| CLIMATE, COMMUNITY AND BIODIVERSITY STANDARDS PROJECT DESIGN DOCUMENT FORM FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CCB-AR-PDD) |
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# Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania

## CONTENTS

## I. BASIC DATA

Green Resources Limited (GRL) is the leading plantation, carbon offset and renewable energy company in Eastern Africa. Green Resources AS are conducting reforestation activities in a number of locations in Tanzania, Uganda and Mozambique, with the purpose of deriving revenue streams from the sale of carbon offsets and timber, whilst simultaneously bringing community and environmental benefits. The Uchindile and Mapanda Forest Projects, is also applying for validation and verification under the A/R category of the Voluntary Carbon Standard, applying approved methodology A/R AM0005.

Date of document: February 24th 2009.

## II.  GENERAL SECTION

## G1.  Original Conditions at Project Site

### G.1.1 Describe the location of the project and basic physical parameters:

*Location*

Mapanda and Uchindile Forest Projects cover a total of 18,379 ha located in Mufindi and Kilombero Districts, Iringa and Morogoro Regions of Tanzania in the Eastern part of Africa. The activity shall be carried out in two separate blocks of 12,121 ha at Uchindile and 6,258 ha at Mapanda Forest Projects. The project boundaries and geographical locations are indicated below. The specific geographical positions (longitude/latitude) have been determined from topographic sheets, satellite images and actual planting area coordinates of the boundaries (polygons) established using GPS and stored in GIS.

Uchindile Forest Project (UFP) (see figure G1)

- **Project Boundary**: This area of land is confined within a parcel of 12,121ha of land, located on the lower elevation of Mufindi Escarpment, between latitudes 8o39′ 34″ S to 8o44′ 55″ S  and longitudes 35o23′ 28″ E to 35o32′ 59″ E , in an altitude of between 1100m and 1437m above sea level. The external boundaries are mainly rivers with Kihata to the West, Luiga to the North, and Mgelela to the South. The area is grassland where the landscape is dominated by undulating

ridges with steep slopes. The topography is generally covered with steep valleys. The area is degraded grassland from frequent anthropogenic caused fires.

Mapanda Forest Project (MFP) (see figure G1):

- **Project Boundary**: The MFP project activity is confined within a parcel of 6,258 ha of land located on the lower elevation of Mufindi escarpment, within latitudes 8°24′30″S to 8°33′19″S longitudes. The altitude varies from 1400 m to 1753 m above sea level. The external boundaries are rivers and the government owned Sao Hill Forest plantation in the Western parts. In the north-east is village land and to the south is convergence of Mkungwe and Mwenga rivers. The area is degraded grassland from frequent anthropogenic caused fires.
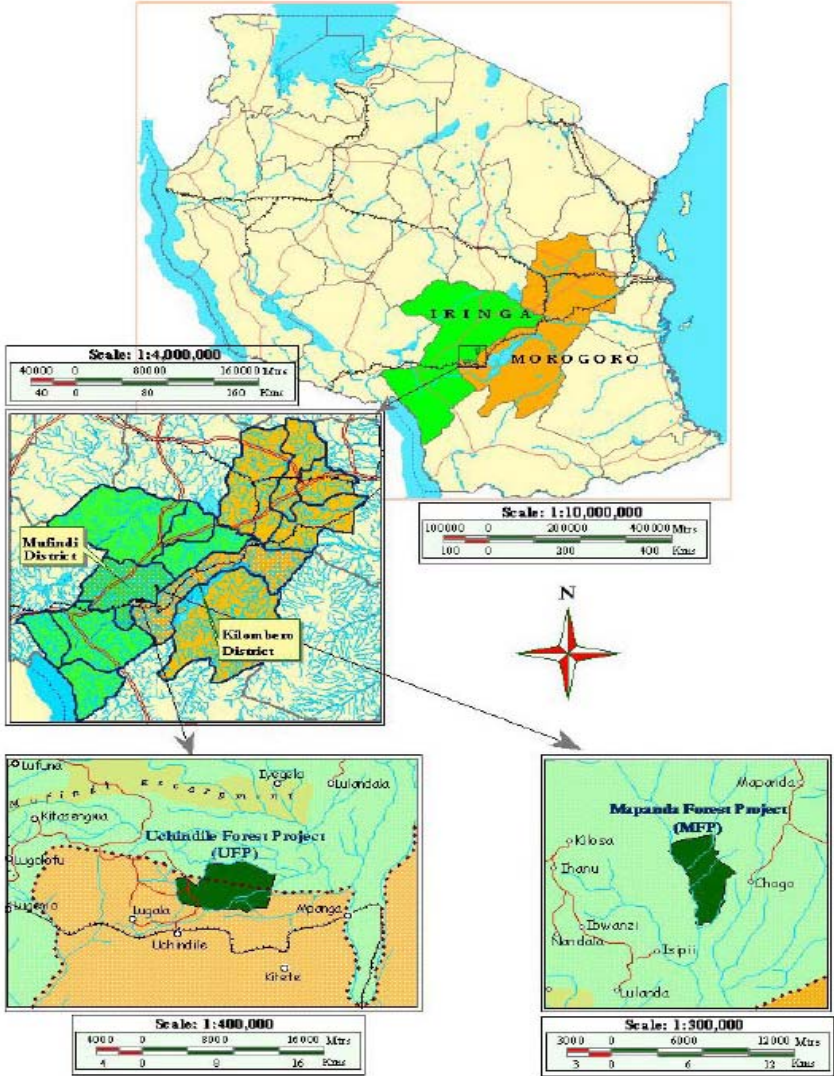
**Figure G1: Location of the proposed A/R project activity**

Both of the two blocks of Mapanda and Uchindile have similar characteristics; namely they are degraded grasslands with scattered shrubs and pockets of indigenous trees along river valleys and gullies. The baseline environmental conditions are described below.

*Hydrology*

**UFP**: The hydrology of the area is characterised by several rivers and small streams flowing through the area including the ones marking the borders of the project. Almost every valley bottom consists of swampy grounds portraying springs and rivers flowing out of the valleys. The major rivers flowing through Uchindile/Lugala are Ngokomiche, Kihata, and Luiga whose banks are covered with natural vegetation. A few small streams have their sources within the area of the Forest Project. Most of the streams flow into the Kilombero Valley which is to the south of the area.

**MFP:** The hydrology of Mapanda project area is characterized by major rivers, namely Mwenga river to the west and Mkungwe, Kiverege, Mvino and Kiumbo rivers all flowing into the Mwenga river. A few other small streams also have their sources in the project area. The river banks and valleys are covered by natural vegetation dominated by riverine tree species e.g. *Syzygium cordatum* and grassland that are left intact for protection purposes.

*Climate*

**UFP:** area has a bi-modal climate, characterised by a long dry season and a bi-modal rainfall distribution in short and long rain periods. On average, it receives an annual rainfall of about 1000 mm. The project area is located in a zone of potential evaporation varying between 800 - 1200 mm/year. The annually variation in potential evaporation is smaller and steadier as compared to rainfall. The short rainy season occurs during November-December and a longer season between March and May. The area is predominantly dry between July and October. The average temperature is around 16$^o$C with the coldest months between May to August/ September. Winds normally blow from the North-East.

**MFP**: the mean annual precipitation is about 1050 mm, most of it falling between December and April/May, but with drizzles (showers) extending to June and sometimes July. The prevailing winds blow from East to West during the dry season and may blow from South-East to North-West during the wet season. The mean temperature is 12$^o$C and the coldest months are May to July.

*Soil*

**UFP:**  The soil in most of the areas originates from granites which are deeply weathered. This type of soil is moderately acid, poor, freely drained and markedly compacted near the surface where there is often a very high coarse grained soil fraction. The top soil have been exposed to annual fires and therefore exhausted in humus content and the pH varies from 4.4 - 6.5. The soil is in general red loamy sand (latosol). The slopes of the ridges are high and in some places range from 20 - 40%.

**MFP:** The soil in Mapanda project area is a mixture of red and yellow clays often with dark humus top soil whose agricultural productivity rating is medium. In some areas the top soil has been exposed to excessive annual fires and erosion, and therefore exhausted in humus content. Soil colour ranges from red clays to yellow. Soil pH ranges from 5.3 - 6.0. Some parts are prone to hardpans formation, which in most cases are found on ridges.

*Ecosystems*

**UFP**: Within the boundary of the project area there are existing patches of naturally growing shrubs and trees and vegetation cover, which are mainly observed along river banks, valleys and steep slopes. These are left as conservation areas so as to protect the areas from erosion by rainwater, as well as protect the rivers and streams from any negative hydrological impacts from the tree planting. The main species dominating native vegetation cover are *Combretum sp. Nuxia congesta*, grasses dominated by species of *hyperenia, aristida* and *themada* and shrubs species. The remaining areas are degraded grassland lands, and are not currently used for any activities due to poor soil and grasses which are not suitable for grazing.

**MFP**: The plantation area has patches of natural vegetation consisting of tree species such as *ficus, albizia,* savannah tree species and bushes. In river valleys riverine tree species can be observed dominated by *Syzygium cordatum, Syzygium guinense.* The present vegetation in the area is savannah - like commodities derived from montane forest. Remnants of the dominant species include *Parinari curatelifolia, Catha edulis, Maesa lanceolata, Albizia gumifera, Prunus Africana and Nuxia congesta*. At present the area is mainly grassland. Within the plantations the natural undergrowth is mainly *Hyperrhenia* grasses with few scattered trees and shrubs. The soil is a mixture of red and yellow clays, often with humus top soil.

## G.1.2 Describe the types and condition of vegetation at the project site:

The vegetation in project area is categorized mainly into two major types; grassland and some scattered trees and shrubs. Before the project`s inception the area was covered with 90 % grassland (of which 40% is put into conservation). The classification of the hill tops and along the hills slopes are dominated by grass. The natural undergrowth is composed of patches of scattered trees and shrubs. The common species found in these slopes are *Prothea angolensis, Syzygium cordatum*, fern (*Tyelypteris confluens*). River valleys and valley bottoms are rich in tree species including *Syzygium cordatum, Bridelia micrantha* and *Gardenia imperialis* and fern (*Tyelypteris confluens*). In the absence of the project activities theses patches of existing vegetation are threatened by the frequent wild fires, caused by anthropogenic burning which often gets out of control.

## G.1.3 Current carbon stocks at the project site(s), using methodologies from the Intergovernmental Panel on Climate Change's Good Practice Guidance (IPCC GPG) or other internationally approved methodologies (e.g. from the CDM Executive Board):

The existing carbon stock was calculated following approved methodology A/R AM0005 for CDM project activity in the area. The approved methodology recommends a hierarchical approach to stratification for both pre-project and with project scenarios. The methodology outlines factors to be considered during *ex-ante* stratification to be based on the regional scale, such as climate, topography or geographical conditions. Based on this stratification methodology, the baseline strata are based on variables that influence carbon stock changes in above-ground and below-ground biomass pools. These variables were identified as climate, soil, topography, vegetation type and anthropogenic pressure. The land use within the project boundary was identified as a continuation of the existing grassland thus not influencing baseline carbon stocks, and therefore not included as the stratification criteria. The two land areas included in this project, although located in two sites, occur within one climatic region, have similar soil types, topography and human induced pressure (e.g. uncontrolled fires). Official topographical map series with topographic details at 1:50,000 scale were used to identify land use/cover data and the information was ground-truthed with field surveys. Satellite images and interpretation of land cover images from the Institute for Research Assessment were acquired to determine the pre-existing conditions and the status of grassland before the project starts. The ground-truthing confirmed the presence of individual scattered trees and shrub vegetation in areas of unmanaged

grasslands. The preliminary (*ex-ante*) stratification was carried out based on baseline land use/cover and topography information where vegetation was used to distinguish grasslands from forest lands along the river valley with insignificant variation. Two strata were identified during *ex-ante* stratification are:

1. Grassland with scattered trees and shrubs
2. Riverine vegetation with trees and shrubs

The approved methodology recommends estimating changes in carbon stocks in the living biomass of unmanaged grasslands based on land use categories identified in the baseline scenario: maintenance of grassland in its present state and the A/R implemented at a specified pre-project rate or a combination of both. The land use under the baseline scenario elaborated in section C.4 of the PDD is grassland with scattered trees and pockets of shrubs.

The carbon stock change in aboveground and belowground biomass for the grassland is estimated based on vegetation data collected from temporary sample plots for grass, trees and shrubs using equation B.1 of the approved methodology AR-AM0005 (Section II.5). Since there are no pre-project A/R activities (Section II.5 (2)), the carbon stock changes in living biomass for this category are neglected.

The baseline net GHG removals by sinks from area estimated from grass, shrubs and trees and are assumed to be in steady state. Hence the sum of the carbon stock changes of the living biomass at the time before the project started is considered zero (See Section II.5 (1) Equation B.2). For areas with isolated/scattered trees, changes in carbon stocks of the living biomass are estimated using Equation B.3 in the approved methodology in Section II.5 (1).

The sum of changes in the living biomass estimated as part of the baseline prior to the project start is frozen and adopted as the baseline to represent the scenario in the absence of the project. According to the methodology, in applying equation B.3, the participants may choose to use the methods described in the step 5 of Section II.5 (2) for estimating the biomass in isolated trees. One of the suggested methods is the use of allometric equation (Equation B.13) which is considered good practice by the IPCC. The allometric equation linking above-ground diameter to mean diameter at breast height (DBH) used during baseline biomass estimation is the general biomass regression equation developed by Brown (1997) for moist tropical zones with trees DBH range from 5 – 148 cm.

$$Y = Exp (-2.134 + 2.530In DBH)\ [1]$$

The DBH of most trees estimated was below 5cm. The allometric equation linking above-ground biomass to mean diameter at breast height uses dominant trees to determine biomass.

In accordance with the approved methodology, monitoring of the baseline is not required; therefore no data is collected during the crediting period. The baseline situation is frozen and shall again be assessed in the run-up to the second crediting period. Since the plausible and most likely land use is continuation of grassland in the state before the project started, the assessment of the baseline biomass on the vegetation cover obtained an average of 2.65 tC/ha of above ground biomass for the projects of 12 t C/ha was calculated. (See also Annex 3 for a detailed description of the calculations of the baseline).[2]

Since the grassland vegetation is assumed to be in a steady state, the carbon stock change will be released as a result of planting activities. The figures obtained after baseline assessment and final calculations of the carbon stock changes in above ground and below ground carbon pools in grasslands being debited due to planting are shown in table G1c. According to the planting plan (Table G1a and Table G1b), from year 2013 there will be no planting since the expected plantable area would have been planted.

**Table G1a:** Planted area (2001-2007) and species composition

| Species \ Year | Area planted (ha) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| Pine | 80 | 54 | 171 | 45 | 566 | 479 | 889 |
| Eucalyptus | 0 | 240 | 6 | 360 | 470 | 178 | 161 |
| Total | 80 | 294 | 177 | 405 | 1036 | 657 | 1050 |

**Table G2b:** Planted area (2008-2013) and species composition

| Species \ Year | Area to be planted (ha) | | | | | |
|---|---|---|---|---|---|---|
| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| Pine | 792 | 784 | 756 | 791 | 301 | 324 |
| Eucalyptus | 388 | 390 | 399 | 230 | 321 | 364 |
| Total | 1180 | 1174 | 2329 | 1021 | 622 | 688 |

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[1] Brown S. (1997). Estimating biomass and biomass change of tropical forests. A primer. FAO Forestry Paper No.134. Rome, Italy. 55 p.

[2] Currently we are awaiting clarification from the A/R Working Group on whether clearance of herbacoues vegetation has to still be included as a project emission.

**Table G3c:** Estimation of the *ex ante* baseline net GHG removals by sinks[3]

| Year | Estimation of baseline net GHG removals by sinks (tCO2e) |
|---|---|
| 2000 | 0 |
| 2001 | 3,514 |
| 2002 | 12,936 |
| 2003 | 7,772 |
| 2004 | 17,804 |
| 2005 | 45,573 |
| 2006 | 28,922 |
| 2007 | 46,173 |
| 2008 | 51,924 |
| 2009 | 51,668 |
| 2010 | 50,828 |
| 2011 | 44,914 |
| 2012 | 27,350 |
| 2013 | 30,291 |
| 2014 | 0 |
| 2015 | 0 |
| 2016 | 0 |
| 2017 | 0 |
| 2018 | 0 |
| 2019 | 0 |
| 2020 | 0 |
| Average over crediting period (2000 -2020) (tCO2 e) | 20,983 |
| Total for crediting period (2000 -2020) (tCO2 e) | 419,670 |

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**G.1.4 Description of communities located in and around the project area, including basic socioeconomic information (using appropriate methodologies such as the livelihoods framework).**

In 1999, a socio-economic study was carried out for the Forest Projects together with an environmental impact assessment (EIA) by Orgut Consultancy. This study analyzed the pre-existing conditions of the communities in the area. The project area itself was largely abandoned prior to the projects inception. This dates back to 1975 of Tanzania's historic

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[3] The values in this table are the annual estimates of carbon stored in grasslands based on the planting schedules and the average storage potential for grasslands of 12 t C/ha.

move towards 'villagization' under 'Ujamaa Village Programme' in which families living in rural isolation were moved into villages to live together and share common goods and properties. As such very few families were reported living in the area before the project commenced, as most of them were living in the village of Idete (or other villages). The main land use was agriculture with limited livestock grazing. The economy was based on smallholder agriculture where crops were grown for food and the surplus sold. The project is located on the land of the "hehe" people.

Following the recommendations from this pre-project survey, the project participants have carried out detailed socio economic studies employing such techniques as PRA[4], semi-structured interviews, focus group discussions, village meetings and questionnaire methods in 1999, 2003, 2006, 2007 and 2008. Project proponents focused on assessing economic wellbeing attributes including housing, education, income, health, infrastructure and culture.

## G.1.5 A description of current land use and land tenure at the project site:

*Land use*

The existing vegetation in the area at the project start was unmanaged grassland with scattered trees and shrubs, exposed to annual fires (picture G1 below). The native vegetation cover would be forest, but this has been lost of the years, and forced back into gullies because of repeated fire events. The subsistence farmers also practised limited livestock grazing where cattle were mainly kept in kraals. At the time of the baseline assessment (EIA by Orgut Consultancy in 1999), the farmers were harvesting their last food crop from this area as the poor soil would not manage to give enough crops.

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[4] Participatory Rural Approach

**Picture G1: Site conditions prior project commence**

*Land tenure*

GRL inherited the land titles from Escarpment Forestry Company Ltd (EFC) which was taken over by GRL in 2001 and has a long term lease for the discrete areas of land from the Government for the purpose of long-term reforestation.

**Table G1.5a: Land tenure and legal title**

| Name | Villages | Area | Tenure | Deed |
|------|----------|------|--------|------|
| **Uchindile** | Uchindile, Kitete | 12,121ha | 99yrs from yr. 2000 | 50742 |
| **Mapanda** | Chogo | 1,606ha | 99yrs from yr. 2003 | 8954 – MBYLR |
| | Chogo & Mapanda | 4,652ha | 99yrs from yr. 2003 | 8955 – MBYLR |

## G.1.6 Description of current biodiversity in the project area and threats to that biodiversity, using appropriate methodologies:

The project is developed on the land that is poor in ecological terms due to primarily poor soil from a successive fire regime, and resulting degradation. The area is comprised of undulating hills and valleys where grassland is dominating. Besides the grassland, the site area consists of remnant vegetation, patches of forest both on the hill side and valley bottoms. Areas around the valley bottoms, streams, riverine and small clusters of native

vegetation on the hill tops contain the richest biodiversity and will be put into conservation.

Plantation forestry shall be carried out in the degraded grassland. Prior to the projects commencement, the unmanaged grassland where highly exposed to fires caused by local communities starting fires for hunting, often initially outside the Forest Project Boundaries, which got out of control , and spread to the Forest Project area. Ecological and botanical studies have been conducted for the area[5]. In the animal, bird and plant life study, a transect method was adopted for species habitat analysis in which transects were laid in a variety range of habitats to give a representative sample of the study area. Information collected by GPS points on the ground to site location of key animal species found within close vicinity was then analysed in Arcview/ArcGIS, plotted and stored. Based on these studies, the area contains high conservation value forest (HCV) and rare threatened and endangered species (RTEs); flora and fauna.

Green Resources Ltd aims to restore connectivity to the wildlife. The project has left intact a wildlife corridor in the eastern part of Uchindile where the project connects to Kilombero Game Controlled Area. This corridor allows for wildlife feeding and provides fresh water inside the project area. In the ecological study done by Wildlife Conservation Society of Tanzania (WCST), the Birdlife International partner in Tanzania, emphasis was made to the *Hirundo atrocaerulea* (commonly known as blue swallow). This is a bird that appears in the IUCN/Red List as endangered and threatened. In the act of protecting this bird, the project has set aside conservation area that was identified to adequately provide perching, nesting and a feeding environment for this bird.

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**G.1.7 List of all IUCN Red List threatened species (which encompasses endangered and vulnerable species) and species on nationally recognized list (where applicable) found within the Project boundary.**

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Listed below are IUCN Red List of threatened species and the national list of threatened species found within the total project area. The list includes mammals, plant and bird species as identified in both the ecological and botanical studies. During the first years of

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[5] Ecological study by P. Munishi and J. Wambura  (2006), Botanical study by Tanzania Tree Seed Agency (2006), Wildlife Conservation society (2008)

the project, the project conducted a detailed assessment of the different groups of fauna and flora in the area.

**Table G4: Overview of the red list mammals, birds and plant species.**

| S/N | Species Name | Life form | IUCN Red List | CITEs | Status |
|-----|-------------|-----------|---------------|-------|--------|
| 1 | *Osyris lanceolata* | Shrub | | | Endangered |
| 2 | *Catha edulis* | Shrub/tree | | | Threatened in Tanzania |
| 3 | *Cyathea thomsonii* | tree | | | Rare |
| 4 | *Orchid* | - | Yes | | Threatened |
| 5 | *Prunus africana* | tree | | Yes | Rare |
| 6 | *Hirundo atrocaurea* | bird | Yes | | Endangered |
| 7 | Syzigium spp | tree | | | Water conserving |
| 8 | *Bridelia Micrantha* | tree | | Yes | Water conserving |
| 9 | *Albizia gummifera* | tree | | Yes | Water conserving |
| 10 | *Parinari culateriflolia* | tree | | Yes | Water conserving |
| 11 | *Poeoptera kenricki* | bird | | | East African endemic |
| 12 | *Uhehe fiscal* | bird | | | Endemic in Iringa |
| 13 | Aardvark | animal | | Yes | |

*Source: Ecological/botanical study, Environmental Impact Assessment reports*

Based on the studies carried out in the project area, the listed species above occur in areas which have now been put into conservation/protection – these are mainly valley bottoms, buffer zones[6] and other areas of remnant forest.

## G2.  Baseline Projections

**G.2.1 Description of the most likely land-use scenario in the absence of the Project activity, identifying whether the scenario assumes that existing laws or regulations would have required that project activities be undertaken anyway:**

The land use was identified by the district development committee during field visits and was predominantly unmanaged grassland.  In the absence of the project, the grassland will continue being degraded from fire.

**Assessment of national sector policies and legislation, and if the activity would be allowed to take place anyway:**

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[6] 30 -60 meters from streams, riverine forest, valley bottoms, wildlife corridors and wetlands.

Tanzania has extensive cross linkages between sectoral policies and legislations, especially governing land and development of natural resources. The following sections give an assessment of the relevant national or sectoral policies:

a) Policies related to the creation of wood sources

The forestry sector is guided by the *National Forest Policy* adopted in March 1998, whose overall goal is to enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of natural resources for the benefit of present and future generations. A *Beekeeping Policy* was also adopted in 1998. The *National Forest Programme* (NFP) is a ten-year framework (2001-2010) which guides implementation of the *Forest Policy* (FBD, 2001). The NFP is based on four implementation programmes: Forest Resources Conservation and Management; Institutions and Human Resources; Legal and Regulatory Framework; and Forestry Based Industries and Sustainable Livelihoods.

The Forest Act (No. 14 of 2002) provides for the management of forests which came into operation on the 1st July 2004 (Forest Act (Date of Commencement) Notice, 2004; Government Notice No. 160). The Forest Regulations, 2004 (Government Notice No. 153) were made under section 106(1) of the Forest Act (2002). During 2006, further revisions to forest legislation have included the Forest Amendment Regulations, 2006 and the Forest (Charcoal Preparation, Transportation and Selling) Regulations, 2006.

b) Legislation related to the requirements of A/R activities and wood use

1. The National Land Use Planning Commission Act No. 3 of 1984. The proposed A/R CDM project activity has been incorporated in the land use planning of the districts as per this act;

2. National Water Policy of 1991 empowers rural people/land owners to communally own water resources within their areas;

3. The Water Utilization Act of 1974 with amendment done in 1981 Act No. 10 (Miscellaneous amendment Act No. 8 of 1997) – this act with its amendments provide a guide for controlling the extraction of water for different uses as well as protection of water resources;

4. National Forest Policy of 1998 provides guidance on sustainable supply of forest products and services, and the conservation, development and management of forest resources for future generations;

5.  National Land Policy of 1995 recognizes a dual system of land tenure i.e. customary and statutory rights of occupancy. Section 4.2.18 provides conditions for transactions of land, which has a market value. The project participants have adhered to this policy as well as the Village Land Act No. 5 of 1999;

6.  Village Land Act No. 5 of 1999 provides procedures to transfer of village land to general or reserved land that can be used for investment. The project participants followed guidelines provided in this act in acquisition of the discrete areas of land for he A/R CDM activity;

7.  National Strategy for Growth and Reduction of Poverty (NSGRP) of June 2005 is committed to the Millennium Development Goals (MDGs). The proposed A/R CDM activity will create employment and contribute to the national GDP;

8.  Poverty Reduction Strategy of 2000 – with strategies to improve rural development, export and private sector development;

9.  The Environmental Management Act No. 20 of 2004 (section 63 on forest management according to the Forest Act No. 14 of 2002;

10. Forest Act No. 14 of 2002 provides requirements for establishment and management of forests.

Policy and legislative revision took place in light of the linked forces of *decentralizing forest management, encouraging participatory forest management* (e.g. Joint Forest Management or Community Based Forest Management), and *ensuring forests contribute towards national poverty alleviation goals*. Although these programs have set overall development goals for forestry development, they are not legally-binding, and meeting the goals depends largely on the availability of funds. Participatory Forest Management (PFM) guidelines were drawn up in 2001. A key issue facing the forestry sector is that despite a relatively comprehensive institutional and legal framework (as detailed above), implementation is severely limited by *inadequate human and financial capacity and the delayed finalisation of various institutional arrangements*. As the domestic funds for the reforestation are limited, local farmers are usually not able to fully finance forest establishment because it is hard for them to get loans from banks for the purpose of afforestation or reforestation activities. Loans for agricultural activities are much easier to pay back because there is a three year payback condition.

In addition, forest management in Tanzania is also dependent upon a range of other sectoral policies and actors. For example, Participatory Forest Management (PFM) is dependent on land titling (*Land Act, 1999* and *Village Land Act, 1999*) and the enactment of village by-laws

(*Local Government Miscellaneous Amendments Act, 1982*), all of which lie outside the jurisdiction of Forestry and Beekeeping Division. Other specific examples include the influence of infrastructure developments and energy demand on forests.

c) Other policy incentives and constraints

An assessment of sectoral policies with respect to opportunities and constraints for improving forest governance included promotion of private investment in forests plantation and management of the existing forests. The strategy for poverty reduction (NSGRP) also contains many direct references to the forestry sector. Environment and natural resources management have been mainstreamed in the Tanzanian National Strategy for Growth and Reduction of Poverty (NSGRP). 14 % of the targets in the strategy relate to environment and natural resources management and there are a considerable number of environmental interventions under non-environment targets. Development partners provide over 60 % of the budget of the forestry department since 1990. These are allocated mainly to conservation of the already depleting natural forests while the forest plantations are expected to be self-financed. Therefore, without the proposed A/R CDM project activity the project area will not be reforested, and with the project activity the goals of the on-going reforestation programs or policies will not be met.

The investment constraints in finance, technique and institutional barriers indicates that the only realistic and credible alternative available to the project participants is to establish forest plantations with incentives from CDM and replace the current land cover due to the economic reasons.

**G.2.2a Provide a projection of future carbon stock changes in the absence of the project, based on the land-use scenario described above:**

In the baseline scenario, the grassland is not expected to change because it is prone to seasonal fires and regeneration. The carbon sequestration from shrubs and bushes is not able to regenerate due to the successive fire regime which occurs in the absence of the project. This was therefore set at zero during the calculation of emissions in the baseline scenario.

**G.2.2b If there is evidence that non-$CO_2$ greenhouse gas (GHG) emissions such as $CH_4$ or $N_2O$ are more than 15% of the baseline GHG fluxes at the project site (in terms of $CO_2$ equivalents), they must be estimated.**

The project proponents do not expect that other GHG-emissions, such as $CH_4$ and $N_2O$, will exceed 15 % thus they are neglected.

## G.2.3 Description of how the "without-project" scenario would affect local communities in the project area.

Population analysis carried out between 1988 to 1994 shows that the number of households remained constant. In 1988 there were 378 households while in 1994 there was a small increase of only 3 households, to 381. The majority of the houses (68%) had mud and pole-thatched roofs while 32 % of the households were constructed of mud bricks (some burnt and reinforced with cement) and roofed with corrugated iron sheets. 68 % of the total adults (above 18 years of age) at Uchindile had attended 7 years of primary school and 16 % had also attended secondary school. The area was affected by waterborne diseases such as diarrhoea, worms, dysentery and amoebiasis. Also eye diseases, venereal diseases, pneumonia, skin diseases, tuberculosis and malaria were predominant as a result of distant medical facilities. The economic gain of people was in 1999 very poor. Over 43 % of the villagers stated that they were earning less than TSHs 50,000 per year[7].

Agriculture and/or labor are the main sources of income for local communities in the project area. However, due to severe soil erosion, agricultural production has suffered very much, land productivity is very low. Without the project the local communities would continue to live below the poverty line, with few improvements.

## G.2.4 Description of how the "without-project" land-use scenario would affect biodiversity in the project area.

The project area in the "without project" scenario shall be under threat from uncontrolled fires. This would result in degradation of land as a consequence of soil cover erosion, exposing the surface soil nutrients to erosion downstream, degrading the top soil so it cannot support natural forest regeneration or sustain native biodiversity. Continued burning, and lack of knowledge and measures to protect biodiversity under the 'without-project' scenario, would result in the reduction and possible extinction of native animal, birds and plants.

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[7] EIA report conducted by Orgut Consultancy (1999)

### G.2.5 Description of how the "without-project" land-use scenario would affect water and soil resources:

Under the 'without-project' scenario the water level would either decrease or remain at its current level. It is also expected that uncontrolled burning of the vegetation and continued clearing of the trees that conserve water courses would increase over time as a consequence of population growth in villages. Fires would expose soil causing erosion that shall result in sedimentation in the lower valleys. Exposed soil will result in rapid evaporation of moisture.

## G3. Project Design & Goals

### G.3.1 Provide a description of the scope of the project and a summary of the major climate, community and biodiversity goals.

The project involves planting trees on grassland areas to contribute to the supply of high quality wood products and transmission poles both in the region and internationally. The project will also contribute to sustainable development. The major purposes of the project activity are to:

1. Enhance carbon sink through reforestation.
2. Reclaim the degraded land in a sustainable manner.
3. Reduce pressure on natural forests of the region.
4. Uplift socio-economic status of native rural.

**Socio-economic benefits are brought** to the native rural poor through project activity have been provided with regular "around-the-year" employment. Training on farming machineries and techniques, land-use planning, management and conservation is provided. The project has also contributed to development of infrastructure (roads, buildings, and water supply and communication systems).

**Environmental benefits are delivered** through creating consciousness among the villagers about effective utilization of their land, and reducing land degradation through fire. The project inspires and provides resources for villagers create their own community woodlots on their land. The project also promotes environmental conservation, such as soil conservation, protection of water sources and enhancement of biodiversity through the

protection and management of existing indigenous flora and fauna and where possible enrichment planting with indigenous species and fruits.

Other environmental benefits include groundwater recharging; through better soil moisture conservation techniques, to result in rising water tables. And also, creating conservation zones to protect RTE, HCV-forests, native species and habitats improves the aesthetics of the area and thus contributes to rise the non-use value.

The projects over-aching objective is to sequester $CO_2$ through forest planting in grassland areas, and generate high quality emission reductions in greenhouse gases (GHG) that can be measured, monitored and verified. The project participants strive to demonstrate that carbon sequestration from forest plantations is a viable instrument to encourage private investment in the forestry sector especially on degraded lands.

### G.3.2 Describe each major project activity (if more than one) and its relevance to achieving the project's goals.

To achieve the project goals, the following activities have been planned:

**The Management Plan**[8] has been developed for all aspects of project implementation and documenting decisions. This gives the scope and overview of all necessary activities and how they shall be implemented. This plan defines the local communities, how they shall participate and benefit from the proposed project activity.

**Socio Economic Impact Assessment**, the project proponents have conducted socio economic impact studies to the communities surrounding the project. These studies are partly done by external agencies, and also the company itself aims to analyze the socio economic standing of the community. Needs and concerns are incorporated in the management decisions to raise the socio economic wellbeing.

**A monitoring program** for GHG reductions and emissions, environmental and socio-economic wellbeing has been planned. In this program the community shall be sampled, mapped and assessed against various indicators of health, income, education, population patterns and infrastructure. The environmental variables such as species abundance,

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[8] The management plan for the two areas exists in two separate documents and is available upon request or during validation/verification.

diversity, landscape connectivity, forest fragmentation, habitat, and other variables at risk of being negatively impacted shall be monitored.

**Climate change assessment:** GRL plans to assess climate change impact projections in the project area/ region. This study shall identify the likely climatic impacts and the role of planting exotic forest in the area as GHG-sinks.

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**G.3.3 Provide a map identifying the project location, where the major project activities will occur, geo-referenced boundaries of the project site(s).**

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The project shall be implemented in two discrete areas, Uchindile and Mapanda located in two distinct areas (see table G5a below). The project boundaries and geographical locations are indicated below. The specific geographical positions (longitude/latitude) of the project boundary have been determined from topographic sheets, satellite images and actual planting area coordinates in accordance with CDM, FSC and other plantable area criteria.

**Uchindile Forest Project (see figure G3a)**

- **Project Boundary**: This area of land is confined within a parcel of 12,121ha of land, located on the lower elevation of Mufindi Escarpment, between latitudes 8o39′ 34″ S to 8o44′ 55″ S and longitudes 35o23′ 28″ E to 35o32′ 59″ E , in an altitude of between 1 100m and 1 437m above sea level. The external boundaries are mainly rivers with Kihata to the West, Luiga to the North, Mgelela to the South. The area is grassland with the landscape dominated by undulating ridges with steep slopes. The topography is generally covered with steep valleys with gradient as high as 7- 10% in some locations.

**Table G5a: The unique identification of the polygons for the UFP**

| BLOCK ID | Grid Coordinates (UTM) | |
| --- | --- | --- |
| | Eastings | Northings |
| UFPBLOCK I | 764576 | 9037500 |
| UFPBLOCK II | 767026 | 9034664 |
| UFPBLOCK III | 768652 | 9037758 |
| UFPBLOCK IV | 770328 | 9033967 |
| UFPBLOCK V | 773372 | 9034740 |
| UFPBLOCK VI | 777653 | 9034612 |
| UFPBLOCK VII | 778710 | 9037087 |
| UFPBLOCK VIII | 772778 | 9037758 |
| UFPBLOCK IX | 770663 | 9040931 |
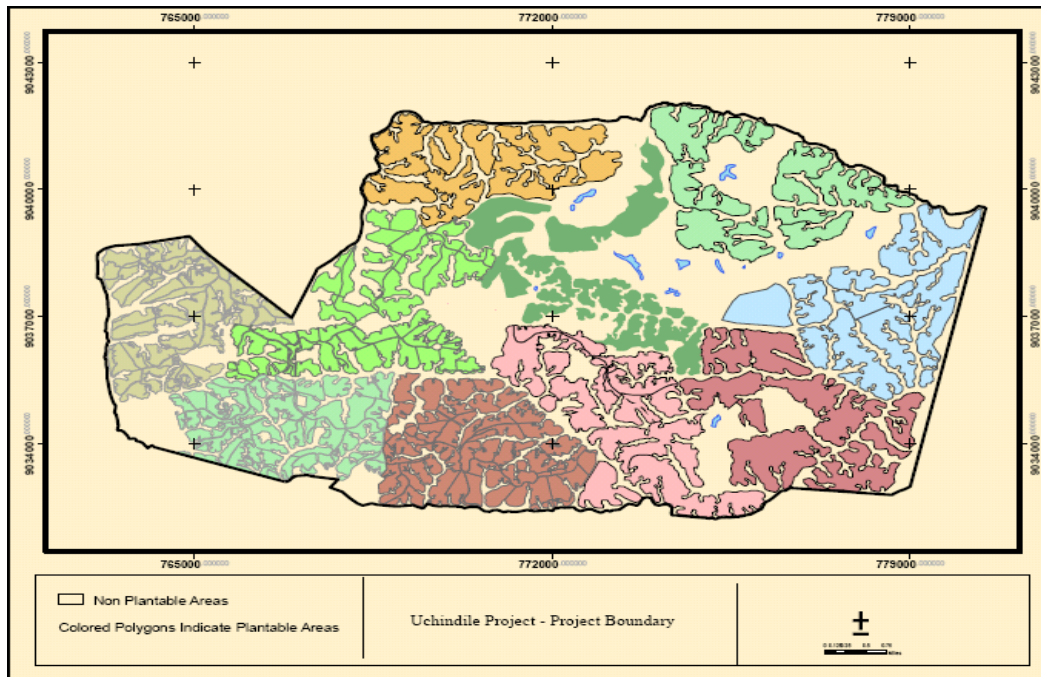
**Figure G2a: Map of the Uchindile Forest Project area showing geographical boundaries of the actual planting areas. Different colours indicate different years of planting.**

**Mapanda Forest Project** (see figure G3b):

- **Project Boundary**: The MFP project activity is confined within a 6,258 ha of land, located on the lower elevation of Mufindi Escarpment, within latitudes 8°24′30″S to 8°33′19″S and longitudes. The altitude varies from 1400m to 1753m above sea level. The external boundaries are rivers and the government owned Sao Hill Forest plantation to the West, to the North and the East is village land and to the south is convergence of Mkungwe and Mwenga rivers. The area is grassland.

**Table G6b: The unique identification of the polygons for the MFP**

| BLOCK ID | Grid Coordinates (UTM), 36S | |
| | Eastings | Northings |
|---|---|---|
| MFPBLOCK I | 797103 | 9065791 |
| MFPBLOCK II | 798177 | 9062737 |
| MFPBLOCK III | 797019 | 9060526 |
| MFPBLOCK IV | 796450 | 9058019 |
| MFPBLOCK V | 795102 | 9065075 |
| MFPBLOCK VI | 793691 | 9066149 |
| MFPBLOCK V II | 795692 | 9068044 |
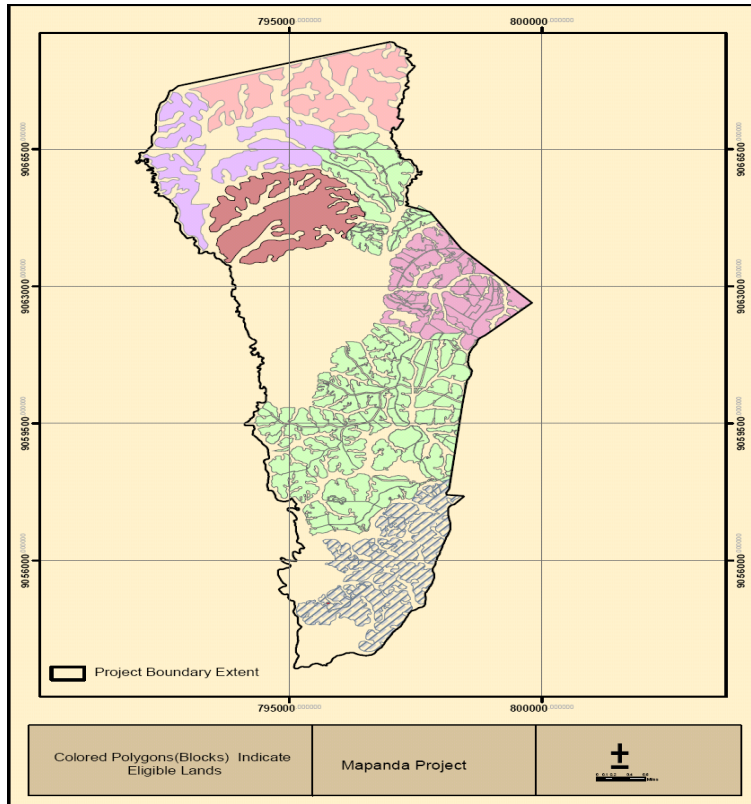
**Figure G3b: The map of the Mapanda Forest Project area showing geographical boundaries, the actual plantable areas. Different colours represent different years of planting.**

> **G.3.4 Provide a timeframe for the project's duration. Describe the rationale used for determining the Project lifetime. If the accounting period for carbon credits differs from the project lifetime, explain.**

The timeframe for the proposed project activity is 99 years. Based on the Tanzania Land Act, land can be leased for a maximum period of 99 years. The project promoters followed the procedures for land acquisition as guided by Ministry of Lands and Human Settlements (available on request and during validation/verification) and has title deeds for this area.

Uchindile Forest Project has a title deed for the area of land for a period of 99 years from 1st April 2000. Mapanda Forest Project has two titles of ownership both for a period of 99 years from 06th December 2003.

The crediting period is 20 years, twice renewable, making a total of 60 years. The management plan for this project indicates long term stewardship beyond the tenure of these crediting periods.

## G.3.5 Identify likely risks to climate, community and biodiversity benefits during the project lifetime. Outline measures that the project plans to undertake to mitigate the risks.

The likely risks in the project include fire, invasive alien species, diseases and pests. Description of how project shall respond to halt any negative effects is shown below:

**Fires:**

Fire is a major threat to both the plantation and biodiversity. The project participants have developed an effective fire control system. In each of the two areas the project boundary is surrounded by fire line. The project has installed fire towers with radio communication and fire fighting equipments like fire beaters. There is also a standby fire patrol team with walkie talkies that communicates any fires spotted within and outside the project boundary.

**Invasive Alien Species (IAS):**

Plant species have been identified as invasive. These are *Acacia mearnsii*, *Rubus spp, Bambusa balcova, Psidium guajava*, *Lantana camara*, *Cleteric centata* and *Rubus spp.* According WCST, these species do not cause major threats to the ecosystem.

**Diseases:**

Disease infestation affects growth and overall productivity of the forest. Workers health is also a determining factor to productivity. The project promoters have assessed this and responded accordingly. According to the Technical Note No. 1 of 2003 (available on request and for validation/verification as supporting documents), all seeds for planting in industrial forest plantations can be derived from improved seed sources i.e. seed orchards and as an interim measure from seed stands. Seed stands should be phased out as genetically improved seed becomes available from seed orchards. The project participants will initially purchase seeds from the Tanzania Tree Seed Agency or from approved foreign suppliers, and later have a mixture of such seed sources as well as from its own seed stands and orchards. The project participants do not use Genetically Modified Organisms (GMOs): Tanzania does not allow it, nor does the FSC.

In the case of disease or pest outburst in the plantation, experts in their control and research centres shall be consulted. The type of diseases and pests affecting planted trees will be monitored in collaboration with TAFORI, KEFRI, SUA and other research institutes in order to determine remedial and preventive measures. The monitoring of emerging pests

and insects in and around the project area will be carried out to assist in the choice of species for plantation establishment and innovative steps to combat the pests and insects. Periodical assessment and reporting of risks of pests and insect attacks and/or plagues will be done so as to ascertain the safe handling of possible outbreaks. Workers will be trained and sensitized on diseases identification and reporting.

The community shall be assisted with medical services like dispensaries, education on health issues like HIV/AIDS, Cholera and Malaria. The project shall assist with the provision of transport to medical centres in the instance where members of local communities fall sick.

## G.3.6 Document and defend how local stakeholders have been or will be defined.

The local stakeholders were defined and involved from the inception of the project[9]. At early stages of land acquisition, meetings were held in the village. The project participants discussed with the community their opinion of the community in contributing land to implement the project and how the community would participate and benefit from the project activities. The environmental impact assessment also considered the views of the local stakeholders to incorporate their concern and propose measures in case any would be affected negatively by the project activities. A PRA assessment is conducted annually. In this process, local stakeholders express their views and doubts and the company documents and incorporates into management decision. The project participants carried out stakeholder consultations in various ways. Potential stakeholders were randomly selected; these cover a wide range of professions and village leaders as well as local workers, subsistence farmers, teachers, priests and women groups. The project promoters hold meetings with these stakeholders every three months. The stakeholders give suggestions that are implemented by the company. Semi-structured interviews, meetings and questionnaires are also held to the community to identify their needs and concern. The company has planned to sell all the carbon credits in the voluntary markets. 10% of the revenues from carbon credits shall be offered to the community. This is expected to ameliorate the communities' conditions among other things.

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[9] For review of stakeholder`s comments please see section H in the CDM PDD.

### G.3.7 Demonstration of transparency:

The project documents are available for review. All project documentation is publicly accessible at, or near, the project site and/or at project proponents' offices; only financial and other information where confidentiality is needed is withheld. Local stakeholders have been informed how they can access the project documentation; and the key project documents have been made available in national languages, where applicable.

## G4. Management Capacity

### G.4.1 Document the management team's experience implementing land management projects. If relevant experience is lacking, the proponents must demonstrate how other organizations will be partnered with to support the project.

Green Resources Limited has employed a sufficient number of competent and qualified staff, including a well tested management structure. The employees` has extensive experience necessary for forest management and certification as well as relevant experience of forest management in the local area. Where specific skills are lacking, individuals, institutions and research centres shall be consulted. These have included researchers from Sokoine University of Agriculture, University of Dar es Salaam, Kenya Forest Research Institute, Tanzania Forest Research Institute, Tanzania National Environmental Management Council, Tanzania Tree Seed Agency, Vice President's Office Division of Environment, Wildlife Conservation Society of Tanzania, Rufiji Water Basin in Iringa, Mufindi Environmental Trust (MUET), Sao Hill Forests, Ministry of Natural Resources, Mufindi and Kilombero District Council.

### G.4.2 Demonstrate that management capacity is appropriate to the scale of the project.

GRL has a well educated management team which is trained and experienced in plantation management. An interdisciplinary team of approximately 25 professionals who work on all GRL projects is based in an office at Sao Hill, where the sawmill is also located, in Mafinga Township (about 17 km south).

The project area lies approximately 110 km south from the head office. GRL has on site project management based at Uchindile and Mapanda Forest Projects. Mapanda has 35 permanent staff whilst Uchindile has 32. Under the authorization of GRL and Green

Resources AS, the project management team is fully responsible for administrating and coordinating all project activities. GRL is facilitating and supervising the implementation of the proposed project activity, organizing technical training and consultation, organizing and coordinating all forest management activities including monitoring of biodiversity and communities. The staff is trained, and workshops and courses are provided to extend knowledge. The project is satisfied that the number of professionals is sufficient to carry out the activities.

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**G.4.3 Document key technical skills that will be required to successfully implement the project and identify members of the management team or project partners who possess the appropriate skills.**

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The project has a wide range of professionals for the implementation of proposed activities. These include foresters with extensive experience in forest management, engineers to support in road construction, environmental scientists, community development professionals, ecologists, botanists, hydrologists, surveyors and map designers, and individuals with significant experience working on conservation and climate change issues.

Geographical Information System (GIS) and Remote Sensing will be used for verification and monitoring of the proposed A/R CDM project activity. Although the project participants rely on in house staff, we also collaborates with local and regional forestry department/agencies, namely; Sokoine University of Agriculture, University of Dar es Salaam, Division of Environment, National Environment Management Council, Sao Hill Forests Project, Department of Forestry and Beekeeping, Tanzania Forestry Research Institute, Kenya Forestry Research Institute, Tanzania Tree Seeds Agency, Tropical Pesticides Research Institute and Local NGOs. These partner organizations assist the GRL team through the provision of technical consultation and guidance as needed, including training courses, quality control checks and technical inputs for the preparation and implementation of the proposed project activity. Project participants will also seek advice from local, national, and international forestry and sustainable forest management experts where required.

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**G.4.5 Document the financial health of the implementing organization(s).**

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The proposed project activity is developed, implemented and managed by Green Resources Ltd., a Tanzanian registered subsidiary company wholly-owned by Green Resources AS, from Norway, which is providing primary financing. Further implementation of this project

is made viable through carbon financing. The company is sufficiently capitalized to implement this project.

## G5. Land Tenure

### G.5.1 Guarantee that the project will not encroach uninvited on private property, community property, or government property.

This area is legally leased to GRL from the government. The project boundary has been mapped and demarcated by beacon as a requirement for the transfer of land title in Tanzania. The project implementation shall be confined to within the project boundary, to ensure no encroachment on either the community, private or government land.

### G.5.2 Guarantee that the project does not require the relocation of people or any relocation is 100% voluntary and fundamentally helps resolve land tenure problems in the area.

The project areas was largely abandoned prior to the project inception, with the exception of a very limited number of migratory small scale farmers, who during early stages of negotiations with the company were amicably compensated and moved their activities to other lands close by their homes in neighbouring villages. The shifting was with free consent of the communities, and has been documented and arbitrated by district officials following all necessary procedures. Furthermore, the project has established solid partnerships with local communities and incorporated community views and ideas into management decisions.

### G.5.3 Describe potential "in-migration" of people from surrounding areas, if relevant, and explain how the project will respond.

The project gives priority for employment at the Forest Project to people from the local villages. This is defined in writing in the agreement with the communities. As such employment is only awarded to people from outside those villages if there are enough employment opportunities. This is likely to limit 'in-migration' as people will only come if they know they will receive a job. In the case that more workers are needed for temporary period (such as planting season) than can be met by villagers from the local communities then workers from outside will be houses in accommodation provided by the Forest Projects, on site.

# G6.  Legal Status

## G.6.1. Guarantee that no laws will be broken by the project.

GRL is registered with the Tanzania Investment Centre (TIC) as a Tanzanian company. All the preliminary processes of land acquisition follow the government legal procedures. The Tanzania Environmental Policy, following a precautionary approach, insists that before any implementation of land-based projects, that an environmental impact assessment must be carried out to identify any negative impacts that may be caused and take precautionary measures to the proposed activities. In the case of this project, two external agencies from a government provided list were contracted to carry out the EIA for the two separate areas[10]. GRL accords all the national and international legal requirements including environmental audit regulations from 2005. The project also applies ISO 9001 and 14001 procedures of Environmental Management Systems and the principles of the Forest Stewardship Council (FSC).

## G.6.2. Document that the project has, or expects to secure, approval from the appropriate authorities:

GRL holds letters of approval for environmental impact assessment both from NEMC and Tanzania Investment Center (TIC).

# G7.  Adaptive Management for Sustainability (optional)

## G.7.1 Demonstrate how management actions and monitoring programs are designed to generate reliable feedback that is used to improve project outcomes.

Green Resources believes that community participation in making management decisions and planning is essential to generate positive socio- and economic outcomes.   As such the project has employed a process for hearing from the communities. An effective community monitoring program has been designed that aims to assess project community support programs and monitor changes in community livelihoods overtime. The monitoring of the biodiversity shall capture necessary information on variability, diversity and abundance of species and biodiversity under risk of being negatively impacted by project activities.

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[10] Orgut Consultancy and Environmental Association of Tanzania.

**G.7.2 Describe the a management plan for documenting decisions, actions and outcomes and sharing this information with others within the project team, so experience is passed on rather than being lost when individuals leave the project.**

The management plan for this project is in place, and is open to stakeholders for review. The development of the MP involves views and comments from the local stakeholder and lies upon local conditions, available facilities and the latest technologies. All the plantation`s management decisions and prescriptions are documented in a transparent manner and archived. The project management team and other staff participate in the development and have access to this document; they are fully informed of the progress with regards to the plans. The MP is not fixed; it is subject to changes with the existing local climatic and administrative conditions.

**G.7.3 Demonstrate how the project design is sufficiently flexible to accommodate potential changes and that the project has a defined process in place to adjust project activities as needed.**

The proposed project will be implemented following the management plan. The management plan is regularly updated depending on changes in the existing conditions improvements that are necessary. Lessons learned, views and suggestions of the stakeholders are also incorporated into the management plan where appropriate. During the implementation of the project, the observed and the expected results will be compared, which will help in monitoring the activities. Any deviations shall be recorded and updated in the management plan.

**G.7.4. Demonstrate an early commitment to the long-term sustainability of project benefits once initial project funding expires, including e.g. a new project; securing payments for ecosystem services; promoting micro-enterprise; and establishing alliances to continue sustainable land management.**

GRL is funded by private investments, initially by Green Resources, but also by carbon financing. Commitments to support community projects will be sustained throughout the project lifetime. The project developer will derive a dual income in the long term from the sale of timber and VERs. Green resources business model is for sustainable reforestation following FSC principles, with reforesting occurring immediately after harvesting. Green Resources has a 99 year lease of the land.

## G8. Knowledge Dissemination

### G.8.1. Describe how they will document the relevant or applicable lessons learned:

The project participants have developed forms for documenting "lesson learned". All notable lessons learned in the forest project shall be documented on-site into these forms held at the project manager's office.

### G.8.2. Describe how they will disseminate this information in order to encourage replication of successful practices:

Each year, during the dry season, the company has its annual planting party day. This day is chosen for celebrating with the local communities and other stakeholders. During the day presentations are given on the company's progress during the proceeding year.

Furthermore, the project encourages and facilitates staff to participate in both national and international conferences. Workshops, seminars and training are held to spread knowledge to cover a wide variety of local communities. The lessons learned shall be disseminated through these seminars and meetings. Technological transfer from one project to another shall be encouraged through project managers meetings within the GRAS group of companies. This involves sharing field experience from various projects, not only in Tanzania but elsewhere in East Africa where GRAS is operating. For the forest projects themselves there is a formalized schedule where the project manager chairs meeting to discuss with staff and workers ongoing matters. At these meetings, the project manager shares information on any new lessons learned. Experience from project activities is documented and archived for the future.

## III. CLIMATE SECTION

## CL1. Net Positive Climate Impacts

**CL.1.1 Estimate the net change in carbon stocks due to the project activities. The net change is equal to carbon stock changes with the project minus carbon stock changes without the project (G2). Alternatively, any methodology approved by the CDM Executive Board may be used. Define and defend assumptions about how project activities will alter carbon stocks over the duration of the project or the project accounting period.**

The project applies A/R AM0005 methodology entitled "Afforestation and reforestation project activities implemented for industrial and/or commercial uses". The baseline scenario in this project is based on estimation of carbon stock changes as a result of unmanaged use of grasslands which is subject to frequent burning in the absence of the project.

The project participants use the baseline approach from paragraph 22 (c) of the CDM A/R modalities and procedures: "Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time project starts". The selected approved methodology is applicable to the proposed A/R CDM project activity as it complies with and is applicable under the conditions provided in the methodology.

Testing the eligibility of land[11] for the approved methodology to fit A/R CDM project was carried out as shown in the CDM PDD (section C.1) and assessment of applicability[12] and justification of the approved methodology is shown in (section C.3.) of the CDM PDD.

The estimates of the actual net GHG removals by sinks in the project activity are based on the carbon stock change in aboveground and belowground biomass are estimated using equations described in section II.7 of the approved methodology. The changes in carbon stocks in the living biomass pool are estimated based on the changes in carbon stocks of the living biomass of trees (gain and losses) minus increase in emissions of GHG within the project activity boundary. As described in section B and section C in the CDM PDD, carbon stock changes in pools of soil organic matter, dead wood and litter are not accounted as part of the net GHG removals by sinks.

**Changes in carbon stocks**:

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[11] The assessment of the eligibility of land has been conducted based on the decision by the EB35-Annex 18 that provides "Procedures to demonstrate the eligibility of lands for afforestation and reforestation CDM project activities".

[12] The project participants use the baseline approach from paragraph 22 (c) of the CDM A/R modalities and procedures: "Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time project starts". The selected approved methodology is applicable to the proposed A/R CDM project activity as it complies and is applicable under the conditions provided in the methodology.

Verifiable changes in carbon stocks of living biomass of trees (above ground and below ground) occurring annually is estimated using equation B.15. For above ground- and below ground biomass, equations B.16 and B.17 are used.

To measure the carbon stock in absence of the project, default values from the GPG LULUCF (table 3A.1.10) and regional specific parameters such as; biomass expansion factors (BEF), Wood density (D), Carbon fraction (CF) and Root to shoot ratio (R) is used. The BEFs given in table 3A.1.10 represent averages for growing stock. In the PDD the value chosen is the upper limit of the range for young forests or forests with low growing stock. And the lower limit of the range was used for the more mature forests or forest with high growing stock.

The project participants use the following BEF in the carbon model; pine 1.1 -3.0, eucalyptus 1.3 – 5.0, the BEF is reduced to the lowest level before it reaches a DBH of 10 cm. A project specific study conducted in Mapanda and Uchindile in year 2005 resulted in BEF values for eucalyptus and pine at 3.1 and 5.9 respectively.  The age of these samples were approximately 5 years in average. The variables to be used in equation B.18 and B.19 are shown in the table CL1 below:

**Table CL1:** Parameters used to calculate carbon stocks

| Biomass Expansion Factor (BEF) | | Wood density (D) | | Carbon Fraction (CF) | Root to shoot ratio (R) |
|---|---|---|---|---|---|
| *P.patula* | *E.saligna* | *P.patula* | *E.saligna* | 0.50 | 0.25 |
| 1.1 - 3.0 | 1.3 – 5.0 | 0.45 | 0.45 | | |

The parameters as listed in Table CL1a fall within the range provided by the GPG LULUCF 2003 (Table 3A.1.10). During verification, the biomass expansion factors (BEF), Wood density (D), Carbon fraction (CF) and Root to shoot ratio (R) for *Eucalyptus saligna* and *Pinus patula* will be established by the project participants and compared with the default values used during the preparation of the PDD. The growth data from Sao Hill Forest Project were used to project the growth of the plantations. These data are from the government plantation which is located in similar climatic conditions. The project participants conduct annual inventories to verify applicability of these data in the project.

During *ex-post* calculations, the growth data (standing volume per hectare) are collected and converted into biomass through wood density and Biomass Expansion Factors (BEF) and root-shoot ratio (R) using equations and steps described in the methodology.

The approved methodology recommends estimating the annual decrease or losses of the carbon in living trees as a result of commercial harvest and fuel wood harvest. There will be no fuel wood harvest during the crediting period. The growth data used follow similar technical guides provided by the government.  Any changes due to thinning will be captured during monitoring events in the Permanent Sample plots (PSPs).   The impact of disturbances e.g. losses from fire and pests are considered to be small and are a result of natural event. For losses due to commercial harvest and fuel wood harvest which occur during crediting period, these shall be calculated using equations B.20 – B.25 from the approved methodology.

**Project Emissions:**

The actual net GHG removals by sinks (annual and cumulative) is the carbon stock change in above- and below-ground biomass minus the increase in anthropogenic emissions as listed in Table CL2 below.

**Table CL2:** Estimation of actual net GHG removals by sinks and estimation of actual net anthropogenic GHG removals by sinks (see also general section).

| Year | Estimation of actual net GHG removals by sinks (tCO2e) | Estimation of net anthropogenic GHG removals by sinks (tCO2e) |
|---|---|---|
| 2000 | 0 | -49 |
| 2001 | 0 | -3,616 |
| 2002 | 0 | -13,050 |
| 2003 | 6,303 | -1,577 |
| 2004 | 15,342 | -2,581 |
| 2005 | 33,728 | -11,999 |
| 2006 | 56,641 | 27,586 |
| 2007 | 94,551 | 48,224 |
| 2008 | 121,433 | 69,348 |
| 2009 | 146,463 | 94,634 |
| 2010 | 178,160 | 127,173 |
| 2011 | 245,642 | 200,576 |
| 2012 | 288,086 | 260,605 |
| 2013 | 347,643 | 317,217 |
| 2014 | 376,858 | 376,760 |
| 2015 | 328,403 | 328,266 |

| 2016 | 364,923 | 364,824 |
|---|---|---|
| 2017 | 226,186 | 226,026 |
| 2018 | 106,793 | 106,614 |
| 2019 | 228,624 | 228,493 |
| 2020 | 155,876 | 155,748 |
| **Average over crediting period (2000 -2020) (tCO$_2$e)** | **166 083** | **144 961** |
| **Total for crediting period (2000 -2020) (tCO$_2$e)** | **3 321 654** | **2 899 222** |

The net amount of GHG that is expected to be sequestered through the reforestation in the 2000-2020 crediting period is 2 899 222 tCO$_2$e. With the project scenario, these GHG-gases shall be sequestered by trees. It is also important to note that these estimates are based only on plantable area[13]. The area left free for conservation, or the sequestration from reforestation with species other than pine and eucalyptus was not included in this estimation.

### CL.1.2 Factor in the non-CO2 gases CH4 and N2O to the net change calculations (estimated in CL.1.1.) if they are likely to account for more than 15% (in terms of CO2 equivalents) of the project's overall GHG impact.

Non-CO2 gas emissions are considered negligible and count for well under 15 % of the overall GHG impact.

### CL.1.3 Demonstrate that the net climate impact of the project (including changes in carbon stocks, andnon-CO2 gases where appropriate) will give a positive result in terms of overall GHG benefits delivered.

Implementation of the project is expected to give positive climatic impacts to the area. The forest cover will contribute to a reduction of green house gases emissions by acting as carbon sinks. The only expected emissions are leakage as a result of fossil fuel uses outside the project boundary; this shall be monitored and subtracted from the actual green house gases sequestered. In addition to the quantified carbon benefits of project, tree growth is also expected on villagers own land outside the project boundary – the project gives away free seedlings to the community and encourage them to develop their own woodlots close to the project area. The project participants believe that these woodlots shall account for more than 5 % of the total planted area since the project offers 20 % of the total amount of

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[13] For plantable area in the years 2000-2008, and the scehduled planting for 2009-2013 see CDM PDD, table A.2.2b and c, p.5.

seedlings raised annually. In the first crediting period 2,9 million $tCO_2e$ shall be sequestered by the reforestation project compared to what would have occurred in the absence of the project.

## CL2. Offsite Climate Impacts ("Leakage")

### CL.2.1 Estimate potential offsite decreases in carbon stocks (increases in emissions or decreases in sequestration) due to project activities.

The approved methodology assumes leakage to be occurring from fossil fuel combustion and activity displacement. Leakage due to activity shifting is not occurring since the area under the project activity had very limited activity occurring on it pre-project. Any activities which were displaced have been moved onto other degraded grassland which is abundant around the villages – no forest has been cleared and hence no leakage has occurred.

The project participants ensures that seedlings are raised close to planting and will be transported to the project planting sites by manpower and less vehicles. There is also a need for transporting raw materials to the project area and management visits, all of which will use medium size vehicle that use diesel which is common in the project area. To avoid underestimation and double counting the project participants shall keep records of fuel consumed. The amount of diesel used has been assumed to be a result of the project outside the project activity boundary. Hence all fuel related emissions are considered under leakage emissions. The amount of diesel used per hectare of planting and management/administration has been estimated conservatively at 50 litres/ha/year and additional 20 l/ha during planting. The leakage caused by vehicles use is estimated using equation B.37 and B.38 in section II.8.a of the approved methodology. The project participants adopt IPCC 1990/2000 default factors to calculate emission from diesel consumption as: 2.76 tCO2/t fuel (see table CL.2.1a). The leakage due to controlled burning in fire lines is considered insignificant because in the baseline all the grasslands would suffer from periodic fires. The leakage as a result of implementation of the project activity is presented in table CL3:

**Table CL3: Expected leakage from project activity**

| Year | Estimation of leakage (tCO2e) |
|---|---|
| 2000 | 49 |
| 2001 | 102 |
| 2002 | 114 |
| 2003 | 107 |
| 2004 | 120 |
| 2005 | 153 |
| 2006 | 133 |
| 2007 | 154 |
| 2008 | 161 |
| 2009 | 161 |
| 2010 | 160 |
| 2011 | 153 |
| 2012 | 131 |
| 2013 | 135 |
| 2014 | 98 |
| 2015 | 137 |
| 2016 | 99 |
| 2017 | 160 |
| 2018 | 178 |
| 2019 | 131 |
| 2020 | 128 |
| **Average over crediting period (2000 -2020) (tCO2 e)** | **138** |
| **Total for crediting period (2000 -2020) (tCO2 e)** | **2,763** |

However, this leakage has been included in the calculations for carbon stock changes (table CL3 above). The net offsite leakage as a result of project activity is positive, since 2.9 mill tonnes of $CO_2$e shall be sequestered.

> **CL.2.2 Document how negative offsite impacts resulting from project activities will be mitigated and estimate the extent to which such impacts will be reduced. Estimate the extent to which the negative offsite impacts will be reduced adequately.**

As explained above, the project does not expect negative offsite impacts as a result of project activities. The project shall rather produce positive impacts outside the project boundary by sequestering a huge amount of $CO_2$ as a result of the establishment of community woodlots as part of the free seedling give-away programme which the company

is offering.

**CL.2.3 Subtract any likely project-related unmitigated negative offsite climate impacts from the climate benefits being claimed by the project:**

As mentioned in CL2.1 and CL2.2, in the project scenario no significant negative impacts to the offsite carbon stocks are expected. All possible negative offsite climate impacts are considered to be mitigated in a sufficient manner within the project lifetime.

## CL3. Climate Impact Monitoring

**CL.3.1   Have an initial plan for how they will select carbon pools and non-CO2 GHGs to be monitored, and the frequency of monitoring. Potential pools include aboveground biomass, litter, dead wood, belowground biomass and soil carbon. Pools to monitor must include any pools expected to decrease as a result of project activities. Relevant non-CO2 gases must be monitored if they account for more than 15% of the project's net climate impact expressed in terms of CO2 equivalents.**

The CDM monitoring plan shall be followed (see section E of the PDD). The non-$CO_2$ GHGs account for less than 15 %, thus considered negligible and so they shall not be included into the monitoring program. The Monitoring Plan assists the project entity in establishing a credible and transparent monitoring and operating procedures and facilitates data collection, recording, and estimation of emission reduction and relevant project information required for the verification of the emissions reduction units. The monitoring plan forms the basis for production and delivery of emission reduction units. It is expected that the project entity adhere to the Monitoring Plan in order to accurately monitor and measure the project development impacts and prepare for periodic review of the project performance.

The provisions of this monitoring plan will be adopted as a key component of the forestry project activity and should be included in the operational manuals. Strict adherence to the guidelines set out in this monitoring plan is necessary to measure and track the project performance. In particular, changes in the operational procedures and changes to the baseline and project emissions and emission removals that are monitored should be monitored and the information recorded as prescribed in the PDD and to facilitate verification.

The project participants shall use standard nationally available procedures to monitor all activities and operations. The procedures shall be provided as guidance in measuring,

documenting and estimating the net GHG removals by sinks. All measured and experimental data shall be documented and archived.

Operational procedures under this monitoring plan are defined as those of measuring and estimating net carbon stock changes associated with the plantations under the project. In order to supply the required information on changes in carbon pools, the project entity shall measure and estimate biomass volumes as per the standard forestry inventory operational procedures. The project entity's inventory procedures are based on statistically valid sampling procedures and on registered software, which performs biomass volume calculations upon scientifically designed allometric equations. Since it complies with the methodology, it can thus be used as the main measurement and monitoring parameters.

The project participants shall keep records of all activities like changes in the actual planted areas, nursery operations, site preparation and forest management. Emissions from the use of fossil fuels, firewood, fertilizer and activities outside the boundary that are a result of the project activity shall be recorded and achieved. The project entity shall prepare all the relevant operational instructions and present them in written format. The project participants shall measure the above ground biomass and use the most conservative factors from GPG LULUCF for estimation of the below ground biomass. Based on the input data on the above -ground biomass volume provided by the project entity's inventory system, the estimation and monitoring of net carbon stock changes are preformed using the appropriate formula presented in the approved methodology. The DOE shall check the consistency with the methodology and it shall also verify that the project operator is able to adequately manage the data as per this MP.

The project participants shall prepare monitoring procedures for all silvicultural activities and carbon stock changes within the project activity boundary based on the monitoring frequency provided in the approved methodology. These procedures shall be communicated in the form of written and oral instructions and shall include responsibilities of personnel.  The personnel shall be trained on job, workshops, and technical conferences to ensure knowledge management and that the project staff is trained for specialized professionalism.

The project monitoring is expected to cover the first crediting period of 20 years with a renewal of up to two times, starting from 2000. The monitoring plan provides flexibility and

shall also include the monitoring frequency recommended under national standards which can be amended in response to changes that may occur in the project activity as long as such amendments are in line with the general monitoring process described in this plan and are approved by a DOE during verification audits.

## CL4. Adapting to Climate Change and Climate Variability (optional)

### CL.4.1 Identify likely regional climate change and climate variability impacts, using available studies.

The Intergovernmental Panel on Climate Change (IPCC) did, in 2001, an assessment on the consequences of climate change and climate variability; Third Assessment Report (TAR). Africa is highly vulnerable to the various manifestations of climate change. The most critical challenges in particular are given in table CL4.

**Table CL4: Summary of the most critical climate change impacts assessed by IPCC**

| Systems | Impacts |
|---|---|
| **Land degradation** | - Arid and semi-arid areas are likely to increase in northern Sahara and southern Africa: by 5 – 8 %<br>- Arid and semi-arid areas are likely to increase (desertification). |
| **Crop yield** | - By 2020: yield of rain-fed agriculture could reduce by 50 % |
| **Water** | - Increase in runoff and flooding<br>- Increase drought risk<br>- Impacts enhanced by poor water management<br>- Water stress |
| **Natural resource management and biodiversity** | - Forest ecosystems: species loss, extinction, dramatic shift or changes in species range and increased fire occurrence<br>- Forest net primary production to decline in the long term |
| **Human health** | - Temperature rises: increased vectors of diseases such malaria<br>- Sea level rises: increased cholera epidemics and other waterborne diseases |

*Source: IPCC Third Assessment Report, ch. 10, 2001.*

This vulnerability assessment to climate change is marked by high uncertainty. However, these impacts are based on Africa as a whole and will not be applicable to the same extent for each country. The diversity of African climates, high rainfall variability, and a very

sparse observational network make precise predictions of future climate change difficult at the sub-regional and local levels.

Given the IPCC TAR assessments, we do recognize the importance of understanding the risks from climate change impacts to our forest projects. Therefore, The International Finance Corporation (IFC) will in cooperation with GRL develop a full assessment of potential climate impacts, through downscaling climate models. Based on the outcome of the projections appropriate mitigation and risk reduction measures will be considered and implemented. IFC will be funding the complete study. This climate risk case study is in its initial stages and will be carried out in 2009.

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**CL.4.2 Demonstrate that the project has anticipated such potential impacts and that appropriate measures will be taken to minimize these negative impacts.**

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The GRL is carrying out several different activities to minimize risk of negative impact. The project is planting species which are robust in terms of adaptability and will be tolerant to changes in temperature and precipitation. The projects anticipate that the species shall be tolerant within the range of predicted changes anticipated by the IPCC due to wide genetic base. Vulnerability to climate change is normally reduced by restoring an area to its natural vegetation cover. In the case of the project the area is naturally forested, in contrast to the degraded grassland state found at the projects inception. Arguably restoring the area to forest will make it more resilient in the face of climate change as it will reduce runoff, increase infiltration and recharge of streams and natural ponds, reduce wild fires. The Climate Risk Case Study elaborated by IFC (see also CL.4.1) will develop general tools and methodologies to assess risks and opportunities resulting from climate change that could affect the private sector, and evaluate responses to these, which will be taken into consideration by GRL when assessed.

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## CL5. Carbon Benefits Withheld from Regulatory Markets (optional)

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**CL.5.1 Demonstrate that at least 10% of the total carbon benefits generated by the project into regulated GHG markets will not be sold. Projects can sell these carbon benefits in a voluntary market or retire them.**

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All of the carbon credits from this project will be sold into the voluntary market. The project is hoping to achieve validation and verification under the Voluntary Carbon Standard (VCS) in 2009.

## IV. COMMUNITY SECTION

## CM1. Net Positive Community Impacts

**CM.1.1. Use appropriate methodologies (e.g. the livelihoods framework) to estimate the net benefits to communities resulting from planned project activities. A credible estimate of net benefits must include changes in community wellbeing given project activities. This estimate must be based on clearly defined and defendable assumptions about how project activities will alter social and economic wellbeing over the duration of the project. The "with project" scenario must then be compared with the baseline scenario of social and economic wellbeing in the absence of the project (completed in G2). The difference (i.e., the net community benefit) must be positive.**

Participatory Rural Appraisal (PRA) were used to assess, characterize and better understand the rural communities of the project. Meetings, interviews, discussions and field surveys were used to obtain information in the study area and issues of environmental concerns raised by the stakeholders were noted and addressed in this study together with additional impacts and mitigation, environmental monitoring plan and management. In the process, the proponents used a checklist consisting of set of prepared topics relevant to the study. A random sample of teachers, village leaders, women's groups, youth groups, villagers and subsistence farmers were involved.

The community has been closely involved since the projects inception when the project participants were applying for land. The project followed land acquisition procedures as guided by the Government of Tanzania under the Ministry of Lands and Human Settlements and the Land Act.

There are both socio-economic and economic impacts arising from the proposed project activity:

**Table CM 1: Short summary of GRL community support.**

| Aspect of improvements | Activity/support/ Benefit |
|---|---|
| **Education** | - Supporting materials for building primary/secondary schools and teacher`s houses since 1998<br>- training |
| **Health status** | - building of dispensaries<br>- providing medical equipments to hospitals<br>- HIV and malaria training |
| **Housing** | - Better economic conditions for villagers have impacted their housing; building bricks, furniture etc. |
| **Women** | - Improved the female status by employment |
| **Infrastructure** | - Improved accessibility by bridges and road constructions/improvements |
| **Environment** | - Soil moisture conservation<br>- Training on pests and diseases, and environmental awareness<br>- Providing free seedlings |

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**CM.1.2a Document local stakeholder participation in the project's planning. If the project occurs in an area with significant local stakeholders, the project must engage a diversity of stakeholders, including appropriate sub-groups, underrepresented groups and women living in the project vicinity.**

The project has carried out extensive stakeholder consultation which has shaped the projects design. Stakeholders were consulted through meetings, semi-structured interviews, and focus group discussions to capture information pertaining to the project. Participatory Rural Appraisals were carried out in the villages to identify the problems, views and concerns of local stakeholders and incorporated into the project design and management plan.

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**CM.1.2b Describe how stakeholders in the project's area of influence will have an opportunity before the project design is finalized, to raise concerns about potential negative impacts, express desired outcomes and provide input on the project design. Project developers must document stakeholder dialogues and indicate if and how the project proposal was revised based on such input.**

The company has frequently been making contact with various stakeholders through discussions, company briefings, and through questionnaires for their references and for seeking comments including benefits accruing from the company, company weaknesses/strengths or problems and expectations of local community from the company that they may have in the course of project implementation. Both Mapanda and Uchindile Forest Projects have collected comments from a diversity of stakeholders. Stakeholders' representative includes; teachers, village leaders, priests, woman groups, youth groups and villagers household. The comments have been taken into account and improved by the project proponents, and are pointed out as follows:

Comments from stakeholder`s in Mapanda and Uchindile, PRA conducted in December 2008:

- Mapanda Village leaders expressed that the company has provided seedlings thus villagers have planted their own woodlots and are undertaking environmental protection.
  There is improvement in assistance to local community on social service provision e.g. building of schools and maintenance of nurse's house, health services and infrastructures.
- It was also expressed that GRL is conserving special specific areas such as natural forest, graves and areas of worship.
- Conservation of endangered species.
- Environmental education is provided; conservation, FSC and CDM
- The communication between the communities and the company have improved, which brings credibility.

Furthermore, the project is planning meetings with potential stakeholders once every three month. During this event, the project participants mention progress and discuss with the stakeholders giving their comments to the project. These include representatives from throughout the district where the project is located.

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**CM.1.3. Formalize a clear process for handling unresolved conflicts and grievances that arise during project planning and implementation:**

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The company`s operating procedure manual (procedure 02) clarifies how any grievances, complaints and conflicts raised by stakeholders shall be handled. This procedure describes

the methods of possible complaint and conflict resolution, raised about the work or any activities conducted by GRL, so as to guarantee the resolution.

The procedure manual of conflict resolution states that every person, inside or outside GRL, can make a complaint against the organization's actions, behaviour, documents, certification process, forest management, etc. Complaints, disputes and issues of contention must be submitted in writing to the attention of the Managing Director, either at the reception of the company, by mail or put into a complaint boxes at the plantation projects which are delivered to the head office by the plantation managers and emptied monthly.

Suggestions boxes have been installed around the villages so that anyone who wants can give their feedback on the project. Grievances and complaints can also be raised in village meetings. Green resources believes it has put into place a transparent, timely and clear process for resolving any issues which arise.

## CM2. Offsite Community Impacts

### CM.2.1 Identify potential negative offsite community impacts that the project is likely to cause.

The project does not expect any offsite negative socio economic impacts resulting from the project. The EIA/SEIA assessors called attention to different areas that the project potentially could have a negative impacts on if not avoided by the project in advance. The comments from stakeholders are given in section H.2, of the CDM PDD, and resolution/mitigation measures are given in section H.3, of the CDM PDD. Wages shall be paid on time and, Green Resources will fulfill the promises made to the villages during land acquisition, provide seedlings and training free of charge.

### CM.2.2 Describe how the project plans to mitigate these negative offsite social and economic impacts.

In the EIA/SEIA report, some possible offsite impacts were projected which are presented in table F.1 and F.2 in section F.1 of the CDM PDD. In the same table the project participants have responded how to mitigate these impacts. However, if any negative offsite social- and economic impacts are noted to be occurring immediate mitigation and compensation measures shall be put into place.

**Table CM2a: Mitigation measures for Uchindile Forest Project.**

| Affected area | Comments provided and mitigation measure proposed by the assessors conducting the EIA/SEIA |
|---|---|
| **Depletion of soil nutrient**: Forest cover depletes more nutrients from the soil than grass cover. The nutrients are lost through timber harvesting although there is also some nutrient recycling through falling litter and other waste. The depletion of nutrients is a threat to survival of other vegetation in the plantation areas. The soil will have insufficient nitrates, phosphates and boron which are key nutrients required by plants. The insufficiency of these nutrients will be more pronounced after the first harvest. | The project must closely follow how the soil fertility develops in the plantations to be established. |
| **Alteration of biological processes due to change of land use:** from grassland to forest cover may result in:<br><br>Restricted growth of other types of vegetation particularly shrubs and grasses.<br><br>Loss of indigenous species used by local people as sources of medicinal plants, firewood, poles, fruits, water conserving species and rare species.<br><br>Destruction of the natural habitat of the potential wildlife.<br><br>Decomposition rate of organic residues might decrease because the litter produced by the planted trees will not favour the growth of a diverse number of micro-organisms. As a result there will be a low rate of organic matter decomposition<br><br>Grasses and leaves of shrubs decompose much faster than the litter from pines and eucalyptus, hence the rate of nutrient cycling will be reduced.<br><br>Decrease in diversity of soil biota will reduce the production of organic materials, which play a big role in stabilisation of soil aggregates, hence soil structure will be affected.<br><br>In the area there are shrubs, which are useful as medicinal plants used by local people. These will probably be negatively affected and disappear as the canopy of the trees closes. This will also then represent a loss of plant biodiversity. | Initially the recommendation for plantation establishment was not to exceed gradients of 12% but this is now considered by the NEMC to be excessive. It has moved up this limitation to 42% and allows for planting of indigenous species on even steeper slopes for conservation purposes. All remaining areas must be protected and remain as control areas for monitoring vegetation change and for safeguarding some of the native grass land that may contain endemic or rare species.<br><br>During land preparation for planting all scattered trees and bushes should be left intact for improved biodiversity.<br><br>Plant water conserving species and fruit trees in valley bottoms beyond the recommended buffer zone of 30m for enhanced biodiversity, carbon sequestration and food production. |
| **Decrease of water levels:** Exotic tree species have deep roots which take much water from the soils and may decrease water tables in the areas adjacent to the plantation with the consequences of gradually lowering and/or drying of river tributaries, downstream wetlands and swamps thus affecting the entire ecosystem of the surrounding areas. | Plant water conserving species beyond the recommended buffer zone of 30m<br><br>The riverine areas should be left intact for protection purposes with a buffer zone of 30m.<br><br>Plant exotic species away from water sources. |
| **Riverine and valley vegetation**<br>Implementation of the project will bring a burden in the | The riverine and valley vegetation should be left intact to offer refuge to wildlife, to improve |

| | |
|---|---|
| ecosystem, threatening the survival of rare species known for conserving water, sources of fire-wood, fruits, poles and sanctuary for wildlife. | biodiversity and protect the areas from erosion. The vegetation will also protect the rivers and streams.<br><br>The trees shall be planted 30m away from the swamps |
| **Spread of tree diseases:** The project aims at large scale planting of Eucalyptus Saligna and other species including indigenous species on the flat areas and Pinus patula on the sloping gradients.<br>Establishment of exotic species have of recent witness attack by exotic pests free from natural enemies in East Africa which have caused serious outbreak of diseases. | GRL to develop preventative and control measures on pests and diseases in an integrated pest management program which include training of foresters for monitoring prevention and control measures for any outbreak of disease and pests as recommended by research institutions. |
| **Spread of fungal flora**: The decaying fallen leaves of Pinus patula may cause growth of deadly poisonous fungi amanita muscaria which local people confuse for edible mushroom species. | Discourage local people from trespassing into the forested areas.<br><br>The local community to be made aware of the problem through seminars, media and use of placards. |
| **Climate Change**: The forest cover will contribute to reduction of green houses emissions through storage of carbon in trees thus leading to stabilization of climate changes. | The project to ensure planting of high quality stock generated from genetically superior quality adopted to the prevailing site conditions and broadened within and between species so as to ensure sustainability of the plantations against pests, diseases and climatic fluctuations. |
| **Air pollution due to outbreak of fire**: Most of the areas are vulnerable to fire, caused by hunters, honey collectors and farming methods. Outbreak of fires will pollute air by smoke and suspended particulate matter causing health hazard to workers and surrounding community. The fires will destroy habitation of fauna of the area and will result loss of biodiversity besides economic loss to the project.<br>The endangered wildlife species of swallows (birds) faces extinction and required protection measures. | The project to put in place elaborate fire fighting plans which will collaborate local community, reinforce extension services, introduction of green belt fire lines, establishment of fire towers and look outs with well trained and equipped fire fighters.<br><br>Protect breeding habitats on the ground for swallows against fires and other factors. Discourage hunting of swallows. |

**Table CM3b: Mitigation measures for Mapanda Forest Project**

| Affected area | Comments provided and mitigation measure proposed by the assessors conducting the EIA/SIA |
|---|---|
| **Change of Land Use** from grassland to forest cover may result in loss of indigenous species used by local people as sources of firewood, poles, fruits, water conserving species and rare species. In addition the natural habitat of the potential wildlife will be destroyed. | Initially the recommendation for plantation establishment was not to exceed gradients of 12% but this is now considered by the NEMC to be excessive. It has moved up this limitation to 42% and allows for planting of indigenous species on even steeper slopes for conservation purposes. All remaining areas must be protected and remain as control areas for monitoring vegetation change and for safeguarding some of the native grass land that may contain endemic or rare species.<br><br>During land preparation for planting all scattered |

| | trees and bushes should be left intact for improved biodiversity.

Plant water conserving species and fruit trees in valley bottoms beyond the recommended buffer zone of 30m for enhanced biodiversity, carbon sequestration and food production. |
|---|---|
| **Riverine and valley vegetation**

Implementation of the project will bring a burden in the ecosystem, threatening the survival of rare species known for conserving water, sources of fire-wood, fruits, poles and sanctuary for wildlife. | The riverine and valley vegetation should be left intact to offer refuge to wildlife, to improve biodiversity and protect the areas from erosion. The vegetation will also protect the rivers and streams.

The trees shall be planted 30m away from the swamps |
| **Spread of fungal flora**: The decaying fallen leaves of Pinus patula may cause growth of deadly poisonous fungi amanita muscaria which local people confuse for edible mushroom species. | Discourage local people from trespassing into the forested areas.

The local community to be made aware of the problem through seminars, media and use of placards. |
| **Decrease of water levels:** Exotic tree species have deep roots which take much water from the soils and may decrease water tables in the areas adjacent to the plantation with the consequences of drying of river tributaries and swamps thus affecting the entire ecosystem of the surrounding areas. | Plant water conserving species beyond the recommended buffer zone of 30m

The riverine areas should be left intact for protection purposes with a buffer zone of 30m.

Plant exotic species away from water sources. |
| **Spread of tree diseases:** The project aims at large scale planting of Eucalyptus Saligna and other species including indigenous species on the flat areas and Pinus Patula on the sloping gradients.
Establishment of exotic species have of recent witness attack by exotic pests free from natural enemies in East Africa which have caused serious outbreak of diseases. | GRL to develop preventative and control measures on pests and diseases in an integrated pest management program which include training of foresters for monitoring prevention and control measures for any outbreak of disease and pests as recommended by research institutions. |
| **Diminish of soil nutrient**: Forest cover depletes more nutrients from the soil than grass cover. The nutrients are lost through timber harvesting although there is also some nutrient recycling through falling litter and other waste. The depletion of nutrients is a threat to survival of other vegetation in the plantation areas. The soil will have insufficient nitrates, phosphates and boron which are key nutrients required by plants. The insufficiency of these nutrients will be more pronounced after the first harvest. | Application of fertilizer should be carried out after soil analysis so as to determine the type of the fertilizer and quantity. |
| **Climate Change**: The forest cover will contribute to reduction of green houses emissions through storage of carbon in trees thus leading to stabilization of climate changes. | The project to ensure planting of high quality stock generated from genetically superior quality adopted to the prevailing site conditions and broadened within and between species so as to ensure sustainability of the plantations against pests, diseases and climatic fluctuations. |
| **Air pollution due to outbreak of fire**: Most of the areas are vulnerable to fire, caused by hunters, honey collectors | The project to put in place elaborate fire fighting plans which will collaborate local community, |

| | |
|---|---|
| and farming methods. Outbreak of fires will pollute air by smoke and suspended particulate matter causing health hazard to workers and surrounding community. The fires will destroy habitation of fauna of the area and will result loss of biodiversity besides economic loss to the project. The endangered wildlife species of swallows (birds) faces extinction and required protection measures. | reinforce extension services, introduction of green belt fire lines, establishment of fire towers and look outs with well trained and equipped fire fighters. Protect breeding habitats on the ground for swallows against fires and other factors. Discourage hunting of swallows. |
| **Spray of Chemicals/pesticides:** Spray of chemicals (pesticides) during nursery and planting operations is a health hazard to workers and public. The chemical spray will destroy other important insects of the area such as bees, butterflies and other living organisms valuable to the ecosystem. Despite spillage will contaminate soil and surface water. | The workers to be provided by safety gears. The project will follow guidelines for sound management of chemicals 2002. Ministry of health Government Chemist Laboratory Agency. The project to use biological control (ie, use of predators or naturals enemies) to destroy pests if possible. |
| **Water pollution:** Part of fertilizers used from nursery and tending operations can be washed by rain water to water receiving bodies causing increments of phosphates, nitrates and sulphates to unwarranted levels for human beings and marine life. | Workers to be trained on management of fertilizer and storage. Water receiving bodies to be tested periodically according to the EMP to establish levels of nitrates, sulphates borates and phosphates. |

> **CM.2.3 Evaluate likely unmitigated negative offsite social and economic impacts against the social and economic benefits of the project within the project boundaries. Justify and demonstrate that the net social and economic effect of the project is positive.**

No unmitigated negative offsite social and economic impacts are anticipated. All negative impacts – offsite and within project boundary – will be mitigated, using the measures described above. The monitoring plan including mitigation measures to address any potential risks will be implemented.

## CM3. Community Impact Monitoring

> **CM.3.1 Define the initial plan for how they will select community variables to be monitored, and the frequency of monitoring. Potential variables include income, health, roads, schools, food security, education and inequality. Include in the monitoring plan, community variables at risk of being negatively impacted by Project activities.**

Green Resources has developed a community monitoring survey which will be administered every 3 years. Variables to be monitored include poverty level, infrastructure, food security, housing, education and health services. The study shall involve representative groups within the community, from the poorest of the poor to those in better standing in the

community. The major objective of monitoring communities is to monitor the impact of the project on community livelihoods and well being.

For GRL improvements to the livelihoods of local communities is a priority. Key areas of focus for community support are education, health and others proposed by the community from their Parish Development Goals. Specifically, the following will be done:

➢ The project will ease the availability of domestic water for the workers and where necessary for public use.

➢ The projects will have their own dispensary and improve the local health facilities by providing laboratory equipment and medicinal kits.

➢ The projects to provide health services and counseling to the workers and laborers on communicable diseases such as the gonorrhea, syphilis, HIV/AIDS pandemic.

➢ The projects to improve road networks and bridges in the project areas and between adjacent villages install road signs and employ licensed competent drivers.

➢ The projects will assist the local communities to expand schools and other required facilities as will be decided through participatory rural appraisal.

➢ GRL is establishing residential and office accommodation for its project workers and will provide services e.g. water, proper sanitation etc. to ensure that the environment is not polluted and to avoid spread of communicative diseases e.g. cholera, typhoid etc. Casual workers will be employed from adjacent villages and will be provided transport to the forest projects.

## CM4. Capacity Building (optional)

### CM.4.1 Explain how the capacity building is structured to accommodate the needs of communities, not only of the project.

Capacity building is structured to accommodate the needs of communities. Capacity building is targeted at a wide range of groups, including women. Capacity building is aimed to increase community participation in project implementation.

Following methods are applied for in house and external capacity building of local community:

1. Workshops and Lectures
2. Training programs
3. On the job training

**CM.4.2 Explain how the capacity building is targeted to a wide range of groups, not just elites:**

The company has a comprehensive education campaign that covers, a wide range of people including teachers, village leaders, woman groups, youth groups, local workers and subsistence farmers. This campaign intends to educate the communities in conserving their environment, protect RTE's and sometimes covers health issues in which communities are informed on common diseases and precautions to prevent the spread of disease. In this view, it can be observed that not only a certain class of people are represented but the community as a whole are represented; from leaders throughout the grass root.

**CM.4.3 Explain how the capacity building is targeted to women to increase their participation:**

The company, by law, mentions the role of women to the project; women are encouraged to participate in decision making and implementation of various activities. As such the company is gender sensitive and will enhance women capacity building as well as development and implementation of various programs. Any support given to the communities shall benefit both men and women.

**CM.4.4 Explain how the capacity building is aimed to increase community participation in project implementation:**

Annually, one day is set for celebrating with the community. On this day, the project informs the community about evaluation and achievements of the project in the year accompanied by more training on fire prevention and diseases. Government leaders and other stakeholders at the district level are also invited to this event. Research Institute representatives as well as students from Sokoine University of Agriculture are also invited. It is desirable that the information they acquire shall be disseminated to other regions over the nation. This sharing of information helps to improve skill building among staff in the execution of their activities.

## CM5. Best Practices in Community Involvement (optional)

**CM.5.1 Demonstrate that the project was developed with a strong knowledge of local customs and that, where relevant, project activities are compatible with local customs:**

In early stages of project development and during EIA/SIA study, the local customs and norms were taken into consideration. The area contains graves yards and other cultural sites. These have been demarcated and mapped. Tree planting shall be done at a distance of 10 metres away from these sites. The sites of special interests (SSI) were identified in cooperation with the stakeholders.

The project will cooperate with the local communities to ensure customary norms are followed by respecting customs and norms of the surrounding communities. Entering these sites shall be given under permission by project management. The projects will assist adjacent local village governments in imposing strict development control to avoid unplanned settlements and disrupting local community and polluting the surrounding environment due to mushrooming of economic activities by service providers and vendors.

> **CM.5.2 Show that local stakeholders will fill all employment positions (including management) if the job requirements are met. Explain how stakeholders will be selected for positions and where relevant, must indicate how traditionally underrepresented stakeholders and women, will be given a fair chance to fill positions for which they can be trained.**

The project offers employment to residents of the area (more than 50 permanent positions), while the number of temporary workers goes to 500 and 700 per day for Mapanda and Uchindile, respectively. The surrounding community is given first priority, as stated in the community agreements with GRL, and as documented in the management plan. The company standard operating procedure 06: `Employee Selection Procedure` (Annex II), shows selection criteria for workers in the project. Local stakeholders with relevant skills are highly encouraged to fill higher positions. Particular care shall be taken to ensure that selection criteria are not in any way directly or indirectly discriminatory on grounds of gender, race, disability, religion or belief.

> **CM.5.3 Demonstrate that the project complies with international rules on worker rights:**

As regards to employment, the Forest Plantation management shall be required to comply with the rules and regulations as stipulated by the project participants' Health and Safety Code of Practice and some ratified ILO Conventions in the following areas:

- Sanitary considerations in shelters
- Protective gears as specified for the different activities
- Training of workers and staff on occupational health and safety precautions.

By laws and regulations will be developed to ensure the communities around and plantations workers are aware of their limitations and rights with regard to the plantations.

Extension programmes and seminars shall be used as tools to educate people on different issues pertaining to plantation activities such as fire protection, no grazing on the project lands, protection of flora and fauna against fire, soil and water conservation practices etc. For dissemination of information, bulletins, newsletters, posters and booklets shall be prepared and distributed.

Educational programmes shall include training to local communities to enable them undertake seed collection, rise their own seedlings and establish their woodlots (indigenous and exotic species) and agro forestry practices.

Social relations shall continue to be reinforced through meetings, gatherings and discussions with village leaders and local communities with the aim of sorting out solutions to perceived problems, enhancing fire protection programmes and improving the workforce availability for achieving the set targets.

### CM.5.4 Comprehensively assess situations and occupations that pose a substantial risk to worker safety

The possible risks to workers include fire, diseases and onsite accidents. The project has so far been providing personal protective equipments like fire fighting equipments, masks, boots, groves, raincoats and helmets. Working gears, the fire beaters, radio communication and bicycles. The workers and staff have been trained on safety issues and precautions. The company so far provides first aid and medical treatment to those who get injured.

## V. BIODIVERSITY SECTION

## B1. Net Positive Biodiversity Impacts

### B.1.1 Describe the appropriate methodologies used to estimate changes in biodiversity as a result of the project. Base this estimate on clearly defined and defendable assumptions:

The project area is dominated by grass on hill tops and along the hill slopes. A total area of

40 % is identified as either remnant forest, wetlands, wildlife corridors and buffer zones, and thus put into conservation. Common species found in the conservation areas are *Prothea angolensis, Syzygium cordatum*, and fern (*Tyelypteris confluens*). In river valleys, tree species include; *Syzygium cordatum, Bridelia micrantha* and *Gardenia imperialis* and *Tyelypteris confluens*.

Based on the environmental assessment conducted in 1999, the wildlife in the area is limited due to its topography. Animals such as wild pigs, moles, rodents, and birds are found within the project boundary, and where they are present is mainly along the rivers[14]. The eastern part of Uchindile Forest Project contains the Kilombero Game Controlled Area. The project participants have created a corridor to allow free movement of wild animals through this area. This corridor area contains ponds, wetlands and regeneration of vegetation. The corridor was created with the intention of providing grazing, water and expanded habitat to the fauna of the area, including large game.

Based on a botanical surveys conducted by Tanzania Tree Seed Agency (TTSA), two threatened species were found; *Osyris lanceolata* and *Prunus Africana,* respectively. Also, the ecological survey conducted by the Wildlife Conservation Society of Tanzania (WCST) identified four species that fall under the "tree reserve" category in Tanzania; these are *Syzigium gunensis, Syzigium codotum, Osyris lanceolata* and *Catha edulis.*

Several birds were identified during this study; *Hirundo atrocaerulea*, a vulnerable bird that appears in the Red List as threaten or endangered; *Poeoptera kenrick*i, an East-African endemic and *Uhehe Fiscal* which is endemic to Iringa region. Orchids categorized as threatened under the IUCN Red List were recorded as well. To prevent adverse effects to the biodiversity, the plantation shall establish a buffer zone of 30 metres along every stream, riverine and natural vegetation[15]. According to TTSA the A/R project activity is not expected to have negative effect on the biodiversity. Additionally the fire protection system also protects the biodiversity in the conservation areas. Project proponents have installed effective fire management systems with fire lines surrounding the project boundary, fire towers and a standby fire crew with fire fighting equipments. Conservation areas have been

[14] Orgut Consulting Tanzania Branch (1999) : An Assessment of the Environmental Impact of the Forest Plantation Project at Uchindile and Lugala Villages in Kilombero district, Tanzania, Prepared for the Kilombero Forests Ltd

15 The width of 30m buffer is recommended in the Water Right Act (2000) and this was the law governing water bodies referred to in the EIA study conducted in 1999.

created to cover the area and provide breeding and perching sites for the blue swallow (*Hirundo atrocaerulea)* as suggested by WCST.

Under the "without project" scenario the project area is described as "edaphic fire climax grasslands"[16] characterised by frequent uncontrolled fires. These fires result from out-of-control burning often started for the purpose of hunting. With the project scenario, campaigns are to be conducted to educate the surrounding communities about how to protect the biodiversity including those species identified as rare threatened or endangered (RTE) that are found in the project area as well as avoid fires etc. The community will be trained on the dangers of starting fires to conserve the environment and avoid the use of identified vulnerable species. The buffer zones and conservation areas contain sample plots to measure changes in biodiversity, which will be included in the monitoring program and any deviation will be followed.

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**B.1.2 Describe possible adverse effects of non-native species on the area's environment, including impacts on native species and disease introduction or facilitation. If these impacts have a substantial bearing on biodiversity or other environmental outcomes, the project proponents must justify the necessity of using non-native species over native species.**

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The site preparation, tree planting and resulting shading will lead to the loss of herbaceous and shrub vegetation. This will cause a shift in species composition especially in the understory and a decline in the grass layer[17]. However, the impacts are not significant to the area as the grass is not native vegetation cover in any case, and all areas containing any rare or threatened species have been put into protection, and will not be planted.

The planted exotic species are obtained from high quality stock generated from genetically superior quality well adapted to the prevailing site conditions and broadened within and between species so as to ensure sustainability of the plantations against pests, diseases and climatic fluctuations.

The project is also planting indigenous tree species in the buffer zones and other parts of

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16 Orgut Consulting Tanzania Branch (1999) : An Assessment of the Environmental Impact of the Forest Plantation Project at Uchindile and Lugala Villages in Kilombero district, Tanzania, Prepared for the Kilombero Forests Ltd.

17 Ecological report for Mapanda and Uchindile, by P. Munishi (2006).

the plantation to sustain the natural habitat and conserve the soil, water quality and quantity.

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**B.1.3 Identify all IUCN Red List threatened species and species deemed threatened on nationally recognized lists that may be found within the project boundary. Project proponents must document how project activities will not be detrimental in any way to these species.**

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During the ecological survey conducted in 2006, two tree species were identified as rare or endangered. The tree species are *Osyris lanceolata* and *Prunus Africana,* occurring in riverine vegetation that remains intact and therefore does not fall within the plantable land area. Appendix II of CITES also points out two orchid species; one aloe species as endangered and one tree species, *Cythea thomsonii,* as rare. Areas with such trees and plants within the project activity boundary have been identified and mapped, and will be conserved. The project has set aside a conservation area of about 40 % of the land as representative area for natural habitats – for flora and fauna. The area also includes lands with some amount of protea (bush) vegetation that will be left. Management prescriptions are prepared and conservation status shall be recorded, monitored and archived. Awareness campaigns will also be carried out to educate staff and the local communities on the importance of the rare or endangered trees species so that their habitats are conserved and protected. Apart from this, all epithet orchids, wetlands and swamps will be protected by means of a 30 m[18] and 60 m[19] buffer zone because they are associated with riverine trees which need protection prescribed in the Water Right Act and NEMC, respectively. This is in accordance with the Country Biodiversity Study (BCS 1995) which points out the low level of endemism in the ecological zone. The project participants believe that, despite the fact that the area burns frequently, there is a limited possibility of losing the grassland orchid species outside the project activity boundary as they are geophytes which easily sprout whenever the perturbation is removed.

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**B.1.4 Identify all species to be used by the project and show that no known invasive species will be used.**

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[18] The width of 30m buffer is recommended in the Water Right Act (2000) and this was the law governing water bodies referred to in the EIA study conducted in 1999.

[19] All areas planted before year 2005 are being governed by the Water Right Act (2000), stating a buffer of 30m

Two main species, eucalyptus and pine, are selected for plantation establishment in the project area. These are *Eucalyptus saligna, Eucalyptus grandis, Eucalyptus camadulensis* and *Pinus patula.*

Native and exotic species of hardwood varieties are selected to broaden the number of species, to promote use of other and less known species, and to improve the health and resilience of the established plantations. The less known species are not considered as part of the removals to be claimed from the A/R project activity. The project participants believe that more heterogeneity will lower the susceptibility to pests and diseases. The choice of these native species offers the best chance for the success of plantations with respect to local ecological benefits, wood supply, soil and site stabilization, and improvement of the landscape.

The species listed below have been screened against the information provided in the global database of invasive species and are not invasive in Tanzania.

**Table B1: Species to be planted by the project participants.**

| SPECIES SELECTED | TYPE |
|---|---|
| *Pinus patula* | Exotic softwood |
| *Eucalyptus saligna* | Exotic hardwood |
| *Eucalyptus grandis* | Exotic hardwood |
| *Khaya anthotheca* | Indigenous hardwood |
| *Eucalyptus saligna* | Exotic hardwood |
| *Pinus elliottii* | Exotic softwood |
| *Cordia africana* | Indigenous hardwood |
| *Eucalyptus camaldulensis* | Exotic hardwood |
| *Prunus africana* | Indigenous hardwood |

**B.1.5 Guarantee that no genetically modified organisms will be used to generate carbon credits:**

No genetically modified organisms (GMOs) are to be planted in this project and hence no carbon credits shall be claimed from these species. The seedling production shall not involve seed culture, but direct sowing on the ground and the project shall ensure seeds for planting are from known seed sources.

## B2. Offsite Biodiversity Impacts

### B.2.1 Identify potential negative offsite biodiversity impacts that the project is likely to cause:

Of the total project area and lands leased to green resources, an area of about 40 % will be put into conservation. This area makes up wildlife corridor, buffer zones and protected areas. The conservation area basically includes;

1. 60 meters buffer zones from the valley bottoms, riverine, streams, wetlands and wildlife corridors, for plantings post 2005.
2. 30 metres buffer zones from patches of indigenous vegetation as well as plantings prior to 2005 as directed by Environmental Management Act and subsequent provisions.
3. 10 metres from grave yards and ritual areas. Effective management shall be employed in the mentioned area.

Indigenous tree species have been planted in the buffer zones and protected areas. Monitoring of biodiversity shall cover both the planted land with exotic species and the land set aside for protection and conservation. Change of land use from grassland to forest cover may result in loss of some indigenous species used by local people as sources of firewood, poles, fruits, water conserving species and rare species. In addition the natural habitat of some potential wildlife may be altered or destroyed.

The net offsite impacts are not expected to be negative; the planted trees in the buffer zones, demarcation and conservation of the wildlife corridors, setting aside areas for protection and elimination of wild fires will guarantee net positive biodiversity impacts.

### B.2.2 Describe how the project plans to mitigate these negative offsite biodiversity impacts:

The project anticipates mitigating any possible negative impact to the biodiversity. The monitoring plan including mitigation measures to address any potential risks will be implemented as indicated in table B2 below.

**Table B2: Possible negative environmental impacts (addressed in EIA 2006):**

| IMPACTS | Mitigation Measure |
|---|---|
| **Change of Land use from Grass Land to Forest Cover:**<br><br>Replacement of the grassland with a forest cover will result in loss of grazing grounds, loss of indigenous species used by local people as sources of firewood, poles, fruits, water conserving species and rare species. In addition the natural habitat of the potential wildlife will be destroyed. | Avail employment to local community as a source of alternative income to abate loss of the grazing ground.<br><br>Plantation to be carried out on land within manageable slopes and areas of extreme slope shall be protected and remain as control areas for monitoring vegetation change and for safeguarding some of the native grass land that may contain endemic or rare species.<br><br>During land preparation for planting all scattered trees and bushes should be left intact for improved biodiversity.<br><br>Plant water conserving species and fruit trees in valley bottoms beyond the recommended buffer zone of 100m for enhancing biodiversity, carbon sequestration and food production.<br><br>To alleviate shortage of fuel wood and building materials local population be assisted with the establishment of wood lots of both exotic species which grow faster and indigenous species to maintain/restore genetic diversity. |
| **Riverine and valley vegetation:**<br>Implementation of the project will bring a burden on the ecosystem, threatening the survival of rare species known for conserving water, sources of fire-wood, fruits, poles and sanctuary for wildlife. | The riverine and valley vegetation should be left intact to offer refuge to wildlife, to improve biodiversity and protect the areas from erosion. The vegetation will also protect the rivers and streams.<br><br>The trees shall be planted 30m away from the swamps |
| **Spread of fungal flora:**<br><br>The decaying fallen leaves of *Pinus patula* may cause growth of deadly poisonous fungi amanita *muscaria* which local people confuse for edible mushroom species. | Discourage local people from trespassing into the forested areas. The local community will be made aware of the problem through seminars, media and use of placards. |
| **Decrease of water levels:**<br><br>Exotic tree species have deep roots which take much water from the soils and may decrease water tables in the areas adjacent to the | Plant water conserving species beyond the recommended buffer zone of 30m<br>The riverine areas should be left intact for protection purposes with a buffer zone of 30m. Plant exotic species away from water sources. |

| | |
|---|---|
| plantation with the consequences of drying of river tributaries and swamps thus affecting the entire ecosystem of the surrounding areas. | |
| **Spread of tree diseases:**<br><br>The project aims at large scale planting of *Eucalyptus saligna and other species including indigenous species* on the flat areas and *Pinus patula* on the slopping gradients.<br><br>Establishment of exotic species have of recent witnessed attack by exotic pests free from natural enemies in East Africa which have caused serious outbreak of diseases. The impact is direct, negative, short term and significant. | GRL to develop preventative and control measures on pests and diseases in an integrated pest management program which include training of foresters for monitoring prevention and control measures for any outbreak of disease and pests as recommended by research institutions. |
| **Diminishing of soil nutrient:**<br><br>Forest cover depletes more nutrients from the soil than grass cover. The nutrients are lost through timber harvesting although there is also some nutrient recycling through falling litter and other waste. The depletion of nutrients is a threat to survival of other vegetation in the plantation areas. The soil will have insufficient nitrates, phosphates and boron which are key nutrients required by plants. The insufficiency of these nutrients will be more pronounced after the first harvest. | Application of fertilizer to be carried out after soil analysis so as to determine the type of the fertilizer and quantity. |

As indicated above, the project does not expect to cause any negative offsite impacts to the biodiversity. The project expects to cause positive biodiversity impacts outside the project boundaries. The communities shall be motivated to plant their own trees. Free seedlings and technology transfer shall be provided to the communities to manage their own woodlots. 10% of revenues from the carbon credits will be given to support community projects; this shall ameliorate environmental conditions among other things. The trees planted and education campaigns shall raise awareness towards the communities to protect

their environment against fires (communities shall not start fires as they also have plantations). Education shall be disseminated to the communities to protect vulnerable species identified during the study.  The project participants found *Acacia melanoxylon, Acasia mearnsii, Agave sisalana,* passion fruits*, Psidium guajava, Caesalpinia decapetala, Mexican sunflower,* Rubus species*, Lantana camara, Celeteric cerrata* and *Bambusa balcoae* as invasive species within the project boundary. This has been documented and properly uprooted.

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**B.2.3 Evaluate likely unmitigated negative offsite biodiversity impacts against the biodiversity benefits of the project within the project boundaries. Justify and demonstrate that the net effect of the project on biodiversity is positive:**

There are no likely unmitigated offsite biodiversity impacts anticipated by the project. The net biodiversity benefits within the project boundary and throughout the project lifetime is expected to be positive. The monitoring program shall be carried out and any deviation shall be checked accordingly.

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## B3. Biodiversity Impact Monitoring

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**B.3.1 Describe the initial plan for how they will select biodiversity variables to be monitored:**

An initial environmental impact assessment study was carried out to determine impacts on the biodiversity before the project was rolled out. Subsequent biodiversity studies have been done through both ecological and botanical surveys. The ecological and botanical surveys assess species abundance, diversity, landscape connectivity and biodiversity at risk of being negatively impacted by the project activities. Biodiversity monitoring is planned to keep track of these attributes. Permanent sample plots (PSP) have been installed in the planted areas in the buffer zones and conservation areas to easily monitor the biodiversity.

The monitoring of possible changes in biodiversity shall be done annually at around the same dates. In addition to that, the project has planned an indoor monitoring to assess any changes in between. Permanent sample plots have been installed in the conservation areas, buffer zones and clusters of native vegetation to assess changes in flora and fauna.

Biodiversity at risk of being negatively impacted by the project were identified in the ecological and botanical survey (refer G.1.6). The biodiversity shall be monitored to ensure that any negative impacts are addressed. Monitoring variables shall include species abundance and diversity, landscape connectivity, forest fragmentation, and habitat area.

## B4. Native Species Use (optional)

### B.4.1 Show that the project will only use species that are native to the region, or justify that any non-native species used by the project are superior to native species for generating concrete biodiversity benefits:

The selection of species for planting (sub species of Eucalyptus and Pine) was mainly based on their adaptability to the land, and the strong knowledge of plantation and silvicultural practises for these species. The area in which the project is implemented contains poor soil and the native species growth is very low. Eucalyptus and Pine is growing fast due to their low nutrient demand and adaptation to high rainfall and high altitudes. These species have no adverse effects on the native species and may grow concurrently with natural vegetation. Trees will be planted on the land that would be exposed to unmanaged fires in the ''business as usual'' scenario. Biodiversity benefits are therefore expected through conservation of these native trees and conservation and protection areas that have been created as a protection measure for the abundant species of birds, mammals and plants.

Tree planting program has been planned by the project in which communities are supplied with 20% of total seedling raised. The trees planted shall reduce the pressure on native trees for fuel wood.

## B5. Water and Soil Resource Enhancement (optional)

### B.5.1 Identify project activities that are likely to enhance water and soil resources:

Setting aside a buffer zone of 60 metres is recommended by NEMC to avoid interference of the exotic species with water resources. Environmental Impact Assessment was carried out by external agency in the project area and they were satisfied that this buffer is reasonable to protect water resources. (see EIA report[20]). Indigenous tree species are planted in the buffer zones; these species include Syzigium cordatum and Bridelia spp which conserves water. Planting of indigenous trees as well as leaving a natural vegetation buffer shall

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[20] National Environment Management Council (NEMC), Oct 2006.

maintain the moisture content of the wetlands allowing repository site for other species like birds. GRL is planting water-conserving species and fruit trees in valley bottoms beyond the recommended buffer zone, for enhancing biodiversity, carbon sequestration and food production. All remaining areas will be protected and remain as control areas for monitoring vegetation change and for safeguarding some of the native grass land that may contain endemic or rare species.

| **B.5.2 Credibly demonstrate that these activities are likely to improve water and soil resource compared to the baseline, using justifiable assumptions about cause and effect, and relevant studies:** |
| --- |

There is no clear proof that the project implementation shall improve water and soil resources. However, the project is not expected to cause negative impacts to these resources because the water courses are left undisturbed by creation of sufficient buffer zones. Soil and water analysed for their chemical composition (at Sokoine University of Agriculture and Iringa Water Office) have not shown any changes in salinity and composition of soil or soil fertility and pH in comparison to the baseline scenario (reports exists and are available upon request or during validation/verification).