

## Forest Management Plan – Gorongosa Project

### *Forest characterisation*

The miombo ecosystem is open canopy deciduous woodland dominated by a few characteristic species of trees. Miombo woodland is characterised by dispersed vegetation with few large trees. Tree crowns are typically not interlocking, and grasses are generally found below and between the trees making this a fire-prone system. Several floristic associations are present in and around the Chicale/Mucombeze Regulados including miombo woodland, Combretum woodland, riverine woodland and Combretum/palm woodland (Mushgrove 2003). Miombo is the most common woodland type in this area and is dominated by genera such as *Brachystegia*, *Julbernardia*, *Erythrophleum*, *Burkea*, *Diplorhynchus*, and *Pterocarpus*.

In 2003 a Preliminary Inventory of the forest in the project area 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 and]. 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 Nhambita community. They do not appear to be of high importance for purposes of forest management planning in Nhambita community in the short-term. It is presumed that adequate attention is being paid to them through the Gorongosa-Marromeu transect studies under auspices of the Millennium Assessment currently underway in southern Africa.



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- 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 terms of conservation efforts such as strict observance of the protection of strips flanking waterways etc.

From the measurement of the PSPs the project zone has been finally stratified in five land cover and vegetation types (note: on basis of these classes, calculations on the carbon stock in the project zone have been carried out, which are described in detail in section, described as follows:

- **Tropical (miombo) woodland:** Woodland including, but not limited to that dominated by miombo species. Deciduous trees, grass up to 2 m high in wet season, canopy cover 40-90%, a few trees/ha of 70 cm dbh. Top five species by biomass ranking: *Brachystegia boehmii*, *Diplorhynchus condylocarpon*, *Pterocarpus rotundfolius*, *Burkea africana*, *Brachystegia spiciformis*.
- **Savanna:** Vegetation dominated by grass, with sparse woodland of *Combretum* or *Acacia*, scattered trees (> 10 m apart) most trees < 10 m high. Soil is often not sand, but a black or dark grey 'cotton' soil with clay and little sand. Top five species by biomass ranking: *Combretum adenogonium*, *Combretum apiculatum*, *Combretum hereroense*, *Commiphora mossambicensis*, *Pterocarpus rotundfolius*.
- **Riverine or riparian forest:** Vegetation characterized by dense, high woodland adjacent to watercourses. Thicket at ground level, climbers and aerial roots may be present. No grass, many trees at least 30 m in height, some greater than 1m dbh, closed canopy. Top five species by biomass ranking: *Sclerocarya birrea*, *Khaya anthoteca*, *Cleistochlamys kirkii*, *Acacia nigrescens* and *Pterocarpus rotundfolius*.
- **Secondary Woodland:** Vegetation including abandoned Mashambas and degraded woodland. Tree clearance, stumps, re-sprouts, few trees > 50 cm dbh, lack of key miombo species (*Brachystegia*, *Julbernardia*, etc.) is a good indicator of abandoned agriculture, but not necessary. Top five species by biomass ranking: *Brachystegia boehmii*, *Julbernardia globiflora*, *Brachystegia spiciformis*, *Diplorhynchus condylocarpon*, *Burkea Africana*.
- **Mashambas:** Areas corresponding to agricultural plots, characterized by crops or residue, occasional trees, often large ones left during clearance for agriculture. Top five species by biomass ranking: *Sclerocarya birrea*, *Diplorhynchus condylocarpon*, *Pterocarpus angolensis*, *Burkea africana*, *Pseudolachnostylis maprouneifolia*.

## ***Management Plan***

### **Summary of overall approach**

The overall approach of the Chicale/Mucombeze Community Forest Management plan involves building on existing community structures (legally constituted Community Associations established in terms of the DUAT process) to establish long-term conservation management plans, processes, roles and responsibilities. The main pillars of the community plan are as follows:

- Development of an understanding within the community that the long-term benefits of conservation will outweigh the short-term opportunity costs of protection.
- Building effective local governance structures to determine and enforce the rules necessary for protection in terms of the Law on Forestry and Wildlife Sept 1999, and to assign key responsibilities to individuals and groups of individuals within the community.
- Establishment of effective teams to monitor the area, undertake fire protection activities and promote complementary economic actions to prevent or reduce any “leakage” effects associated with the protection of the area.
- Provision of financial support through carbon finance to cover the costs of protection.
- Develop a mechanism for Third Party verification of management activities.

### **Management plan requirements**

According to the Technical Specification for Forest Management “ the requirements for a Plan Vivo management plan for the conservation of miombo woodland reflect the general principles of the Plan Vivo Standards. Management plans should be:

- Based on local needs and capabilities;
- Developed through participatory approaches;
- Agreed by relevant community authorities (for project areas that include communal lands);
- Simple enough to be understood by the community; and
- Practical to implement with local resources”

### **The management plan contains:**

- Maps of the project area;
- A governance plan;
- A plan for project activities; and
- A plan for monitoring the achievements of the project.

### **Maps of project area**

**The map(s) include:**

- Location of the project area within the wider landscape.
- Location and extent of vegetation categories within project area.
- Location and extent of other vegetation types within the community boundaries.
- Altitude.
- Ownership boundaries to distinguish between community, private, and public land.
- Roads, tracks and other access routes.
- Rivers, streams and lakes.
- Co-ordinates of access points and other prominent features.
- Delineation of compartments or divisions within the woodland where management for different purposes (e.g. sustainable charcoal production or strict conservation) are planned

**Governance plan**

The governance plan explains who controls the area and how the management of the area will be governed. It consists of the following elements:

- A management agreement or community agreement stating that the area of protected woodland is to be established as a community reserve. The agreement should include a statement relating to the protection of any other woodland areas outside the boundaries of the agreement over which the community has direct control.
- A list of the people responsible for the conservation and management of the area and representatives with whom the project administrator should communicate.
- Whenever possible, a letter of agreement or recognition from the Provincial authorities.

***Governance***

A consultative meeting was held in October 9<sup>th</sup> with the local government representative (Presidente da Localidade), Traditional Leaders at all levels (regulo, sapandas and fumos), the Community Association and project team to present and discuss issues related to the “conservation areas”. A presentation was given to the assembled stakeholders on the concepts, the requirements and the possible alternatives. The meeting discussed the proposals in detail and resolved to adopt a programme of action to take the plan to the various wards that make up the regulados.

## Traditional Structures

Régulo	Sapandas (4)	M'fumos (12)
Manecas Luis Chicale - Régulo Nhambita	Eduardo Ranguisse (Nhambita)	Florindo Chonze Sande
	João Miquissene (Pavoa)	Manuel Camujoma
		João Miquicene
		Manuel Massuila
		Bene Meque
	Jonal Thole Kancune (Bué-Maria)	Jaime Saize
		Lucas Melo
	Torge Melo (Púngue)	Francisco Quembo
		Jó Augusto Massamba
		Tomás Francisco Charles
		Gonçalves Oliveira Godzo
		Zacarias Alberto Saita

## Community Association Structure (CGRN)

Conselho de Gestão	Conselho Fiscal	Advogado	Floresta	Queimadas
Presidente do CGRN	Pres. do Cons Fiscal	Advogado do CGRN	Chefe FFB	Chefe de controlo das queimadas descontroladas
Vice-Pres. do CGRN	Vice Pres. do C.Fiscal	Assist. do Advogado	Assist. de FFB	Assistente
Tesoureiro do CGRN	2do Vogal			
Secretario do CGRN				

## Legal Status and Agreement

The Communities of Chicale and Mucombeze have committed themselves to the establishment of a forest management plan that involves participatory management of natural resources within the existing national legal framework. This management activity will allow the community to sustainably utilise resources in a manner that benefits them financially in the managed areas, while simultaneously engaging in their management and conservation. This programme must take into consideration both local values, norms and practices of the community as well as legal requirements. The plan also addresses those fragmented areas of forest that fall outside of the community forested areas and are interspersed with agricultural lands. The plan envisages these areas being included as

smaller forest conservation units under the management of individuals or small groups of individuals.

The Forestry and Wildlife Law of 1999 (Article 10) of Mozambique defines three categories of protected areas. These are, National Parks; National Reserves; and “Areas of Use and With Cultural and Historic Importance”. For an *Area of Use and With Cultural and Historic Importance* to be defined as such, it is required that a community make representations to the Provincial Governor requesting that such status be afforded forested areas.

*Areas of Use and With Cultural and Historic Importance* are defined by law (Article 13) as “areas destined to protect forest with religious interest and other areas of historical and cultural use importance according to norms and customary practices”.

The law allow use of natural resources according to customary practices for own consumption based on rules and norms of sustainable natural resources use and conservation. Once approved by the provincial governor and declared as an *Area of Use and With Cultural and Historic Importance*, the community has all management responsibility of the area including patrolling and enforcement.

<i>Law on Forestry and Wildlife Sept 1999</i>	<b>Regulation on the Law on Forestry and Wildlife</b>
<p><b>CHAPTER II</b> Protection of Forest and Fauna Resources  <b>ARTICLE 13</b></p> <p>Areas of use and with cultural and historic importance</p> <p>1. Areas of use and with cultural and historic importance are areas meant for the protection of forests of religious interest and other sites of historical importance and of cultural use, in conformity to the customary norms and practices of the respective local communities.</p> <p>2. Forest and fauna resources existing in the areas referred to in the previous paragraph may be used according to the customary norms and practices of the respective communities.</p>	<p><b>SECTION II</b> Zones with historical cultural use or value  <b>ARTICLE 7</b></p> <p>Declaration 1. The following are considered to be zones of historical cultural use or value, forests situated in rural cemeteries, cult worship areas, forestry comprising vegetation used by the local community for the extraction of traditional medicine, forests which are home to species of wildlife used in cults, assuming that the exploitation of such species is not prohibited by law</p> <p>2. It is within the competence of the Provincial Governor to declare, by despatch, such zones in terms of the law related to the present article. The provincial governor may declare such zones when they are very well known as such, or by method of the transference into writing of a verbal declaration signed by the representatives laid out in line a) of No. 3 of this article.</p> <p>3. The request for the declaration of a zone as laid out in this article may be made by the local community and should contain: a) A letter of request signed by not less than 10 members of the respective community, suitably identified  b) The basis of the request, with an indication of the cultural value, historical and social facts, and other elements which justify the declaration in terms of the law  c) Geographical limits of the area</p> <p>4. The absence of a declaration does not prejudice the rights defined in the law relative to the use of the area and the forestry and wildlife resources by the local communities for economic, social, cultural and historic ends in accordance with their customary norms and practices.</p>

### **Areas of Use and With Cultural And Historic Importance**

The Community Associations of the Project Area have resolved to apply to the Provincial Government for the designation of areas selected through community consultation and consensus in terms of this legislation. The proposal has been formulated to:

- i) Preserve all historical and cultural forests in the community;
- ii) Preserve areas for harvesting of NTFP's in particular medicinal plants and edible caterpillars; and
- iii) Bringing added value to the designated areas through economic activities that are based on sustainable use of resources such as eco-tourism activities, carbon offset based income, and sustainable use of timber and not-timber products.

### **Letter of Agreement or Recognition from the Provincial Authorities**

The project is drafting a proposal in terms of the above legislation for submission to provincial governor requesting the designated areas to be declared as Area of Use and With Cultural and Historic Importance. According to the Forest and Wildlife Law the proposal include an official application on the behalf of the community by the Community Associations with arguments setting out the social-cultural and historic importance of specific forest areas, rules and uses, and the area delimitation. It is anticipated that this will be granted as it enjoys the support of the local Administrator and the Department of Forestry.

### **Second Phase of Consultation**

All leaders and stakeholders at the community meeting agreed to discuss these issues with their communities and define "conservation areas" on a ward by ward basis for each chieftaincy. Community meetings were held by community leaders and Community Association in all wards. On these meetings the community of each ward suggested the blocks members of the community were chosen to work with community technicians during mapping process.

### **Mapping and Identification of Areas**

The people identified at each of the ward meetings participated in the mapping and identification of areas. Areas were identified according to the criteria agreed upon in the meetings and included the requirements that all areas be free of human habitation or agricultural activity.

### Management Strategy

The Community Association will coordinate the management of these areas in collaboration with community leaders and other related stakeholders. The Community Association has subcontracted people close to each area that will be involved in all stages or management activities including fire management, patrolling and reforestation. The number of people will be decided according with to the size of the block and will be submitted to training and as much as possible professionalize the groups without, however, exclude participation of other community members.

For the 2008 season 25 community members were subcontracted after being chosen by the community of each ward. They were involved on the firebreaks cleaning, early burning and patrolling activities.

Block	No. people	Names
A	4	Fabiao Rale, Lucas Fabiao, Manuel Tores, and Adriano Caetano
B	7	Pedro Mateus, Jovaldo Joaquim, Antonio Jairosse, Vicente Inacio, Paulino Augusto, Chico Paulino, and Alberto Luis
C	3	Felix Fernando, Paulo Manuel Jeremias, and Moises Saimone
D	3	Luis Conde Baera, Tuisse Saene, and Paulo Novas
E	5	Sabado Joaquim, Victor Joaquim, Antonio Ussene, Zondane Languissone, and Castro Jose
F	3	Nelson Francisco, Bernardo Zacarias, and Lucas Joao
<b>Total</b>	<b>25</b>	

### Activity plan

The activity plan lists the activities necessary for the conservation and sustainable management of the project area. It consists of the following elements:

- A list of activities with estimates of time inputs for the protection of woodland in the project area.
- A list of activities to protect and restore stocks of carbon in other woodland areas under the control of the community (to minimise the risk of displacement of activities that result in woodland degradation to areas outside the project area).
- An estimate of the cost of implementing the project activities
- Estimates of any income from forest products or other outputs (excluding carbon).
- A fire management plan.

### Identification of Areas and Description : Chicare

A total of 10,296 ha representing 6 blocks were mapped covering all wards of Chicare community (see map-GIS).

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 areas were determined by the amount of forest without habitation or agricultural production and varies between about 700 ha to 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. In addition various individuals in the community have agreed to set aside forested areas that fall within their mashamba network for conservation purposes. This area in total is another 642.67 ha. The 12 individual/private blocks varies from between 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 crop lands 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. The total area put aside by individual/private groups comes to 776.08 ha.

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

Chicare Individuals Protected areas			
Nome	Area (ha)	Perimetro (m)	Zona
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
Telix	4.57	894.96	Pavua

Sakki	30.52	2993.15	Nhambita
Paulo Sozinho	3.71	940.97	Nhambita
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	Nhambita
Luis Felix	4.93	1,098.83	Pungue
Ernesto Seda	16.55	1,915.55	Pungue
Total Forestry for Individuals - Ha and tCO2	776.08	30,695.58	
Total Forestry for Chicare - Ha and tCO2	11,071.95		

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

#### **Identification of Areas and Description : Mucombeze**

Meetings were also held with the Mucombeze community and a similar programme has been undertaken. The Community Association has embarked on a programme of consultation and mapping. The Community Association in collaboration with Envirotrade already mapped the first two blocks and started to protect the area in the 2008 season.

#### **Mucombeze Community Areas.**

Comunidade de Mucombeze

Area	Tamanho	
	Area (ha)	perimetro (m)
Area Conservacao 1	3,105.44	12,331.77
Area Conservacao 2	993.78	7,665.19
<b>Total Forestry for Mucombeze - Ha</b>	<b>4,099.22</b>	

Below is the total number of hectares proposed and now placed under protection in the Gorongosa area.

<b>Total Forestry for Gorongosa - Ha</b>	<b>15,171.17</b>	
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In the months to follow, more consultations will take place and there are more areas that will be mapped and could be added to fall under the protected areas set aside by the communities.

## ***Management Activities***

The management of these areas will focus in three main components nominally:

1. Fire management
2. Reforestation/regeneration
3. Sustainable use of natural resources (medicinal plants, edible warms, wild fruits)
4. Patrolling

### **Fire management**

Bush fire has been a recurring event in Mozambique, causing massive damage. The bush fire had caused lost of human lives, livestock, wildlife, lost of houses and thousands hectares of forest. For instance in 2006, 2 peoples were killed and 25 people lost their houses and granaries in Chicare community. In 2008 (September 1<sup>st</sup>), the fire which were recorded as the largest bush fire of the last years killed 43 people in Manica and Sofala provinces. In Chicare the 2008 fire killed one person and burned 99 houses including granaries, thousands of forest was affected except the blocks that were early burned.

As in other areas in Chicare community most bush fires are man-made mainly for crop field clearance, hunting, and traditional beekeeping. Normally the fires occur during the late dry season between July and October when high quantities of dry biomass fuel is available.

### **Legal requirements**

According to the Forest and Wildlife Law (article 40) those who deliberately provoke fire that destroys forest is penalized with jail that can reach 1 year. Apart from this must pay a penalty according to the damage caused. The statutory laws governing the making of fire and the penalties for doing so will be made available to the community, if necessary in a simple poster form.

### **Fire awareness, education and training**

The education of the project personnel, the blocks managers, the fire fighter, the community and the general public in fire awareness is essential for the successful implementation of the fire management. An effective way of involving the community, which without their involvement the plan is doomed, is through education. A well informed public is most likely to use fire more carefully and adhere to laws and policy through being more aware of the risks and dangers. This activity will have three components nominally the school component, community and general public.

## **Educational Programmes in Schools**

There are six primary schools on the Chicare community. Those schools already started environmental education since 2005 in which the fire is one of the subject. The program consists have theoretical and practical sections that will include:

- The fire triangle – Oxygen, Fuel, Heat.
- The use of and good effects of controlled fire.
- The dangers of playing with fire.
- The bad effects of fire and the danger to the human and natural environment.
- The causes of wild fire and what is responsible.
- The influence of weather on fire and being able to recognize fire danger periods.
- Fire behavior and the influence of weather, terrain and fuel types on fire.
- Methods of controlling and combating fire.

As practical exercise school children will be involved on the opening firebreaks around the school fields (all schools have a crop field and/or fruit orchard) and in the early burning activities.

The education program will be presented annually at the onset of the fire season and should be followed up with repeat exercises during the season. The supply of fire posters strategically placed in the class room and movie projection will enhance the impact of the program, after the training has ended.

## **Community**

The community located in the Areas of use and of historical-cultural value and in general all Chicare community members will be informed and mobilized about the fire management program and strategy. The community education program concerned with fire management will focus on mobilization through meetings, movie projection (including local made movies and interviews), training sections, and posters/bill boards.

Particular attention will be given to community leaders who will take it upon themselves to monitor and enforce the rules.

## **General public**

To awareness the general public (mainly travelers) bill boards will be affixed along the roads near sensitive areas.

## **Project employees and the blocks managers**

The Envirotrade employees and all those involved on the management of Areas of use and of historical-cultural value have a specific responsibility in that they carry a good deal of the responsibility in extinguishing the fires. As with the community they must be

given the fire awareness education. They will be given training in prevention and combating fire.

A Proto Team will be selected from the work force and from the Areas of use and of historical-cultural value managers which will receive more advanced training than the other staff members.

Pre-fire season training for these Teams and all employees on the project will consist of the following, every year regardless of previous training;

- The formal education that the schoolchildren receive.
- The discussion points that the community have undergone.
- Safety aspects required when fighting fires.
- Changes to fire behavior under certain conditions.
- Call out requirements and action response.
- A description and the use of the available hand tools for fire fighting.
- The correct method of using fire fighting tools.
- The best form of attack when addressing a wild fire.
- Mopping up methods and fire re-ignition control.
- Post fire management.

### Firebreaks and early burning

#### Firebreaks

Firebreaks will be open annually along the perimeter of all Areas of use and of historical-cultural value as a barrier. Two parallel strips of 5 m will be open and the 20 m width in between burned to gives firebreaks with total of 30 m width when the option is exclude fire on the block. Taking in account that each person can open a strip (cut grass) of 5 m width by 200 m length will be needed about 500 working days when the option is early burning on the all block or about 1,000 working days if the option is exclusion of fire.

Working days for the firebreaks cleaning follow for the protected area under Chicare Community.

Block	Wards	Perimeter (m)	Working day	Working day (2 strips)
<b>A</b>	<b>1,000</b>			
<b>B</b>	6,201.81	37,364.36	186.82	373.64
<b>C</b>	733.02	14,502.50	72.51	145.03
<b>D</b>	850.15	17,407.37	87.04	174.07
<b>E</b>	713.48	17,071.63	85.36	170.72
<b>F</b>	797.41	12,170.87	60.85	121.71
	<b>10,295.87</b>	<b>98,516.73</b>	<b>492.58</b>	<b>985.17</b>

Note: Perimeter calculation for the block **A** still to be done using GIS because of the rivers.

### Early burning

Chidumaio (2004) recommends that irregular burning has most economical silvicultural practice, but the last three years experience shows that there is still lots of work to be done in order to persuade people and avoid late fires on these areas. On the other hand early burning will prevent up-building of fuel biomass and big fire (Käll, 2006) and stimulate regeneration and diversity (Chidumaio, 1997). The suggestion for the next 5 to 10 years and the best option will be to do early burning in the most areas and doing firebreak clearing around all the areas. While there are still not enough large browsing herbivores to help relieve the build-up of grass this is going to be important. For the early burning activity about 1,000 working days will be needed as the table that follows shows over the whole area.

Working days necessary for early burning

Block	Wards	Working day
<b>A</b>	1,000	100
<b>B</b>	6,201.81	620
<b>C</b>	733.02	73
<b>D</b>	850.15	85
<b>E</b>	713.48	71
<b>F</b>	797.41	80
	<b>10,295.87</b>	<b>1,030</b>

Before the early burning wood-litter will be collected and used as firewood or timber helping both to reduce the amount of fuel biomass and maximize benefits from these areas.

The early burning activity will be extended to other areas including persuade people to do around their houses with involvement of community leaders and local government representatives.

### Enforcement

The use of fire restriction periods is highly successful and will reduce the incidence of fire dramatically if enforced. There should be no lighting of fires during the months of August to November, if this can be enforced it will contribute immensely to the reduction of wild fires.

According to Forest and wildlife Regulation Law community have primary responsibility to enforce the law and customary rules and principles on the areas in collaboration to

other government departments (Agriculture and Tourism) or related intervenient responsible on law enforcement and patrolling. Currently Community Association have a group of community rangers (fiscais) who have responsibility to patrol the community area. These groups will coordinate with people from the blocks, and community leaders. The Community rangers will report to the Community Association and those to government authorities when necessary.

Should be a by-law enacted that there are to be no fires during certain periods and that prosecution will be enforced on anybody lighting a fire, it would be highly advantageous for the law enforcement parties to carry out a prosecution in order to make an example of someone.

### **Recording data**

It is important to keep records of data pertaining to fires and to analyze this periodically in order to build up a pattern for the purpose of predicting fire behavior. The following information should be recorded for each fire, on a standard **Fire Report Form**.

- Time first spotted.
- Time extinguished.
- Resources used and cost.
- Weather behavior, temperature, wind speed and direction.
- Source of ignition or entry into fire protection zone.
- Cause of fire.
- Reported to Police and result of investigation.

The information from the Fire Report Form must be summarized by topic and a pattern determined if possible. Any pertinent information, such as a ‘hot spot’ can be marked on the fire map for careful surveillance.

### **Equipment and tool**

Equipment and tools for fire prevention and fighting are necessary. Part of the equipment such as tractor and water tanks and tools will be allocated to a project fire fighting team and other tools will be allocated to each block team. The table below shows tools needed for the fire fighting teams.

#### **Tools for the fire fighting teams**

<b>TOOL</b>	<b>QUANTITY</b>	<b>SPECIFICATION</b>
Fire beaters	100	Handle length 2.0 m., Head 50 x 80 cm split 3 three times. Bottom 80 cm of handle painted yellow.
Rake-hoes	40	Handle length 1.8 m. The bottom 80 cm of handle and the back of the head painted yellow.

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Knapsack pumps	20	Knapsack tanks numbered, as with the lid and the pump barrel (same number).
Garden rakes	20	Standard tool, bottom 80 cm of handle painted as is the top edge of the rake.
Garden Hoes	20	Standard tool, bottom 20 cm of handle and top 10 cm of head painted yellow.
Axes	10	Standard 2.5 pound axe with bottom 20 cm of handle and axe head painted yellow.
Shovels	10	Standard builders shovel with bottom 20 cm of handle and top portion of head painted yellow.
Bow saws	10	Standard 1.0 m saw with spare blades, frame between the grip areas painted yellow.
Drip torches	10	Standard issue, bottom 10 cm of fuel tank painted yellow.

## **Reforestation/regeneration and coppice management**

Regeneration (natural or planted) and coppice management are some of main important issues of forest management (Chidumaio et al, 1996).

To stimulate natural regeneration late dry fires will be avoided as much as possible and creating gaps in the canopy. Gaps on the canopy will be done by selective harvesting taking in account the minimal diameter allowed by law (appendix) and based on the admissible annual cutting. Although the Mozambican Law doesn't specify the selected tree must be cut with an angle to drain water and avoid stump to be rotten and stump must be less than 30 cm (Chidumayo, 1997).

Artificial regeneration will be done planting trees prioritizing river bunks where will be encouraged to plant umbaua (*Khaya nyasica*) and muonha (*Breonadia microcephala*) considered good for soil erosion control. Priority will be also given to degraded areas or opened areas inside the blocks using the pre-existing species.

All tree selectively cut will be marked and recorded on the appropriate form and on the stump. A GPS references will be taken and as most of the miombo species are able to coppice (Luoga et al, 2004) the shoots will be managed. Species such as umbila (*Pterocarpus angolensis*), messassa (*Brachystegia* spp), muhimbe (*Jubernardia globiflora*) panga-panga (*Milletia stuhlmannii*) are some of the most cuted tree and showed to respond well to coppicing and from which the coppicing monitor will focus.

## **Sustainable use of natural resources – NTFP's**

Communities are allowed, by law, to use natural resources from these Areas of use and of historical-cultural value. However must respect the restrictions imposed by law



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concerning to protected areas and species. Rules, alternative techniques, and time table to harvest products from these areas will be established and publicized to all community users. For instance on the block A people currently harvest edible caterpillar from mucarate (*Burkea africana*) by cutting the trees down in an unsustainable manner.

The community will be allowed to harvest caterpillars and other insects (in the sustainable manner), collect medicinal plants or parts of the tree without compromising them, and collect wild fruits. Timber and other resources such as bamboo must be done according with a permitted annual cutting specifically agreed for each block.

The most important edible insects harvested in the community forests include species of caterpillars and termites, as well as some crickets and grasshoppers. Insect availability is highly seasonal and shows considerable yearly variation. Research conducted in Malawi suggests that the practice of early burning can markedly increase the yield of at least one species of marketed caterpillar. As many as fourteen species of edible insect are harvested in this community and non-destructive measures to harvest the insects will be encouraged.

Indigenous fruits of the miombo woodland are of great importance in the diet of rural people and although some are commercially harvested, most of them are for personal consumption, especially during times of climate stress when food is not available. The project is also working to improve the availability of these species by planting significant numbers in and around agriculture areas and homesteads. There are also other edible, non-animal resources harvested from the forest that include mushrooms, leafy vegetables and roots.

Important sources of fibre in miombo woodlands include the bark of *Brachystegia* spp. and *Julbernardia globiflora* (McGregor 1991). Barkfibre is used to bind leafy vegetables together, for construction, manufacture of furniture and is also a component of handicrafts and other utensils manufactured in the community for personal use. Training in sustainable harvesting will be conducted and community patrols will be encouraged to convey information about sustainable harvesting to users.

Indigenous woodlands are the major source of herbal medicines; perhaps 10% of the country's flora is used by traditional healers with roots and bark of native trees and shrubs making up a significant proportion of the total. Traditional collection of medicinal herbs was often destructive and a lack of training in the preservation of harvested materials results in waste. This will be addressed through education.

Eight bee keepers associations have been set up, trained and equipped by the project. Some 70 bee farmers are involved in this community venture. Bee farmers have abandoned traditional bee hives (that are unsustainably produced by destroying trees) and have been trained in the use of the Kenya Topbar Hive (manufactured in the community) and equipped with modern equipment to minimise the risk of fire traditionally associated with harvesting of honey. These measures contribute to the sustainable extraction of NTFP's from the conservation areas.

Activities such as opening crop fields (machambas), cutting trees for charcoal and other that compromise sustainable of natural resources and attempt the legislation will not be allowed.

## **Monitoring plan**

The monitoring plan lists the activities and indicators to be used to monitor the achievements of project activities. It should contain details of the following activities and items:

- Annual boundary inspection. A project representative shall patrol the boundary of the community reserve no less than once per year to inspect fire breaks, incursions and integrity of the boundary controls.
- Annual visual inspection of MODIS NDVI (Normalized Difference Vegetation Index) for the project area and surrounding landscape, to assess the integrity of woodland in the project area, and identify any possible leakage of forest degradation to areas outside the project area. This should be carried out in the late dry season when the grass has died back so that there is maximum contrast between woodland and non-woodland areas (see [Section 5.2](#)).
- Annual monitoring of carbon stocks in project areas using ground based measurements from sample plots (see [Section 6.3](#)).
- A plan for monitoring the presence of key indicator species.
- Annual assessment of governance structures. The governing committee should produce a report summarizing their activities for the year, any problems encountered, and corrective actions required.

## **Third Party Verification**

Annual monitoring will be done by Universidade Eduardo Mondlane and proposal for that and Memorandum of Understanding is under preparation. The monitoring will include boundary inspection, satellite image analyses and comparison, sample plot measurements, governance assessment, and remote sensing monitoring.

## **General Principles:**

1. Monitoring criteria and regime should be referenced to the Technical Specification (Moz-Nha-TS-AD)
2. Parameters and guidelines for inspections need to be agreed between all stake holders up front.
3. A contract will be signed between University of Eduardo Mondlane and the Mozambique Carbon Livelihoods Trust.

4. Annual inspection process of the Gorongosa project sites will take place in June/July.
5. Inspection to be followed promptly by a written report.
6. Corrective actions in October.
7. Final annual report produced.

### **Monitoring plan**

The monitoring plan will include:

1. Annual boundary inspection: the inspection team will patrol the boundary of the community reserve to inspect fire breaks, incursions and integrity of the boundary controls and protection programme for the forest.
2. Remote sensing plan (annual visual inspection of Modis NDVI for the area).
3. Ecological indicators: a plan for monitoring the presence of key indicator species and other biodiversity factors.
4. Functioning management / governance: meet with the governing committee which shall produce a report summarising their activities for the year, problems encountered and including fire breaks
5. Inspect any restoration activities
6. Monitor fire management programme.
7. Ensure forest resources are being used sustainably according to the management plan. (ie check on extraction figures supplied by the committee)
8. Monitor leakage.

### **Key threats to the ecosystem in monitored areas have been identified in the Technical Specification as:**

1. Encroachment – land clearances for agriculture. This is observed throughout the area in particular on low lying ground in proximity to water sources.
2. Charcoal production. Illegal and unsustainable charcoal production is the key driver of deforestation throughout sub-Saharan Africa.

3. Uncontrolled burning. Prior to the introduction of a fire management regime (which commenced within the managed area in 2005) almost the entire project area was burnt annually (by uncontrolled fires). Frequent burning will hinder natural regeneration (and hence stand recovery) and thus reduce the accumulation of carbon both in biomass as well as in the soils.

4. Illegal logging.

**Required Actions to avoid Leakage as set out in the Technical Specification :**

The annual inspection should ensure that a plan is in operation and that its interventions should include:

1. Protection / sustainable management of any woodland areas within the community
2. Implementation of agroforestry measures to provide products such as fuelwood or poles that may no longer be available from within the conserved woodland
3. A plan to monitor leakage on specific woodland areas outside of the woodland conservation area.

Where communities have a satisfactory plan for managing leakage risk resulting from the conservation of woodlands there should be no assumption of leakage.

**Requirements of the Technical Specification re the efficacy of the management plan:**

Monitoring should be undertaken by the project operator annually to check that the governance structures are maintained and corrective actions enforced. Crediting for forest conservation may continue as long as project indicators remain Green (see table 2). If a project indicator turns amber then crediting should be delayed by 50% for that year until corrective actions have been implemented to the satisfaction of the operator. If a project indicator turns red then crediting should be suspended until issues have been resolved and corrective actions implemented.

Table 2

<b>Crediting</b>	<b>Governance</b>	<b>Activities</b>	<b>Physical damage</b>
<b>Continue as per schedule</b>	Governance working effectively	Protection activities implemented as per plan	Woodland / forest conservation consistent with management plan
<b>Delay 50% until CARs implemented</b>	Significant breakdown in governance	Protection activities not properly implemented	Loss of woodland / forest at 50% of baseline rate
<b>Suspend crediting until issues resolved</b>	Governance not functioning	No effective protection activities	Loss of woodland / forest proceeding at or above baseline rate

Annual site monitoring should combine techniques of satellite remote sensing (to monitor changes in extent of woodland distribution) and ground truthing based on sampling methods described in Ryan et al (2007) for rapid assessment of carbon stock in the N’hambita area. The key monitoring indicators for the five land cover types described are shown in table 3.

Land cover type	Number of trees per hectare (mean)	Dominant tree species	Mean basal area (m <sup>2</sup> /ha)
Riverine Forest	421	<ul style="list-style-type: none"> <li>• <i>Sclerocarya birrea</i></li> <li>• <i>Khaya anthoteca</i></li> <li>• <i>Cleistochlamys kirkii</i></li> <li>• <i>Acacia nigrescens</i></li> <li>• <i>Pterocarpus rotundfolius</i></li> <li>• <i>Brachystegia boehmii</i></li> <li>• <i>Diplorhynchus condylocarpon</i></li> </ul>	13.8
Tropical Woodland	406	<ul style="list-style-type: none"> <li>• <i>Pterocarpus rotundfolius</i></li> <li>• <i>Burkea africana</i></li> <li>• <i>Brachystegia spiciformis</i></li> <li>• <i>Combretum adenogonium</i></li> <li>• <i>Combretum apiculatum</i></li> <li>• <i>Combretum hereroense</i></li> <li>• <i>Commiphora mossambicensis</i></li> </ul>	10
Savanna	386	<ul style="list-style-type: none"> <li>• <i>Pterocarpus rotundfolius</i></li> <li>• <i>Brachystegia boehmii</i></li> <li>• <i>Julbernardia globiflora</i></li> </ul>	5.8
Secondary Woodland	561	<ul style="list-style-type: none"> <li>• <i>Brachystegia spiciformis</i></li> <li>• <i>Diplorhynchus</i></li> </ul>	8



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*condylocarpon*

- *Burkea africana*
  - *Sclerocarya birrea*
  - *Diplorhynchus*
- condylocarpon*
- *Pterocarpus angolensis*
  - *Burkea africana*
  - *Pseudolachnostylis*

Machamba

38

*maprouneifolia*

2.4

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