management and socio-economic improvements. The main concern expressed was on the growing population on the entire administrative District of Gorongosa, and on the demand of new land for growing subsistence crops, and their possible allocation within the Project area. These concerns and their possible land use conflicts should be adequately addressed in the Forest Management Plan.

Details of the Mozambique Carbon Livelihoods Trust (MCLT)

The Project has established the Trust Fund (The Mozambique Carbon Livelihoods Trust (MCLT), hereafter called 'the Trust Fund' based on the previous model created in Mexico in a similar project (Scolel Te Project). The Trust Fund is the point of exchange between carbon buyers and the communities involved in establishing carbon sequestration

Trust Fund started to run regularly in 2007 , providing verification services to purchasers and ensuring transparent accounting of carbon.; in Envirotrade views it should act as a registry of carbon offsets for other communities after the project finishes and will eventually be funded by carbon sales The Trust Fund could become an independent body, self financing, on the example of the experience in Mexico. Trust Fund is supported in all of its activities by Envirotrade Lda.

Governance
At the time of the field visit by the Consultancy, (8 August 2009), the MCLT was governed by a steering committee composed by:

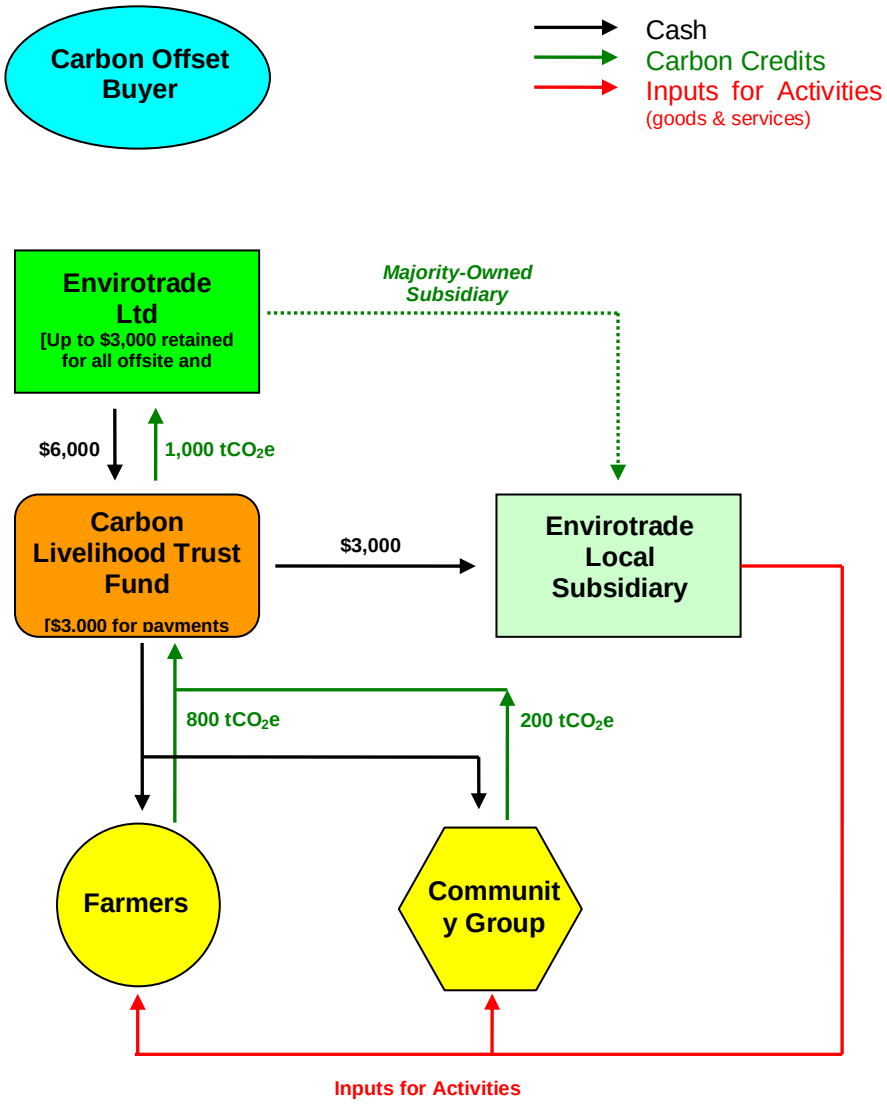
Mr. Pete Van Zyl, Envirotrade Lda., Mozambique
Mr. José Chibuzze- WWF Beira
Mr. José Fernandez, Contabil- Beira
Mr. Farncisco Dos Santos Camacho, Presidente do Comité de Gestão de N'hambita

The Committee takes important strategic decisions on planned activities and fund allocation. Wider consultations with local communities are also taking place for major activities discussion (e.g. forest protection).

Financial structure and benefit sharing [9]
Envirotrade is in a partnership relationship with the local communities in project areas. To facilitate this partnership, a community trust is established for each project, and one-third of the proceeds from carbon credit sales is paid directly into the community trust to fund payments for Agroforestry and Forest Management activities as well as provide a pool of resources for other community-related activities such as construction of new school buildings, health clinics, and micro-enterprises of all types. These funds are paid over to the trust fund which serves as an escrow account administered by an independent third party immediately following the transaction with the client. Producers are paid on the basis of inspections irrespective of whether the carbon offsets have actually been sold, an important departure point that reflects the poverty alleviation objectives of the model.
A further one-third share is paid over to the trust fund to be disbursed to Envirotrade's local non-profit subsidiary to cover the costs of providing inputs and training for the various activities on-site and in-country. All operational costs relating to project delivery that relate to the support role played by the subsidiary are financed from this portion of the proceeds of the sale. The trust fund performs an oversight role ensuring that the not for profit company acts in the best interests of the trust and the producers. Any unused funds are contributed by the non-profit subsidiary to the community trust.
Envirotrade Ltd (the parent company) receives up to one-third of the proceeds to cover all off-site and international administrative, research, project development and marketing costs and provide the Company a profit. This includes responsibility for certification and validation. All taxes etc are also paid from this portion of the funds. Importantly, Envirotrade Ltd takes on the responsibility of covering any shortfalls at the community trust by extending interest-free loans. These shortfalls arise when carbon is sequestered by project activities and is not immediately sold. Any profits retained by Envirotrade will be a small proportion of total offset credit sales, and will have to be used (along with other financing sources) to cover the development costs of new projects.
A break-even analysis, which includes the requirement of floor pricing below which farmers will not have sufficient incentive to participate in Agroforestry activities, results in a minimum carbon price of approximately \$4.85/tCO_2e. The base case price is \$7.38/tCO_2e, which is \$1.50 below the Company's current historical weighted average selling price. Furthermore the proportional allocation of funds from the

[9] Extracts from Annex , by Philip Powell

proceeds of sales is not altered by the margin of profit (i.e. the difference between the floor pricing and the sale price), ensuring a level of equitable distribution of profit between the producers and Envirotrade. Envirotrade's role is to provide training along with vital goods and services to support activities that assist farmers to move from slash-and-burn agriculture to sustainable farming, and that assist the community in protecting native forest areas. Envirotrade also has the responsibility for marketing the carbon credits that these activities generate. Support activities are intensive for a 10-year period, during which time the bulk of the carbon credits are generated. There is a further 5-year "tailing off" period during which Envirotrade's involvement gradually lessens as local communities take on responsibility for managing activities. Envirotrade retains up to a one-third share of the carbon revenues to cover all the offsite management and marketing expenses, and to provide a profit for investors. The Company's local non-profit subsidiary receives approximately one-third of the revenues to cover its costs for providing support. The local communities participating in the projects also receive a one-third share, from which they make payments for environmental services to farmers and other members of the community. However, a significant amount of these funds are retained by the local communities, and they have decision-making control over how best to apply the funds. The community may decide to build a new school, for example, or pay for increased nursing coverage at a health clinic. The local community is therefore a partner with Envirotrade in the business of generating and selling credits. The higher the revenues generated by carbon credit sales, the greater the benefit for both Envirotrade and the local communities.



In the N'hambita Pilot Project the carbon offsets generated by agroforestry and forest protection are sold by Envirotrade on the Voluntary Carbon Market.

Compensations for carbon sequestration are paid to individual farmers, while in the case of avoided deforestation these are paid to the Community Association. The forecasts made by Project indicate that major part of the financial benefits is expected to be generated from forest protection (approximately 80%) against 20% from agroforestry.

The schedule of payments to farmers for tree planting runs as follows: immediately after planting, 30% of payment, then 12% per year for five years, then a final payment of 10% in the seventh year. Thereafter, the trees are expected to be established and yielding sufficient tangible benefits to dissuade the farmer from reverting to slash and burn. Farmers applying to the agroforestry programmes can register for multiple treatments, thus expanding the funding period.

The Project plans to generate the following carbon offsets.

	Estimation of baseline net. GHG removals	Estimation of actual total GHG removals with project	Risk buffer (10%)	Estimation of leakage buffer (forestry only 25%)	Estimation of net anthropogenic GHG removals
Year	tCO2	tCO2	tCO2	tCO2	tCO2
2004	0	1,466	173	0	1,293
2005	19	3,927	485	0	3,422
2006	2,768	42,747	3,712	7,424	28,842
2007	3,223	51,612	4,997	7,424	35,969
2008	10,606	173,017	15,980	29,914	116,517
2009	11,348	216,513	22,985	29,914	152,265
2010	11,348	216,513	22,985	29,914	152,265
2011	11,348	215,047	22,812	29,914	150,972
2012	11,329	212,586	22,500	29,914	148,843
2013	11,126	206,009	21,501	29,914	143,467
2014	10,672	197,143	20,216	29,914	136,341
2015	10,606	173,017	15,980	29,914	116,517
2016	7,317	97,278	6,747	22,490	60,724
2017	7,317	97,278	6,747	22,490	60,724
2018	0	0	0	0	0
2019	0	0	0	0	0
2020	0	0	0	0	0
2021	0	0	0	0	0
Total	**109,029**	**1,904,151**	**187,820**	**299,141**	**1,308,159**

Carbon offsets are expected to increase up to a maximum in 2010 and to progressively decrease to zero in year 2017.

It must be pointed out that for agroforestry the monitoring and accounting systems are well in place, including financial auditing carried out by CONTABIL (a financial auditing company based in Beira) while the development of the forest protection component is still under way, due to delays in forest protection area calculation. Both the Carbon stocks and areas are under revision. In general it is felt that so far the Project has relatively well developed the agroforestry component of the trust fund, while the forestry

component is still under development. In future, Envirotrade is planning to relate each sale of carbon credits to a specific piece of land where the carbon sequestration is taking place not to a generic carbon credit as it is now. This will certainly add transparency to the overall system and is strongly recommended by the consultancy.

The following projected carbon offsets have been produced by Prof. John Grace during the field mission.

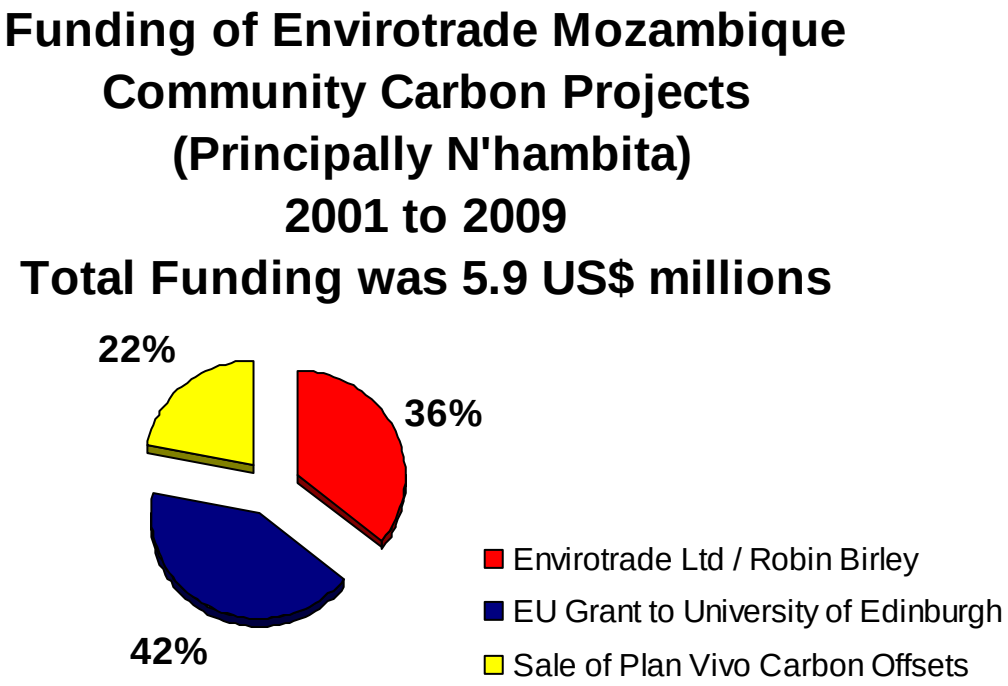
		Total standing stock (tC)			saleable C	saleable VERs (tCO2)
Name	Area (ha)	sum	error	with roots		
Nhambita Boemaria	852.4	22,606	2,735	32,101	20,011	73,374.19
Nhambita Mucinhaua	822.1	19,987	2,598	28,382	17,560	64,385.11
Muncinuaua						
Munhanganha						
Nhambita	713.4	15,776	2,453	22,402	13,734	50,359.21
Vunduze	927.8	25,540	2,654	36,267	22,676	83,147.00
Mbulawa Mudoda	5248.8	136,470	13,716	193,787	120,602	442,208.48
Mucombeze 1	365.9	7,523	1,370	10,683	6,500	23,832.23
Mucombeze 2	169.7	3,779	628	5,367	3,293	12,072.70
Castiano	22.2	527	153	748	462	1,693.39
Serra	555.3	15,099	1,627	21,440	13,393	49,106.69
Envirotrade camp	126.0	2,072	498	2,942	1,741	6,383.07
Telix	4.6	123	12	175	109	400.78
Sakki	25.4	461	164	655	393	1,439.25
Paulo Sozinho	3.7	93	51	132	82	300.27
Chico Joao	9.0	193	17	274	167	614.10
Mario Chimuaza	7.3	125	15	178	106	388.39
Luis Felix	4.9	232	36	329	212	778.87
Raimundo	8.8	316	125	448	286	1,047.08
Costa Pereira	43.2	886	282	1,258	765	2,804.41
Ernesto Seda	16.5	322	132	457	277	1,014.26
Neto Chimuaza	13.7	178	30	253	144	528.34
Mucombeze 3	1727.8	46,568	5,615	66,127	41,277	151,348.00
	11,669	298,876	34,909	424,404	263,789	967,226

Since the beginning of the Project, Envirotrade has been successfully selling carbon offsets to individuals or organizations under voluntary carbon schemes.

A summary of the Total Carbon Credits Sales 2003 to 31-07-2009 is given in the next table

Period	Total Tons CO2 sold	$ / Ton CO2	Total $
2003 to 2005	9,006	3.00	27,000
2006	26,116	5.00	130,580
2007	53,647	7.83	420,159
2008	27,005	12.71	343,280
2009	39,900	10.22	407,952
Total	155,675	8.54	1,328,971

It must be pointed out that in spite of the volume of Carbon sales the Project is not yet profitable and considerable funds have been invested in the Project activities. See next graph



The following detail of costs for year 2009 was obtained during the field phase.

Carbon Offset Credit Sales	$ 524,901
Mozambique Direct Expenses	-$ 102,255
Mozambique Overheads	-$ 693,543
UK Overheads	-$ 380,290
Balance	-$ 651,186

Mozambique Direct expenses include Labour, Materials and Services.

Mozambique and UK overheads include Personnel Expense, Administrative Expenses, Motor Vehicle Expenses, General Maintenance Expenses, Premises and Security Expenses, Travel Expenses, Professional Services and Fees, Financial Expenses, Capital Expenditure and Payments to MCLT

At present the Project is not profitable but it is understood that Envirotrade is considering its financial involvement in the Project as an investment for his future business.

Comments on Carbon Trust Fund management:
In the Desk Phase Report the Consultancy raised some doubts about the correct sharing of the funds coming from the Carbon Sequestration: 1/3 to the Community, 1/3 to Envirotrade Ltd and 1/3 to Envirotrade Local subsidiary
This issue was deeply discussed with the Envirotrade Representative during the field visit; besides, the Consultancy had the possibility to verify the efficiency and the capability of the field structure of Envirotrade Local subsidiary, which is operating with a staff of 36 people plus some 80 seasonal labourers.
The Consultancy has recognised that the cost of Envirotrade Mozambique is in line with the investment, because the activity of the project in the field is well managed, as agroforestry, forestry protection, and as community involvement as well.

Envirotrade UK decided to invest on carbon offsets as a business and is considering its financial contribution as an initial investment that may provide revenues in the future. Moreover Envirotrade is providing financial details for its entire investment in carbon offsets in Mozambique, including Zambezi and Quirimbas Projects. Analyzing the data available for the NPP, during the first 5 years the revenues from carbon sales were not sufficient to cover the overall costs including Envirotrade Mozambique running costs and Envirotrade UK overheads. For the future, Envirotrade seems confident on the profitability of their carbon business and is expecting increasing revenues as stated in the projections shown in this report, especially from avoided deforestation. The consultancy recognizes the potential but it must be kept in mind that this is strongly linked to future carbon market conditions that are sincerely unpredictable at the moment.

Some further comments on the financial structure of the Project will be discussed under the sustainability item.

Overall assessment

In this Chapter the main conclusions of the evaluation mission are presented with special reference to the DAC

Relevance

The Project is of high relevance. Problems related to rural poverty, low yields of subsistence crops, clearing of natural forest formation for agriculture and for charcoal production represent severe threats for the forest resources in Mozambique in general, and especially in the Province of Sofala. Actually the Central Part of Sofala is likely to represent a 'hot spot' for deforestation and forest degradation. The presence of two major National Roads (EN 1 and EN 6) facilitates the penetration of shifting cultivators and the production and marketing of charcoal to Beira, Chimoio and even Maputo towns.

Additional specific features of the Project are the socio-economic conditions, the Gorongosa area became one of the most intense areas of conflict during the civil war (1976-1992). Farming was limited by the civil war, landmines and a breakdown in infrastructure. Due to severe food shortages most of the population was displaced for many years before they were able to return in the mid-1990s. Moreover the contiguity with Gorongosa National Park, offers opportunities for developing a synergy for integrated forest management including forest production, protection and conservation actions.

The objectives of the Project are well in line with the key issues of the Mozambican Government policy dealing with Absolute Poverty Alleviation.

In addition, it is felt that forest conservation through carbon credits allowances under REDD and related voluntary carbon schemes can really provide a significant and innovative contribution to sustainable development of rural areas located in the vast ecological domain dominated by 'miombo woodlands' in Africa.

This findings are also coherent with the Commission Communication (COM (2007) 540) proposing to build a new alliance on climate change between the European Union and the poor developing countries that are most affected and that have the least capacity to deal with climate change: "Global Climate Change Alliance" (GCCA), which defines Reducing Emission from Deforestation as one of the priority areas for stepped up cooperation.

Effectiveness

The achievements of propose is broken down into Project activities, since the evaluation conclusions are heterogeneous.

At level of Administrative management and monitoring of the Actions – The monitoring of the project is carried out in correct manner, villagers are receiving their carbon offsets, respecting the plan subject of each agreement, and wages are regularly paid.

At level of Agroforestry - In 2008 the villagers involved in the project were 1510 with 3527 hectares of invested surface. All farmers met by the Consultancy during the field visit, showed satisfaction for their involvement in the project. They declared also that they were willing to settle in the same farm, without restarting the system of the shifting cultivation. Following this good situation verified in the field the Consultancy has strongly recommended the periodical verification of the soil fertility, considering that its maintenance is crucial to allow villagers to become residential

At level of Forest protection – Considering the available period of 5 years for increasing the community awareness about the natural resources protection, the project achieved good results. Some doubts can arise about the system of fire control, through the practice of early burning, and the possible damages to the forest regeneration and to the wild animals habitat.

At level of Forest Management and carbon sequestration – As discussed above, the forest management activities carried out by the Project appear to have been insufficiently developed. Major drawbacks found by the Consultancy include:

- The absence of a statistically sound forest inventory
- The lack of a detailed overall thematic cartography
- The baselines and projections for avoided deforestation are still under development
- The guidelines defined for forest management have not yet been fully implemented

At level of Micro-business (Nurseries, Saw-mill, Carpentry, NTF) – Regardless of the financial success of the Micro-business, these small enterprises have the advantage of creating small industries in a traditional agricultural field; besides, tendency to form associations has been established and new job opportunities are becoming available in the area

Efficiency

The quality of day-to-day management of the Project is satisfactory. All Project activities are carried out with competence and dedication. The involvement of the local communities is growing. About 70% of the Community is involved in the project activity; during the visit in the field the Consultancy had the possibility to appreciate the increased awareness of villagers about the protection and improvement of the natural resources.
The development of the agroforestry component is considered adequate for the Project funding and timing. However some concern is raised by some communication gaps between the Project management and the EC Delegation. Relevant information (for instance the monitoring of agroforestry and the details of the training programmes) were made available during the field visit only. In spite of the conspicuous exchange of correspondence between the Delegation and the Project, it seems that not all information's were distributed in a correct manner, or not correctly presented in the Project Reports. The Project is still continuing its activities under Envirotrade management and it is expanding to new areas, taking advantage of the momentum created. At present several new or revised activities are still taking place, making it a bit difficult to judge where to 'draw the line' of the Project performance under the EC funded phase.

For the forest inventory and definition of the baselines the Project is not considered very efficient. Several forest inventories have been conducted in successive occasions and for different purposes, including forest area estimates based on field transects. The consultancy expresses its opinion that a more structured and integrated approach to forest inventory and mapping would have provided more solid results with less work.

Impact

The positive impact of the project in the buffer area of Gorongosa Park, can be positively evaluated in view of the environmental and human situation before the activity of the project: most of the infrastructures destroyed by the civil war, groups of families evacuated coming back to the villages partially or totally destroyed; no schools, nor sanitary centres; the agriculture practiced with the system slash and burn.
For deforestation, a rough calculation has established the total destruction of the forest within 2050 without an external intervention. The extent of forest protection including avoided deforestation is difficult to assess, in absence a change analysis based on satellite images of successive dates. The consultancy suggested the analysis of SPOT images of 1997, 2002 and 2008. Their visual interpretation can provide conclusive evidence of the pre-project (1997-2002) and post-project (2002-2008). It is highly recommended that this activity is implemented as follow-up to the Project. However at present such information is not available. For this reason, the consultancy had to base an evaluation of ongoing deforestation on ocular inspections during the field visits. No massively deforested areas were encountered and the major forest blocks appear intact. The delineation of such blocks carried out by the Project in cooperation with local communities seems to reinforce this perception. However no quantitative evaluation was possible.

During the field visit the consultancy had the perception of an improved situation in the Project area, compared to neighbouring zones. The Project has become the point of reference, farmers are followed and sustained by field technicians visiting periodically their farms, and a system of incentives for farmers and communities help the protection of forests. The Project produced a substantial positive impact on the socio-economic development of the area, for instance two schools are in activity and a Sanitary Centre is operating with a nurse trained by the project.

Sustainability

The project through the Trust Fund (The Mozambique Carbon Livelihoods Trust (MCLT), branch of Envirotrade Ltd, is providing Carbon offsets from the reclamation of fallows, better management of farms and from the protection of forests. The carbon offsets from agroforestry are received directly by farmers, while the carbon offsets from the forest protection are received by the community which uses this money for public services, as schools or sanitary centres.
The total amount of carbon offsets is divided in three parts: One third is going to the agroforestry and to the community, one third to Envirotrade Ltda, which provides the management of the project and the last third to Envirotrade Ltd UK, as enterprise compensation.
This system is sustainable as far as the buyers of Carbon are accepting the evaluation of forestry surfaces, value and carbon sequestration of the forest established with the present technical specifications. The issue of sustainability must consider as well the future evolution of international voluntary carbon market and related required standards.
The calculations presented in Trust fund component of this report, show a potential of carbon sales of 1,300,000 of Co2 between 2004 and 2017. Using the reported average sale price of 8.54 US$ per ton of CO2, this gives a total of around 11 million US$. If this amount is sufficient to ensure economic sustainability is hard to judge. However Envirotrade as business company seems to be confident on the success, and has expanded the area of N'hambita Project and has initiated similar Projects in other zones of Mozambique (Marromeu, Quirimbas). From the point of view of sustainability it must be kept in mind that Envirotrade have given a significant monetary contribution . Envirotrade is considering this Pilot Project as an investment for future business. If a similar Project is to be replicated by the EC, the required level of investment by the implementing agency must be evaluated. In other words, looking at the development of the NPP, the Project was not not able to cover its running costs during the first 5 years, in spite of the EC grant.

Conclusions
An overall evaluation of the N'hambita Pilot Project is not straightforward. The consultancy has observed some positive developments (e.g. agroforestry, socio-economic impact, fire control) together with some components insufficiently developed (e.g. forest inventory, carbon baselines and forest management). For simplicity, the main conclusions of the evaluation mission are summarized in the following table.

Element	Evaluation score	Comment
Project implementation and management	**Adequate / Good**	The quality of day-to-day management of the Project in the field is satisfactory. Project activities are carried out with competence and dedication. The administration of the project is carried out in correct manner, villagers are receiving their carbon offsets, respecting the plan for each agreement, and wages are regularly paid.
Agroforestry component	**Good**	In 2008 the villagers involved in the project were 1510 (around 70% of the residents) with 3527 hectares of invested surface. All farmers met by the consultancy during the field visit, showed satisfaction for their involvement in the project. This activity is expanding and active monitoring is being implemented. However the consultancy is strongly recommending to continue the periodical verification of the soil fertility, started in early 2009, considering that its maintenance is crucial to allow villagers to become residential. The satisfaction of beneficiaries might seem obvious given the amount of funds injected into the Project. However the social impact on the communities and the ongoing changes in the landscape due to the transition between shifting and sedentary agriculture are considered positive for a pilot Project
Micro-enterprises	**Adequate**	Regardless of the financial success of the Micro-business, these small enterprises have the advantage of creating small industries in a traditional agricultural field; besides, tendency to form associations has been established and new job opportunities are becoming available in the area.
Forest inventory and biomass estimates	**Insufficient**	Major drawbacks found by the consultancy include: – The absence of a statistically sound forest inventory – The lack of a detailed overall thematic cartography – Biomass equations are based on a small sample and Project estimates are derived from observations taken also outside the Project area.
Forest management and monitoring	**Insufficient / in progress**	The guidelines defined by the Project for forest management have not yet been fully implemented. It is understood that this issue is being tackled with a new partnership with Universidade Eduardo Mondlane, Maputo, however the MoU is still in the initial phases.
Carbon baselines and avoided deforestation	**Insufficient / in progress**	In view of the above, the baselines and projections for avoided deforestation still under development. See the corresponding chapter in the Report for more details.
Benefit sharing and Trust Fund Management	**Adequate**	The project through the Trust Fund (The Mozambique Carbon Livelihoods Trust (MCLT),

Element	Evaluation score	Comment
		branch of Envirotrade Ltd, is providing Carbon offsets from the reclamation of fallows, better management of farms and from the protection of forests. The carbon offsets from agroforestry are received directly by farmers, while the carbon offsets from the forest protection are received by the community, which uses this money for public services, as schools or sanitary centres. The total amount of carbon offsets is divided in three parts: one third is going to the agroforestry and to the community, one third to Envirotrade Ltda, which provides the management of the project and the last third to Envirotrade Ltd UK, as enterprise compensation. Between 2003-2008, the NPP was able to sell carbon credits totalling around 900,000 US$ on the voluntary carbon market. It must be pointed out that so far, carbon offsets have been mainly generated by agroforestry activities, while the major share of offsets mechanisms, expected from avoided deforestation, are still under technical revisions by NPP Management. Moreover it is a bit difficult to clearly distinguish the cash flow for the EC grant component separately as activities and carbon sales are still ongoing beyond the EC Project. For the EC Project component the following breakdown was given by NPP staff: 53% were required for the running costs, 21% funded agroforestry activities and 26% funded community based forest management.
Socio-economic impact	**Good**	The Project produced a substantial positive impact on the socio-economic development of the area, given the initial post-war conditions.

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Lessons learned and recommendations

In the case of the NPP it was decided to implement the Project in close collaboration with the local communities, and this choice seems well justified. In fact, in the area, the main driver of deforestation is the demand for new agricultural land for subsistence crops, carried out by individuals or group of farmers. In other cases, where for instance deforestation could be caused by the expansion of cash-crops, a more direct strategic involvement of government authorities might be also be considered. In any case a substantial social component, associated with sharing of carbon offsets sharing, should always be present.
Also, a period of 5 years is the minimum duration required for similar project deployment and implementation.
Furthermore, Projects of similar nature are ambitious and require a strong multi-disciplinary knowledge of the various technical aspects involved. Selected project implementation agencies must possess proven experience in the multi-disciplinary fields required for similar projects (forestry, deforestation modelling, forest inventory and biomass estimations, land-use planning, agroforestry, soil fertility monitoring, rural development)

In general, the following technical components should be correctly addressed.

Land cover
A well designed land use map based on remote sensing instruments (SPOT, LANDSAT or higher resolution satellites or aerial photos, if available). It is advisable to follow internationally agreed standards like Land Cover Classification System (defined by FAO/UNEP) for land cover classification, for compatibility.

Forest inventory
One comprehensive multi-purpose forest inventory, where multi-purpose is intended to give statistically sound information in a single inventory activity, regarding:

- Total volumes
- Timber production sustainable production
- Bio-diversity indices

It is important to point out that it is much more efficient to carry out one single forest inventory where all relevant variables are collected in the field, avoiding successive field inventories given the time and costs associated with field work.
The sampling intensity should be defined on a case-by-case evaluation. In general a precision of ± 10% is required, and the number of samples needed to achieve this precision can be determined by a preliminary survey of low intensity for estimation of variance. A correct use of remote sensing maps for stratification is essential to improve the efficiency of the field inventory and for reducing the sampling error. Systematic sampling designs are generally recommended. In the case of N'hambita a systematic grid of 1 x 1 kilometre is considered appropriate. However the sampling intensity may vary according to size, local variability and scope of the forest inventory.

Biomass and carbon
Generally, forest inventories are designed to provide total tree volumes. The volumes need to be converted into biomass and carbon content using appropriate allometric equations or expansion factors, and these procedures must be fully documented.

Forest change assessment:
It is suggested to tackle this issue in three phases:

- A preliminary assessment of the rate of deforestation prior to Project implementation (baseline for deforestation), using one set of satellite images taken indicatively 5 years prior to Project initiation and one set taken at the beginning of the project. From the technical point of view the inter-dependent satellite interpretation as defined by FAO is strongly suggested in order to provide the baseline for 'without project' deforestation.
- Successively, the observed deforestation rates need to be projected into the future, to become the reference baselines. Several explicit models for such analyses exist in literature, and typically make use of different future scenarios, which can be adapted over time to different conditions. Typically, deforestation models make use of ancillary socio-economic variables (population density and growth, GNP, agricultural productivity, etc.) which should be collected during the socio-economic data collection, see below. However it is recognized that future deforestation projections are based on modelling and carry some degree of uncertainty. As a general rule, it is advisable to document in full the analytical approach and the parameters used for deforestation modelling, so that the calculations can be updated and revised over time.
- Finally, an additional set of satellite images taken around the end of the project should be acquired and interpreted, to derive the observed deforestation rates. This activity is crucial to demonstrate objectively the Project impact and additionality for avoided deforestation

Socio-economic analysis
A detailed socio-economic analysis of the project area should be carried out at the beginning of the project and one at the end. The results can be used to estimate social 'additionality' and should also be integrated in the deforestation modelling scenarios.