Project Description Template for the Voluntary Carbon Standard ARR project activity

Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania

July 7th 2009

The CDM PDD template has been used for documenting the project design of the VCS project. Following the CDM PDD format documentation supplementary information required for VCS can be found in the VCS PD format.

CDM – Executive Board

PROJECT DESIGN DOCUMENT FORM
FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD) - Version 03

CLEAN DEVELOPMENT MECHANISM

PROJECT DESIGN DOCUMENT FORM FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD) Version 03

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SECTION A. General description of the proposed ARR VCS project activity:

A.1. Title of the proposed ARR VCS project activity:

Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania

Version number: 06

Date of the document: July 7th, 2009.

A.2. Description of the proposed ARR VCS project activity:

Overview: The proposed ARR VCS project activity described in this document is for two separate areas namely, Uchindile Forest Project (UFP) and Mapanda Forest Project (MFP), located in the southern part of Tanzania in the districts of Kilombero, Morogoro Region and Mufindi, Iringa Region. Both these areas contain multiple "discrete areas of land" where planting will take place.

Objectives of the proposed ARR VCS project activity:

- To establish and manage forest plantations so as to contribute to the demand of high quality wood products from a sustainable managed forest. NB: The Government of Tanzania, through the Forestry Division in the Ministry of Natural Resources and Tourism (MNRT) encourages establishment of private forests plantations and admits that limited government financing has been a major set back in developing new forest plantations in the country[1,2]. The implementation of the proposed ARR VCS project activity will therefore, benefit the forestry sector through an increase in the resource supply, management and overall sustainability.
- To sequester CO_2 through forest planting in grassland areas, generating 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 grasslands and/or degraded lands.
- To promote environmental conservation, such as soil conservation, protection of water sources and enhancement of biodiversity through the protection and management of

[1] The forests in Tanzania, mostly public/natural forests, are under pressure of deforestation at an estimated annual rate ranging from 150, 000ha -450,000ha (Source: The Tanzania National Forest Policy (MNRT, 1998)). The Tanzania Forest Action Plan (MNRT, 2000) mentions Kilombero Forest Project (now called Uchindile Forest Project) as the only private plantation forest aiming at CO_2 sequestration and generation of VCUs for sale.

[2] The Forest Policy (MNRT, 1998) and Forest Law (Forest Act, 2002) gives opportunities to the private sector to play key roles in the national economy, not only in the development of forestry sector but also to buy shares in the public industries including the public forestry industries: Mugasha et al, , (2004), Indicators and Tools for Restoration and Sustainable Management of Forests in East Africa, I-TOO working paper No. 3, State of Forests and Forestry Research in Tanzania, page 31.

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

- To facilitate socio-economic development of the local communities through:
  - promotion of tree planting/reforestation activities in the local communities;
  - providing employment opportunities;
  - generation of income for the communities through the sale of carbon credits (10% of the benefits of all carbon credits will be used for community development projects)
- Infrastructure development of roads, buildings and other aspects, such as water supply and communication systems.
- To create employment to other Tanzanians apart from those in the village local communities.

To achieve these objectives, the proposed ARR VCS project activity will establish plantation forests at two discrete areas of land (for the location of the discrete areas, see figure A.1):

1. Uchindile: total area 12,121 ha (as stated on the title deed) of which 7,252 ha will be planted; and,
2. Mapanda: total area 6,258 (as stated on the title deed) of which 3,562 ha will be planted.

Species to be planted are shown in Table A.2.1. The species have been screened against the information provided in the global database of invasive species and are not invasive in Tanzania.

Table A.2.1: Species to be planted in the discrete areas of land

Species	Type	Uses
Pinus Patula	Exotic softwood	Timber
Eucalyptus Saligna	Exotic hardwood	Poles
Eucalyptus Globulus	Exotic hardwood	Poles
Eucalyptus Camadulensis	Exotic hardwood	Poles

For a map of the locations of the project areas, see Figure A.4.1.

The proposed ARR VCS project activity is a reforestation project. The source of information that dates back longest is the local population that reports on forests in the valleys and grasslands on the hill tops. According to them, the forest areas have been pushed back further into the riverine areas up until about two to three generations ago (1960s). The first documented sources of information are maps compiled between 1977 and 1983 that indicate the area was grassland at that time. The satellite images that are available closest to 1990 and that cover the land area of the project show that these areas have remained grassland.

The idea for the project started in 1997, when the company realised that planting trees and fighting climate change go hand in hand. Some planting was undertaken from year 1997 to 1999 on a trial basis in both areas (financed with private money). Foreign investments were invited but did not really take off until 2004 when the 9th Conference of the Parties to the UNFCCC in 2003 agreed on the rules for VCS ARR project activities. The 2006 Annual Report (page 4) states that: “The start of the 2000s saw slower than expected development of the GHG-offset regulations and markets.

Green Resources maintained the organisation, but planted only smaller areas of new forest. Table A.2.2.a shows what has been planted from 1997 until 2008. Table A.2.2.b. shows planned planting from 2009 to 2013.

Table A.2.2.a Areas planted per species 1997-2008

Year of Planting	Uchindile			Mapanda		
	Area planted per species (ha)			Area planted per species (ha)		
	Pine	Eucalyptus	Total	Pine	Eucalyptus	Total
1997	19	19	39	-	-	
1998	241	153	394	-	121	121
1999	-	-	0	-	8	8
2000	-	-	0	-	-	0
2001	74	-	74	-	-	0
2002	26	112	138	-	98	98
2003	123	-	123	-	2	2
2004	28	161	188	-	85	85
2005	190	166	356	57	62	119
2006	-	99	99	526	15	541
2007	277	107	383	447	11	458
2008	148	361	508	260	72	332

Table A.2.2.b Areas planted per species 2009-2013

Year of Planting	Uchindile			Mapanda		
	Area planted per species (ha)			Area planted per species (ha)		
	Pine	Eucalyptus	Total	Pine	Eucalyptus	Total
2009	500	500	1,000	500	-	500
2010	500	500	1,000	500	-	500
2011	500	519	1,019	500	-	500
2012	500	653	1,153	298	121	419
2013	448	500	948	-	8	8

This planting schedule will then be repeated following harvesting at 13 and 21 years respectively for the eucalyptus and pine.

The process of formally obtaining land titles is a lengthy one in Tanzania and can take more than a year (document describing process is available on request and during validation/verification as supporting documents).

The 1st title deed for this project was obtained in 2000. The land title for the UFP area is for 12,121ha of which approximately 7,252 ha of grassland will be forested, while the land title for the MFP area is 6,258 ha, out of which approximately 3,562 ha will be forested. Planting will be done mainly with various exotic species, including different subspecies of *Eucalyptus* and *Pinus* . In

addition, some exotic and indigenous hardwood species and indigenous fruit tree species will be planted in approximately 270 ha and 280 ha in Uchindile and Mapanda respectively. The project participants shall not claim carbon sequestration credits accrued from any species other than the pine and eucalyptus. GRL adheres to all national legislation and the technical notes as provided by the Ministry of Natural Resources and Tourism (MNRT) governing plantation forestry.
Seedlings are produced in company nurseries. Where possible temporary nurseries are established closed to the sites that will be planted during the next rains to reduce transport distances. Seeds are obtained from or approved by the Tanzania Tree Seed Agency (TTSA), an officially authorized distributor/importer of tree seeds in Tanzania. Certificates of origin are available for all planting material and the policy of Tanzania is not to use Genetically Modified Organisms (GMOs).

Land preparation is done by hand (with hoe) by local labourers. Workers are transported back and forth to their villages as much as possible so an not to disrupt family lives in the villages too much. But if need be, workers are housed temporarily in the facilities of the company on the plantations. These are wooden houses with electricity (solar) and good water, waste and sanitation provisions. Since the company is working in accordance with the Forest Stewardship Council's Principles and Criteria (FSC P&C) the standard must be considered acceptable. It is anticipated that the compliance of the Uchindile and Mapanda forestry operations with the FSC P&C will be confirmed as a result of the formal assessment that will take place in April 2008.

To plant, planting holes are made and circular plots of 1 meter diameter are cleaned of grass and weeds. After planting spot weeding is continued until the seedlings outgrow the grass and start to suppress it. Rotations for eucalypt poles are approximately 18 years and the rotation for pine saw logs is approximately 25 years. The rotations for other exotic and indigenous hardwoods remain to be determined on the basis of performance.

An extensive monitoring programme is running on all of GRL's operations (see also section E) keeping track not only of growth performance of the plantations and the carbon aspects, but also of the practices of forest workers, plantation managers, rangers, fire fighters, community work, stakeholder consultations, PSPs, development and protection of indigenous vegetation, potential spread of plantation species into conservation areas and watercourses, insects attacks and diseases, water quality and quantity, sites of specific interest (culturally or environmentally), etc.

The ex ante estimate of areas where the project will conserve and where possible enhance the naturalness of existing vegetation in the areas is estimated to be approximately 4, 500 ha at UFP and 2,700 ha at MFP, mainly along rivers, valleys, gullies, wetlands and sites protected for environmental or cultural reasons.

The ex ante estimates of emissions reductions are based on the planted areas only and do not take into account the increase in carbon stocks in the natural vegetation/conservation areas.

GRL has set up a Geographical Information System (GIS) database which is used during implementation and monitoring of the project activities. The most up-to-date technologies and silvicultural models will be developed or adopted for in the proposed ARR VCS project activity. All spatial and non-spatial data in project activities shall be collected and recorded. The data recorded shall be processed and stored in a GIS database for the purpose of analysis and modelling. Using geographical software (Arcview/ArcGIS) and associated software tools, the models will assist the management in planning and decision making.

GRL has appointed dedicated VCS and FSC officers in addition to officers introducing ISO 14001 to the company. All operations will be managed in accordance with all associated requirements.

This has also been firmed up by the company's core environmental and social values as laid down in the 2006 annual report. The Core Environmental and Social Values are reflected below.

GRL has an extensive community development programme with the surrounding villages that have made the land available to GRL. Besides the compensation agreement, which is part of the transfer of the title deed, the communities are assisted with various activities, such as building school and dispensaries (see also section F and G).
In addition, the company makes available 10% of the revenues of the sale of carbon credits to the community and environmental conservation projects. And the remainder of the carbon revenues will be reinvested in local industries and/or in Eastern Africa. These commitments have been published in the 2006 annual report (see operational review page 28 of that document)

CORE ENVIRONMENTAL AND SOCIAL VALUES

1. We are a young, dynamic, carbon offset, plantation, forest products and renewable energy company that aims for profitable growth and value added for shareholders;
2. We are committed to become the largest and best carbon offset, plantation, forest product and renewable energy company in East Africa;
3. We aspire to be the preferred employer in our industry, as well as the preferred partner for the local communities and our customers.
4. We respect and protect the environment and foster the social improvement and well-being of our people and the rural communities we work with;
5. We want to bring development to some of the poorest areas in the world's least developed countries;
6. We invest in people and our staff because that is the basis for our success. employees that perform well, show commitment, loyalty and integrity will be fostered and rewarded;
7. We have zero tolerance towards discrimination, poor working conditions and work-related accidents within the company and corruption;
8. We are committed to protecting the natural environment and creating a socially responsible organisation and therefore, we are committed to sustainable forest management principles, including those of the Forest Stewardship Council;
9. We want our operations to contribute to mitigating climate change and assist industrialised countries to meet their emission reduction commitments under the United Nation's Framework Convention on Climate Change, and,
10. We want to contribute to local, regional and national sustainable development objectives, in accordance with national legislation and relevant international treaties and other requirements to which the organisation subscribes (e.g. ISO 14001).

View of the Project Participants on the contribution of the proposed ARR VCS project activity to sustainable development:

Local Benefits:

1) The project participants will set aside 10% of the carbon revenues obtained from the sale of the carbon credits for the benefit of the local communities to be spent on projects that support the community as a whole.
2) The project participants shall establish community forestry programmes in villages around the project locations. This will be done through free provision of seedlings to villagers amounting to 17% of all seedlings produced in the nurseries. Technical support will be provided as well.
3) Provision of free training on best forest management practices to villagers. The villages surrounding the project areas are shown in Figure A.4.1. Population figures derived from

the population survey in 2006, conducted by the Village Executive Committee yielded the following numbers: For UFP: Uchindile: 1,060; Kitete: 214 – For MFP: Mapanda: 4,357; Chogo: 1,600.

4) The proposed ARR VCS project activity will result into increased revenues, adding an average of more than 200 mandays/day per year of employment opportunities in both of the plantation areas[3].

5) Improved infrastructure: An estimated 200 km of roads will be constructed and approximately 100 km renovated, including river crossings and culverts. Road sign and signaling to avoid traffic accidents will be installed along the public roads that are used for the log transports etc.

6) Improve accessibility to clean water by providing boreholes in the villages and settlements, where necessary.

7) In addition, the project will provide the capital needed to stimulate local sustainable development priorities such as improved social services: hospitals and schools to serve the local population.

Regional and National Benefits: The proposed ARR VCS project activity will:

1) Demonstrate that carbon sequestration from forest plantations is a viable instrument to encourage private investment in the forestry sector.

2) Enhance institutional and management capacity for the forestry sector in Tanzania

3) Expand the timber plantations to reduce pressure on natural forests.

4) Contribute to significant increased revenue to the government, the district council and villages through sale of wood products.

5) Taxes and levies for the Tanzanian Revenue Authority.

6) Contribute to the pension of workers through the National Social Security Fund (NSSF).

7) In addition, the project will provide the capital needed to stimulate multiple national and local sustainable development priorities.

A.3. Project participants:

The proposed ARR VCS project activity is developed, implemented and managed by Green Resources Ltd., a Tanzanian subsidiary wholly owned by TreeFarms AS, from Norway, which is providing primary financing. GRL is a Tanzanian registered company.

Table A.3.1: Project participants

[3] The NSGRP/MKUKUTA is planned to reduced unemployment from 12.9 % in 2000/01 to 6.9% by 2010 and address underemployment in rural areas. GRL guarantees long term (up to 99 years of title deed holding) employment to these remote areas, multiplier effect for income generation activities, self-employment –woodlots establishment, beekeeping, as it relies on employing local people.

Name of Party involved (*) (host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Indicate if the Party involved wishes to be considered as a project participant (Yes/No)
United Republic of Tanzania	Private entity: Green Resources Ltd, subsidiary of Green Resources AS, Norway	No
Norway	Private entity: Green Resources AS. Norwegian company with offices in Norway and the UK	No

A.4. Technical description of the ARR VCS project activity:

A.4.1. Location of the proposed ARR VCS project activity:

The proposed ARR VCS project activity is located in the Eastern part of Africa, in the United Republic of Tanzania. The discrete project areas of land are found in the south eastern part of the country. See figure A.4.1.

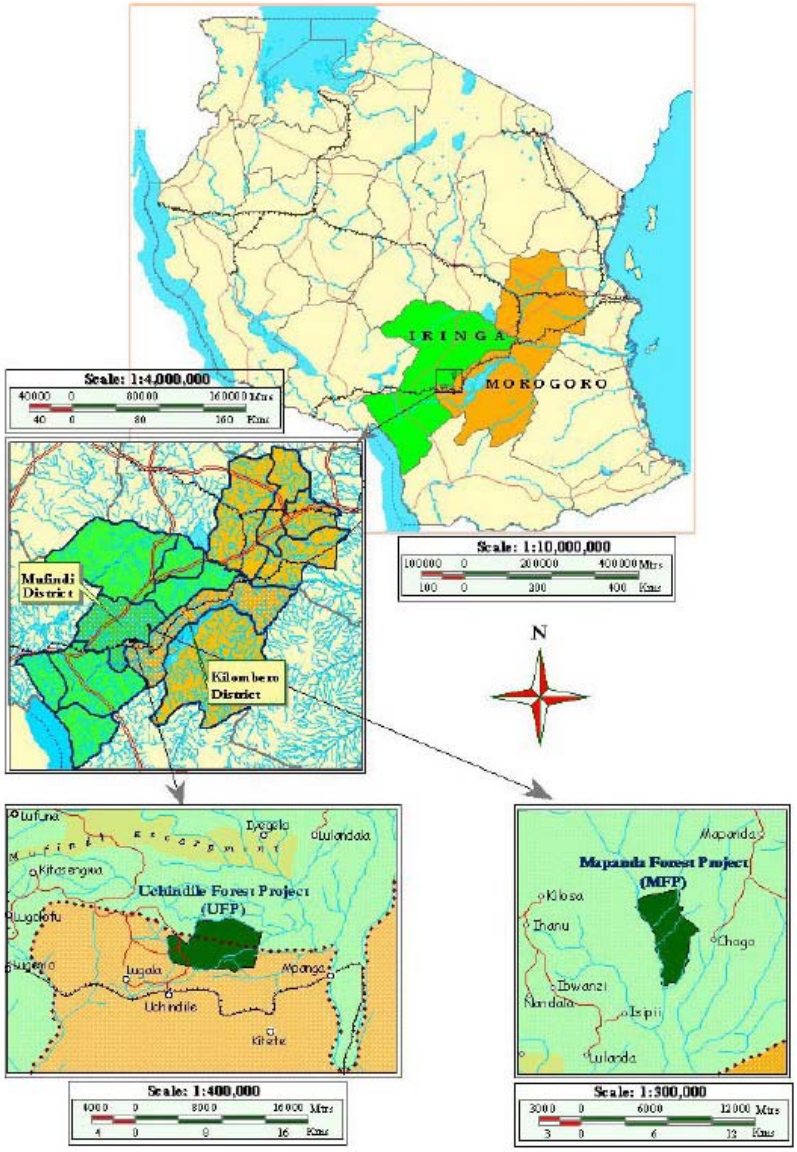

Figure A.4.1: Location of the proposed ARR VCS project activity

A.4.1.1. Host Party(ies):

United Republic of Tanzania

A.4.1.2. Region/State/Province etc.:

1. **Region:** East Africa; **State:** Tanzania; **Province:** Morogoro Region; **District**: Kilombero District, and,
2. **Region:** East Africa; **State:** Tanzania; **Province:** Iringa Region; **Distict**: Mufindi District

A.4.1.3. City/Town/Community etc:

The areas of land to be reforested are located in:

1. 2 villages (Uchindile and Kitete) in the Uchindile Forest Project area
2. 2 villages (Chogo and Mapanda) in the Mapanda Forest Project area
3. The project participant's main headquarter is in Mafinga township, Mufindi district.

A.4.1.4. Detailed geographic delineation of the project boundary, including information allowing the unique identification(s) of the proposed ARR VCS project activity:

The proposed ARR VCS project activity is located in two main areas of land. 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 (see figure A.4.1.4.a):

- **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 8°39′ 34″ S to 8°44′ 55″ S and longitudes 35°23′ 28″ E to 35°32′ 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, 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.
- **Title Deed:** GRL has a title deed for the area of land for a period of 99 years from 1st April 2000. Land acquisition followed the required procedures as guided by the government of Tanzania under the Ministry of Lands. Land acquisition process in Tanzania is described (available on request and during validation/verification as supporting documents).
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Table **A.4.1.4.a**: 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

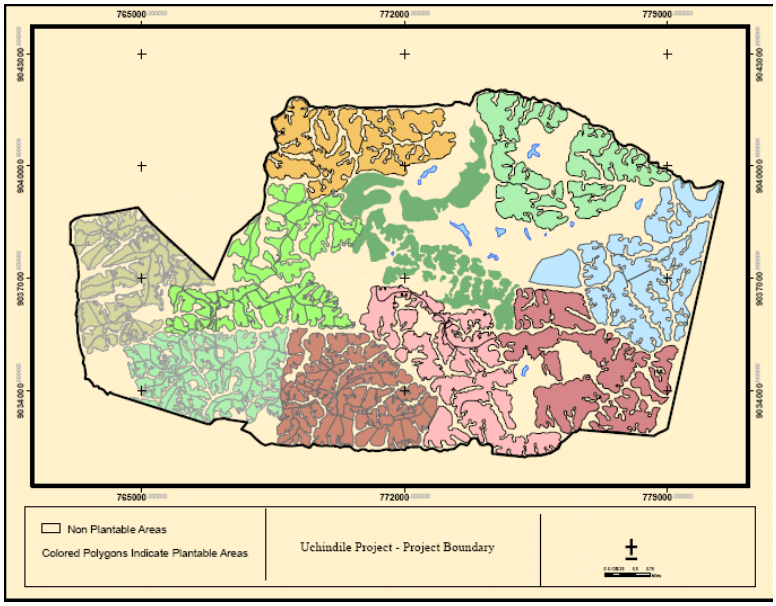

Figure A.4.1.4.a: Map of the Uchindile Forest Project area showing geographical boundaries of the actual planting areas. Different colours indicate different years of planting

Mapanda Forest Project (see Figure A.4.1.4.b):

- **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.
- **Title Deed:** The project participants have two titles of ownership for this area for a period of 99 years from 06th December 2003. Land acquisition followed the required procedures as guided by the Ministry of Lands, Tanzania. Land acquisition process in Tanzania is described (available on request and during validation/verification as supporting documents).

- The title deeds are for areas of 1,606ha and 4,652ha located at the Chogo and Mapanda villages.

Table **A.4.1.4.b**: 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

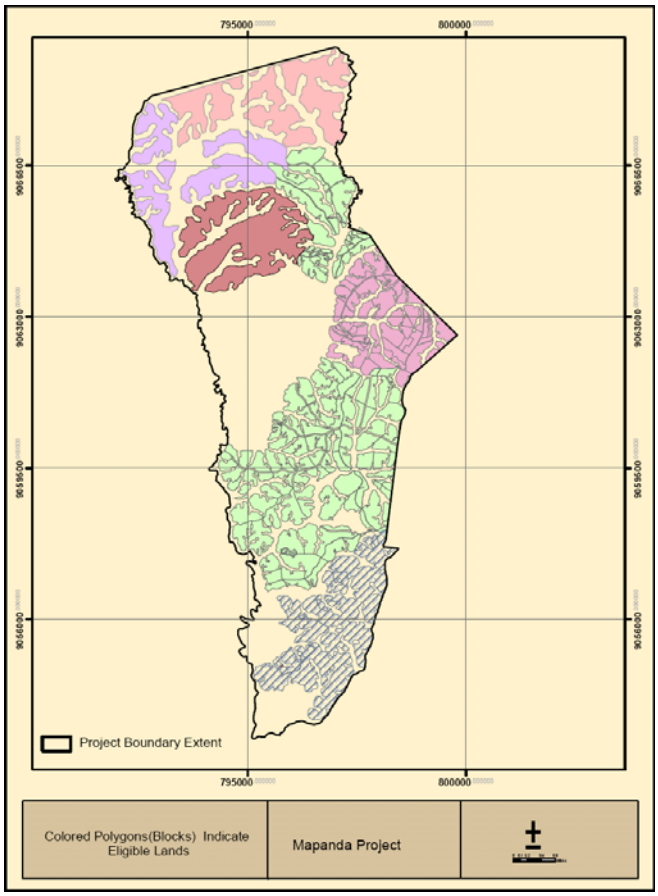

Figure A.4.1.4.b: The map of the Mapanda Forest Project area showing geographical boundaries, the actual plantable areas. Different colours represent different years of planting.

A.4.1.5. Description of the present environmental conditions of the area planned for the proposed ARR VCS project activity, including a brief description of climate, hydrology, soils, ecosystems (including land use):

The proposed ARR VCS project activity is implemented in two areas which have similar characteristics of being grassland with scattered shrubs and pockets of indigenous trees along river valleys and gullies. The present environmental conditions have not changed from the conditions before the project started and the climate, hydrology, soils, ecosystem is being monitored. The environmental conditions of each land before the project started are described respectively as follows:

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 1000mm. The project area is located in a zone of potential evaporation varying between 800 - 1200 mm/year. The yearly variation in potential evaporation is smaller and steadier as compared to rainfall. The short rainy season occurs during November-December and a long one between March and May. The area is predominantly dry between July and October. The average climate temperature is around 16^{o}C with the coldest months between May to August/ September. Winds normally blow from North-East.

At **MFP**, the mean annual precipitation is about 1050mm, 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.

Hydrology:

UFP: The hydrological condition of the area is characterised by several rivers and small streams flowing through the area including the ones making 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 at this planned forest plantation. Most of the streams flow into the Kilombero Valley which is to the south of the area.

The hydrology of **MFP** is represented by major rivers named Mwenga river on the west, Mkungwe, Kiverege, Mvino and Kiumbo rivers rivers all flowing into the Mwenga river. Few 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.

Soils:

UFP: the soils are in most of the areas originated from granites which are deeply weathered. These soils are moderately acid, poor, freely drained and markedly compacted near the surface where there is often a very high coarse grained soil fraction. Top soil have been exposed to annual fires and therefore exhausted in humus content. The soil pH varies between 4.4-6.5. Erosion is more realized on bare soil. The soils are generally red loamy sand soils (latosolic). The slopes of the ridges are high where in some places range from 20-40%.

The soils at MFP are a mixture of red and yellow clays often with dark humic top soils whose agricultural productivity rating is medium. In some areas top soils have been exposed to excessive annual fires and cultivation and therefore exhausted in humus content. Soil colour ranges from red clays to yellow. Soil pH ranges between 5.3 and 6.0. Some parts are prone to forming hardpans, which in most cases are found on most ridges.

Ecosystem:
UFP: Within the boundary of the project area there are existing patches of naturally growing shrubs and trees vegetation cover which are observed along river bottoms, valleys and steep slopes (see Figure 3.1 and Figure A.6). These are left to protect the areas from erosion by rainwater, also protect the rivers and streams from drying. The main species dominating primary vegetation cover are *Combretum sp. Nuxia congesta*, grasses dominated by species of *hyperenia, aristida* and *themada* and shrubs species. The lands are not used due to poor soils and grasses are not suitable for grazing.

MFP: Natural Vegetation Cover - In the plantation area there are 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 soils are a mixture of red and yellow clays, often with humic top soils, whose agricultural productivity rating is medium.

Land Use:

The local community in the neighbourhood are small scale farmers, just for subsistence with limited livestock grazing close to the villages where cattle is kept mainly in kraals. The most crops grown are annuals such as maize, beans, peas, potatoes and vegetables (cabbages). Bananas are also grown in the area. Recently they have been involved in cultivation of cash crops such as pyrethrum and coffee. Maize is the main food and cash crop.

History of land use & land cover:

On hill tops and along the hills slopes which are covered 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*). In river valleys, tree species include *Syzygium cordatum, Bridelia micrantha* and *Gardenia imperialis* and fern (*Tyelypteris confluens*). Based on the assessment conducted within the project boundary in 1999, the wildlife in the area is limited due to its topography. Few small animals such as wild pigs, moles, rodents, birds

found within the project boundary along rivers[4]. To prevent adverse effect of the plantation establishment, a buffer zone of 30m width will be respected along each stream and river and natural vegetation[5].

Based on a botanical survey conducted by TTSA two threatened species were found (Osyris lanceolata and Prunus Africana), but the ARR VCS project activity is not expected to have a negative effect on them according to the TTSA. See also section F.

A.4.1.6. Description of the presence, if any, of rare or endangered species and their habitats:

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 and one aloe species are endangered and one rare specie, *Cythea thomsonii*. Areas with such trees within the project activity boundary areas have been identified and mapped and will be conserved. The project set aside 10% of the land (approximately 1800 ha) as representative area of natural habitats for flora and fauna. The area also includes lands with an amount of protea (bush) vegetation that will be left as conservation areas. 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 epithic orchids, wetlands and swamps will be protected by means of a 30m[6] and 60m[7] buffer zone because they are associated with riverine trees which need protection prescribed in water right and the NEMC act respectively. This is in agreement with the Country Biodiversity Study (BCS 1995) carried out in 1995 which points out the low level of endemism in this ecological zone. Despite the fact that the area burns frequently, there is a limited possibility of losing the grassland orchid species as they are geophytes which easily sprout whenever the perturbation is removed[8].

A.4.2. Species and varieties selected for the proposed ARR VCS project activity:

Two main species (Eucalyptus and pine) are selected for plantation establishment in the project area. The native (*Acacia melanoxylon, Khaya nyasica, melicia excelsa, Cordia Africana*) and exotic

[4] 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

[5] 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.

[6] All areas planted before year 2004 are being governed by the The Water Right Act (2000), stating a buffer of 30m

[7] The National Environment Management Council Act, 2004 recommends a buffer of 60 m should be left from rivers, and this is applied for all plantations established after 2004.

[8] C.K. Ruffo and L.O.N. Uronu, Report on Botanical Survey: Kilombero Forest Project (Uchindile), Mafinga Forest Project (Mapanda) and Idete Forest Project (Idete), Tanzania Tree Seed Agency, 2005. During vegetation survey a total numbers of 88 species were identified.

(*Tectona grandis, Grevillea robusta, Cedrella Africana*) species of hardwood varieties are selected to broaden the number of species, to promote use of other, lesser known species, and to improve the health and resilience of the established plantations. The lesser known species are not considered as part of the removals to be claimed from the ARR VCS 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 landscapes. None of the softwood exotic species as well as the chosen hardwood species to be planted have been reported to be invasive in Tanzania and in the region.

Table A.4.2.1 (a): Trees selected for the proposed ARR VCS project activity

AREA	SPECIES SELECTED	TYPE
Uchindile	Pinus patula	Exotic softwood
	Eucalyptus saligna	Exotic hardwood
	Eucalyptus grandis	Exotic hardwood
Mapanda	Eucalyptus saligna	Exotic hardwood
	Pinus patula	Exotic softwood
	Eucalyptus grandis	Exotic hardwood

The growing conditions for the chosen species have been obtained from various literatures (Table A.4.2.1 (b)). These conditions are suitable and have a fair similarity with the condition in the lands to be planted. The Forest Management Plan that was drawn from the Technical Notes takes into consideration planting locations based on the soil characteristics and suitability of the lands.

Table A.4.2.1 (b) Required growing condition for various species to be planted in UFP and MFP:-

Growing Conditions	**Species**	
	pinus patula	eucalyptus saligna/grandis
Rainfall mm	>1000	800 -1500
Altitude m	1600 -3000	1200 – 2400
Soils	Well drained sandy loams & rocky soils	Well drained sandy clay loams
Temperature (degree C)	12 – 20	16 -22
Invasive	NO	NO

A.4.3. Description of legal title to the land, current land tenure and rights to VCUs issued for the proposed ARR VCS project activity:

Tanzania land ownership law: The land in Tanzania is by law the state property and can only be leased from the Government for a specific period and activity. The land areas of this project were under customary law occupied by villages owning the land but remained idle. The project participants followed all the required necessary steps as guided by the government of Tanzania under the Ministry of Lands and Human Settlements to acquire the discrete land areas under a 99 year lease agreement. Land acquisition process in Tanzania is described (available on request and during validation/verification as supporting documents).

Land tenure and Legal title for the proposed ARR VCS project activity:

GRL inherited the land titles from its predecessor Escarpment Forestry Company Ltd (EFC) and has a long term lease for the discrete areas of land from the Government for the purpose of long-term land development on reforestation.

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

Based on Tanzania's Land Policy the payment of compensation extinguishes customary rights to the land, legally placing the parcels of land to the project participants[9]. Conditions attached by the government include: development conditions and rights which include payment of land rent, development of the area by reforestation, protection of the beacons of the boundary and sustainable use of the land according to cross-sectoral laws associated with land management. The current land rent is approximately 0.4 US dollar cents per acre per year.

The activities that were indemnified due to the transfer of the title deed are:

1. Annual crops: 7 ha maize, 2 ha beans, 0.5 ha millets, 0.5 ha pepper, 18 stems of sugarcane and 230 stems of pineapple;
2. Other properties: 397 stems of bananas, 1161 stems of bamboo trees, 7 mango trees, 6 orange trees, 402 eucalypt trees, 8 pine trees, 35 peach trees, 94 stems of sisal and 30 bee hives.

[9] The National Land Policy 1995 recognizes the dual system of land tenure, i.e. customary and statutory rights of occupancy, as equal before the law (section 4.1.1.). The statutory rights of occupancy is granted by the government for a period not exceeding 99 years, while customary rights of occupancy has no time limit. The period of 99 years is the maximum period in granted right by law equivalent to a lease of land while the customary rights, having no time limit, is an absolute right of ownership of land. Section 4.2.18 provides conditions for transactions of land, which has a market value. The policy is weak in that it does not mention the difference between surface land tenure rights and resource tenure rights in both customary and statutory rights of occupancy. The clear recognition of land having a market value by section 4.2.17 in fact bestows that resource tenure to individual landowners. It is the resource tenure, which determines land quality and the value of parcels of land, where applicable.

All of these properties and crops are detailed in the title deed transfer, including the amount paid.

Right to VCUs: The project participants have exclusive rights to all accumulated VCUs. However, 10% of the revenues will be reinvested for the benefit of the communities and the remainder of the carbon revenues will be reinvested in the local economy and industries and/or Eastern Africa.

Before the VCS/VCS rules for ARR project activities were operationalised, GRL sought independent verification of its carbon sequestration activities and one of the world's largest testing and inspection companies based in Switzerland called Société Génerale de Surveillance (SGS), confirmed the sequestration of carbon by GRL's operations up till 2007 and issued a "SAVER": a schedule of achieved voluntary emission reductions. Such credits are tradable on the voluntary market but no sale has been made to date.

A.4.4. Technology to be employed by the proposed ARR VCS project activity:

GRL employs the latest technologies such as Global Positioning Systems and Geographic Information Systems. It is unlikely that these systems will be replaced in the near future by the transfer of technologies because the project is committed to use the state of the art technologies when they become available.

In the proposed ARR VCS project activity, modern plantation technologies available for forest management and silvicultural practices will be used. The following standards will be followed:

1. Government Technical Note on Silvicultural Practices issued by the MNRT (available on request and during validation/verification as supporting documents).
2. Procedures and Work instructions for Forest plantations for Kilombero Forest project (Third Edition).
3. Forest Management Plans
4. Forest Stewardship Council's Principles and Criteria
5. Any requirement under the VCS as detailed in this PD
6. Annual Budgets
7. Plantation Unit Tasks
8. Environmental and Socio-Economic Impact Assessment reports
9. Monitoring Plans

ISO 9001 and 14001 approaches will be introduced corporate wise as an instrument for the efficient management of all environmental aspects and quality assurance.

Geographical Information System (GIS) and Geographical Position System (GPS) will be used for verification and monitoring of the proposed ARR VCS project activity. Although the project participants rely on own trained staff and professionals, it collaborates with local and regional forestry department/agencies, i.e. 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 in providing technical consultation and guidance, including training courses, quality control checks and technical inputs for the preparation and implementation of the proposed ARR VCS project activity. Project participants will also seek advice from local, national, and international

forestry and sustainable forest management experts where required. In addition, the project participants will demonstrate the potential of carbon sequestration as the monetary window to attract investment for developing the Tanzania's forestry sector.

Specific technologies employed during establishment, silvicultural practices, monitoring and verification of the plantation development include:

Site preparation:

To prevent soil erosion, reduce GHG emission and protect existing carbon stocks, site burning, strip ploughing and overall tillage will not be employed during site preparation (traditionally in Tanzania, sites to be planted are slashed and burned, followed by overall tillage, which results in carbon and non-CO_2 GHGs being released into the atmosphere).

In the proposed ARR VCS project activity, the planting site is determined based on small manageable units in the form of compartments established before planting and mapped and stored using GIS applications. The compartment maps of planted areas will indicate all plantable areas, buffer zones and conservation areas, rivers, fire lines, fire towers, roads, offices, cultural sites, valleys and wetlands. Depending on monitoring requirements and purpose, additional variables can be included in the GIS system after the geographical coordinates are established using the GPS.

During site preparation small holes (diameter 20-30cm and depth 30-40cm) are dug manually using hand hoe, along linear rows using 2.5m x 2.5m spacing, leaving the primary vegetation with minimum damage. This operational plan effectively prevents soil erosion especially on steep slopes and also reduces GHG emission while protecting existing carbon stocks. Larger pockets of indigenous vegetation are mapped and buffer zones of 30 meter (approximately one tree length) are established around these areas where no planting is done. A similar approach is taken along rivers and watercourses: no planting on either side for 30 meters.

Seeds Procurement:
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. However, all seed must be procured through the Tanzania Tree Seed Agency (TTSA). Vegetative propagation can be used for species which root easily as cuttings.

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.

Nursery establishment and seedling management:

Nurseries for all species to be planted in the following year will be established 8 months prior to planting in temporary sites close to the planting area to reduce transport distances and the disturbance that it can cause to seedlings during transportation. At least one permanent nursery will be established close to the office. The size of the nurseries ranges from 0.5 to 2 ha depending on the annual planting target. Temporary nurseries will be established where there are necessary

requirements like labour, water, accessibility to the planting site. All nurseries are irrigated by water from boreholes and/or natural water courses. Currently, UFP has two permanent nurseries at Isimani and Mpombochi, while at MFP there is one permanent (Mapanda) and one temporary (Mvino river) nursery.

Seedlings are produced in plastic tubes that hold soil and a humus/fertilizer mix. This technique ensures the control of the growing conditions in the initial stage after planting, as a result increases the survival rate and early growth. In addition, 250 kg of super-phosphate (NPK) fertilizer is used to boost growth in case of stunted growth due to lack of necessary mineral ingredients from the soil mixture. 50kg of CAN is also used for top dressing. Sowing is carried out in April/May for *Pinus patula* and in August/September for *Eucalyptus saligna*. Pricking out takes place 2 weeks after sowing. After sowing, watering in the nursery is done twice a day until the seedlings are prepared for planting; then it is reduced to twice a week. Root pruning is carried out twice a month using a hand held knife. Current survival rates after planting out are: *Pinus patula* – 94% and *Eucalyptus saligna* – 60%.

Forest maintenance:

The first year following planting, spot weeding is done at a spacing of between diameter 75-100cm around the tree seedling. Forest maintenance operations include weeding, pruning, and thinning and are carried out following the guidelines detailed in the forest management plan (and according to the government technical order No. 1 of 2003 (available on request and during validation/verification as supporting documents) and in methodology as described in Section C of the PD. At this stage the tree will have out-competed the surrounding vegetation. The pruning to remove dead or low branches of the stem in order to improve wood quality from *Pinus patula* is carried out using the national guidelines recommended by the Forest and Bee keeping Division (FBD)[10].

Pruning and thinning schedules are documented (available on request and during validation/verification as supporting documents). These schedules are prepared based on the practices guided by the government Technical Note No.1 of 2003.

Roads, buffer zones, fire lines, patrol and control management shall be developed with the aid of the GIS maps. In addition, tree species will be planted in small scale landscape mosaics to minimize risks (fire, pest insect and disease) and maximize environmental benefits.

Survival control and beating up (replanting) is subject to inventories conducted at the finishing of the planting activities. To ensure high survival rates and good growth in the early stages, weed is controlled by slashing manually three times a year in the first three years after planting. Survival rates are assessed after every planting and beating up (replanting) takes place in the following season if the survival rate is below 85%. The operational planting design is carried out for each compartment under GIS platform (see also the section below).

[10] The Ministry of Natural Resources and Tourism through the Forest and Beekeeping Division (FBD) issued a Technical Order No. 22 (1968), recommending omission of first pruning in pine (Amending: Technical Order No. 17 of 1962) since it leaves the young trees crownless and retards young trees growth. The recommended pruning schedule 1st pruning is at age of 4 year, 2nd pruning (Selective) is scheduled 2 years after the 1st and 3rd pruning to be 2 years after pruning.

Application of the GIS:

In the proposed ARR VCS project activity, GIS provides useful tools for management decision-making, and hence improve the management efficiency. GIS will be employed in the planning, verification and monitoring the implementation. By using Global Positioning System (GPS) techniques, specific geographical positions of the project activity boundary e.g. compartments, land use, land cover, land tenure, permanent sample plots, planting pattern, thinning regime, harvesting schedule and other management activities will be indicated visually in an integrated system.

A.4.5. Approach for addressing non-permanence:

The project will hold a VCS buffer in reserve for use in case of loss of permanence. The project has also put into place robust measures to reduce risks to the forest which are described in the management plan.

A.4.6. Estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period :

Summary of net anthropogenic GHG removals by sinks prior to the start of the crediting period (demonstrating exclusion from accounting is conservative)

Year	Estimation of baseline net GHG removals by sinks (tonnes of CO_2 e)	Estimation of actual net GHG removals by sinks (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of net anthropogenic GHG removals by sinks (tonnes of CO2 e)
1997	78	0	0	-78
1998	1,052	0	0	-1,052
1999	16	0	0	-16
2000	0	4,320	0	4,320
2001	151	53,509	0	53,358
Total (tonnes of CO2 e)	1,297	57,829	0	56,532

Summary of results obtained in Sections C.7., D.1., and D.2.

Year	Estimation of baseline net GHG removals by sinks (tonnes of CO_2 e)	Estimation of actual net GHG removals by sinks (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of net anthropogenic GHG removals by sinks (tonnes of CO2 e)
2002	482	39,963	0	39,481
2003	255	46,377	0	46,122
2004	560	44,994	0	44,434
2005	970	77,790	0	76,820
2006	1,307	66,058	0	64,751
2007	1,720	110,974	0	109,255
2008	1,718	139,009	0	137,291
2009	3,064	123,562	0	120,499
2010	3,064	162,883	0	159,819
2011	3,102	232,533	0	229,431
2012	2,963	83,421	0	80,457
2013	1,936	398,172	0	396,236

2014	0	527,580	0	527,580
2015	0	685,675	0	685,675
2016	0	529,791	0	529,791
2017	0	665,023	0	665,023
2018	0	357,574	0	357,574
2019	0	382,913	0	382,913
2020	0	227,323	0	227,323
2021	0	300,387	0	300,387
2022	0	-90,245	0	-90,245
2023	0	-233,399	0	-233,399
2024	0	-295,709	0	-295,709
2025	0	-293,312	0	-293,312
2026	0	-457,039	0	-457,039
2027	0	-267,167	0	-267,167
2028	0	262,163	0	262,163
2029	0	290,785	0	290,785
2030	0	253,379	0	253,379
2031	0	21,197	0	21,197
2032	0	-281,489	0	-281,489
2033	0	-301,237	0	-301,237
2034	0	-154,255	0	-154,255
2035	0	1,307	0	1,307
2036	0	-68,242	0	-68,242
2037	0	-158,156	0	-158,156
2038	0	-165,295	0	-165,295
2039	0	-122,230	0	-122,230
2040	0	-319,643	0	-319,643
2041	0	16,904	0	16,904
2042	0	463,385	0	463,385
2043	0	639,707	0	639,707
2044	0	429,419	0	429,419
2045	0	549,205	0	549,205
2046	0	208,169	0	208,169
2047	0	175,935	0	175,935
2048	0	251,481	0	251,481
2049	0	138,753	0	138,753
2050	0	-333,659	0	-333,659
2051	0	-553,045	0	-553,045
2052	0	-441,706	0	-441,706
2053	0	-766,056	0	-766,056
2054	0	-958,706	0	-958,706
2055	0	-667,246	0	-667,246
2056	0	81,807	0	81,807

2057	0	340,627	0	340,627
2058	0	451,422	0	451,422
2059	0	624,448	0	624,448
2060	0	338,583	0	338,583
2061	0	347,018	0	347,018
2062	0	388,878	0	388,878
2063	0	422,824	0	422,824
2064	0	-132,437	0	-132,437
2065	0	-204,123	0	-204,123
2066	0	-265,666	0	-265,666
2067	0	-238,048	0	-238,048
2068	0	-469,048	0	-469,048
2069	0	-190,073	0	-190,073
2070	0	487,543	0	487,543
2071	0	478,073	0	478,073
2072	0	186,004	0	186,004
2073	0	229,559	0	229,559
2074	0	62,172	0	62,172
2075	0	-296,808	0	-296,808
2076	0	-250,185	0	-250,185
2077	0	-261,326	0	-261,326
2078	0	-514,015	0	-514,015
2079	0	-503,203	0	-503,203
2080	0	-243,663	0	-243,663
2081	0	-162,805	0	-162,805
2082	0	-338,633	0	-338,633
2083	0	-18,991	0	-18,991
2084	0	624,939	0	624,939
2085	0	762,144	0	762,144
2086	0	387,226	0	387,226
2087	0	578,481	0	578,481
2088	0	238,211	0	238,211
2089	0	231,200	0	231,200
2090	0	239,473	0	239,473
2091	0	215,847	0	215,847
2092	0	-108,279	0	-108,279
2093	0	-365,757	0	-365,757
2094	0	-509,081	0	-509,081
2095	0	-557,694	0	-557,694
2096	0	-615,045	0	-615,045
2097	0	-662,816	0	-662,816
2098	0	-14,123	0	-14,123

2099	0	-86,180	0	-86,180
2100	0	-224,107	0	-224,107
Total (tonnes of CO2 e)	**21,140.19**	**2,460,323.86**	**0**	**2,439,183.67**

The project tables from years 1997 -2001 are included to show there were net positive GHG removals during that time period, so their exclusion from total net project GHG is conservative. The crediting period commences in year 2002 in line with VCS guidance. According to the VCS AFOLU Methodological guidance for ARR the maximum number of carbon credits to be assigned to the project shall not exceed the project's net carbon stock benefits (i.e., project minus baseline carbon stocks, including long-lived wood products) averaged across the harvesting/rotation cycles during the project crediting period. For this project with a cumulative total of **2,439,183.67** tCO2 over the 99 crediting period 2002-2100 it implies that the project cannot sell credits beyond a ceiling of **3,538,663.3** tCO2 which is equal to the cumulative mean over the crediting period. The cumulative mean is higher than the cumulative total because the cumulative total falls at a time where there is a dip in the carbon stock due to harvesting, whilst the cumulative mean relates to the average carbon stock held at the plantation over time which is higher.

A.4.7. Public funding of the proposed ARR VCS project activity:

No public funding has been and will be used for the proposed ARR VCS project activity.

SECTION B. Duration of the project activity / crediting period

B.1 Starting date of the proposed ARR VCS project activity and of the crediting period:

The project start date is January 1st 1997. The start of the crediting period is 1st January 2002.

B. 2. Expected operational lifetime of the proposed ARR VCS project activity:

The operational lifetime of the project is from 1997 to 2100.

B.3 Choice of crediting period and related information:

The proposed **ARR VCS project activity** will use a **fixed** crediting period.

B.3.1. Renewable crediting period, if selected:

B.3.2. Fixed crediting period, if selected:

A fixed **crediting period** of 99 years has been selected.

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SECTION C. Application of an approved baseline and monitoring methodology

C.1. Assessment of the eligibility of land:

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 VCS project activities"[11]. These procedures require a demonstration of two issues, first the land is not forest at the time the project starts and secondly, that the activity is a reforestation or afforestation project activity. The project participants have assessed the land eligibility a follows:

(a) The land is not a forest at the moment the project starts:

i. The land is below the national forest thresholds (crown cover, tree height and minimum land area) for forest definition under decisions 11/CP.7 and 19/CP.9 as communicated by the respective DNA;

The procedure to define eligibility of land requires that the lands or discrete areas of land to be forested must meet the definition of forest by the host country under decisions 11/CP.7 and 19/CP.9 as communicated by the respective DNA. At the time of preparing the PD no thresholds have been set and communicated by the Tanzanian DNA. In absence of the forest national thresholds the project participants will demonstrate that the land is below the national forests definition provided in the Forest Act (2002) and test the land against the highest and lowest thresholds. Under the Forest Act/Law, forests are defined as "an area of land with at least 10% tree crown cover, naturally grown or planted and or 50% or more shrub and tree regeneration cover and includes all forest reserves of whatever kind declared or gazetted under the forest act and all plantations" [12].

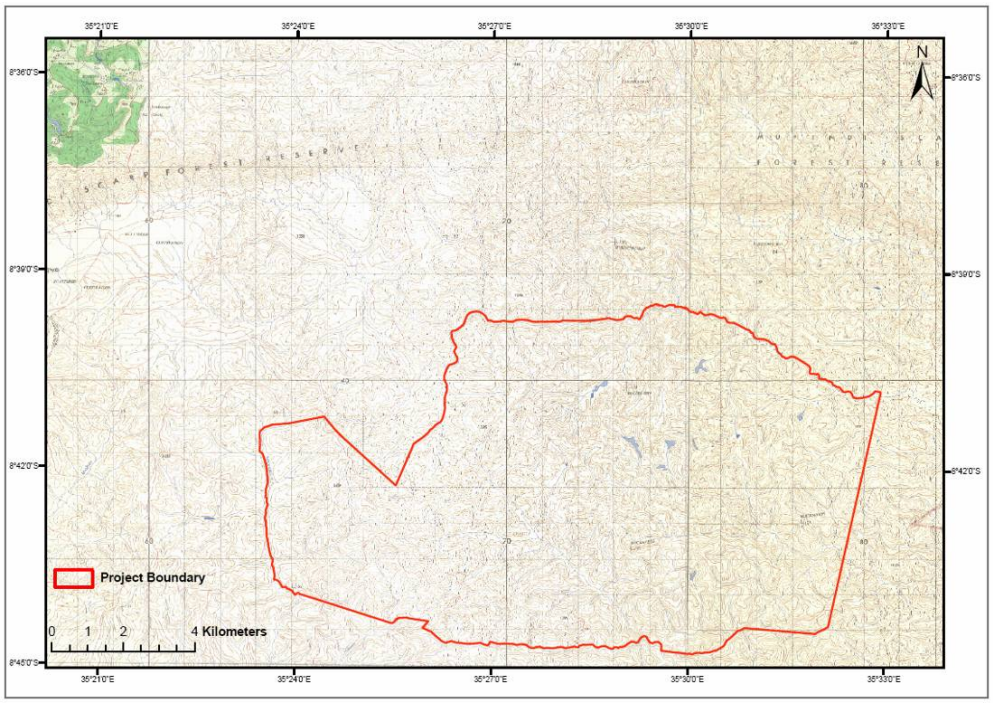
In the absence of a VCS Forest Definition for Tanzania registered with the UNFCCC the project adopted what was deemed a conservative definition of forest, namely: a forest is areas with trees of a height of more than 3m, with a crown cover of 30%, covering one hectare of land. This definition is similar to verbal indications from the government of Tanzania of the likely definition. [13]

The land areas that include the scheduled project land consist predominantly of grassland without tree cover. The plantable areas are delineated and are grasslands. The land eligibility is demonstrated using Landsat imagery from 1995 and 2000 and topographical base maps[14] which were reproduced in 1983 on the basis of aerial photographs taken between 1977and 1983 with ground truthing performed validating the information.

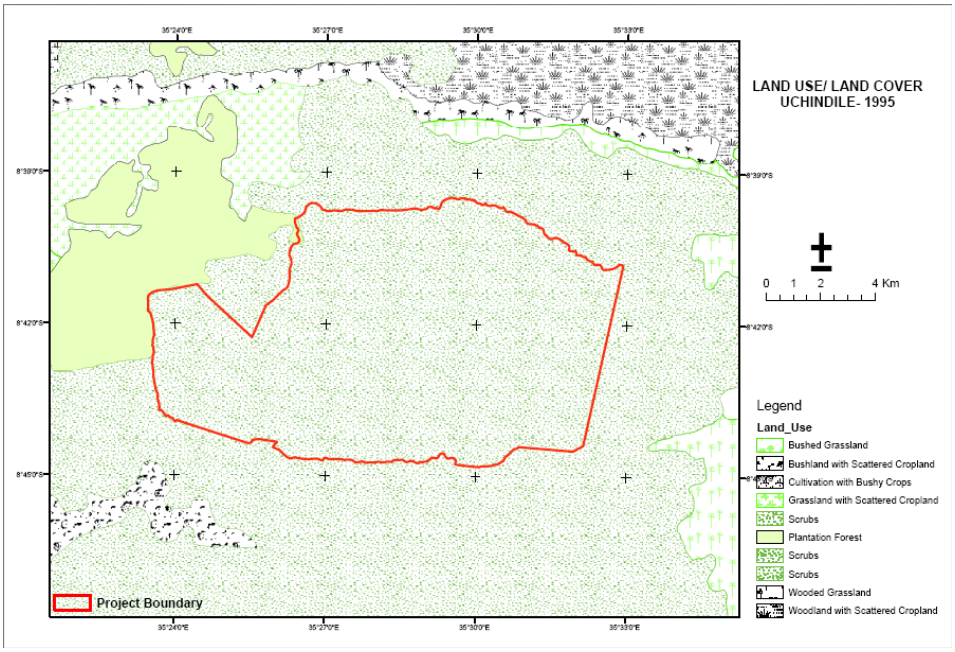
[11] VCS.unfccc.int/EB/Meetings/035/eb18repan1.pdf
[12] The Tanzania Forest Act, 2002.

[13] In a personal communication in October 2008 between Sangito Sumari, Managing Director of Green Resources Ltd and Dr Tango, Ministry of National Resources and Tourism, Tanzania, a definition of 2.5m, 30% and 1 ha was indicated. The final official definition is yet to be confirmed by the DNA.
[14] The standard map series for Tanzania at a quarter degree sheet (QDS).

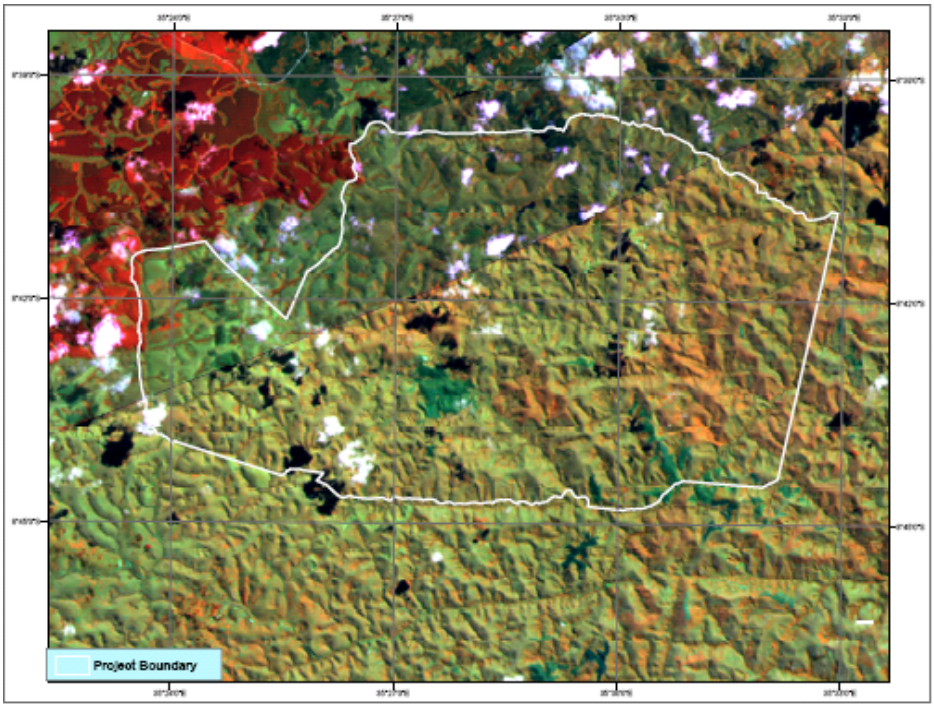
The various maps as presented on the next pages by figures C.1.1 for Uchindile and C.1.2 for Mapanda, reflecting the land cover/land use topographic maps and Landsat images of 1995 for Uchindile and from 2000 for Mapanda. Both types of maps (pre 1990 and post 1990) indicate that there isn't any forest on the land under title deed with GRL in Mapanda and Uchindile.



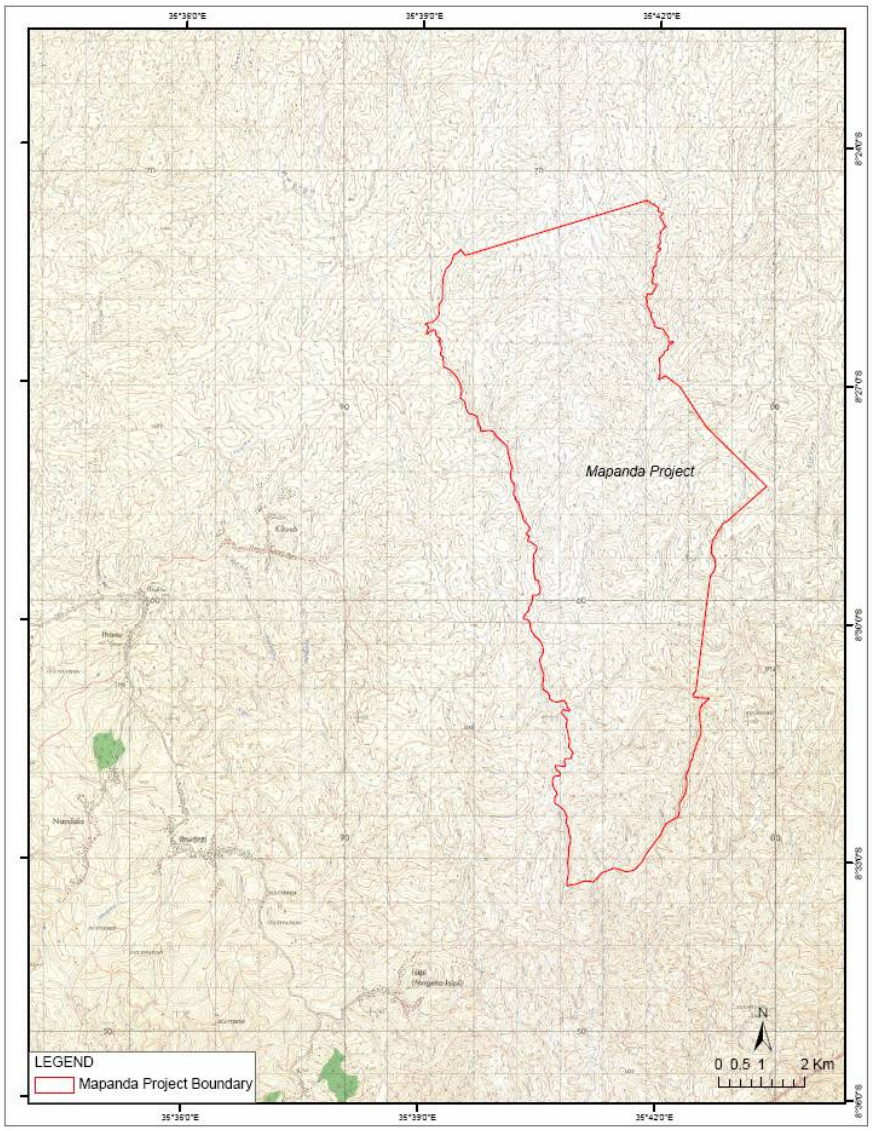
Map C.1.1.a: Digitized copy of the topographic maps produced between 1977 and 1985 showing land use/land cover before 1990 for Uchindile (top left green area is forest, rest is grassland)



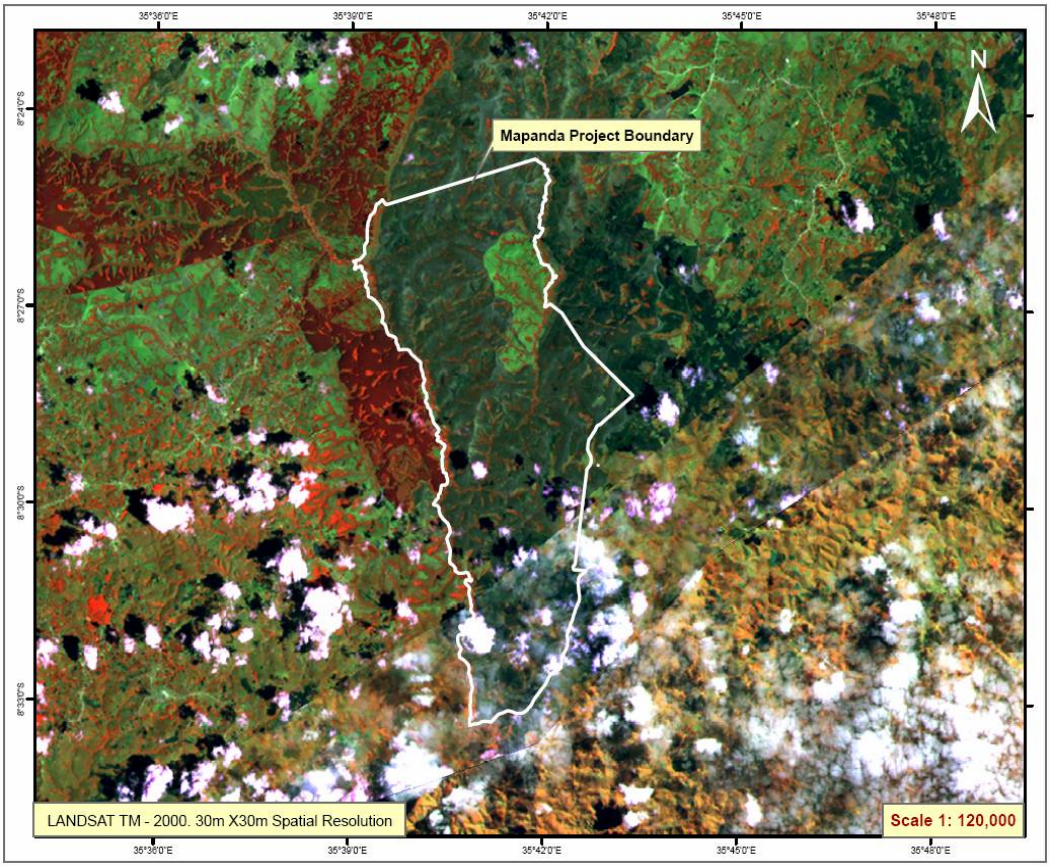
Map C.1.1.b: Map of land use/land cover in 1995 for Uchindile: interpretation based on Landsat images of 1995



C1.1.c: Landsat images of 1995 indicating land use/land cover in 1995 for Uchindile



Map C.1.2.a: Digitized copy of the topographic maps produced between 1977 and 1985 showing land use/land cover before 1990 for Mapanda.



Map C.1.2.b: Map of land use/land cover in 2000 for Mapanda based on Landsat images of 2000 (light green area is area already planted by GRL (mainly eucalypt), dark green is grassland, and red is pine plantations of the Sao Hill Forestry Project (approx. 20 years))

Consistent with the existing national forest definition and description of the lands in section A.4.1.4, and A.4.3 the proposed ARR VCS project activity is carried out in areas defined as grassland. The areas to be planted may have some scattered trees and shrubs[15]. The pockets of indigenous vegetation in the valleys and gullies are delineated and excluded as plantable (eligible) areas and are protected. Based on inventory work and botanical surveys the valley vegetation is quite mature and not expected to grow further. To demonstrate the steady state of the indigenous vegetation, these areas are included in the monitoring plan and contain PSPs.

An intensive and sophisticated GIS and field campaign has taken place to delineate all plantable areas within the boundary of the title deeds. Various exclusion criteria have been applied to the

[15] The scattered trees described in this PDD refer to single standing trees found on hill tops or along the slopes.

entire area so as it be left with eligible land only. A separate note – submitted jointly with this PD – elaborates the process of arriving at the maps presented below. Data sets that were used include:

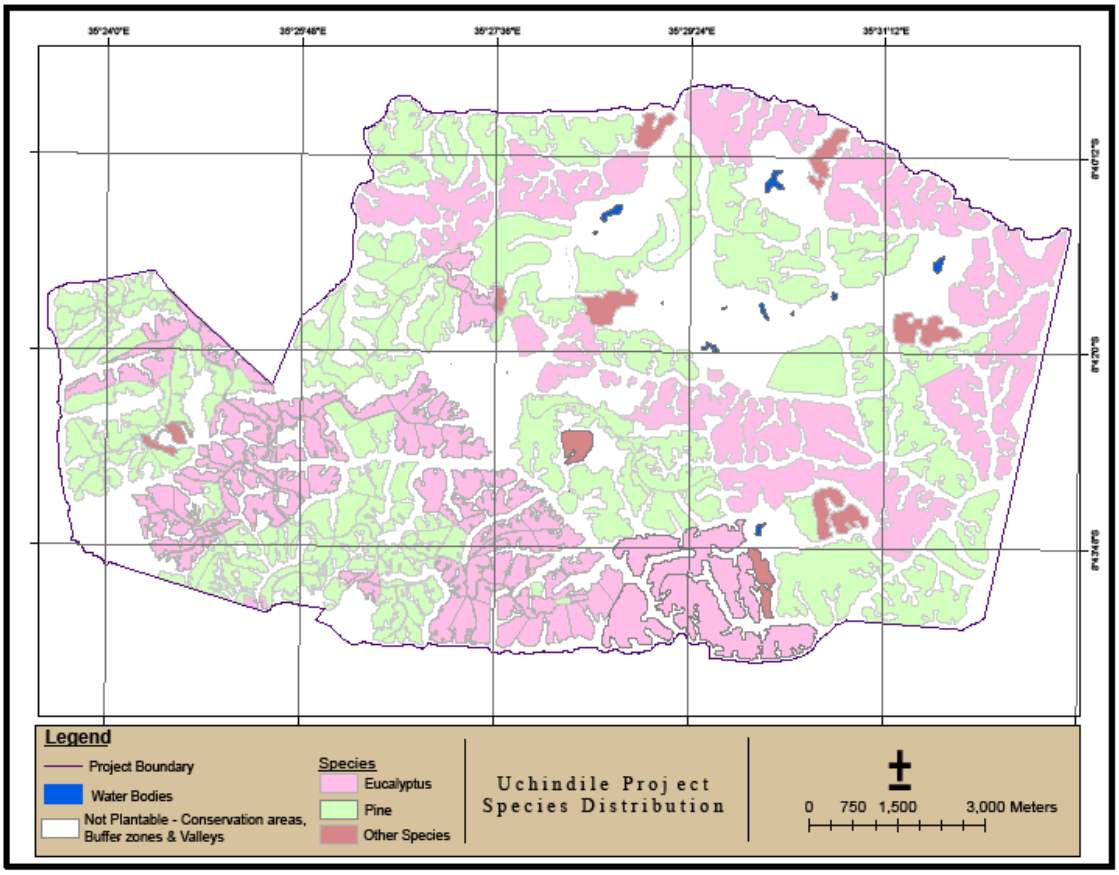
- Reserve Boundaries:
- Field GPS Mapping:

- Crown Cover Density:

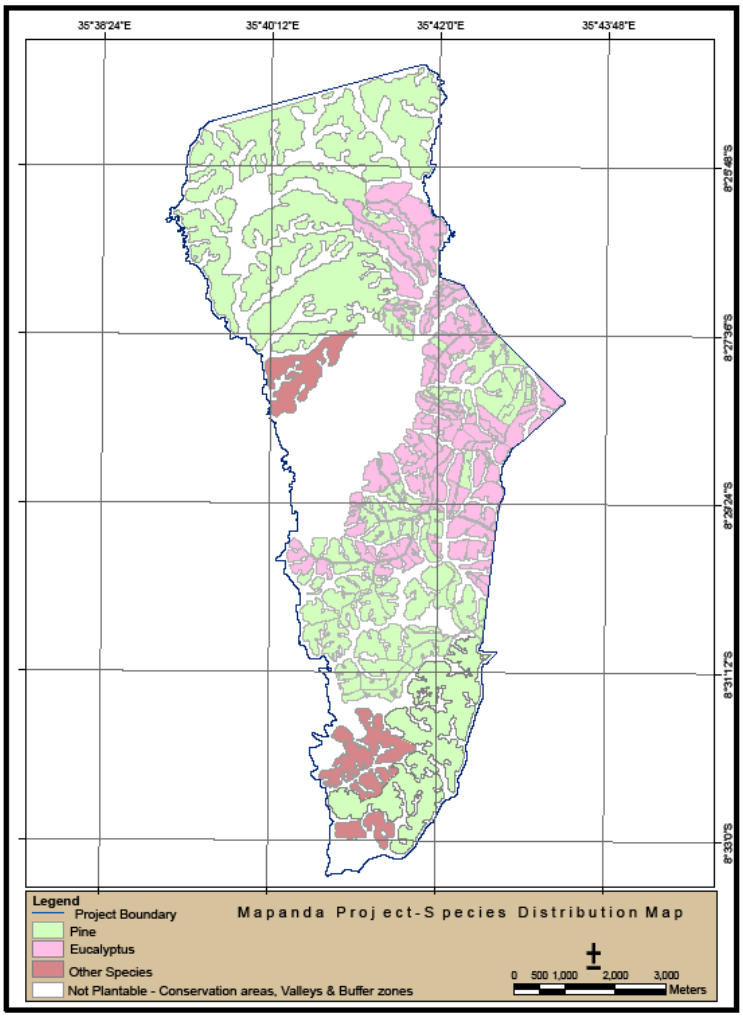
- Landsat TM for 1995 & 2000:

- Government Topographic maps:
- Digital Elevation Dataset:
- Land-use and Land Cover Datasets:

The resulting strata were: conservation area (including all areas with notable clusters of indigenous trees, 10% land representative for the baseline vegetation, incl. protea woodland), etc.; data is available in Shapefile Arcview format); wetlands and 60 meter buffer zones (available in ArcGIS); areas planted before the year 2000; plantable area and plantable area pending verification (verification of the remote interpretation of the land cover could not be completed for a small proportion of the land in Uchindile).



Map C.1.3.a: Species distribution and eligible land within the Uchindile Forestry Project



Map C.1.3.b: Species distribution and eligible land within the Mapanda Forestry Project

ii. *The land is not temporarily unstocked as a result of human intervention such as harvesting or natural causes or is not covered by young natural stands or plantations which have yet to reach a crown density or tree height in accordance with national thresholds and which have the potential to revert to forest without human intervention.*

Field surveys and locally available information indicate that the discrete areas of land are not temporarily unstocked as a result of human intervention. The land has been in this state as demonstrated by the maps contained by the maps C.1.1 and C.1.2.

(b) Demonstrate that the activity is a reforestation or afforestation project activity:

i. *For reforestation project activities, demonstrate that the land was not forest by demonstrating that the conditions outlined under (a) above also applied to the land on 31 December 1989. If the land was forested after 31 December 1989 and converted to non-forest land before commencement of an ARR VCS project activity then provide transparent information that demonstrates that the land was not intentionally converted to non-forest land for the purpose of implementing an ARR VCS project activity:*

   On the basis of anecdotal evidence (discussion with villagers, plantation developers (Sao Hill Forests Project (SHFP) foresters), and experts (e.g. EIA consultants, Sokoine University of Agriculture (SUA) researchers, etc.) the project participants are convinced that the activity within the project boundary is a reforestation project activity with forest vegetation pushed back into the gullies and river valleys and grasslands maintained as a fire-driven vegetation cover that is static now for at least 30 years. .

   The external boundaries of the proposed AR VCS project activity was approved by the Commissioner of lands in 2000. The lands were surveyed where the GPS coordinates of the boundaries were collected using a Total Station (T2 Theodolite) and GPS (Trimble). The project participants used GIS to delineate natural boundaries (river and valleys) by extracting boundary information from standard 1:50,000 scale Topographical Sheets available from the Government's Survey and Mapping Department (Dar es Salaam). Topographical Sheets are government mapping documents providing topographic details that form the basis for topographical information. Areas with indigenous vegetation, water courses and areas of specific interest (culturally and/or environmentally) plus a buffer zone of 30 meter will not be planted but are an integral part of the proposed AR VCS project activity: active management (protection, monitoring, etc.) will take place on all of these areas. However, no carbon credits are claimed for any of these areas

ii. *For afforestation project activities, demonstrate that for at least 50 years vegetation on the land has been below the thresholds adopted by the host country for definition of forest*
   Anecdotal evidence of the villagers report on deforestation in the 1960s and 1970s, pushing the forest vegetation into the gullies and river valleys.

C.2. Title and reference of the approved baseline and monitoring methodology applied to the proposed ARR VCS project activity:

The approved baseline and monitoring methodology AR-AM0005 is applied to this proposed ARR VCS project activity, called: "Afforestation and reforestation project activities implemented for industrial and/or commercial uses". AR-AM0005 Version 3.

C.3. Assessment of the applicability of the selected approved methodology to the proposed ARR VCS project activity and justification of the choice of the methodology:

The project participants use the baseline approach from paragraph 22 (c) of the VCS ARR 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 ARR VCS project activity as it complies and is applicable under the conditions provided in the methodology. The conditions under which this methodology is applicable to the proposed ARR VCS project activity are:

i. *Land cover within the project boundary is in steady state either as unmanaged or extensively managed grassland*;
As described in Section A of the PD and maps provided in Section C.1.(a) as objective evidence, the lands to be planted within the project activity boundary are described as grasslands that are unmanaged. The lands have been subjected to annual wildfires originating from anthropogenic activities outside the project boundary, or natural causes (lightning).

ii. *Natural regeneration is not expected to occur in the project area because of the absence of seed sources or because land use practices do not permit the establishment of tree vegetation*;
The historical information (See Section C.1.(b)) of the lands to be reforested shows that the lands have been grasslands with scattered trees and shrubs already for a long time. The lands have poor soils and are covered by fired-driven grassland vegetation. No forest has established spontaneously for many years.

iii. *Carbon stocks in soil organic matter, litter and deadwood can be expected to decrease more or increase less in the absence of the project activity during the time frame that coincides with the crediting period of the project activity, relative to the baseline scenario. Lower soil carbon under grassland compared to plantations or secondary forests can be expected under tropical conditions 1; it cannot necessarily be expected under non-tropical conditions 2; evidence has to be provided that the exclusion of soil organic carbon is conservative for the project case through, e.g. representative scientific literature*;
In the absence of the project activity, the baseline is expected to remain unmanaged grasslands. Such grasslands under tropical conditions have less soil carbon compared to plantations[16]. Therefore, not accounting for soil organic carbon is a conservative approach for the project case as it is expected to increase less in the absence of the project activity relative to the baseline.

iv. *Flooding irrigation is not permitted*;
There will be no flooding irrigation.

v. *Soil drainage and disturbance are insignificant, so that non CO_2-greenhouse gas emissions from this these types of activities can be neglected ;*
Mechanical site preparation is not practiced because of the nature of the land (steep slopes, rocky soils, shallow soils, degraded, etc), and because mechanically site preparation shall cause soil emissions. Therefore, no non CO_2 GHG emissions are expected. Soil drainage is not expected to occur since species are planted in appropriate locations.

[16] Annual cycles of fire reduced Soil Organic Carbon stock to about 5.5 and 10MgCha^{-1} for sand and clay soils, respectively, and resulted in about 20 per cent higher losses than where the savanna was burnt every five years: T.G. Vagen, R. Lal and B.R.Singh, Soil Carbon Sequestration in Sub-Saharan Africa: A Review, Land Degrad. Develop. 16: 53–71 (2005), John Wiley & Sons.

Although Eucalyptus species that are selected will be appropriate to the location and the availability of nutrients and water, some third parties persist that eucalypt will dry up river streams. Therefore, the project participants decided to undertake monitoring of the water quality and quantity. The impact of the harvesting on soil disturbance shall be assessed and minimised when the time of harvesting comes.

This assessment based on the conditions outlined in the approved methodology coupled with the information provided in Section A of the PD, shows that the approved methodology is applicable to the proposed ARR VCS project activity since it is implemented on unmanaged grassland for industrial purposes.

Justification of the choice of the methodology:
The approved methodology outlines methods for measuring, monitoring and estimating the net anthropogenic GHG removals by sinks for ARR projects undertaken for industrial or commercial purposes. In addition the methodology assumes the ARR VCS project activity is implemented on unmanaged grasslands.

The applicability conditions and procedures described in the approved methodology provides transparent steps to monitor the overall performance of the proposed ARR VCS project activity, including the project boundary, forest establishment and forest management activities in the following ways:

- The methodology recommends appropriate methods and equations for estimating carbon stock changes, GHG emissions and leakage, actual net GHG removals by sinks and net anthropogenic removals by sinks in a consistent, clear manner and follows a step-wise approach.
- Provides procedures and methods to monitor changes in living biomass that are actual net GHG removals by sinks including changes in carbon stock in above and belowground biomass, increase in GHG emissions within the project boundary due to nitrogen fertilization;
- Recommends methods to monitor and account for leakage caused due to activity displacement, as a result of the implementation of the proposed ARR project activity;
- Provides guidance for the implementation of a Quality Assurance/Quality Control plan, for field measurements, data collection verification, and archiving, as an integral part of the monitoring plan of the proposed ARR project activity that ensure the integrity of data collected and to improve the monitoring efficiency.
- To be conservative and make the monitoring cost-effective, the methodology recommends not measure or monitor carbon stock changes in the soil organic carbon, dead wood and litter pools in unmanaged grasslands because carbon stock changes in these pools are unlikely to be positive under the baseline scenario compared to the project scenario.
- The proposed monitoring methodology recommends stratification of the project area based on local climate, topography or geographic conditions, existing vegetation, site class and tree species to be planted based on land use/cover maps, satellite image and soil map, and specifies application of the GPS and field survey in monitoring the project performance to ensure the measuring and monitoring is consistent over time.
- The proposed methodology clearly outlines and recommends the use of permanent sample plots (PSPs) to monitor carbon stock changes in above- and below-ground biomass. The

methodology outlines the procedures to determine the number, size and location of PSPs needed in each stratum/sub-stratum to reach the precision in a cost-effective manner.

C.4. Description of strata identified using the *ex ante* stratification:

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. These factors should be considered on priority followed by the next level of variables where applicable in order to identify the minimum contiguous area that represents a stratum or for a stratum that is equal to the minimum area defined for a forest by the DNA. Tanzania has not yet set thresholds for the forest definition hence the project participants use the forest definition from the forest act as a basis to determine the minimum contiguous areas. The *ex-ante* stratification was conducted following Steps 1-5 outlined in Section II.2 of the approved methodology AR-AM0005 Version 3.

Step 1: Pre-existing conditions and likely evolution of baseline:

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 continuation of the existing grassland thus not influencing baseline carbon stocks, 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 and identical topography and suffer from identical 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 from 1995 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 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 identified during *ex-ante* stratification are:

1. Grassland with scattered trees and shrubs

2. Riverine vegetation with trees and shrubs

The baseline information collected on pre-existing conditions of the grassland in terms of its vegetation and composition demonstrate the maintenance of grassland in its state in the absence of implementation of the ARR VCS project.

The ex-ante stratification of ARR VCS project activity has taken into account the stratification criteria and land use/cover within the project boundary. During the ex-ante stratification of the project area, the boundary of each stratum was delineated using land-use maps and available data,

contours, etc digitized from topographic sheets. The data was updated by ground truthing to ensure that the project boundary is consistent with the parcels of plantable land identified under the project.

Since grassland with scattered trees and shrubs is the only stratum eligible for planting, further stratification shall be based on this stratum. Riverine vegetation shall be excluded as eligible lands for VCS ARR project activity. The strata identified during ex-ante stratification and their respective areas are stored in the GIS database.

Step 2: Stratification of the project area:
The *ex-ante* stratification in the proposed ARR VCS project activity considered species characteristics and species types that represent a mix of species to be planted on a site within the same planting year, silvicultural regime of species, such as planting, tending, thinning, harvesting, coppicing, and replanting cycle. The main species to be planted as part of the ARR VCS project activity are eucalyptus and pine species as indicated in section A of the PD.

Soil information was not used during ex ante stratification. However, based on experience with the neighbourhood government forests, eucalyptus grows in deep soils. This criterion was used to stratify the area indication for planting eucalyptus and pine.

The temporal and spatial information on the plantation establishment as specified in the monitoring plan will be adopted as stratification criteria. The geographical locations of the planting sites, planting dates and the actual areas to be planted per year have been identified and are represented as polygons in the stratification map.

Step 3: *Ex-ante* stratification of the ARR VCS project activity
The land use within the project activity boundary has been a continuation of the grassland situation. The boundary of each stratum was delineated using land cover maps of year 2000 compiled from digitally enhanced Landsat TM 30x30m using bands (4, 5 and 3) and 1:50,000 official topographic maps overlaid in GIS. Using these data and GPS field observations the project activity boundary was established and can be demonstrated using stratification maps that it is consistent with the parcels identified under the project.

Step 4: *Ex-ante* stratification map
A stratification map showing different strata has been prepared. The stratification map includes information pertaining to the sub-strata and is presented as overlays of GIS database of information on the ex-ante stratification.

Step 5: Changes to ARR project
The changes that occur to the ARR project activity implementation after the adoption of *ex ante* stratification will be recorded and taken into account during the ex post stratification at the monitoring stage of the project. The changes shall include the lands with similar stocking levels and growth patterns. The use of GIS overlays on the stratification maps will facilitate the representation of changes to the *ex ante* stratification during the *ex post* stratification and will be spatially represented on the stratification map.

C.5. Identification of the baseline scenario:

C.5.1. Description of the application of the procedure to identify the most plausible baseline scenario (separately for each stratum defined in C.4., if procedures differ among strata):

In accordance with the provision described in Section II.4 of the approved methodology AR-AM0005 Version 3 and since the baseline scenario is determined through a sequence of steps, the plausible baseline scenario is determined following the steps described in the methodology in a transparent and conservative manner. The procedure to identify the most plausible scenario is based on the strata identified in section C.4 Step 1, and on this basis, only one stratum will be considered during identification of the baseline scenario. The work steps which reflect the changes in carbon stocks in above-ground biomass from the most likely land use at the time the project starts as described in the approved methodology AR-AM0005 Version 3 (Section II.4, Step 1-6) are followed in identifying the most plausible baseline scenario:

Step 1: Demonstration of the most likely land use at the time the project starts

The scenario anticipated for the land use and land cover within the project boundary in the absence of the project, is the continuation of unmanaged grassland. Similar lands, in the vicinity, are under similar land cover and are not expected to be used for private large scale plantation as alternative land use. The Tanzanian land law allows allocation of land for specific investments based on a land use plan. For forestry to be authorised as the alternative land use, it must be clear that the area will not be subjected to certain land pressure. The changes in the land uses in similar lands in the vicinity can be small scale (woodlots) forests or large scale plantation by the Government in areas already declared as forest reserve. In the region, the main large scale planter is the Government through the Sao Hill Forest Project (SHFP) that is doing mainly replanting. In addition, SHFP is being established in a forest reserve which legally restricts other land uses. The land use at the time the project starts, in absence of the VCS finance, is economically unattractive. Although there is no pressure on land availability within the region, the economical, technical and institutional barriers prevent the possibility of land to be converted to large scale plantation forests. In addition, the lands have poor soil condition and the topography prevents them to be used for agricultural land uses.

In the project participants' views, and as per approved methodology, before the start of the proposed ARR VCS project activity, supplementary field investigation by the district development committee before the issuance of the title from the landowner and confirmation by ecological and botanical surveys demonstrates the fact that the land cover before the project starts is grassland. The land use was identified during the field visits and was predominantly unmanaged grassland, a little bit of subsistence agriculture and very small patches of tree planting (woodlots). All of these activities have been listed in section A.4.3 and have been compensated.

Step 2: Assessment of national and sector policies and legislation

Tanzania has extensive cross linkages between sectoral policies and legislations, especially governing lands and natural resources development. In order to adequately reflect the impacts of prevailing policies, an assessment of the relevant national or sectoral policies results in the following:

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 ARR activities and wood use

1. The National Land Use Planning Commission Act No. 3 of 1984. The proposed ARR VCS 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 ARR VCS activity;
7. National Strategy for Growth and Reduction of Poverty (NSGRP) of June 2005 is committed to the Millennium Development Goals (MDGs). The proposed ARR VCS 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 ARR VCS 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 barriers 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 VCS and replace the current land cover due to the economic reasons.

Step 3: Assessment of demand and supply of wood resources for industrial and commercial purposes

The analysis of demand and supply balance of wood sources for industrial and commercial purposes, taking into account the factors influencing the ARR activities (e.g. end-uses of wood from the plantations) indicates that industrial plantations are the major sources of wood resources both locally and for export into major markets.
There is a potential market for sawn timber and other wood products locally and world wide, this can be evidenced by the diminishing of the current forest resources and the high demand of the forest products worldwide. In Tanzania timber supply is mainly dominated by state owned forests with Sao Hill Forest Project (SHFP). The other government owned forest plantation projects in Tanzania has run short of raw material supply due to overexploitation, lack of capital and poor Management, thus SHFP has remained the sole prime supply of softwood in Tanzania[17].

Logging ban in the neighbouring countries, has forced timber traders to start operating in the SHFP, going by the current logging pace in this forest, it is obvious that the state owned forests can no longer sustain to be the only raw material supplier to the ever increasing demand of saw millers/timber traders.

The demand for wood resources in Tanzania and in the neighbouring countries is ever increasing. Besides the project entity, the only other large private owner of plantation forests is the Tanwat Company. The company had started reforestation activities in the late 1980s; it is estimated to have about 4,500 ha pine and 900 ha eucalyptus forest which already reached its rotation age. The company is currently harvesting and processing timber using its own sawmill.

Step 4 Assessment of land-use practices and prevailing land uses in the project region

The land use practices in the region and the project area are forestry and subsistence agriculture. The management practices of agriculture outside the project boundary are likely to impact the carbon stocks inside the project boundary due to fires being caused. The forestry land use is mainly government forests plantations (SHFP) and woodlots being established by private individuals mainly used for planting trees on the economically attractive lands or more accessible lands.

Since independence in 1961, the forest policy on plantations targeted establishment of government owned plantations. The government industrial plantations cover 83,000ha located in different blocks countrywide. The main species planted are pines, cypress, eucalyptus and teak. These plantations are under poor management and don't supply quality wood to support modern and efficient industries. The main reasons are[18]:

- No incentive for increasing plantation productivity and maximizing revenue on a sustainable manner
- The net planted area and growing stock are declining in terms of quality and quantity
- Mostly understocked where fire and/or encroachment occurs, or overstocked where there has been a lack of proper silvicultural treatments (e.g. thinnings)
- Shortage of investment capital, unsupportive/incentive framework
- Poor functioning of timber markets

[17] FRA/FAO report (2005) indicates that, plantations in Tanzania has been at 150,000ha since 1990.

[18] National Forest Program in Tanzania, 2001-2010, Page 23.

As described in Section A. 4.1.4 and A.4.3 of the PD, the project lands are located in remote areas which are not attractive for timber markets and are usually not target lands for commercial reforestation/afforestation programs. In addition, local farmers/communities are usually not able to fully finance forest establishment because it is difficult to get loans from local commercial banks for the purpose of reforestation because of longer moratorium period required until harvesting. Therefore, loans for agriculture and forestry activities, even on economically attractive lands, can be obtained from international financial institutions but not from commercial banks. Therefore, without the proposed ARR VCS project activity the project sites will not be reforested as a result of national or sectoral policies and with the project activity the government or private individual reforestation programs will not be affected.

The management of natural forests and protection of existing natural trees in unmanaged grassland indicates that there is no possibility of natural encroachment of trees because there are few seed sources that can disperse onto the project sites. The large pieces of adjacent lands have no forests, and the grass cover prevents seed from landing on soil and competes with young seedlings, if any, even on lands with some growing trees. In addition, the soil properties have degraded and are often not suitable anymore to spontaneous establishment of forest cover.

Step 5: Identification of plausible and credible land-use alternatives

Since the lands to be forested are grasslands, plausible and credible land-use alternatives are based on the scope of maintaining current land use, including the possibility of undertaking ARR as per the applicable trends. Three scenarios have been identified as plausible and credible land-use alternatives:

1. Maintaining the current land-use without ARR to occur:
The current land use has been unmanaged grassland – baseline and is likely to continue

2. Small-scale ARR:
The lands have been owned by villages where villagers which majority are subsistence farmers have the right of use to the land for establishing small-scale/woodlots within the lands. The seeds source and technology to establish woodlots is small. The possibility of having both the natural plantation is limited to seeds availability and high costs for establishing and managing plantations. Barrier of new income streams drives farmers to be conservative and hence maintain a constant income stream.

3. Establishment of plantations on grasslands for commercial purpose:
Not realistic since large investment is required. This is only possible with the incentive from VCS.

Interviews with stakeholders and land use surveys show that similar lands in the vicinity are not being converted to either commercial plantation. They largely remain as grasslands except in farms where scattered woodlots (about 1 ha size) can be seen. Investment barriers prevents small land holders the finances to invest in commercial timber or necessary equipment; Institutional barriers prevent farmers from manipulating the chain from investment through production and sales; Technological barriers limit the access of farmers to either quality seed or the necessary skills for successful commercial timber plantations.

Step 6: Identification of the most likely land-use

The plausible scenarios identified in Step 5 can be evaluated to examine their suitability as the project scenario. The analysis indicated that Scenario 2 is not plausible in the near future, because of the relative large investment needed and absence of near term benefits in terms of meeting local needs from the grasslands or small scale ARR since the benefits from these come several years later after establishment. Scenario 1 is the continuation of existing situation, which is identified as the baseline scenario. Scenario 3 is the establishment of large scale plantations which these are aimed for commercial purpose. With the barriers in financing such projects it is unlikely that these project can be established in the lands as an alternative land use.

The analysis indicates that the plausible alternative land uses available to the project participants are either continuation of the current status of the land or small scale AR, the latter being less likely because of financial, technical and institutional barriers

C.5.2. Description of the identified baseline scenario (separately for each stratum defined in Section C.4.):

Since no natural regeneration of trees can be identified within the project activity boundary, the sum of net carbon stock change in biomass carbon pools of grassland strata, except for trees along rivers and valleys which will not be disturbed and shall continue to be on steady state, is set as zero. For the rest of the project area with grass and shrubs, the sum of carbon stock change in biomass carbon pools can be estimated based on the carbon stock pools in grass and shrubs. The projected growth rate of these pools is assumed to be constant for the project lifetime. As per the provisions of the approved methodology, the soil carbon, dead wood and litter is not expected to increase in the baseline compared to the project scenario when the grassland is planted with trees than in the baseline, and thus can be omitted.
In summary:

- The Grassland with scattered trees and shrubs has remained as it is since generations and is therefore assumed to remain steady state. A detailed description of the quantification of the carbon in the baseline in the grassland is contained by Annex 3.
- The riverine vegetation with trees and shrubs will not be touched by the project in the sense that such areas are an integral part of the project management but the areas is will be protected. In addition, its development will be monitored during the project lifetime: PSPs are established to monitor all relevant parameters. A buffer zone of 30 meter (approximately one tree height) is established during ex-ante stratification around all pockets of indigenous vegetation and riverine areas and these are protected and will be mapped.

C.6. Assessment and demonstration of additionality:

The adopted approved methodology recommends application of the 'Tool for the Demonstration and Assessment of Additionality in ARR VCS Project Activities.' Version 2. The steps as outlined

in the additionality tool are followed to demonstrate that the proposed ARR VCS project activity is additional and not the baseline scenario.

STEP 0: Preliminary screening based on the starting date of the ARR project activity

Step 0a. Preliminary screening based on the specific features of ARR activity

This step determines the land eligibility prior to the starting of the ARR VCS project activity; using criteria and procedures set by the government on how to acquire the land for reforestation purpose. The lands within the project boundary undergone authoritative scrutiny and were defined as grassland based on the description provided in section C.1 of the PD.

Further, the ground survey was initiated to delineate the project boundaries, overlaid on topographic sheets details after the land title was leased for 99 years by the government. After the outside boundaries were set the internal mapping of areas with various land cover and proposed land use compartment was prepared and produced on maps and archived GIS database. The project participants believed that the area has been grassland and the possibility of forest regeneration is unlikely, prone to human induced disturbances like wild fires, which, with the establishment of the ARR VCS project activity, will be monitored.

The company (Escarpment Forestry Co. Ltd) that was intended to implement the "carbon offset" project was established in 1997. TreeFarms A/S then took liberty in ensuring financial backstopping while soliciting financing for sustaining the project. In years 1997/98 trial plantings as part of implementing the already existing international standards like FSC were already underway. When the VCS rules were not established by 2000, the operations ceased until 2003 when the rules were apparent and the investment in forestry plantations with the main driver as "for carbon trading" caught attention of investors. Financing was henceforth made available and planting started as per the original idea of carbon offsets in forestry which we can now define as ARR VCS project activity. The project participants considered the project activity as an ARR VCS project activity when the rules and modalities for ARR VCS are established. In that view, from 1998 a third party (SGS) was invited to conduct training to the project staff as part of the preparatory work and internal capacity building on carbon offset project in forestry. In 2000, SGS was invited to conduct a preliminary survey of project design and issued a certificate of project design and tradable carbon offsets. In 2006, the project was evaluated by SGS as a voluntary emission reduction project and achieved a certificate of voluntary emission reductions achieved up till the end of 2005.

STEP 1: Identification of alternative land use scenarios to the proposed ARR VCS project activity

Sub-step 1a: Define alternatives to the project activity

The lands to be reforested within the project boundary are unmanaged grasslands occupied by scattered trees and shrubs. As elaborated in section C.5, due to the barriers in finance, technique and institutional barriers, the only realistic and credible alternative available to is to continue the current land use as grassland. In this scenario, natural regeneration is not expected to occur, because the lands have poor soils and there are few seed sources that can disperse onto the project sites due to unavailability trees within the project boundary. In addition, the tall grass cover prevents seeds from landing on the soil and compete with young seedlings, if any, which can be demonstrated by the

failure of tree-growth. Thus, the continuation of the current situation or establishment of forest plantation represents the only alternative to the project activity.

As described in Section C.5, the project lands are located in remote areas which are not attractive for timber markets especially for small scale ARR VCS project activity. The technical capability and economies of scale does not permit small farmers/individuals to target lands for reforestation. As indicated in Section C.5.2, with small scale ARR in the form of woodlots or with large scale plantation, it is difficult to secure commercial loans from local commercial banks due to longer moratorium period required normally until harvesting. The continuation of the current situation as unmanaged grassland does not face the identified barriers.

Sub-step 1b. ***Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations***

As elaborated in section C.4, the national and sectoral programmes (PFM or Plantation) have been launched in the last several years, including the yearly planting day (1st January) that may influence the project. The large scale plantation established successfully are those government owned (e.g SHFP) which is currently overexploited. The less successful ARR projects are privately owned plantations e.g. TANWAT and woodlots program especially for those establishing small scale ARR projects. However, most of the reforestation or conservation programmes are not legally-binding, and meeting the goals of these programmes depends largely on the voluntary participation and availability of financing. Domestic funds available for reforestation in Tanzania are limited, primarily, because the focus is on the sectors and activities that are economically attractive rather than small scale ARR or plantations in areas where the proposed ARR VCS project activity takes place. The identified alternatives on status – quo in Section C.5.1 (Step 5) are entirely in compliance with applicable legal and regulatory requirements, currently and in the foreseeable future.

STEP 2: Investment analysis

The barriers for the establishment of the ARR VCS project activity within the grasslands were identified to be the set-back for establishment of the projects. In this situation it was not necessary to conduct investment. The barrier analysis was conducted as described in Step 3.

STEP 3: Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of the type of the proposed project activity:

a) Investment barriers

The main source of income for local communities around the project region is subsistence agriculture. Problems affecting farmers include absence of a crop market, food shortages, poor access to farm inputs, no access to improved farming tools and weak purchasing power. Under this situation, many farmers live below the national poverty level thus establishing small scale or a large scale plantation ARR VCS project activity is not an economic priority. It is hardly possible for local people to afford establishment investment for reforestation as an alternative in the early stage, because all income from timber, poles, pulpwood and VCUs is obtained after several years since the start of the proposed ARR VCS project activity.

There are no developed financial facilities that provide financial support to forestry related projects in the form of either loans or grants. This is limited by inadequate access to international capital markets and access to credits due to required bank guarantee.

The chances to obtain commercial loans from local banks for the purpose of reforestation activities are very low because of the high economic risk and economical unattractiveness of reforestation projects. Only with the proposed ARR VCS project activity, reforestation on unmanaged grasslands shall become attractive since the funds from the sale of VCUs shall be available in early years of establishment thus making commercial loans easier to be obtained.

b) Technological barriers:
Technical/Technological barriers are representing a complete array of shortcomings in the successful establishment of either small or large scale plantations. Interview with the technical team at the government owned SHFP, District officials and local communities indicates that there is usually short of access to inputs required and management. Lack of knowledge on quality seed sources and lack skills for producing high quality seedlings has been a major setback. For successful tree planting as well as for preventing planted trees from being subject to fire, pest and disease attack the planting team has to overcome technical and technological barrier, especially for large scale plantations. Small scale planting may suffer less from this barrier as there are some programs that supply seedlings to local communities and private individuals for woodlots establishment as part of environmental conservation.

c) Institutional barriers:
Although the forestry sector institutional set up exists, individual households or companies are too weak to successfully manipulate the chain from investment, production to market especially for the timber and other forest products which takes a much longer period than annual crop production. In addition, the lack of organizational instruments also prevents them from overcoming technological barriers mentioned above.

d) Market risks:
The availability of an income stream can be guaranteed by means of a fixed commodity price. However, there is a high market risks for timber and non-wood forest products for which it will take at least 15 years. Currently the risks of timber market prices, especially in such remote areas like Uchindile and Mapanda with low productivity and high transportation costs, are perceived to be high by the project participants, whereas the carbon price will be guaranteed in the proposed ARR VCS project activity. This provides the certainty of future incomes (subject only to risk of failure of the reforestation per se). Although the market risks do exist for all other reforestation projects, the higher productivity tends to reduce the risks for small scale plantation. In addition, the project participants see the proposed ARR VCS project activity as a pilot for carbon business, which further increases their interest to go ahead with the proposed ARR VCS project activity. Without the sale of carbon offsets, the basic financial considerations and the risk awareness cited above would drive the decision not to go ahead with the project.

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity).

As explained in sub-step 3b above, establishment of plantations is limited by financial, technical, institutional and market barriers. The alternative land use (continued status as grassland) does, not face the above-mentioned barriers.

Summarizing the above, the table below illustrates which of the alternatives outlined in step 5 of section C.5.1 are facing what barriers (a tick in the box means this alternative is facing this barrier).

Alternative	Barrier			
	Investment	Technological	Institutional	Market
Alternative 1				
Alternative 2		√		√
Alternative 3	√	√	√	√

Impact of VCS registration

The approval and registration of the proposed ARR VCS project activity will alleviate economic and financial hurdles, as well as the other identified barriers, and thus enable the proposed ARR VCS project activity to be undertaken and generate the following benefits:

- Removals of carbon from the atmosphere, and resulting sale of VCUs. In absence of the project, carbon stocks in the project areas are expected to decrease or remain at lower steady status due to the continued human induced land degradation.
- Attracting participants locally who see this as a testing ground for future carbon finance activities, and are highly motivated to participate in a "learning by doing" exercise regarding carbon monitoring, verification, certification, trading, and carbon project development in general.
- Reducing the perceived investment risks of the project activity, by providing a more steady (timing), and guaranteed (fixed purchase price of CO_2) income stream that makes the project more independent from timber market risks and the risks associated with long transport distances from timber markets. The carbon sequestered by the growing trees at a guaranteed price creates a new income to the project participants i.e. developers, government, local communities (subject to negotiation), which is more secure and thus advantageous to add to the other products (such as wood products) which have an uncertain market price in the future. Income from VCUs depends only on reaching the growth objectives, whereas income from wood products i.e. saw logs, poles and pulpwood depends both on reaching growth objectives and on a viable market in the future, including established means of transportation. The cost of the latter is uncertain, and thus the VCUs are the only income of the project that can be estimated and expected with a reasonably low market risk. Thus VCUs can be seen as the means so that the proposed ARR VCS project activity, if timber products have a lower market price in the future, at least does not incur a loss. With that, the local farmers and investors are interested in it. Therefore, without the VCS registration, the reforestation investment and the financial, social and environmental benefits that will accrue as a result would not be possible.
- As stated above, local private participants and small scale farmers themselves are usually unable to establish tree stands since it is hard for them to get loans from banks for the purpose

of reforestation activities. Only with the proposed ARR VCS project activity, plantation projects participants would like to borrow bank loans

Step 4: Common practice analysis

The geographical area of the proposed ARR project is considered to be the Southern Highlands of Tanzania, where growing conditions are similar because of the similar physical conditions and because of its shared geographic and transport similarities to markets and the coast.

A similar project has been implemented by Green Resources AS and Green Resources Ltd in the Southern Highlands of Tanzania. This project covers approximately 6,500 ha of plantable area, and is called the Idete Forest Project. This project was developed later than the UFP/MFP project and so is eligible under the Clean Development Mechanism as it started after 2000. The project is currently undergoing VCS validation. There are no other ARR forestry carbon projects in the region of the Southern Highlands of Tanzania being implemented.

The other reforestation occurring in the region is happening under quite distinct circumstances to reforestation occurring at the Uchindile and Mapanda Forest Projects. The other reforestation is occurring either by the government or the Mufundi Paper Mill (MPM).

Reforestation carried out by the government is made possible and funded by the Logging and Miscellaneous Development Account (LMDA) which comes from a stumpage fee paid by the companies and individuals logging in the Sao Hill Forest Project. As such, in contrast to UFP/MFP, the financing for the government plantations is not from private profit generating investors. Additionally new reforestation by the government is now occurring on land which has been previously clear-felled. This reduces the costs of reforestation in comparison from reforestation in a new area. Reforestation by the government is done for overall sector development, and does not have the same return on investment criteria as Green Resources AS.

The other limited reforestation that is occurring in the region is by MPM. MPM took over a paper mill from the previously government owned, parastatal Southern Paper Mill Company which had initially received government funding to set up its operations. MPM's plantations are directly integrated with its pulp and paper mill, and have shorter rotation times than at UFP/MFP. MPM has better land than Green Resources and is also optimizing productivity by burning existing vegetation as part of site preparation and ploughing their land completely prior to planting. This is in contrast to Green Resources where we are implementing measures to maximize biodiversity conservations and environmental projection. The MPM is not incurring costs to meet international best practises such as FSC like Green Resources. In sum, the MPM has a very different business model to Green Resources.

C.7. Estimation of the *ex ante* baseline net GHG removals by sinks:

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 ARR 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 PD 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 trees and shrubs using equation B.1 of the approved methodology AR-AM0005 (Section II.5). Since there are no pre-project ARR 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 for the trees and are assumed to be in a 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.

$Y = Exp\ (-2.134 + 2.530 In\ DBH)$ [19].

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. The formula is applicable and suits the conditions for tropical forests with scattered trees.

In accordance to 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 0.04 tC/ha of above ground biomass. To estimate the belowground biomass a root-to-shoot ratio (R) a higher and conservative value for grassland categories i.e. in semi-arid area with R= 2.8 from Table 3a.1.8: Average below-ground to above-ground biomass ratio (root-shoot ratio, R) in natural regeneration for the tropical grassland category (tonnes dry matter/tonne dry matter) has been used. According to equation B.10 of the approved methodology the baseline carbon stock before the project activity started was found to be 0.557 C/ha. (See also Annex 3 for a detailed description of the calculations of the baseline).

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

Since the grassland vegetation is assumed to be at steady state, the carbon stock change will be a 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 C.7.3. According to the planting plan from year 2013 there will be no planting since the expected plantable area would have been planted.

Table C.7.1. Estimation of the baseline net GHG removals by sinks[20]

Summary of net baseline GHG removals by sinks prior to the start of the crediting period

Year	Estimation of baseline net GHG removals by sinks (tonnes of CO_2 e)
1997	78
1998	1,052
1999	16
2000	0
2001	151
Total (tonnes of CO2 e)	1,297

Estimation of the baseline net GHG removals by sinks during the crediting period

Year	Estimation of baseline net GHG removals by sinks (tonnes of CO_2 e)
2002	482
2003	255
2004	560
2005	970
2006	1,307
2007	1,720
2008	1,718

[20] 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.

2009	3,064
2010	3,064
2011	3,102
2012	2,963
2013	1,936
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
2023	0
2024	0
2025	0
2026	0
2027	0
2028	0
2029	0
2030	0
2031	0
2032	0
2033	0
2034	0
2035	0
2036	0
2037	0
2038	0
2039	0
2040	0
2041	0
2042	0
2043	0
2044	0
2045	0
2046	0
2047	0
2048	0
2049	0
2050	0
2051	0
2052	0

2053	0
2054	0
2055	0
2056	0
2057	0
2058	0
2059	0
2060	0
2061	0
2062	0
2063	0
2064	0
2065	0
2066	0
2067	0
2068	0
2069	0
2070	0
2071	0
2072	0
2073	0
2074	0
2075	0
2076	0
2077	0
2078	0
2079	0
2080	0
2081	0
2082	0
2083	0
2084	0
2085	0
2086	0
2087	0
2088	0
2089	0
2090	0
2091	0
2092	0
2093	0
2094	0

2095	0
2096	0
2097	0
2098	0
2099	0
2100	0
Total (tonnes of CO2 e)	**21,140.19**

C.8. Date of completion of the baseline study and the name of person(s)/entity(ies) determining the baseline:

An assessment to determine baseline carbon stock within the project activity boundary was conducted during year 2000. Two articles for the allometric equations to be used foe *ex-ante* baseline estimates and the baseline biomass within the project boundary have been prepared. Allometric equations were published in the Commonwealth Journal of Forestry. Date of completion of the baseline study was 30th June 2000.

Table C.8.1 Name of persons/entity determining the baseline:

Name of the Person	Entity	Contact Information
Dr. Suzana Augustino	Sokoine University of Agriculture	sanhemati@yahoo.com
Dr. Peter Mussami	Green Resources Ltd	mussamigrl2004@yahoo.com
Mr. Bartholomew Lyimo	Green Resources AS	lyimo@hotmail.com
Ms Jenny Henman	Green Resources AS	jenny.henman@greenresources.no

SECTION D. Estimation of *ex ante* actual net GHG removals by sinks, leakage and estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period

D.1. Estimate of the *ex ante* actual net GHG removals by sinks:

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 with the project activity boundary. As described in the section B and Section C, 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. In addition, the carbon stocks for the lesser known species are neglected in the estimation of GHG removals by sinks.

Changes in carbon stocks:
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. The living biomass at any particular time is estimated from the gain and losses in living biomass of trees through equations B.18- B.21. In absence of the project and regional specific parameters during PD preparation for the biomass expansion factors (BEF), Wood density (D), Carbon fraction (CF) and Root to shoot ratio, the project participants uses default values from the GPG LULUCF 2003 (Table 3A.1.10) and from other relevant regional and peer reviewed literature. The BEFs given in Table 3A.1.10 represent averages for average growing stock or age.. The project participants uses the following BEF in the carbon model; pine1.3[21], eucalyptus2.0. The variables to be used in equation B.18 and B.19 are shown in the table D.1 below:

Table D.1. 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	*P.patula*	*E.saligna*
1.3	2.0[22]	0.45	0.8[23]		0.32[24]	0.35[25]

[21] Taken from Table 3A.1.10 of the GPG LULUCF 2003. Value taken for Tropical Pine

[22] Teobaldelli et al, 2009, Generalized functions of biomass expansion factors for confers and broadleaved by stand age, growing stock and site index, Forest Ecology and Management VOl 257 pp1004-1013

[23] Taken from the book 'The Commercial Timbers of Tanzania' by J.M.Bryce revised edition of 1999.

[24] Taken from Table 3A.1.8 10 of the GPG LULUCF 2003. Mean value taken from the Conifer Forest/Plantation category with aboveground biomass (t/ha) of 50-150.

The parameters as listed in Table D.1 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 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 PD. The project specific parameters shall be communicated to the DOE. The growth data from SHFP project were used to project the growth of the plantations. These data are from the government plantation which is located in good climatic condition. 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. The project participants consider that any changes due to thinning have been taken into consideration in the growth figures that were used. However the trend shall be monitored. The impact of disturbances e.g. losses from fire pests are considered to be small and are a result of natural event. For losses due to commercial harvest and fuel wood harvest if occurs during crediting period, these shall be calculated using equations B.20 – B.25.

Increase in emissions of greenhouse gases:
According to the approved methodology, the increase in emissions of GHG gases resulting from loss of biomass due to conversion of grassland (excluding loss of biomass from herbaceous vegetation) and burning of biomass must be quantified.

The project participants do not practice tillage, machinery or site burning during site preparation.

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 are listed in Table D.1.1 below.

[25] Taken from Table 3A.1.8 10 of the GPG LULUCF 2003. Mean value for Eucalypt Plantation taken for biomass of 50-150 t/ha.

Table D.1.1: **Estimation of actual net GHG removals by sinks and estimation of actual net anthropogenic GHG removals by sinks**

Summary of net baseline GHG removals by sinks prior to the start of the crediting period

Year	Estimation of actual net GHG removals by sinks (tCO2e)	Estimation of net anthropogenic GHG removals by sinks (tCO2e)
1997	0	-78
1998	0	-1,052
1999	0	-16
2000	4,320	4,320
2001	53,509	53,358
Total (tonnes of CO2 e)	57,829	56,532

Estimation of actual net GHG removals by sinks and estimation of actual net anthropogenic GHG removals by sinks during the crediting period

Year	Estimation of actual net GHG removals by sinks (tCO2e)	Estimation of net anthropogenic GHG removals by sinks (tCO2e)
2002	39,963	39,481
2003	46,377	46,122
2004	44,994	44,434
2005	77,790	76,820
2006	66,058	64,751
2007	110,974	109,255
2008	139,009	137,291
2009	123,562	120,499
2010	162,883	159,819
2011	232,533	229,431
2012	83,421	80,457
2013	398,172	396,236
2014	527,580	527,580
2015	685,675	685,675

2016	529,791	529,791
2017	665,023	665,023
2018	357,574	357,574
2019	382,913	382,913
2020	227,323	227,323
2021	300,387	300,387
2022	-90,245	-90,245
2023	-233,399	-233,399
2024	-295,709	-295,709
2025	-293,312	-293,312
2026	-457,039	-457,039
2027	-267,167	-267,167
2028	262,163	262,163
2029	290,785	290,785
2030	253,379	253,379
2031	21,197	21,197
2032	-281,489	-281,489
2033	-301,237	-301,237
2034	-154,255	-154,255
2035	1,307	1,307
2036	-68,242	-68,242
2037	-158,156	-158,156
2038	-165,295	-165,295
2039	-122,230	-122,230
2040	-319,643	-319,643
2041	16,904	16,904
2042	463,385	463,385
2043	639,707	639,707
2044	429,419	429,419
2045	549,205	549,205
2046	208,169	208,169
2047	175,935	175,935
2048	251,481	251,481
2049	138,753	138,753
2050	-333,659	-333,659
2051	-553,045	-553,045
2052	-441,706	-441,706
2053	-766,056	-766,056
2054	-958,706	-958,706
2055	-667,246	-667,246
2056	81,807	81,807
2057	340,627	340,627
2058	451,422	451,422

2059	624,448	624,448
2060	338,583	338,583
2061	347,018	347,018
2062	388,878	388,878
2063	422,824	422,824
2064	-132,437	-132,437
2065	-204,123	-204,123
2066	-265,666	-265,666
2067	-238,048	-238,048
2068	-469,048	-469,048
2069	-190,073	-190,073
2070	487,543	487,543
2071	478,073	478,073
2072	186,004	186,004
2073	229,559	229,559
2074	62,172	62,172
2075	-296,808	-296,808
2076	-250,185	-250,185
2077	-261,326	-261,326
2078	-514,015	-514,015
2079	-503,203	-503,203
2080	-243,663	-243,663
2081	-162,805	-162,805
2082	-338,633	-338,633
2083	-18,991	-18,991
2084	624,939	624,939
2085	762,144	762,144
2086	387,226	387,226
2087	578,481	578,481
2088	238,211	238,211
2089	231,200	231,200
2090	239,473	239,473
2091	215,847	215,847
2092	-108,279	-108,279
2093	-365,757	-365,757
2094	-509,081	-509,081
2095	-557,694	-557,694
2096	-615,045	-615,045
2097	-662,816	-662,816
2098	-14,123	-14,123
2099	-86,180	-86,180
2100	-224,107	-224,107

Total (tonnes of CO2 e)	**2,460,324**	**2,439,184**

D.2. Estimate of the *ex ante* leakage:

The project does not anticipate any leakage.

The leakage as a result of implementation of the project activity is presented in Table D.2.1 below:

Summary of net baseline GHG removals by sinks prior to the start of the crediting period

Year	Estimation of leakage (tCO2e)
	0
1997	0
1998	0
1999	0
2000	0
2001	0
Total (tonnes of CO2 e)	0

Summary of leakage as a result of implementation of the project activity during the crediting period

Year	Estimation of leakage (tCO2e)
	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	0
2009	0
2010	0
2011	0

2012	0
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
2023	0
2024	0
2025	0
2026	0
2027	0
2028	0
2029	0
2030	0
2031	0
2032	0
2033	0
2034	0
2035	0
2036	0
2037	0
2038	0
2039	0
2040	0
2041	0
2042	0
2043	0
2044	0
2045	0
2046	0
2047	0
2048	0
2049	0
2050	0
2051	0
2052	0
2053	0
2054	0

2055	0
2056	0
2057	0
2058	0
2059	0
2060	0
2061	0
2062	0
2063	0
2064	0
2065	0
2066	0
2067	0
2068	0
2069	0
2070	0
2071	0
2072	0
2073	0
2074	0
2075	0
2076	0
2077	0
2078	0
2079	0
2080	0
2081	0
2082	0
2083	0
2084	0
2085	0
2086	0
2087	0
2088	0
2089	0
2090	0
2091	0
2092	0
2093	0
2094	0
2095	0
2096	0

2097	0
2098	0
2099	0
2100	0
Total (tonnes of CO2 e)	0

SECTION E. Monitoring plan

E.1. Monitoring of the project implementation:

E.1.1. Monitoring of the project boundary:

The boundary delineating the title deed was identified and delineated as a distinct land area in relation to the land uses in the adjoining lands after earmarking, identification, and confirmation from the villages, and verified by an authorised surveyor. The project boundary coordinates are determined during a boundary survey followed by the construction of beacons. During the crediting period, field surveys (observational) are used to monitor the project boundary (monitoring the existence and permanence of beacons and related permanent marks). The natural boundaries (rivers, valleys, ridges, roads, vegetation features) are usually used as reference and where no natural boundary exists, several lines of trees is established that are clearly distinct from the surrounding, by which means they act as a reference to the boundary.

The project activity boundary was delineated when the strata were determined (Section C.4). Therefore, monitoring of the boundary of the project within the proposed ARR VCS activity and the boundary delineating the title deed, is conducted through the following activities:

- Field surveys and remote sensing are used to determine the actual boundary of the ARR VCS project activity and that of the actual reforestation activity that has occurred compartment[26] by compartment, species by species and by the year planted. In the case where the actual boundary deviates from the description in section A, additional information will be provided and projections will be adjusted ex-post.
- The geographical coordinates (latitude and longitude) of each corner of polygon sites are determined using GPS, collected and exported to the GIS software (ArcView 9) and processed to generate monitoring maps of the actual project boundary and that of the actual reforestation activity for each compartment, including variables of the compartment i.e. compartment ID, species and year planted. Alternatively or in addition boundaries will be checked using remotely sensed data processed in GIS. Here too maps showing boundaries of planted area will be generated.
- The area planted within the project boundary will be monitored periodically throughout the crediting period. If changes to the planted area occur during the crediting period, the specific areas will be identified, mapped and reported to the DOE for subsequent verifications. This includes those areas where the planting has failed to recover and in case of areas affected by fire and/or disease outbreak.

[26] Compartments are defined as small manageable forests management units (FMU) which are in plantable area. All plantable compartments together make up the VCS ARR project activity. During crediting period the compartment boundaries are monitored as strata with only planted areas following the procedures prescribed in the approved methodology. The discrete areas and the corresponding characteristics conform to the planted areas under the ARR VCS project activity.

The data and variables to be used to monitor the project boundary are shown in the **Table E.1** below:

ID number[27]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[28]	Recording frequency	Number of data points / Other measure of number of collected data	Comment
E.1.1.01.	Project ID	Alpha numeric		Before the start of the project	100%	Each project, referring here to the boundary survey, is named before the start of the project
E.1.1.02.	Project location	Alpha numeric	M	Before the start of the project	100%	Using GPS to locate geographical coordinates of the project boundary before start of the project
E.1.1.03.	Compartment ID	Alpha numeric		Annually	100%	Each compartment has a particular combination of tree species and year planted. Numeric series ID will be assigned to each compartment
E.1.1.04.	Beacon ID	Alpha numeric		5 years	100%	Each beacon has a unique national number and name
E.1.1.05.	Bearing	degree	M	5 years	100%	The angular magnitude between one beacon to the other
E.1.1.06.	Distance	M	M	5 years	100%	The vectorial magnitude between one beacon point to the other along the project boundary
E.1.1.07.	Natural ID	Alpha		5 years	100%	Each natural boundary has a particular name and feature type

E.1.2. Monitoring of forest establishment:

To ensure the planting regime conforms to the silvicultural practice described in section A.4.4 of the PD and by following the approved methodology and is well-implemented, the following monitoring activities are conducted in the first three years after planting:

- Confirm site preparation is implemented based on practice documented in section A.4.4, for instance no slash and burn and overall tillage will be used in the site and soil preparation
- Assess and confirm that the size and strength of seedlings to be planted conforms to the silvicultural activities described in the national technical notes and standard available as appendix in the forest management plans.

[27] Please provide ID number for cross-referencing in the PDD.

[28] Please provide full reference to data source.

- Survival checking; conducted in two stages:
  a) The initial survival rate of planted seedlings is checked within 2-3 weeks after the planting, and replacement of all dead seedlings is done in the same planting season
  b) The second and final survival assessment is conducted using temporary sample plots established just before the following planting season. If the survival rate is lower than 80 percent, beating up is carried out during the following planting season.
- Spot weeding is carried out during the second and third year after planting and checked if it conforms to the weeding practices as described in the forest management plan.
- Survey and check the area of planted species and planting year including areas affected by natural and anthropogenic disturbances for each Compartment document in maps after completion of the planting season.
- Establishment of permanent sample plots during year 3 after planting in every compartment, GPS readings will be taken at the centre of the plot, determine radius of the plot, mark all trees in the plot, take measurements (H, DBH, slope, elevation, geographical coordinates), soil analysis, understorey, quantity of dead wood, natural regeneration.
- Information on the number of species planted, area of stratum, and planting layout as per the management plan shall be prepared (i.e.Parameter E.1.2.11 area planted per stratum)
- Any deviation in the implementation in relation to the management or silvicultural plan and the information on such deviation shall be recorded and the justification shall be presented in the monitoring report.

- The planted areas affected by natural and anthropogenic disturbances and seedlings planted by species as part of the gap planting during the year 2 and year 3 shall be recorded as during the assessment

The data used to monitor forest establishment are shown in the **TableE.2** below:

ID number[29]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[30]	Recording frequency	Number of data points / Other measure of number of collected data	Comment
E.1.2.01	Compartment ID	Alpha numeric		Before the start of the project	100%	Every compartment is named by a number/number and alphabet in case of incidence that it has to be divided
E.1.2.02	Compartment	Grid /	m	Before the start of	100%	Using GPS to locate geographical coordinates of the

[29] Please provide ID number for cross-referencing in the PDD.

[30] Please provide full reference to data source.

	location	geographical units		the project		compartment boundary before start of the project
E.1.2.03	Compartment size	Ha	c	Before the start of the project	100%	Calculated from the geographical points collected by GPS
E.1.2.04	Compartment composition			Before the start of the project	100%	Every compartment has a composition of year of establishment, specie planted, year planted,
E.1.2.05	Marking of planting spots	mark	M	Before the start of the project	100%	Using calibrated chain to establish the appropriate planting spacing before cleaning the planting circle of vegetation (screefing)
E.1.2.06	Areas cleaned (screefed)	m^2	C	Before the start of the project	100%	Using hoes to remove grass around the marked area before pitting (diameter 75-100cm)
E.1.2.07	Volume of pit	m^3	C	Before the start of the project	100%	Using hoes to remove soil around the screefed area before pitting (diameter 75-100cm)
E.1.2.08	Height of seedlings	Cm	M	Before the start of the project	100%	Seedling to be planted should reach 20-25cm height
E.1.2.09	Area weeded	m^2	C	Before the start of the project	100%	Weeding is conducted to minimise competition from grass three months after planting
E.1.2.10	Area slashed	m^2	C	Before the start of the project	100%	Slashing is conducted the second and third year after planting
E.1.2.11	Area planted per stratum	Ha	C	Before the start of the project	100%	Spatial extent of the planted determined by the use of GPS
E.1.2.12	Number of trees survived	numeric	C	After planting season	100%	Seedlings are counted after planting activity to determine the survival rate
E.1.2.13	Survival rate	%	C	After planting season	100%	Sampling survey for the planted compartment after the planting season
E.1.2.14	Stock count	Ha	C	5 years		The total number of trees in a compartment
E.1.2.15	Stocking rate	%	C	5 years		The ratio between the counted trees to the expected number of tree in a compartment
E.1.2.16	Area of fireline and fire breaks	Ha	C	Annually	100%	Measured for different compartment
E.1.2.17	biomass stock per unit area before slash and burn	t d.m.ha^{-1}	C	Annually	100%	The biomass loss estimated before slash and burning of the fire lines

E.1.3. Monitoring of forest management:

The forests are managed according to the description in the forest management plan and consistent with the approved methodology. Monitoring of the following management activities is carried out from year 4 after the plantation establishment through until the end of the rotation:

- Tending procedures and practices are implemented;
- Harvesting: harvested location, area, tree species, m^3, etc.
- Checking and confirming that the harvested lands are re-planted immediately after harvesting if direct planting is used.
- Checking and ensuring that good conditions exist for natural regeneration if harvested lands are allowed to re-sprout naturally.
- Record natural or anthropogenic disturbances (including the fire or other catastrophic events) by date, location, species, volume of biomass lost or affected, and the preventive, salvation or curative measures, if any, implemented, and their success (monitoring of the regrowth).
- Confirm and checking the information on forest protection practices such as fire breaks, controlled burning of fire breaks, and closure of compartments to prevent anthropogenic activities that impact the standing biomass
- Schedule of replanting, coppicing and other management implemented to ensure the land use in its intended purpose.
- date, location, species, of biomass lost or affected, and the preventive or curative measures, if any implemented

The data used to monitor forest management are shown in the **Table E.3** below:

ID number[31]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[32]	Recording frequency	Number of sample plots at which the data will be monitored / Other measure of number of collected data	Comment
E.1.3.02	Area of thinning	ha	C	Once every 5 years	100%	The thinning areas are stored in the GIS database and on management (silviculture) maps to determine thinning schedule
E.1.3.03	Biomass stock lost per ha during thinning	t d.m.ha^{-1}	C	Once every 5 years	100%	The biomass removed during the thinning process to be accounted during the following year of inventory
E.1.3.04	Harvesting		M	Once every 10	100%	Spatial location of mature blocks to be harvested in a

[31] Please provide ID number for cross-referencing in the PDD.

[32] Please provide full reference to data source.

	location			years		given time are prepared GIS
E.1.3.05	Area of harvest	ha	C	Once every 10 years	100%	The harvested areas are stored in the GIS database and on management (silviculture) maps to determine harvesting schedule, by species,
E.1.3.06	Volume harvested	m^3	C	Once every 10 years	100%	The volume harvested is recorded and tracked
E.1.3.07	Area replanted	ha	C	Once every 3 years	100%	The area replanted will be remeasured and mapped
E.1.3.08	Area allowed to regenerate/resprout	ha	C	Once every 3 years	100%	The area replanted will be remeasured and mapped
E.1.3.09	Area affected by diseases and pest	ha	C	Annually	100%	The area will be measured and mapped. The damage will be assessed and the area will be monitored to see how the vegetation develops/recovers
E.1.3.10	Area burnt by fire	ha	C	Annually	100%	Salvation measures will be implemented if needed. The area will be measured and mapped. Damage will be assessed and the area will be monitored to see how the vegetation recovers. If it doesn't recover it will be replanted.
E.1.3.11	Location burnt	M	M	Annually	100%	By species
E.1.3.12	Volume of biomass lost due to fire	M3	C	Annually	100%	Will be calculated on the basis of last inventory data.
E.1.3.13	Area re-growth after fire	M2	C	Once every 3 years	100%	Will be calculated from ground surveys.
E.1.3.14	Area of fire breaks	M2	C	Annually	100%	Will be calculated from ground surveys.

E.2. Sampling design and stratification:

a) Stratification of the project area The compartments established in section E.1 are characterized in terms of the year planted, species type, site characteristics, natural boundaries (rivers, valleys, etc). The *ex-post* stratification considers maps that are produced from monitoring of strata and are generated from the GIS platform with a scale 1:20,000. The ex-post stratification is conducted three years after planting to address the possible changes of planting activity boundary due to catastrophic disturbances such as fire, pest (termites), or disease outbreaks that modify the homogeneous character of a compartment, stand development, soil type (moisture retention, infiltration, nutrients content), spatial variation (physiographic nature) of the area and planting timing in comparison with the project design. The geo-referenced spatial database of the sample plots and growth and yield parameters are measured and updated annually during monitoring of strata and stand boundaries since this is critical to the verification of the area of stratum. The quality assurance and quality control measures are applied in order to maintain the consistency of the monitoring data over the crediting period. The need for ex post stratification shall be evaluated at each monitoring event and changes in strata shall be reported to the DOE for verification.

a.1 Factors to be considered in the *ex post* stratification (Section III.2.1a):

The factors to be considered during ex post stratification shall reflect the characteristics of proposed ARR activity, stand type, age class, and planting year. The maps of suitable scale should be used to delineate a sub-stratum and stratum levels. The potential anthropogenic and natural influences should be taken into account in *ex post* stratification for the purpose of evaluating variables influencing actual GHG removals by sinks. The project adopts the factors to be considered in the ex-post stratification recommended by the methodology as outlined below.

- Catastrophic disturbances such as fire, pest, or disease outbreaks that modify the homogeneous character of a stratum;
- The influence of grassland vegetation on stand development, for example, level of competition or shrub and herb weed growth that has changed during the period subsequent to ex ante stratification and could impact the growth of young stands should be taken into account;
- Management and silvicultural activities such as planting, thinning, harvesting, coppicing, replanting etc. implemented at different intervals and locations than those proposed at the start of the project;
- Changes in local factors that lead to different planting regimes than those planned at the time of *ex ante* stratification leading to differences in the composition of strata and the associated carbon stocks,
- Information on land use, tenure and institutional issues that were either not available at the time of *ex ante* stratification or were not taken into account at the earlier stage of stratification,
- Additional information on site characteristics or other variables not considered during the *ex ante* stratification of grassland.

The ex post stratification implemented taking into account above factors and any other additional information shall form the basis for the sampling frame required for monitoring of the stands.

b) Sampling Frame (Section III.2.b. of the approved methodology)

Permanent sample plots (PSPs) are used for sampling over time to measure and monitoring changes in carbon stocks of the relevant carbon pools in each compartment. The plots are treated in the same way as other lands within the compartment e.g., site preparation, weeding, pruning, thinning, harvesting, etc., and will be prevented from being deforested over the crediting period. The PSPs are established based on the characteristics of the compartment described in E.2 (a). The total number of sample size, plot size and location is described below:

Sample size (Section III.2.b.1 of the approved methodology)

The approved methodology recommends the number of sample plots in a compartment to be established depending on accuracy desired, variability of carbon stocks, composition of species and costs associated species growth variation, stocking and the accuracy required during monitoring the interval. In the proposed ARR VCS project activity number of samples plots shall be established using parameters described in Equation (M.1) and (M.2.). The plots shall be treated in the same way as the other lands within the project activity boundary. The stratification will be carried out ex-post.

Plot size:

The project participants have chosen to use circular shaped permanent sample plots since these are easy to establish and are traceable in the terrain within the project activity boundary. The lands have poor soils, landform and various species types, it is expected that a relatively high variability in sampling intensity and growth of stands shall lead to high sampling costs; hence plots of the same size within the recommended range will be adopted. The methodology recommends large sized plots in achieving desired accuracy in which the size of plots can range between 100 m^2 for dense stands and 1000 m^2 for open stands. Since the plot size depends on the density of stands (stocking) and spatial heterogeneity of compartment, sample plot area of 400 m^2 shall be used to minimise sampling intensity, time, and resources spent in the measurements.

Locating permanent sample plots

To date PSPs were elected behind the desk from the maps (random), trying to cover all variation in terrain circumstances, but were not spread evenly over the planted area (not systematically). To avoid subjective choice of plot locations (plot centres, plot reference points, movement of plot centres to more "convenient" positions), the permanent sample plots will be located systematically with a random start from now on. In case of special circumstances, e.g. forest fires, uneven growth, additional PSPs may be laid out. This has been accomplished with the help of a GPS in the field. The geographic position (GPS coordinate), administrative location, compartment series number of each plots is recorded and archived. It is to be ensured that the sampling plots are distributed randomly, and as evenly spread as possible.

E.3. Monitoring of the baseline net GHG removals by sinks :

The proposed ARR VCS project activity aims to establish forests plantations on grasslands. The baseline net GHG removals by sinks from baseline scenario identified in section C uses approved methodology in quantifying the carbon stock changes in the baseline scenario. Based on the recommendations of the methodology the baseline net GHG removal by sinks prior to the start of the proposed ARR VCS project activity are set to zero for lands without growing trees. The projected carbon stock changes in above- and below-ground biomass of existing trees for lands with growing trees defined before the project starts shall be valid for the entire crediting period. The methodology does not require the monitoring of baseline scenario during the crediting period.

E.3.1. Monitoring of the baseline net GHG removals by sinks (before start of the project), if required:

Under the approved methodology (AR-AM0005 version 3) monitoring of the baseline net GHG removal by sinks (before the start of the project) is not required.

ID number[33]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[34]	Recording frequency	Number of sample plots at which the data will be monitored	Comment

E.3.2. Monitoring of the *ex post* baseline net GHG removals by sinks (after start of the project), if required:

[33] Please provide ID number for cross-referencing in the PDD.

[34] Please provide full reference to data source.

No monitoring of the *ex-post* baseline net GHG removal by sinks is foreseen as this is not required by the approved methodology

ID number[35]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[36]	Recording frequency	Number of sample plots at which the data will be monitored	Comment

E.4. Monitoring of the actual net GHG removals by sinks:

E.4.1. Data to be collected in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary resulting from the proposed ARR VCS project activity:

Monitoring the actual net GHG removals by sinks

The project participants shall monitor changes in carbon stocks in accordance with the approved methodology associated with the carbon stock changes in above-ground and below-ground biomass from Eucalyptus and Pine species as described in Section A of the PD. These pools shall form a basis for basis for monitoring actual net GHG removal by sinks within the project boundary. Carbon stocks in dead wood, litter and soil pools are not monitored. However, the project participants shall periodically monitor changes in soil carbon as part of the requirements in the management plan and the Environmental Impact Assessment (EIA). The monitoring of the actual net GHG removals by sinks includes:

- Monitoring the changes in the aboveground and belowground biomass pools of the ARR project through taking measurements from the PSPs established in each compartment.
- Monitoring of GHG emissions within the project boundary that result from the implementation of the ARR project activities such as site preparation, biomass burning and harvesting

Measuring and estimating carbon stock changes within the project activity boundary

[35] Please provide ID number for cross-referencing in the PDD.

[36] Please provide full reference to data source.

The carbon stock changes in every compartment and by species type are calculated using equations M.3 to M.5. The growth variables (DBH, dominant height) of individual trees in permanent sample plots are measured annually to develop growth curves that can be used during the subsequent crediting periods. The approved methodology recommends use of allometric equations; however, no country or regional specific allometric equations were obtained during the preparation of the PD. The project participants decided to use the Biomass Expansion Factor (BEF) method, using a default value from the GPG LULUCF 2003.

Carbon stocks of the living biomass:

The carbon stock of living trees is calculated from volume, D, BEF and CF via equations (M.15) to (M.18)[37] outlined in the approved methodology. The carbon fraction value used is taken from the Good Practice Guidance on LULUFC (2003) and is CF = 0.5.

The data to be collected in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary resulting from the proposed ARR VCS project activity are shown in the **Table E.5** below:

[37] The standing volume of trees has been converted to carbon stock using the biomass equations (M.15) and (M.16) by multiplying with the carbon fraction (CF = 0.5)

ID number[38]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[39]	Recording frequency	Number of sample plots at which the data will be monitored	Comment
2.1.1.01	Stratum ID	Alpha numeric		Before the planting starts	100%	Each stratum has a particular combination of soil type, climate, existing vegetation and landform
2.1.1.02	Sub-stratum ID	Alpha numeric		Before the planting starts	100%	Each sub-stratum has a particular year to be planted under each stratum
2.1.1.03	Confidence level			Before the planting starts	100%	95% for the purpose of QA/QC and measuring and monitoring precision control
2.1.1.04	Accuracy			Before the planting starts	100%	5% for the purpose of QA/QC and measuring and monitoring precision control
2.1.1.05	Standard deviation of each stratum		e	Before the planting starts	100%	Used for estimating numbers of sample plots of each stratum and substratum
2.1.1.06	Number of sample plots		e	Before the planting starts	100%	Established and estimated for each stratum and sub-stratum
2.1.1.07	Sample plot ID	Alpha numeric	Named	Annually	100%	Numeric series ID will be assigned to each permanent sample plot
2.1.1.08	Plot location		M	Annually	100%	Using GPS to locate before start of the project and at time of each field measurement
2.1.1.09	Tree species		Named	Annually	100%	Arranged in PD
2.1.1.10	Age of plantation	Year	C	Annually	100% sampling plot	Counted since the planted year
2.1.1.11	Number of trees	Number	C	Once every 5 years	100% trees in plots	Counted in plot measurement
2.1.1.12	Diameter at breast height (DBH)	Cm	M	Annually	100% trees in plots	Measuring at each monitoring time per sampling method
2.1.1.13	Mean DBH	Cm	C	Annually	100% of sampling plots	Calculated from
2.1.1.14	Tree height	m	M	Annually	100% trees in	Measuring at each monitoring time per sampling method

[38] Please provide ID number for cross-referencing in the PDD.

[39] Please provide full reference to data source.

					plots	
2.1.1.15	Mean tree height	m	C	Annually	100% of sampling plots	Calculated from
2.1.1.16	Merchantable (Standing) volume	M^3ha^{-1}	C	Annually	100% of sampling plots	Calculated using local derived equations, or directly measured by field instrument
2.1.1.17	Wood density	$td.m.m^{-3}$	C	5 years	100% of sampling plots	Local-derived and species specific value have the priority
2.1.1.18	Biomass expansion factor (BEF)	Dimensionless	C	5 year	100% of sampling plots	Local-derived and species specific value have the priority
2.1.1.19	Carbon fraction	$tC.(t\ d.m)^{-1}$	E	5 year	100% of sampling plots	Local-derived and species specific value have the priority
2.1.1.20	Root-shoot ratio	Dimensionless	E	5 year	100% of sampling plots	Local-derived and species specific value have the priority
2.1.1.21	Carbon stock in above-ground biomass of plots	$tCha^{-1}$	C	Annually	100% of sampling plots	Calculated from equation
2.1.1.22	Carbon stock in below-ground biomass of plots	$tCha^{-1}$	C	5 year	100% of sampling plots	Calculated from equation
2.1.1.23	Carbon stock in above-ground biomass of plots	$tCha^{-1}$	C	5 year	100% of sampling plots	Calculated from equation
2.1.1.23	Carbon stock in below-ground biomass of plots	$tCha^{-1}$	C	5 year	100% of sampling plots	Calculated from equation
2.1.1.25	Mean Carbon stock in aboveground biomass per unit area per compartment per species	$tCha^{-1}$	C	annually	100% of Compartment	Calculated from equation
2.1.1.26	Mean Carbon stock in belowground biomass per unit	$tCha^{-1}$	C	5 year	100% of Compartment	Calculated from equation

	area per compartment per species					
2.1.1.27	Area of compartment	ha	M	annually	100% of Compartment	Actual area of each compartment
2.1.1.28	Carbon stock in aboveground biomass of compartment per species	tC	C	annually	100% of Compartment	Calculated from equation
2.1.1.29	Carbon stock in belowground biomass of r compartment per species	tC	C	5 year	100% of Compartment	Calculated from equation
2.1.1.30	Carbon stock change in aboveground biomass of compartment per species	$tCyr^{-1}$	$tCyr^{-1}$	C	100% of Compartment	Calculated from equation
2.1.1.31	Carbon stock change in belowground biomass of compartment per species	$t\ C\ yr^{-1}$	$t\ C\ yr^{-1}$	C	100% of Compartment	Calculated from equation
2.1.1.32	Total carbon stock change	$tCO_2\text{-}eyr^{-1}$	$tCO_2\text{-}eyr^{-1}$	C	100% project area	Summing up carbon stock change in all compartment, and tree species

E.4.2. Data to be collected in order to monitor the GHG emissions by the sources, measured in units of CO_2 equivalent, that are increased as a result of the implementation of the proposed ARR VCS project activity within the project boundary:

Monitoring GHG emissions by sources as the results of the ARR VCS project activity

CO_2 emissions from burning (AR-AM0005 Section III.5.b.1):

No associated emissions from the loss of biomass due to site preparation and conversion of grassland (Section II.5.b.2) are envisaged as the site preparation is not performed mechanically or by burning. Burning for preparation of fire lines does occur, but is expected to be negligible, however the monitoring parameters for this are described below. However, this is monitored and in case they do occur estimates will be adjusted using the procedure outlined in the methodology. (Equations M.21 and M.22).

The methodology provides steps to calculate emissions of biomass burning (Section III.5.b.3). The project participants do not intend to practice biomass burning during site preparation. Therefore the emissions associated with this source are not calculated.

No variables need to be monitored in Table E.6 below:

ID number[40]	Data variable	Data unit	Measured (m), calculated (c) estimated (e) or default (d)[41]	Recording frequency	Number of sample plots at which the data will be monitored	Comment
2.1.2.01	Area affected by biomass burning	ha	C	Annually	100%	Measured for different compartment
2.1.2.02	Mean above-ground biomass stock before burning	t d.m.ha-1	C	Annually	100%	Sampling survey for different compartment before slash and burn
2.1.2.03	Proportion of biomass burned	dimensionless	C	Annually	100%	Sampling survey after slash and burn

[40] Please provide ID number for cross-referencing in the PDD.

[41] Please provide full reference to data source.

2.1.2.04	Biomass combustion efficiency	dimensionless	E	Before the start of the project	100%	IPCC default value (0.5) is used if no appropriate value
2.1.2.05	Carbon fraction	t C.(t d.m)-1	E	5 year	100%	can be used if no appropriate value
2.1.2.06	Loss of above-ground biomass carbon due to biomass burning	t CO2-e yr-1	C	5 year	100%	Calculated using equation
2.1.2.07	N/C ratio	dimensionless	E	Before the start of the project	100%	IPCC default value (0.01) is used if no appropriate value
2.1.2.08	N2O emission from biomass burning	t CO2-e yr-1	C	5 year	100%	Calculated using equation
2.1.2.09	CH4 emission from biomass burning	t CO2-e yr-1	C	5 year	100%	Calculated using equation
2.1.2.10	Increase in non-CO2 emission as a result of biomass burning	t CO2-e yr-1	C	5 year	100%	Calculated using equation
2.1.2.11	Total	t CO2-e yr-1	C	Annually	100%	Calculated using equation

	increase in GHG emission					

E.5. Leakage:

E.5.1. If applicable, please describe the data and information that will be collected in order to monitor leakage of the proposed ARR VCS project activity:

Emissions from activity displacement (Section III.7.b):
According to the provisions of the approved methodology (Section III.7.b.1), the project participants may choose not to account for leakage if leakage prevention activities are implemented. In addition, as per EB22, "pre-project GHG emissions by sources which are displaced outside the project boundary in order to enable a reforestation project activity under VCS shall not be included under VCS if the displacement does not increase these emissions with respect to pre-project conditions"[42].

ID number	Data Variable	Source of data	Data unit	Measured (m) Calculated (c) Estimated (e)	Recording frequency	Proportion of data monitored	Comment

E.5.2. Please specify the procedures for the periodic review of implementation of activities and measures to minimize leakage:

n/a

E.6. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

The methodology requires uncertainty assessment and procedures to reduce uncertainties.

Uncertainty assessment (Section III.10.a)
The methodology provides methods and formulas for estimation the baseline net GHG removal by sinks, leakage, actual net GHG removal by sinks and net anthropogenic removal by sinks based on IPCC GPG for LULUCF, GPG 2000, as well as the modalities and procedures for ARR VCS project activities. In the context of AR-AM0005, the major sources of uncertainties are related to changes in carbon stock in the living biomass pool as natural factors such as fire and pest breaks, stand variables such as variation in the yield tables, allometric equations, biomass expansion factors (BEFs), wood density, and carbon fraction; and the errors contributed by the measurement.

[42] Annex 15 of EB 22: http://VCS.unfccc.int/EB/Meetings/022/eb22_repan15.pdf

To assess uncertainty from these sources, the methodology recommends the use Tier 1 methods since theses are spreadsheet based. Where there is no significant correlation among data and where uncertainties are relatively small, the Tier 1 method shall be used to combine uncertainties based on error propagation equation introduced in GPG 2000, as recommended in the methodology and apply the standard deviation less than about 30% of the mean. The methodology recommends calculating error estimates in terms of standard error, standard deviation or range.

The default parameters shall be estimated from the expert judgment. The uncertainty is likely to be higher compared to locally measured parameters. The error estimates shall be calculated in terms of standard error, standard deviation or range in line with the methodology. The uncertainties from the increase in emission, carbon stock in above- and below-ground biomass pools, as well as those arising from field measurement, shall be estimated using equation M.53. The total percentage uncertainty shall be estimated using the simple error propagation equation M.54

Table E.8 below presents variables, uncertainty and offers explanation from the planned procedures to reduce such uncertainty.

Data (Indicate ID number)	Uncertainty level of data (High/Medium/Low)	**Explain QA/QC procedures planned for these data, or why such procedures are not necessary.**
E.6.01 Plot location	Low	**Verify plots were established in the field at correct predefined locations**
E.6.02 Number of trees per hectare	Low	**Check sapling spacing after 1 year of tree growth using transects**
E.6.04 Wood density	Low	**Field data collected that deviates significantly from IPCC default value shall be verified**
E.6.05 Biomass expansion factor (BEF)	Low	**Destructive sampling of trees to verify applicability of IPCC default value**

Measures to reduce uncertainty (Section III.10.b)
The methodology recommends QA/QC plan and standard procedures be developed and implemented under the project with the aim of monitoring and collecting of reliable field measurements. To ensure that the net anthropogenic GHG removals by sinks are estimated and monitored accurately, the quality assurance and quality control (QA/QC) procedures such as (1) collection of field data; (2) verification of the data collected; (3) data entry and analysis and (4) data storage, are proposed to be implemented.

Quality assurance of field monitoring (Section III.10.b.1)
The personnel involved in the project monitoring will be carefully trained in data collection and analyses. The data collection and organization will be based on the Standard Operating Procedures (SOPs) developed for the purpose. These SOPs contain provisions for documentation and verification so that continuity in the field monitoring is maintained and measurements can be verified. In order to ensure consistency in field monitoring and measurements, the team members are trained in all procedures of data collection. The monitoring and data collection unit will be organized and the team's responsibilities are clearly outlined.

Data collection (Section III.10.b.2)
The field data collection will be verified by undertaking random checks of plots, including their re-measurement by a senior member of the monitoring team. In case of errors, these will be corrected and recorded for each stratum. The errors identified are recorded as a percentage of errors on all the verified plots to estimate the measurement error. Since measurement error contributes to the desired precision levels of the plot and stratum level estimates, the team will act with precision in order to minimize the error.

Data entry and analysis (Section III.10.b.4)
The data entry process shall be reviewed by a senior member of the monitoring team and compared with independent data sources to ensure consistency. Regular meetings between the monitoring and data entry personnel will be held during the data analysis in order to resolve any anomalies in the field data before its analysis.

E.7. Please describe the operational and management structure(s) that the project operator will implement in order to monitor actual GHG removals by sinks and any leakage generated by the proposed ARR VCS project activity:

The proposed ARR VCS project activity is implemented by GRL utilizing the locally available and experienced staff. Financing and management backstopping is provided by Green Resources AS of Norway. GRL has separate project management coordination in Uchindile and Mapanda villages. Under the authorization of GRL and Green Resources AS, the project management team is fully responsibility for administrating and coordinating all project activities. GRL is facilitating and supervising the implementation of the proposed ARR VCS project activity, organizing technical training and consultation, and organizing and coordinating the measuring and monitoring of the actual GHG removals by sinks. Any activity data and monitoring and measuring data will be reported to and archived under GRL in both electronic and paper copy. In the proposed ARR VCS project activity, GRL will:

- provide technical instruction on reforestation and forest management, and conduct the specific supervision of the implementation of the proposed ARR VCS project activity, and collect specific activity data at routine basis.
- be responsible for measuring and monitoring of the actual GHG removals by sinks.
- establish an expert team where necessary, for instance in addressing any technical issues arising, conducting checking and verification of measured and monitored data.

E.8. Name of person(s)/entity(ies) applying the monitoring plan:

The names of persons from GRL, TreeFarms and the Project team that applies and ensures the monitoring plan is being implemented as described in this section are listed on **table E.9**:

Name of the Person	Entity	Contact Information (email)
Mr. Sangito Sumari	Green Resources AS	sangito.sumari@greenresources.no
Dr. Peter Mussami	Green Resources Ltd	mussamigrl2004@yahoo.com
Mr. Anthony Kisondella	Green Resources Ltd	kisondellagrl2004@yahoo.com
Mr. Zenob Nkana	Mapanda Forests Project	nkanagrl2004@yahoo.com
Mr. Sylvester Luwagila	Uchindile Forests Project	luwagilagrl2004@yahoo.com
Mr. Vincent Nambombe	Green Resources Ltd	nambombegrl2004@yahoo.com
Mr Jakob Sandven	Green Resources AS	Jakob.sandven@greenresources.no
Ms Jenny Henman	Green Resources AS	jenny.henman@greenresources.no

SECTION F. Environmental impacts of the proposed ARR VCS project activity:

F.1. Documentation on the analysis of the environmental impacts, including impacts on biodiversity and natural ecosystems, and impacts outside the project boundary of the proposed ARR VCS project activity:

Based on the government regulations and investment procedures the project participant is required to get approval for the environmental aspects of the project from NEMC. This includes conducting a thorough study on the environmental impacts as well as impacts on the biodiversity and natural ecosystem.

Two separate studies have been conducted for the two areas of land (Mapanda and Uchindile). In both areas the environmental and socio-economic impacts were analyzed during one assessment. The result is two separate EIA/SIA reports: one for Mapanda (and another area called Idete), and one for Uchindile.

Applied methods:

1. The Environmental Impact Assessment and Audit Regulations (an early version for Uchindile and the currently valid version of 2005 for Mapanda) and the Forestry Act of 2002 requirements were used as key guides during the study.
2. 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.

A summary of the reports for Uchindile and Mapanda forest projects are available on request and for validation/verification as supporting material[43] .

The main points of the assessments will be discussed in this section. The assessment agency for Mapanda also made recommendations on how to mitigate the environmental and socio-economic impacts in several tables. Relevant parts of those tables will be reproduced below and an indication is given how the negative impacts are mitigated by the project.

Main points related to the environmental impact assessment for both areas are:

1. The areas for tree plantation in the villages have been acquired following Government laid down procedures. See the annex on description of the land acquisition process;
2. The discrete area of the project at Uchindile cover an area of 12,121 ha and is located in the villages of Uchindile and Kitete which have a total population of around 1,500 residents;

[43] Support documents available on request and for validation/verification: Summary report of the EIA/SIA for Uchindile and for Mapanda

while the project at Mapanda covers an area of 6,258 ha and is located in the villages of Mapanda and Chogo which have a total population of around 7,000 residents;

3. Availing a block for each village apart from minimizing risks of disasters such as fire or diseases, will give employment opportunities to villagers;
4. Choice of species to be planted taking into consideration the soil and climatic factors, performance in trial planting and timber quality. Species selected based on good performance are: *Pinus Patula* and *Eucalyptus Saligna*;
5. Forest management practises including nursery establishment and management, planting, fire protection, silvicultural regimes and timber harvesting;
6. Ecological study to identify (if any) threatened and endangered species;
7. Protection of indigenous vegetation as well as streams and rivers;
8. The project will put in place sound fire protection plan which will incorporate training of the local community, education and extension services;
9. The assessment of impacts for the proposed tree plantation projects of Mapanda has taken into consideration concerns from the stakeholders, local community on the potential loss of catchments and the disappearance of the local species, influx of migrant workers and burden over the provision of social services.
10. The mitigation measures for environmental impacts need to cover:
    a. Plantations to be carried out on flat grassland areas,
    b. Trees and bushes be left intact to improve biodiversity,
    c. Planting of water conserving species,
    d. Promotion of fruit trees,
    e. Conservation of riverine valley vegetation;
    f. Training on management of fertilizers and storage,
    g. Provision of elaborate fire fighting plans,
    h. Provision of safety gears to workers,
    i. Public and workers education.
11. Consideration of and choice of planting areas to avoid soil erosion,
12. Advantages of global emission reductions vs. the financial rewards from VCS under the Kyoto protocol.
13. The project though generally welcomed by the local community, the investor has to address on the environmental concerns raised and ensure implementation of the mitigation measures as summarized in the attached tables.
14. The ”ZERO OPTION” means to leave the areas as they are but this is not favoured given the Government poverty alleviation policy and the envisaged technological benefits of transfer of forestry-related technologies which would otherwise not be realized.
15. Implementation of the project will reduce greenhouse gas emissions and enable the project participant to trade on carbon offsets, create employment to local community, generate revenue to the Government, and contribute numerous socio-economic and environmental benefits as well as technology transfer to the country and the local community. The environmental benefits include conservation of biodiversity and ecological improvement through control of local microclimate and regulation of local hydrological processes in the project are. It is therefore, recommended that the project be implemented taking into

consideration the environmental impacts and mitigation measures identified during the study and the monitoring programme to be followed with the approval of NEMC.

Mitigation measures that are recommended by the assessors for the potentially negative environmental impacts are presented in the table below. Activities that the project undertakes to implement the mitigation measures and/or to avoid the negative impacts are discussed in Section F.3.

Table F.1: Mitigation measures for Uchindile

Affected area	**Comments provided and mitigation measure proposed by the assessors conducting the EIA/SIA**
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: Restricted growth of other types of vegetation particularly shrubs and grasses. Loss of indigenous species used by local people as sources of medicinal plants, firewood, poles, fruits, water conserving species and rare species. Destruction of the natural habitat of the potential wildlife. 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 Grasses and leaves of shrubs decompose much faster than the litter from *pines* and *eucalyptus*, hence the rate of nutrient cycling will be reduced. 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.	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. 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.

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.	
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, down stream wetlands 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.
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 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 out break 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. 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 project to put in place elaborate fire fighting

the areas are vulnerable to fire, caused by hunters, honey collectors and farming methods. Out break 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.	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. Protect breeding habitats on the ground for swallows against fires and other factors. Discourage hunting of swallows.

Mitigation measures for the potentially negative environmental impacts that are recommended by the assessors for Mapanda are presented in the table below. Activities that the project undertakes to implement the mitigation measures and/or to avoid the negative impacts are discussed in section F.3.

Table F.2: Mitigation measures for Mapanda

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. 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 out break 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 and farming methods. Out break of fires will pollute air by smoke and	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

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.	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.

F.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken an environmental impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to support documentation:

The project participants invited two independent agencies to carry out Environmental Impact Assessments for both Uchindile and Mapanda areas in accordance with the regulations of the Tanzanian government effective at the time of the assessments. The letter to the ministry responsible for environment demonstrating acceptance of the quality and contents of the EIA/SEIA is available on request and during validation/verification as supporting documents.

The conclusions are presented in section F.1 and the references to supporting documents are as follows:

1. "An Assessment of the Environmental Impact of the forest plantation project at Uchindile and Lugala villages in Kilombero District, Tanzania". Prepared by Orgut Consulting, Tanzania Branch. August 1999; and,
2. "Environmental impact assessment on proposed Mapanda and Idete Forest Projects in Mufindi District, Iringa Region, Tanzania. Prepared by the Environmental Association of Tanzania (ENATA). November 2006.

F.3. Description of planned monitoring and remedial measures to address significant impacts referred to in section F.2. above:

Based on the recommendations from the EIA studies for the two areas of land at Uchindile and Mapanda, and based on the experience acquired from the Sao Hill Forestry Project a list of mitigation measures and monitoring plans were prepared by the project participants.

F. 3. 1: Mitigation Measures:

In order to mitigate the identified potential negative impacts on the environment as a result of the ARR VCS project activity, the following management issues are addressed by the project participant as part of the overall management planning:

Conservation of water resources:

In order to conserve the water resources within the project activity boundaries the following will be adhered to:

- Site / Species assessments will be conducted to identify suitable areas and suitable species for planting based on, amongst other things, the consideration of water retention and biodiversity aspects;
- No planting of trees will take place in valley bottoms and along streams. A distance of 30 meters on either side of water courses will be respected;
- Groundwater levels will be monitored during the dry season in order to establish long term effect of the planting on the slopes;
- Water quantity and water quality in the rivers throughout the plantation areas will be monitored;
- In case chemicals are used during site preparation in order to destroy termites, consultation and approval from the Water Resource Authority Office (i.e. the Rufiji Basin Water Office) will be sought; and,
- Site preparation will be done with a minimum clearing and ploughing.

Forest Plantation Management

- Minimum disturbance during logging activities (use the best techniques and technology) as a soil conservation measure to reduce soil erosion on slopes and immediate planting after clear felling to protect the litter and avoid soil exposure, to increase soil fertility and to conserve and benefit from soil nutrients;
- Plan forest roads and extraction routes before opening up a compartment for harvesting and aim for minimal impact and minimal distances;
- Identify sensitive areas (e.g. for erosion), conservation areas, and river streams before a harvesting plan is made and demarcate them in the field during operations;
- Use proper felling techniques to control felling direction;
- Identify a safe area for maintenance and refuelling of chainsaws so as to avoid oil spills etc.;
- Minimise the removal of litter and fine logging slash at the harvesting time, as the residue will act as a source of nutrients for the subsequent crop and conserves soil moisture and reduces the growth of weeds;
- Weeding to be done until the trees close up their canopy to avoid soil moisture and nutrients competition with the planted trees;

- Preventive and control measures on pests and diseases will be enforced by using an integrated pest management programme which shall include the monitoring of insects and pathogens in the plantations;
- Thinning and pruning are important measures to keep the plantation stands healthy and to produce good quality products with sound diameter growth and stem quality in a stand.

Fire Fighting:

- Preparation and implementation of a systematic fire prevention program and control measures to avoid burning of the plantations, measures to include clearing of fire breaks/lines, weeding of the plantations, clearing of bushes/grasses adjacent to the plantation and local community education on fire hazards;
- Establishment of the belts of *Eucalyptus* sp. on the periphery of the plantation, open corridors, and around plantation blocks, especially for the pine blocks; and,
- Local community involvement in project management and education on the importance of the forest plantation, ensure employment for the maintenance of the periphery fire belts.

Biodiversity:

- Assist the local community with the establishment of woodlots to alleviate the shortage of fuelwood and building materials;
- Promote the use of indigenous species in order to maintain/restore the genetic diversity of the grassland. The local communities will be guided on the silvicultural performance of the indigenous tree species;
- Establish and monitor the performance of designated "Control Areas" to be used as an example of the natural grassland as compared with the landscape of the forest plantation;
- Locate civil works (e.g. roads and bridges) in areas with low density of biodiversity, do not remove indigenous vegetation, and align roads so as to avoid steep slopes and erosion hazards, wherever possible and practicable; and,
- Monitor and control the spread of plantation species into the conservation areas.

F.3.2: Monitoring programme:

As the plantation project develops, it will be necessary to monitor a number of parameters, in order to follow overall progress and impact, but also to obtain information that is to be used for re-planning of the activities under implementation. The monitoring plan is approved by the National Environment Management Council (NEMC), a statutory body of the Government responsible for all environmental matters in the country. For any amendments to the monitoring plan, the project participants will seek approval from NEMC.

Monitoring of Soil Parameters should be done once during the dry season and repeated once during the rainy season.

Soil composition, texture and structure, nutrient status and soil moisture shall be monitored to determine their impacts on various species of trees;
Changes in salinity, porosity, pH level and types of biota in the soils shall be monitored in the plantations;
Soil analysis shall be carried out regularly to determine whether (organic) fertilizers are needed for replenishment in the plantations and in what quantities;
Soil erosion monitoring shall also be carried out through collection of sediment in the gauging stations;

- In case of severe nutrient deficiency the land will be left fallow to enable natural fertility to regenerate;
- A nutrient management scenario will be prepared after every rotation through the assessment and quantification of the nutrient balance.

Water Resources Monitoring:

A monitoring program to follow the development of the water balance and the water yield is outlined below:

- Installation of gauging stations on the rivers draining through the project areas;
- Installation of a Meteorological Stations in the project areas;
- Collection of meteorological data from the installed meteorological station: temperature, rainfall, wind speed and direction, cloud cover, dew point and relative humidity;
- Collection of discharge and water levels at the installed gauging stations: water levels, water samples for assessing the water qualities (sediment loads, Biological Oxygen Demand, Transparency, pH level, salinity and nutrients contents), water flow measurements and checking of planktons;
- Assessment of runoff characteristics;
- Assessment of the hydrological characteristics of the main aquifer in the project area;
- Assessment of base flows in the drainage system.
- Analysis of the data collected and provision of remedial measures.

Monitoring of plantation development:

- Apart from following the overall growth of the plantation and different species, monitoring should focus on the succession after the first harvest.
- Yield studies will be conducted to compare first and second harvests to determine suitable rotations for the plantation, also in relation to the use of fertilizers and disease resistance.
- Study and establish the optimal mix for the combination of exotic and indigenous tree species through provenance and progeny tests for representative species.
- Monitor and determine the wind firmness as well as the fire resistance of different species will be done.

- Coordinate with the networks of research scientists and pest management specialists to exchange information on experiences of handling various insects and pest problems.
- Monitor the behaviour and attitude of the communities adjacent to the forest and identify and implement possible extension programs that reduce pressure and avoid damages to the forest on the plantation resource, encourage the local communities to plant trees on their own farms and woodlots.

Diseases Monitoring:

- The type of diseases and pests affecting planted trees will be monitored in collaboration with TAFORI, KEFRI, SUA and other researchers 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 innovation 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.

Monitoring of Biodiversity: Changes in bio-composition and fauna and their impacts to the existing ecosystems shall be monitored and recorded and protection of biodiversity shall be implemented as follows:

- Organizing tree planting in areas with a gradient up to 42% (or planting of indigenous species on steeper slopes for conservation purposes) and protect areas above this gradient for monitoring vegetation changes and for safeguarding some of the native grassland.
- Pockets of indigenous vegetation other than the grassland, predominantly in the valleys and gullies, shall be left intact and protected;
- A buffer zone of 30 metres will be respected along each stream and river as limits for plantations establishment for protection of water sources
- Areas containing original vegetation will be set aside and mapped as control for monitoring and studies on vegetation changes and to safeguard some of the native grasslands that may contain endemic or rare species.
- Planting of water conserving species and fruits in valley bottoms and conservation and regeneration of these species shall be implemented for improved water levels as recommended in the botanical survey carried out by the Tanzania Tree Seed Agency in February 2006.
- Changes in the vegetation genetic resources, species and their habitats and migratory species if found to exist in the project area will be encouraged.
- Endangered/rare/ threatened and endemic species shall be protected.
- Burning of vegetation before planting and collection of firewood shall be prohibited.
- The project participants will ensure protection of the breeding habitats of rare wildlife (birds) species
- The project participants will implement the company fire protection plan in collaboration with the local community by reinforcing extension education, introduction of fire lines, and establishment of fire towers and look outs with well trained and equipped fire fighters.

SECTION G. Socio-economic impacts of the proposed ARR VCS project activity:

G.1. Documentation on the analysis of the major socio-economic impacts, including impacts outside the project boundary of the proposed ARR VCS project activity:

Two separate studies have been conducted for the two areas of land (Mapanda and Uchindile). In both areas the socio-economic and environmental impacts were analyzed during one assessment. The result is two separate reports: one for Mapanda (and another area called Idete) and one for Uchindile.

A summary of the report for Uchindile and Mapanda forest projects is available on request and during validation/verification as supporting documents.

The main points of the assessments will be discussed in this section, first for Mapanda and then for Uchindile. The assessment agency for Mapanda also made recommendations how to mitigate the environmental and socio-economic impacts in several tables. Relevant parts of those tables will be reproduced below and an indication will be given how the negative impacts will be mitigated by the project.

G.1.1 Main results for the Mapanda Forestry Project:

Main point of the assessments:

1. The areas for tree plantations in the villages have been acquired following Government laid down procedures;
2. The Mafinga part of the project covers an area of 6264 ha and is located in the villages of Mapanda and Chogo which have a total population of around 7,000 residents;
3. Making an area of land available by each village, apart of minimizing risks of disasters such as fire or diseases, will give employment opportunities to villagers.
4. The project will put in place sound fire protection plan which will include training of the local community and education and extension services.
5. The assessment of impacts for the proposed tree plantation projects of Mafinga […] has taken into consideration concerns from the stakeholders, local community on the potential loss of catchments and the disappearance of the local species, influx of migrant workers and burden over the provision of social services.
6. The potential negative socio-economic impacts are resettlement and compensation, change of land use, mushrooming of economic activities, conflicts over shared resources, impact on the communities by migrants, increase of traffic accidents, and impact on cultural sites.
7. The potential positive impacts are [….]; employment gains, economic gains to local companies, improved revenue to central and local governments and improved infrastructure, while in the decommission phase impacts will be mainly unemployment and loss of revenue to central and local governments.
8. The mitigation measures will cover: to avail employment to local community, …., workers to be provided with safety gears, public and workers education, to avail compensation to

villagers, assist in imposition of strict development control of unplanned settlements, to avail water sources, improve road networks and bridges in the project area and protect the ritual ceremonies by local people. In addition, the project should have its own dispensary and transport to non resident workers.

9. The ”zero option” means to leave the areas as they are but this is not favoured given the Government poverty alleviation policy and the envisaged technological benefits of transfer of forestry-related technologies which would otherwise not be realized.
10. Implementation of the project will [….] create employment to local community, generate revenue to the Government, and contribute numerous socio-economic and environmental benefits as well as technology transfer to the country and the local community. It is therefore, recommended that the project be implemented taking into consideration the [….] mitigation measures identified during the study and the monitoring programme to be followed with the approval of NEMC.

Mitigation measures that are recommended by the assessors are presented in the table below, together with the activities that the project undertakes to implement the mitigation measure and/or to avoid the negative impacts.

Table G.1 : Mitigation measures recommended by the EIA/SIA assessors and action to be taken by GRL

Affected area	Comments provided and mitigation measure proposed by the assessors conducting the EIA/SIA	Comments and/or measures/activities undertaken by GRL to mitigate and/or avoid the negative impacts
Cultural sites: One site at Chogo range and three grave yards at Mapanda ranges	The site at Chogo shall be demarcated and mapped and protected for ritual ceremonies by local people. The graveyards shall also be protected. Planting shall be done 10 m away from the sites.	The suggested mitigation measure will be implemented.
Change of Land Use The change of land use from grassland to forest cover may deny local community access to pastoral areas and land for agricultural activities.	The project promoter has chosen land in the villages where there is adequate land for expansion for the villagers in several years to come. The local people in the areas of reforestation are quite poor. The project will offer alternative source of income by providing employment and other income generating activities.	The area received from the villages remained idle and together does not constitute more than 30% of the total landholdings of the village. The commissioner of Lands has overlooked that the villages are left with enough alternative land for now and future development so as not to run short. Alternative sources of income will be offered to villagers through the increased activity level in the region due to the project.
Resettlement compensation GRL has followed legal procedures in acquiring the areas for tree plantation from the villages. However there are areas with properties belonging to individual villagers	GRL is aware of the few cases and is prepared to compensate adequately to avoid litigations. However, valuation has been done and final approval is being done at the Ministry for Lands	Stakeholder comment will be sought throughout the duration of the project at regular intervals (see monitoring plan). Any signals of discontentment that will reach GRL

who were still grudging during the scoping exercise.	before effecting payment.	as a result of such surveys will be followed up.
Mushrooming of economic activities. Service providers and vendors during planting and harvesting operations may result in unplanned human settlements and illegal traders disrupting local community norms and polluting the surrounding environment.	GRL has to assist local village governments in imposing strict development control to avoid unplanned settlements.	Meetings will be planned with village councils to monitor this situation and where necessary assistance will be provide may need be.
Conflict over shared resources. The nursery activities especially at Mapanda are carried close to water sources used by pastoralists as the water is believed to be rich in minerals required by animals. The nursery activities have blocked the accessibility of the water sources by pastoralists. Domestic water in the area surrounding the plantations is scarce, obtainable in temporary ponds and streams. Community enlargement due to manpower requirement by the project will overburden the water sources.	GRL has to work out with the local community the accessibility to mineral rich water source for the pastoralists. GRL has to ease the availability of domestic water by providing boreholes where necessary for both company and public use	Meetings will be planned with village councils to work out access to water sources for the local communities and pastoralists. If necessary GRL will assist the villages in establishing bore holes.
Increase in traffic accidents Increase of haulage trucks and personnel cars connecting the TANZAM Highway and project areas through the village roads of Mapanda, Chogo and Idete will cause accidents to the rural community involving people, animals and loss in properties.	The GRL to improve the networks and bridges in the project areas, install road signs and employ licensed competent drivers.	GRL will implement the suggestions of the assessors.
Cultural sites There are identified graves and grave yard in some few places within the project boundaries. Non removal of the graves and protection of the graveyards in accordance to customary norms will antagonize the local community with the project implementers. Some areas in Chogo are used for ritual ceremonies by local people and grave yards.	GRL is aware of the existence of the graves and will cooperate with the local community to ensure customary norms are followed in the removal of the graves and the reburial to the new sites. The sites for ritual ceremonies be demarcated mapped and to be protected for ritual ceremonies by local people.	The graves and sites for ritual ceremonies will be mapped and integrated in the management planning. Appropriate measures will be put in place to protect the sites, the customs of the local communities, the graves and the environment of the sites and graves. If the communities so wish, graves can be removed or reburials can take place, but only on a voluntary basis. GRL will provide its full cooperation.
Public health The villagers surrounding the project area lack health facilities and have no accessibility to clean waters. Implementation of the project will bring in additional people and overburden the existing health facilities and utilities.	The project to have its own dispensary and improve the local health facilities by providing laboratory equipments and medicinal kits. The project will improve accessibility of clean water by providing boreholes where necessary.	Suggestions will be followed up and implemented.

The influx of immigrant workers The influx of immigrant workers, vendors and service providers with higher income will increase communicable diseases eg. Cholera, typhoid, TB HIV/AIDS and STDs.	The project to provide transport to non resident workers so that they live outside the villagers. The project to employ as much as possible workers and casual labourers from the surrounding community. The project to provide health services and counselling to the workers and labourers on communicable diseases such as HIV/AIDs pandemonium	Suggestions will be followed up and implemented.
Unemployment due to Decommissioning phase Several employees, service providers and vendors will loose meaningful way of earning income.	The company to ensure that regulations of National Social Security Fund (NSSF) are followed. Employees will be prepared for forced retirement by providing skills for self employment and others with special skills will be availed jobs to other sister companies in the Tree Farm group.	Suggestions will be followed up and implemented.
Unattended Forest Cover The unattended may be hideout for criminal and endanger the public.	Retain key personnel to attend and patrol the forests	In case of decommissioning the forest stands and/or the timbers will probably be sold. That way the forest cover will not remain unattended. In the unlikely case that this is not possible and the forest would become unattended GRL will do its utmost best to follow up on the suggestions and implement them as suggested.
Unattended buildings, equipments and infrastructure Unattended buildings can be hideout for criminal and vermin	The buildings can be retained for community use or availed to private developers. The machinery and equipment will be deposed off in an agreeable manner such as public auction and the unusable equipment to be sold.	In the unlikely case of decommissioning, GRL will do its utmost best to follow up on the suggestions and implement them as suggested.

G1.2 Main results for the Uchindile Forestry Project:

Main point of the assessments:

1. In broad terms, the assessment team strongly supports the proposal to bring the area, presently grassland, under a productive forest cover. The activities in the plantations will contribute to the national economy by generating foreign exchange and to the local economy by employment, opportunities and other benefits such as improved roads, schools and clinics;
2. The project is fully in line with the present Forest Policy of Tanzania, which encourages private investment in forestry, as well as the involvement of local communities in forest management. In the context of national development, the project represents a new

approach in the forest sector, that is, a private investment that in turn supports the economic development efforts of the nation.

3. A Participatory Rural Appraisal has to be conducted to determine the interests of the local people and their future interaction with the project
4. Social issues that need to be considered are limited to those concerned with participation of local communities in project related activities. Local people will get job opportunities through the project. It would be helpful for the project to make estimates of the casual labour demand and its seasonality, to include an assessment of any need of immigration to meet the labour needs of the project. The project should promote the planting of trees in and around villages near the project.
5. GRL will support extension activities to villages, who have provided land to the Company, in fields such as fire control and agro-forestry and environment. In order to encourage tree planting activities among smallholder farmers, the company will also sell and/or provide seedlings to the public.
6. GRL will improve the local infrastructure by contributing towards the improvement of schools, health care and roads. A road connecting the two villages of Lugala and Uchindile with main centre of Mgololo has already been repaired.
7. In areas where tree planting is taking place the local people are relatively poor. Currently the company is employing a total of about 400 workers, in the sawmill and in the plantation areas. This level of employment is very significant in this area and is improving the income of the local people. GRL pays the minimum wage. As the activities of the company expand, more people will be employed.
8. Traditionally, local communities in Tanzania have had no access to planted forest. However, this is now changing rapidly and it is expected that successful management of forest plantations in the very near future will depend heavily on local actors, who will then also see many direct benefits for themselves.
9. The present income taxes and property taxes act as disincentives to investors in forest plantations. The property tax might become a liability to a not yet fully established plantation not generating any income to the investor.
10. When performing nursery activities and planting operations, there could be threats to worker´s environment and safety. In the nursery, the use of chemical fertilizers and insecticides may be a health hazards to workers and may also lead to spillage into streams.
11. There is enough land for expansion for the villagers who have been displaced by the forest plantation project in all villages of Lugala, Uchindile and Kitete. Interviews by the EIA team with those who have been displaced by the project showed that all of them have acquired alternative parcels of land at Kilalo subvillage of Uchindile village. This subvillage is located in the area shown on the map as an area for village expansion. The interviews conducted revealed that a land shortage will not be experienced in the villages for the next 20 years.

To assess whether the project should be implemented or not when considering socio-economic factors, alternative scenarios were assessed. Alternative in the sense that: what would happen if the project was not implemented. Below the alternative scenarios are presented and an analysis.

Alternative scenarios

The project has two alternatives which are namely (a) leaving the grasslands undisturbed and continue to be utilised by the subsistence farmers in the present manner or (b) allow large scale farming to take place in the area. The negative and positive impacts for both alternatives were identified.

(a) The Subsistence economy left to continue.
The present subsistence economy in the area has been there for the past years since time in memorial. The farmers are living in very difficult conditions having low incomes, no road accessibility, poor housing, no health facilities and the general standard of living is at a very pathetic stage. Interviews with the villagers around the project site invited the project with all hands. The villagers will get employment, support to village development project from GRL and already have a support to improved road accessibility from the company. Therefore, the alternative of leaving the project site remain as it is today will seriously affect the local community expectations and terminate whatever the socio-economic benefits they are getting at present.

(b) Large-scale farming.
Large-scale farming may bring similar benefits as those provided by GRL in forest plantation project. The only difference between large-scale farming and forest plantation is on carbon storage. Large-scale farming project will clear the present vegetation of grassland and automatically become a source of carbon emissions from soils and cleared vegetation. The forest plantation project is a carbon storage, whereby carbon and other greenhouse gases are sunk in the forest. Therefore, large-scale farming is not a good alternative to the forest project.

In conclusion: in view of the assessors the project will bring significant commercial and development benefits to Tanzania. The team believes that the project has been positively received in the society, from the village to the national levels. However, there are a few specific comments on the social and environmental impacts of the project activities, although the possible negative impacts are few and can easily be mitigated.

G.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken a socio-economic impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to supporting documentation:

The project participants invited two independent agencies to carry out Socio-Economic Impact Assessments for both Uchindile and Mapanda areas in accordance with the regulations of the Tanzanian government effective at the time of the assessments. Letter from the ministry responsible for environment demonstrating acceptance of the quality and contents of the EIA/SEIA is available on request and during validation/verification as supporting documents.

The conclusions are presented in section G.1 and the references to supporting documents are as follows:

3. "An Assessment of the Environmental Impact of the forest plantation project at Uchindile and Lugala villages in Kilombero District, Tanzania". Prepared by Orgut Consulting, Tanzania Branch. August 1999; and,

4. "Environmental impact assessment on proposed Mafinga and Idete Forest Projects in Mufindi District, Iringa Region, Tanzania. Prepared by the Environmental Association of Tanzania (ENATA). November 2006.

G.3. Description of planned monitoring and remedial measures to address significant impacts referred to in section G.2 above:

The following monitoring activities (listed in table G.3.1) are suggested by the assessors of the Mapanda plantation area. All of these suggestions will be implemented, not only for Mapanda but also for Uchindile. In addition, a number of other items will be monitored, which are listed in table G.3.2.

Table G.3.1: Monitoring activities suggested by the assessors for the Mapanda plantation area (these will also be implemented for Uchindile)

MONITORING OF SOCIO-ECONOMIC AND CULTURAL ISSUES/ACTIVITIES			
AREA	FREQUENCY	TYPE OF INFORMATION	BASELINE
Public relation	Twice a year	Number of conflicts, court cases, grievances	Labour laws
Workers safety, health and occupation rights	Twice a year	Salary levels, safety measurements and disease control	Existing work regulations and labour laws
Economic impact	Once a year	Economic activity profile to villagers around the company economic gains by District through service charges	Economic performance prior establishment of the project
Effect on culture	Once a year	Changes in behaviour	Current state prior establishment of the project
Health occupation	Twice a year	Prominent diseases trend in STI and HIV/AIDS.	Health data prior to the established of the project

Table G.3.2: other items for monitoring

- Monitor the behaviour, activities and attitude of the adjacent communities in order to develop possible extension programs to support them for the benefit of both the project and surrounding local communities;
- To involve and encourage local communities to monitor socio-economic issues using effective methods (participatory ones e.g. Participatory Rural Appraisal) for obtaining information from the community e.g. net immigration monitoring of people in the local community, population dynamics monitoring in villages around the project, wood consumption surveys etc.

- The project participants will accord high priority in the contribution to infrastructure development such as roads, education: building of schools, health facilities improvement or building and others proposed by the communities.
- A regular evaluation of the socio-economic impacts of project activities is carried out through discussions, company briefings, questionnaires etc to all key stakeholders. This enables us perceive what stakeholders understand about the company, evaluate company performance vide its goals and its impacts to stake holders and eventually giving room for improvement and redesigning our plans depending on the outcome of this exercise. See Section H of this PD.
- The project participants will establish residential and office accommodation for its projects workers and will provide services e.g, water and proper sanitation.
- Casual workers will be employed from villages surrounding the project areas. The workers will be provided with transport to/from their work places

➢ **Law enforcement, Education and Extension programmes**

- By-laws and regulations shall 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, zero grazing, 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.
- Education and extension shall be reinforced to minimize the interference in the plantation with man and domestic animals but where necessary legal actions shall be taken against violators. In this regard, the local communities will also be made aware of the deadly poisonous fungi Amanita muscaria which is easily confused for edible mushroom species.
- Education messages shall include expertise and other services to the local communities to enable them undertake seed collection, raise 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 improved workforce availability for achieving the set targets.

➢ **Employment Opportunities**

- Jobs shall be created and provided to the surrounding local communities to enable local economic empowerment and hence opening up new business opportunities and improved standard of living. As regards to employment, the Forest Plantation management shall be required to comply to 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.

- Specifications for shelters for workers and casuals during planting and fire protection crew.
- Restrictions to child labour
- Execution of Government laws and regulations on security of employment
- Adherence to guidelines for sound management and storage of chemicals, as stipulated by the Ministry for Health.

- The Plantation Manager shall be required to assess the training needs of the project workers for approval and implementation by the project participants.
- On the job training will also be arranged and carried out at work places for both supporting staff and casual workers to ensure that the project has a highly skilled and motivated work force

➢ **Effects on Culture**

- The project will cooperate with the local communities to ensure customary norms are followed by protecting and mapping graves and other ritual sites etc and ensure strict permission to visit the sites.
- 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.

➢ **Decommissioning phase**

- The Company will pay terminal benefits to all its employees according to Tanzania Labour Laws. However, some employees with special skills may avail jobs depending on the prevailing conditions and activities of new developer.
- It is most likely that buildings may be retained for community use or availed to the new developer and likewise machinery and equipment may be disposed off or availed to the new developer.

SECTION H. Stakeholders' comments:

H.1. Brief description of how comments by local stakeholders have been invited and compiled:

Collection of comments from stakeholders was conducted by staff from the project promoter's offices in Mafinga, Mufindi District in collaboration with the plantation managers of the two project areas of Mapanda and Uchindile. Vincent Nambombe: (Planning Manager) was in charge of the exercise assisted by Ms. Christina Mohamed (Assistant Planning Manager) and Miss. Neemaeli Ussiri (Community Support Manager). Uchindile Plantation Manager, Mr. Sylvester Lwagila and Mapanda Plantation Manager, Mr. Zenobi Nkana assisted in the exercise.

Methodology Used

Comments by stakeholders were collected using the Participatory Rural Appraisal (PRA) methodology and Semi-Structured Interviews (SSI) with the overall aim of ensuring increased participation.

The following methods were used to collect comments:

(i) Introduction of the company to stakeholders:

A short profile of Green Resources Ltd was given to the key stakeholders one month before any discussions so as to let them be aware of the company's objectives and activities. The profile comprised of a description of the proposed ARR VCS activity, company objectives, operations, certification and achievements including existing contributions towards surrounding local communities.

(ii) Semi-Structured Interviews (National, Regional and District Level):

The project participants then made formal discussions with key stakeholders from the National, Regional and District levels. These discussions were aimed at 1) examining how the stakeholders understand the activities of the project participants and the proposed ARR VCS project activity; 2) evaluating the performance of the project participants and its impacts to stakeholders and 3) collecting comments for improvement. The following key stakeholders were interviewed: Tanzania Tree Seeds Agency (TTSA), Regional Water Supply Office, Regional Forest Officer (Iringa), Tanzania Electricity Supply Company (TANESCO) – Mafinga District, National Social Security Fund (NSSF) – Mafinga District, Tanzania Revenue Authority (TRA) – Mafinga District, Mufindi District Commissioner, Mufindi District Executive Director (DED), Natural Resources Office – Mafinga, Land Development Officer-Mafinga, Mufindi Environmental Trust –Mafinga and Sao Hill Forest Project (SHFP) - Mafinga.

(iii) Participatory Rural Appraisal (PRA) and Semi-Structured Interviews:

Specifically the PRA included the following processes:

1. **Reconnaissance Survey:** A letter and project profile was prepared with a brief introduction of the project objective, main activities, benefits and potential risk, as well as the modalities and procedures of the proposed ARR VCS project. The letters were distributed

to the proposed project communities before the PRA process, and were explained during the PRA process. PRA started with villages surrounding Uchindile Forest Project area i.e. Lugala and Uchindile villages, followed by Chogo and Mapanda villages in Mapanda Forest Project area.

2. **Questionnaire**: Questionnaire forms were developed and distributed among different stakeholders, including key informants such as churches, schools, dispensaries, village leaders, Tanzania Zambia Railway (TAZARA) management and one marketing group. The questionnaire forms were collected and analyzed to understand the local socio-economic profiles, land use, land tenure, income and sources, land management ways, awareness, technical know-how, favorable tree species, technical and financial barriers, need and desire of communities in the ways to participating in the proposed ARR VCS project activity from relevant stakeholders. A copy of the Questionnaire form is available on request and for validation/verification as supporting documents [44].
3. **Interviews:** The sample size consisted mainly of mature people of age between 18 years to 45 years (those who are able to work) and a few people from age 45 to 60 years. Interviews were held in areas where the proposed ARR VCS project activity is located. Few households randomly selected from each village were also interviewed using the SSI approach.

H.2. Summary of the comments received:

Stakeholder comments have been collected from the local (villages surrounding the two discrete areas of land (Mapanda and Uchindile), regional and national levels.

Comments from different stakeholders are summarized as follow:

1. Primary stakeholders:

1.1 Mapanda Forest Project

Comments from Mapanda and Chogo Villages: 131 Respondents

Direct benefits from the project promoters:

- 84% of respondents explained that they get direct employment from the company, which has enabled local economic empowerment thus opening up new business opportunities and improved standard of living, e.g. building good houses, micro-enterprises and improved household facilities. In addition, the communities are learning good practices on tree planting and forest management from technical training.
- 84% expressed that the company has provided seedlings thus many people have planted their own trees and undertaking environmental protection. This will in future improve the communities' economic growth through sale of wood and non-wood products.
- 73% expressed that the company is assisting the local community in development issues e.g. building schools, maintenance of teacher's houses, health services and other infrastructures.

[44] Copy of Stakeholders' Questionnaire form

- 69% expressed that the company does protect water sources as most of their water sources especially ponds where local community obtain water are drying. This will in time improve the local environment.
- 54% expressed improvement of transport and food during tree planting period though the roads are still problematic in this area.
- 69% said that the salaries are paid on time and it is on average satisfactory.
- 83% expressed that the company does provide permanent employment to the casuals who have worked with the company for a long time.
- 86% expressed that the company improved in provide working gears to employees like hoes, bush knives, machetes, over coats, boots, etc. for the company activities.

Company Problems/Weaknesses:

- 41% claimed that wages are low and paid late though there is a bit improvement.
- 38% expressed that the company does not fulfil promises made during land acquisition.
- 40% expressed that the company does not provide knowledge in environmental protection.
- Less than 5% claimed lack of health and safety to workers e.g. no first aid kit, no treatment to workers if they get injured during work.

Expectations/Advice:

Out of the respondents to our questionnaires the following are the results expressed in percentages as regard to their expectations and advices to the company:

- 79% expect the company will assist in building schools, maintenance of teachers' houses, assistance on infrastructures maintenance especially the road from Mapanda (highway to Kihansi) to Chogo village. In addition to that, they advised the company to ensure good living environment for workers especially during the planting period where most workers stay in camp.
- 62% expressed the need for the company to strengthen cooperation with local community e.g. the company should arrange for frequent/planned meetings with the communities to know their problems/requirements.

1.2 Uchindile Forest Project

Comments from Uchindile and Kitete Villages: 129 Respondents

Direct benefits from the project promoters:

- 79% expressed that the company has been providing employment to the people surrounding project thus contributing in poverty alleviation, increased money circulation and enabling them to build good houses.
- 64% claimed that the company does provide working gears to workers.

- 75% explained that company fulfils promises and there is good relationship with the local community.
- 60% expressed there is improvement of health facilities to workers.
- 71% expressed that there are strong initiatives and improvements in fire protection especially in the use of fire lines and fire towers.
- 65% expressed more people are employed in permanent positions.
- 67% expressed that assistance to the local communities in development issues e.g. schools, health services, infrastructures has improved.
- 97% of the respondents appreciate the company initiatives in conservation of forest resources.
- 84% explained that the company has planted trees and environment protection is being undertaken.
- 84% expressed that the company does contribute in road maintenance.
- 93% of the respondents expressed that the company has provided seedlings thus many people have planted their own trees and undertaking environmental protection, though there is a need to increase distribution.
- 89% of the respondents expressed that the company does protect water sources as most of their water sources especially ponds where local community obtain water are drying.
- 58% of the respondents explained that the company had improved in provision of health services to its workers.
- 72.41 % expressed that workers are working in a well improved conditions with provision of working gears, health and safety facilities.

Company Problems/Weaknesses:

- 31% expressed that there are still transport problems for workers and communities surrounding the project.
- 11% claimed that the company does not provide knowledge in environmental protection and water sources.
- Less than 5% claimed that the company does not contribute to the health services and maintenance of the hospitals.

Expectations/Advice:

Out of the respondents to our questionnaires the following are the results expressed in percentages as regard to their expectations and advices to the company:

- 24% advised the company to increase employment opportunities.
- 40% advised the company to assist local community in building of social services.

- 60% are expecting that the company will fulfil the promises made during land acquisition e.g. road construction.

2. Secondary Stakeholders:

2.1 Mapanda Forest Project

- The chairman – Village Executive Officer (VEO): 1) The project has provided employment and at times transport. Unfortunately some promises e.g. 100 bags of cement for the village dispensary staff house etc. have not been respected. They gave an example of Highland Forest Company (HFC). Suggested to respect the promises and point out that any other land application will be reacted depending the magnitude of assistance by the company to the village. 2) Requested the project promoters to train and provide technical services to villagers so that they can produce their own seedlings for planting which has already given substantial development assistance. 3) Plans to call upon a meeting with all companies investing in the village land areas so as to explain the village development programmes as suggested by the villagers themselves.
- Mapanda Primary School Head Teacher: Mr. Calvin George described the following benefits: 1) Employment, 2) School rehabilitation (Cement and Iron Sheets provided), 3) Tree seedlings provided to schools to improve ground cover/ landscape around the school. He also made the following suggestions: 1) Salaries be paid promptly, 2) Improve workers welfare, 3) To respect promises made to villagers, 4) Train workers to improve efficiency, 5) Awareness education in fire hazards/prevention.
- Lutheran Church Priest Ole Kimaia described the following benefits: 1) Employment – in terms of income, 2) Transport services, 3) Improved Social services. Suggestions offered: 1) Company should create a good relationship with villages through regular meetings, 2) Suggested also that assistance in social services should be strengthened and the project promoters should assist road construction to Chogo for improved communication.
- Chogo Primary School Assistant Head Teachers, Mr. Joseph Kinyunyu and Robinson Lufyagile: pointed out the following benefits: 1) Iron sheets and Cement provided for school building, 2) Temporary and permanent employment has raised income of people and it is the only big investing company in the village. Suggestions: 1) Prompt payment of salaries should be the motto, 2) Assistance requested for school rehabilitation which is already in shambles, 3) Company should assist in training and awareness education in environmental conservation, Soil conservation, Tree planting as communities are very interested to plant their own woodlots, Promote fire prevention and fire fighting when it occurs through employing a local group to deal with the matters which will in turn educate their fellow villages, To continue with tree distribution by the project promoters to schools and local people.
- Chogo Dispensary, Dr. Sanga pointed out the following benefits: 1) Environmental conservation through tree planting by the project participants and local people, 2) Employment – life style of people and infrastructures changed. Suggestion: To strengthen tree planting for strengthening the above services.

- Chogo Village Chairman (acting) Mr. Kitinusa and acting VEO, Mr. Ayubu Kiwelu: Benefits: 1) Permanent employment to three and temporary employment available, 2) Assisted cement for dispensary and school, 3) Infrastructure and business opportunities. Suggestions: 1) A road connecting Chogo and the project should be built to ease communication and strength fire protection (fight fire when it occurs), 2) An environment group be formed to educate people on environment and sanitation at work places. 3) Salaries timely payment has improved, 4) The services provided to Chogo village is not proportional to the big parcel of land provided, 5) More people should be employed on permanent basis, 6) Environment conservation through tree planting be strengthened as people are very interested.

2.2 Uchindile Forest Project:

- Tazara –Uchindile Station Master, Mr. James: The project has contributed in employment micro-entrepreneurship, tree planting. Requested the project to assist in schools/Water supply and road making.
- Uchindile Dispensary: So far assistance in health is not much and requested that equipment and medical support be sent directly to the villages concerned and gave examples of the medical support which has not been received yet to-date.
- Leaders of the village (Chairman and VEO): The project assistance in the villages was not significant in the past but now the project promoters have contributed greatly in the construction of a secondary school which is in present a priority for the village of Uchindile. Requested transport for ferrying sand.
- Secondary School Kiyowela: Suggestions: 1) Recommended the project participants to strengthen their development assistance in health, schools and other development activities, 2) Educate people to prepare own seedlings through inputs and technical services, 3) Strengthen employment of staff from surrounding villages (as more people are completing secondary school).

2.3 Other District, Regional and National Stakeholders:

- **Tanzania Tree Seed Agency**, Mr. Shelimo: 1) Satisfied with company management activities, 2) Accept advice and corporation from its stakeholder such as TTSA on seed handling process, 3) The project participants are transparent in management and administrative matters. Advice: 1) There is need for consultancy for the management of their plantations, 2) The company has to improve its working facilities in tree Management i.e. fire Protection, 3) Training packages: Develop skills of workers e.g. in nurseries and plantation management, 4) Community and stakeholder relationships are strengthened.
- **Iringa Regional Hydrologist,** Mr. Ngowi: The company deals with tree planting. Do not know if the local community is benefiting from the company activities.
- **Mufindi District Commissioner**: Achievements: The company has succeeded to plant a lot of trees & has provided employment thus poverty alleviation through raising the income of local community. Advice: 1) The company lacks publicity i.e. the specific company

objectives are not known to the community and its stakeholders, 2) The company to assist local community on development issues i.e. infrastructure especially Mapanda – Chogo road, Schools building especially Chogo Primary School, 3) Local communities be provided with seeds and education on how to raise nurseries, 4) Help local communities on water sources where water sources continue to decrease, 5) Pay wages on time, 6) Fulfil promises made during land acquisition.

- **District Natural Resources & Tourism Officer,** Mr. Shabani**:** Achievements: 1) The company has good objectives because deals with environment protection. 2) Contribute towards poverty alleviation through providing jobs to local community. 3) Commended on Carbon Offset activities by the company as important in stabilizing climate change globally and generate revenues to company and the national at large, 4) Has obtained enough land. Advice: 1)The company needs to assist local community, 2)The company should involve itself in protection of water source, 3) Provide seeds and training on nursery establishment and management, 4) Provide permanent employment to people or workers, 5) Pay wages on time, 6) Provide transport to workers.
- **Mufindi District Land Development Officer,** Mr. Kilasi: Achievements: 1) Increased Revenue to the Central Government and District Council, 2) Has succeeded to acquire enough land, 3) Provides employment, 4) It has been transferring technology to the local community on tree planting and management. Advice: 1) The Company should fulfil the promises they made during land acquisition e.g. infrastructures and School building and maintenance, 2) The Company should pay salaries and wages effectively and on time, 3) Strengthen publicity to stakeholders on their activities, 4) The Company should coordinate with District Council for assistance they provide to local community.
- **National Social Security Fund (NSSF), Mafinga Branch**: Achievements: 1) The Company is alleviating poverty through providing employment to the people, 2) Environmental protection through tree planting and other natural habitats, 3) NSSF has been collecting contribution form NSSF members from project promoters. Advice: 1) Increase the activity of tree planting, 2) Protect water sources, 3) Help local community on Development issues, 4) Send NSSF contribution on time.
- **Mufindi Environment Trust (MUET)**: 1) Employment is provided and social services assisted to villages and provide seedlings to society, 2) The project should be very close to the local communities, 3) Company has good strength and provides good working conditions for their workers, 4) The company complies with involvement policies of the government, 5) The company usually involved in environmental conservation including biodiversity protection.
- **Mufindi District Water Department**: 1) The project promoters should strengthen publicity so that it is known to more stakeholders; and, 2) The department suggests that, local communities have many expectations as regards assistance to social services like water supply, health, schools, etc.

H.3. Report on how due account was taken of any comments received:

The comments received from the PRA and SSI surveys were fully taken into account as follows:

- **Development Assistance to Local Communities**: The project promoters are committed in fulfilling promises made to the villages during land acquisition. However, these development assistance projects are implemented in phases over a 5 year period. The project promoters has so far spent almost US$300,000 (TShs 370,140,503) in community development projects and has developed a community development plan for each of the discrete project areas (Mapanda & Uchindile Community Development Plans);
- Timely payment of wages: To implement this, the project promoters has entered into an agreement with the MUCOBA (Mufindi Cooperative Bank) who ensure timely payments to all workers in both project areas. This system was implemented from August, 2006.
- Provision of seeds and training: Every year, the project participants raise 20% seedlings more than the current planting target. This amount is for the surrounding villages. All nursery workers, plantation workers, and other staff are mainly from the villages and therefore are directly trained on forest practices. So far the company has given out 1,600,000 seedlings to villages.
- Employment: The company has promoted 35 casual workers into permanent jobs. In addition, the company employs 600 casual workers on average per project per year. The project participants will in future continue to employ more people, with priority given to competent locals.
- Health and Education are among the priority areas in terms of development assistance. The project participants will continue to invest in these sectors, assisting in building schools, increasing the number of attendance in schools, improving/building teachers houses, building health centers, providing medical assistance to health facilities, providing free condoms, training on HIV/AIDS, etc. Currently, the company has spent about US$150,000 (TShs. 190,469,536) in health support and US$31,000 (TShs. 38,882,986) in education assistance.
- Environmental Protection Training: The project promoters will work with local NGOs like MUET in provision of training programs on environmental protection.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROPOSED ARR VCS PROJECT ACTIVITY

Organization:	Green Resources Ltd
Street/P.O.Box:	Uhuru Road/P. O. Box 4730
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URL:	
Represented by:	Sangito Sumari
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Salutation:	Mr
Last Name:	Sumari
Middle Name:	
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Organization:	Green Resources AS, Norway
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State/Region:	
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Country:	United Kingdom
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Represented by:	Mads Asprem
Title:	Managing Director

Salutation:	Mr
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This annex has been left blank intentionally as no public funding is used in this proposed AR VCS project activity.

Annex 3

BASELINE INFORMATION

Baseline Calculations for Uchindile and Mapanda grasslands

1. Introduction:

Initial studies and baseline estimations were carried out in Uchindile and Mapanda Forest Project areas when the VCS project activity was anticipated. The areas were assessed in terms of soils and vegetation cover. Initial information collected during environmental studies since 2000 found that the areas have similar soil characteristics characterized as dark red to red loamy sands (latosolic soils) and the growing vegetation characterized by savannah grassland-like communities derived from montane forest. The grassland area was determined to establish the area to be planted: the vegetation cover was used as a criterion for ex-ante stratification of the land in determining the baseline carbon stocks in the living biomass of the grassland.

2. Vegetation classification and stratification:

The grasslands ecosystem in this area has been described as edaphic fire climax grasslands as well as headwater valley grasslands and do occupy about 90% of the area. The baseline assessment on this type of grassland focused mainly on areas that are open for planting. The dominant species of the area observes included *Hyparrheni rufa, Loudetia simplex and Loudentia sp.* Other species observed in these areas include *Leonitis africana, Vangueria sp., Comelina africana, Solanum incanum, Cynodon dactilifera, Parinari curatelifolia, Syzygium guineense, Ficus sp., Croton macrostachys, Markhamia obtusifolia, Clausena anisata Dodonaea viscosa var.anguistifolia and Vangueria infausta.* There are other species that have not been identified, some bearing only the vernacular name. White (1983) has described such grasslands especially with respect to the major composition of the grass layer.

The most dominant tree species in the bottomland forests and adjacent lands include *Syzygium cordutum, Macaranga capensis, Aphloia theirformis, Bridelia micrantha, Ficus vallis-choudae, Horungana madagascariensis, Syzygium cordutum, Harungana madagascariensis, Maesa lanceolata, Rauvolfia caffra, Gardenia imperialis and Myrica salicifolia.* The shrub/herb layer is dominated by common wetland species that include *Cyperus papyrus, C. dives, C. corymbetes, C glaucophyillus and C. articulatus.* Ferns include *Pteridium aquilinum.* The valley-bottom wetlands/riverine ecosystems have higher species richness. They will not be planted, but be protected and monitored, and are excluded from the carbon inventory work required for this baseline study.

3. Estimation of baseline net GHG removals by sinks:

The baseline net GHG removals by sinks were estimated from the vegetation carbon stocks in areas eligible for ARR activity. In the plantable areas, the above ground biomass determined was from

fourteen (14) plots out of 20 established plots. Six plots fell in the areas where no planting is expected (systematic sampling) and since the forest management plan provides a management methodology for swampy and riverine vegetation, the plots were excluded from this study concentrating on carbon. The established temporary sample plots were concentric and circular. The size of the outer circle of the plot was 0.071ha. Within a plot sub-plots of 2m, 5m, 10m and 15m radius were established and in each sub-plot all trees with <5cm, 5-<10cm, 10-<20cm and >20cm diameter at breast height and height of the dominant species respectively were measured and recorded. In addition to the above measurements, the species names in vernaculars and botanicals were recorded.

3.a. Tree biomass stocks of trees in the grassland (not the forest in the valley bottoms):

In calculating the above ground biomass of trees, in (kg) by using general biomass regression equation developed by Brown (1997) for moist tropical zones with trees dbh range from 5 – 148 cm. The equation was in the form of Y = Exp (-2.134 + 2.530In Dbh). Trees biomass was calculated and converted to carbon using a conversion of 0.45.

During the study, measurement surveys in temporary sample plots were conducted for the grassland stratum containing scattered trees. It was possible to estimate the total amount of above ground carbon stock in the lands in the two vegetation types i.e. trees and shrubs.

The assessment was conducted by dividing grassland into three types of vegetation. The results for the measurements are put together in the table below.

Temporary sample plot	Carbon stock (tC/ha)	
	Trees	Trees
1	*Markhamia obtusifolia*	0.07
2	*Parinari curratellifolia*	0.06
3	*Bridelia micratha*	0.07
4	*Parinari curratellifolia*	0.02
5	*Mhehefu (Unkown)*	0.04
6	*Syzigium cordatum*	0.01
7	*Markhamia obtusifolia*	0.02
8	*Parinari curratellifolia*	0.06
9	*Markhamia obtusifolia*	0.03
10	*Parinari curratellifolia*	0.02
11	*Mhehefu (Unkown)*	0.04
12	*Markhamia obtusifolia*	0.02
13	*Syzigium cordatum*	0.04
14	*Markhamia obtusifolia*	0.12
Mean		**0.04**

The total biomass carbon stocks from grassland obtained based on the above ground biomass estimated is 0.557 tC/ha. To determine the below ground biomass the root-to-shoot ratio of 2.8 was selected from the GPG 2003.

Annex 4

MONITORING PLAN

The monitoring plan has been prepared based on the provisions of the approved monitoring methodology – AR-AM0005 Version 3

1 PURPOSE OF THE MONITORING PLAN

This Monitoring Plan provides guidelines on monitoring and operational procedures of the GRL ARR VCS Project Activity, which proposes to generate net anthropogenic GHG removals by establishing sustainably grown forests plantations of eucalyptus and pine species on the land areas that are currently grassland.

This Monitoring Plan fulfils the VCS requirement that the project activity should have credible and accurate monitoring procedures to enable the evaluation of project performance and verification of the net anthropogenic GHG emission removals. It sets out monitoring procedures that follow the provisions outlined in the Project Design Document and the approved Monitoring methodology (ARM-0005).

2 THE ARR VCS PROJECT ACTIVITY

2.1 Project boundary

The spatial extent and location of the species planted under the ARR project activity, in each stratum, shall be recorded. As per the availability of remote sensing data of adequate resolution, project participants can assess the area planted and compare the changes observed in the planted area using remote sensing data and the data from ground checks, field monitoring, and from planting records. Any discrepancies between the area reported and the area estimated under the proposed ARRVCS project activity in any part of the strata or sub-strata along with the species planted, including the areas of mortality due to natural factors (e.g. fire and pests) and anthropogenic factors shall be recorded and reported.

2.2 Monitoring periods and frequency

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 project participants shall use the VCS buffer approach to address any loss of permanence. The monitoring plan provides flexibility and shall also include the monitoring frequency recommended under national standards 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.

2.3 Monitoring and operational procedures

The project participants shall use standard nationally available procedures to monitor all activities and operations. The project is also complying with FSC standards for it forestry operations. 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, as well as general monitoring of forestry operations, and social and environmental impacts.

The project participants shall keep records of all activities like changes in the actual planted areas, nursery operations, site preparation and forest management.

3 PROCEDURES FOR MONITORING OF THE BASELINE AND PROJECT SCENARIOS

3.1 Monitoring of the Baseline

Under the selected methodology, the carbon stock changes are set to zero and do not need to be monitored over the project lifetime.

3.2 Monitoring of the Carbon Stocks of the Planted Area

The project participants shall monitor the implementation of the ARR VCS project activity through monitoring the boundary, forest establishment and the forest management operations. The project monitoring team will monitor and record the plots on which ARR project activity is undertaken in each stratum over the crediting period. In monitoring the ARR, particular emphasis will be paid to the varieties of tree species being planted in eligible areas. Changes in the plots will be recorded, including the areas of mortality due to natural factors (e.g. fire and pests), and anthropogenic factors in any part of the strata and sub-strata.

The project participants shall ensure that the established plantation is protected over the crediting period. The fire line and firebreaks shall be established. In event of fire and pests outbreak the stratum affected shall be recorded and mapped. Replanting of the areas should be done and data recorded for each stratum. The factors affecting the carbon stock changes shall be monitored.

3.3 Monitoring using Permanent Sample Plots

Permanent sample plots (PSPs) are used for sampling over time to measure and monitoring changes in carbon stocks of the relevant carbon pools in each compartment. The plots are treated in the same way as other lands within the compartment and stratum e.g. in terms of site preparation, weeding,

pruning, thinning, harvesting, etc. Once ex-post stratification has been carried out the number of PSP's required will be calculated. The ex-post stratification will be carried out in GIS and allow for the area of each stratum to be calculated. Equations M.1 and M.2 from AR-AM0005, in conjunction with the Winrock Plot Calculator (Brown et al., 2006) will be used to calculate number of PSP's required per stratum to reach a confidence level of 95 %. (using parameters derived from existing plantation data from the region) The project participants anticipate using circular shaped PSP of 400 m^2. The plots will be systematically located with a random start in each stratum or sub-stratum.

Unique number tags are assigned on all trees inside the plot. These numbers are written by use of oily paint on aluminium covers to allow keeping the information concerning the tree and easy for cross-referencing. All trees are marked with white weather resistant paint at DHB i.e. at 1.3 m height so that the same point is measure d all the time during measurement. Other parameters to be measured from every PSP are the carbon pools: live biomass; (Trees, Roots, Fine Litter and Course Woody debris) and dead biomass (soil and wood products). These parameters will be analyzed including information recorded for other purpose e.g. species, altitudes, GPS reading, slope, vegetation cover etc. The field forms for every PSP shall be recorded and kept in the PSP file.

3.4 Volume Equations

Tree volume will be estimated using the measurements from the PSPs and yield tables from a model developed in neighbouring government plantations. [45, 46] Two different models have been applied. For the older stands where both DBH and Dominant Height can be measured the volume model is used. For the PSP's where DBH is not measurable because the trees are too small then stocking is used in combination with volume tables to calculate volume.

For *P. patula*: Two volume equations are used for *p.patula* a) for stands younger than six years (pp_vol1) and b) for stands older than six years (pp_vol) In addition site index (hdom) and basal area(ba1 & ba2) calculation were used for calculation of the standing volume in 2002.

*(PP_Vol) (m3/ha)= Exp (0.06192 + 0.73434 * Ln(hdom)+1.0786 *
Pp_vol1 (m3/ha) = Exp (-0.0476 + 1.00679 * ln(BA1) - (1.4379 / Age) + 0.88471 * Log (Hdom))*

Dominant height (hdom) m= 1.32 * SI * (1-Exp(-0.13 * Age)1.83)
Initial Basal Area (BA1)m2/ha= Exp(-0.3618 + 0.14365 * Hdom+0.00119 * N)
Basal Area Growth (BA2) m2/ha= Exp(-0.02 + 3.94 * (1-A1/A2) + 0.02844 * (1-A1/A2) * SI +(A1/A2) *ln(BA1))

Where: BA is basal area (Calculated from equation: PI*((dbh ^2)/40000) Hdom = Dominating height from the 100 tallest trees pr. Hectare

[45] Malimbwi, R. E., Mugasha, A. G. & Zahabu, E. (1998). Yield tables for *Pinus patula* at Sao Hill Forest Plantations, Southern Tanzania.

[46] Malimbwi, R. E., Mugasha, A. G. & Zahabu, E. (draft). Yield tables for *Eucalyptus saligna* at Sao Hill Forest Plantations, Southern Tanzania.

For *E. saligna*: One volume equation is used to calculate of stand volume. In addition site index and basal area growth is used to calculate standing volume in the 2002 stands.

*Es_Vol = Exp (1.83184 + 0.21614 * Ln(Hdom)+0.96278 * Ln(BA))*

Where: BA is basal area (Calculated from equation: PI((dbh ^2)/40000)*
Hdom = Dominating height from the 100 tallest trees pr. Hectare

Dominant height (hdom) =Exp (Ln(site index)+0.57824-6.0443/Age+2.61854(1/Age^2))Ba*

For the calculation of volume in 2008 basal area is calculated for each plot and converted to basal area per hectare. Dominant height is used for these estimates.

3.5 Conversion of Volume Estimates to total tree biomass

At the time of preparation of the PD no regionally applicable allometric equations could be found for the calculations of carbon stocks from *pinus patula* and *eucalyptus saligna* applicable for the conditions found in the Southern Highlands of Tanzania. As such a default BEF was selected as discussed in the PD. For the ex-ante estimates of carbon stocks a default BEF from the GPG LULUCF 2003 (Table 3A.1.10) was used.

The range of values was applied in accordance with age of stands, meaning that the lower end of the BEF range was applied for the older stands. The BEF was reduced to the lowest level once it reached a DBH of 10cm.

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	*P.patula*	*E.saligna*
1.3	2.0[47]	0.45	0.8[48]		0.32[49]	0.35[50]

It is anticipated that this BEF will be applied to measured volume estimates. The BEF will be regionally validated using destructive sampling of trees to determine volume, total dry biomass and biomass expansion factors.

[47] Teobaldelli et al, 2009, Generalized functions of biomass expansion factors for confers and broadleaved by stand age, growing stock and site index, Forest Ecology and Management VOl 257 pp1004-1013

[48] Taken from the book 'The Commercial Timbers of Tanzania' by J.M.Bryce revised edition of 1999.

[49] Taken from Table 3A.1.8 10 of the GPG LULUCF 2003. Mean value taken from the Conifer Forest/Plantation category with aboveground biomass (t/ha) of 50-150.

[50] Taken from Table 3A.1.8 10 of the GPG LULUCF 2003. Mean value for Eucalypt Plantation taken for biomass of 50-150 t/ha.

4 INSTRUCTIONS ON DATA COLLECTION

4.1 General instructions

Collecting reliable field measurements is an important step in the quality assurance plan. Standard procedures should be followed to collect reliable data to ensure the estimation of credible baseline and project emissions

During the monitoring process, the senior personnel overseeing the carbonization activity shall verify data collected by the field personnel. The project entity must implement procedures that will ensure independent verification. Considering the differences in the electronic and paper based formats, there must be clarity in the terms defined and procedures followed. Particular attention shall be paid to monitoring and measurement errors and mandatory data checks shall be performed.

4.2 Data storage

The project entity shall make necessary arrangements for data entry on the registry forms in paper and electronic formats and ensure transfer to the spreadsheet database at required intervals as outlined in the monitoring methodology. The data shall be archived using acceptable standards and stored in compliance with the instructions of the project information management system: The project entity shall adopt both paper and electronic formats to ensure that the information is stored in multiple formats. All GHG related information is collected and aggregated into monthly and annual data. The electronic data shall be stored securely at multiple locations using monthly back-up procedures.

4.3 Information (data) management system:

The project information management links the operations of the field data collection and spreadsheet database management and outlines responsibilities of staff involved in collecting field data and organizing spreadsheet database. The supervisory staff overseeing the field data and spreadsheet database must certify the data each month and provide necessary clarifications on the changes, if any in the data collected and processed during the month.

5 GUIDANCE ON MONITORING OF THE ENVIRONMENTAL AND SOCIAL ISSUES OF THE PROJECT

The project will develop an environmental monitoring protocol inline with the recommendations in Section F. Environmental monitoring will comply with FSC and CCBA requirements.

The project has developed a socio-economic monitoring plan. This will be targeted at assessing livelihood changes across all sectors of the village communities as a result of the project activities. This is available to the certifier on request. This will be carried out every three years.

Voluntary Carbon Standard
Project Description Template

19 May 2009

Please note – information is only filled out in sections which have not already been covered by the CDM PD.

1 Description of Project:

1.1 Project title

Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania

1.2 Type/Category of the project

- *Project category which is part of a GHG program that has been approved by the VCS Board.*
- *Specify here if the project is a Grouped project*

1.3 Estimated amount of emission reductions over the crediting period including project size:

- *Micro project: Less than 5,000 tonnes CO2 equivalent emissions reductions per year.*
- *Mega Project: More than 1,000,000 tonnes CO2 equivalent emissions reductions per year*

1.4 A brief description of the project:

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

Include GPS project boundaries.

1.6 Duration of the project activity/crediting period:

- *Project start date: Date on which a financial commitment was made to the project and the project reached financial closure.*
- *Crediting period start date: the date the first monitoring period commenced*
  - *VCS project crediting period:* A maximum of ten years which may be renewed at most two times

Compliance with VCS start data and early crediting requirements :

The project must meet the following conditions:

- *The project proponent can verifiably demonstrate that the project was designed and implemented as a climate change mitigation project from its inception; and that*
- *Prior to 1 January 2002, the project applied an externally reviewed methodology and engaged independent carbon monitoring experts to assess and quantify the project's baseline scenario and net emissions reductions or removals.*

The project was designed and implemented as a climate change mitigation project from its inception:

The enclosed annexes prove that the Uchindile Forest Project (originally called the Kilombero Forests Limited) and Mapanda Forest Projects were started as carbon credit projects[1].

As an essential part of the equity financing activity, the company approached SGS for independent carbon verification in the first quarter of 1998 (see '*supporting document a*' which is correspondence between SGS and Green Resources 27.5.1998 related to forthcoming carbon certification). The kick-off for the carbon project was a work shop in July 1998 held in Tanzania for the relevant work force (see '*supporting document b*' "Invitation- Training Workshop) and a subsequent forest management certification pre-assessment report dated 20th July 1998 (*see supporting document c*) both carried out by SGS. The final GHG Project Verification and Certification report was produced by SGS, and is dated 10th November 2000.

An independent source, the Forest Action Plan (MNRT, 2000) mentions Kilombero Forest Project as the only private plantation forest in Tanzania aiming at CO2 sequestration and generation of VCUs for sale. Although this report is written in 2000 it clearly shows that by then it was common knowledge that this project was aiming for carbon sequestration as the first of its kind in Tanzania.

Prior to 1 January 2002, the project applied an externally reviewed methodology and engaged independent carbon monitoring experts to assess and quantify the project's baseline scenario and net emissions reductions or removals.

[1] For clarification the Tanzanian company at the time was called Escarpment Forestry Company, now re-named Green Resources Ltd, which was a subsidiary of Tree Farms A/S, now renamed as Green Resources AS.

In 2000 the project under went GHG Project Verification and Certification by SGS, and received the 'Certificate of Project Design.' Kilombero Forest Limited was assessed again the SGS GHG Eligibility Criteria (hereafter called Eligibility Criteria) and subsequent verification of CO_2 sequestration arising from plantation establishment activities. In the absence of the internationally agreed procedures at the time under the Kyoto Protocol, SGS defined the Eligibility Criteria and the GHG Project Verification and Certification Service.

The quantification of the CO_2 benefits was conducted at the time through either i)the use of a scientific methodology, as designed by the project, or ii) through the application of improved methodologies that were approved by SGS. Initially an assessment of the scientific methodology was made by SGS. This included qualitative analysis of the scientific methodology to test the logic and assumptions behind the methodology and the accuracy of the data that was used. The three main areas of methodology assessment are

a) stratification and description of the project area
b) identification of CO_2 pools and flows
c) data sources and methods of data analysis.

The quantification of GHG Credits is determined by subtracting the average CO_2 storage capacity in the baseline scenario from the average CO_2 storage capacity in the project case.

SGS certified the baseline quantifications that were made by the project team, namely that:

- The average storage capacity of the baseline – field measurements indicate that on average the grasslands hold 44 tonnes of CO_2 per ha. This CO_2 is periodically released into the atmosphere when the grassland burns
- The average storage capacity of the plantations is based on the CO_2 content of the above ground biomass calculated as:

Area*annual wood increment*biomass expansion factor* carbon density.

To conclude Kilombero Forests Limited has been awarded a Certification of Project Design and a Schedule of Projected Emission Reductions. Verified activities implemented pre-01/01/2000 have resulted in the generation of 15,752 pre-2000 GHG Credits. Kilombero Forests Limited has been certified as meeting the requirements of the SGS GHG Project Verification and Certification Service. This means that it has met the Eligibility Criteria under the main headings of Acceptability, Additionality, Externalities and Capacity. The Schedule of Projected Emission Reductions was issued by SGS specifying that the project expects to deliver 3.722 million GHG Credits over the next 16 years. These are underwritten by a further 5.642 million tonnes of CO_2 which are held in the buffer to protect against losses in CO_2 arising from quantitative risks and uncertainties.

For further details see document 'GHG Project Verification and Certification – Executive Summary'

1.7 Conditions prior to project initiation:

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

1.9 Project technologies, products, services and the expected level of activity:

1.10 Compliance with relevant local laws and regulations related to the project:

The VCS PD shall include identification of relevant local laws and regulations related to the project and demonstration of compliance with them.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

Risk factors and ratings for Afforestation/Reforestation/ Revegetation (ARR) projects according to the AFOLU Guidelines published by the Voluntary Carbon Standard Nov 2008

Uchindile and Mapanda Forest Projects, Tanzania

Submitted by Green Resources - May 19th 2009

List of Generic Risk Factors that shall be assessed for all AFOLU project types:

Risk Factors Applicable to ARR projects

Risk factor	Risk Rating	Comment
Project longevity/Commitment Period		
Long-term commitment with harvesting	Medium	Project lands are under 99 year leases, and will operate under FSC certifications
Medium-term commitment with harvesting	High	
Short-term commitment with harvesting	Fail	
Long-term commitment (i.e., many decades or unlimited) with no harvesting	Low	
Long-term commitment with no harvesting in politically unstable countries	Medium	
Medium-term commitment (i.e., a few decades) with no harvesting	High	
Short-term commitment with no harvesting	Fail	
Ownership type		

Established NGO or conservation agency; owner-operated private land	Low	
Rented or tenant-operated land	Medium	Land is under 99 year lease from the national and local governments
Uncertain tenure but with established user rights	High	
Uncertain land tenure and no established user rights	Fail	

Technical capability		
Proven technologies and ready access to relevant expertise	Low	Necessary forest establishment and management technology and local in-house expertise have been employed– as demonstrated by successful project implementation and management since 1998.Furthermore, GRAS subsidiaries in Uganda (since 1996) and Mozambique (2006) also implement forestry and carbon projects with in-house staff
Technologies proven to be effective in other regions under similar soil and climate conditions, but lacking local experimental results and having limited access to relevant expertise	Medium	
Financial capacity		
Demonstrable backing from established financial institutions, NGOs and governments	Low	Project backed by private sector investors; parent company is well capitalized and has access to other sources of finance for expansion. Loan from IFC secured and loan from Norfund under negociation
No external financing	Medium	
Management capacity		
Substantial previous project experience (≥ 5 projects) with on-site management team	Low	Project in operation since 1998; on-site management team in place since 1997. The

		company policy is to employ predominantly senior local management with a proven track record in planting, forestry and carbon operations
Limited project experience (<5 projects) with on-site management team	Medium	
Limited project experience (<5 projects) without on-site management team	High	
Future income		
Appropriate management plan and financial analysis include future income to finance future management activities (e.g. carbon finance to be used for project management, tending operations, etc.)	Low	Yes, in place
Future costs and income not considered	High	
Future/current opportunity costs		
Alternative land uses are unlikely to occur in the future	Low	Past and likely alternative use is unmanaged grassland – with no related income
Project is competing with other land uses that are likely to become more attractive in the future	High	
Endorsement of project or land-use activity by local or national political establishment		
Endorsement given and not likely to change in the future	Low	
Endorsement given but may be subject to change in the future	Medium	Bottom to top process used in Tanzania with approval starting from the Village elders to the President
No endorsement given	High	

Risk of social instability

Social structure in the project area and wider region

In 1999, a socio-economic study was carried out for the Uchindile and Mapanda 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 and Tanzania's historic 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 villages of Uchindile, Lugala, Kitete, Mapanda and Chogo (or other villages namely Uhafiwa and Ihimbo). 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. The Hehe tribe is an ethnic and linguistic group based in the Iringa Region in south central Tanzania. The Hehe began as a number of chiefdoms made up of mixed people who were in some instances related to one another. Historically, no chiefdom had over 5 000 people. In contemporary Hehe society, the political authority of chiefdoms has been replaced by locally elected chairmen and village councils. In 1994 the Hehe population was estimated to a number of 750.000[2]. The Hehe society is comprised mainly of Christians. The largest town[3] in the region is Mafinga, and had in 2002, a population of 33 669. The main employment in the region is agriculture, forestry, and Tanzania`s largest tea industry.

Migration[4]

Given the project started more than 10 years ago Green Resources is able to quantify the population growth and inward migration that has been experienced in the communities around the project area. GRL uses government census data for determining the population status for the villages.(Source: Tanzania National Census 2002 and survey's carried out by village officials and submitted to the district post 2002) This data is also available at each village office. At Uchindile since the project started, the population growth has increased, but it does not indicate a significant increase as a result of immigration but rather as a result of natural growth. In contrast at Mapanda village there has been quite a large increase in population. This can be explained by the Kilhansi hydropower station near Mapanda, which had the peak of its establishment operations in the early 2000's. The power station has employed many people from villages around the district. Some of these people were stationed at Kihansi, but also in other villages where activities such as road construction were taking place. This explains the increase in population in Mapanda Village, rather than the reforestation project which prioritises jobs for the long term population of the village in accordance with the land agreement.

Table 1: Population dynamics - Uchindile Villages

Village	1994	1998	2003	2006	2007
Uchindile	1,020	1,103	902	1,060	935

[2] Gordon, Raymond G., Jr. (ed.), 2005. Ethnologue: Languages of the World, Fifteenth edition. Dallas, Tex.: SIL International. Online version: http://www.ethnologue.com/
[3] Considering population number.
[4] Source from census obtained from village offices.

Lugala	500	486	874	744	700
Kitete	314	419	357	214	450
Total	**1,834**	**2,008**	**2,133**	**2,018**	**2,085**

Table 2: Population dynamics - Mapanda Villages

Village	1998	2002	2006	2007
Mapanda	2,954	3,969	4,211	4,274
Chogo	1000	909	964	979
Total	**3,054**	**4,878**	**5,175**	**5,253**

Institutions

Each village has an elected chairman and a village council. The village council consists of 25 representatives. Elections take place every 5th year, in which the following are elected: 1. Chairman (one representative), 2. Hamlet leaders (number depends upon number of hamlets in the village), All people above 18 years have voting right. Representatives for the different village committees are being elected; i.e. health, environment, financial, social and planning committee.

Within villages there are different groups and societies. Some institutions present are schools (nursery/primary/secondary), religious societies; both churches and mosque. Other organizations present are youth social clubs, women groups and also some of the villages have their own football teams.

Local stakeholders

The villagers have been involved since the early stages of the project development, and are continuously informed about project activities and plans. Stakeholders have the opportunity to have their say and give suggestions. The project has carried out extensive stakeholder consultation [5] 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. Villagers employed by GRL are trained on environmental conservation, diseases, pests and other risks.

Table 3 Overview of Consulted Stakeholders.

Stakeholders at local level:	Name:
Uchindile Village Chairman	Humphrey Matimbwi
Uchindile Station Master	Mr. James
Uchindile Dispensary	
Mapanda Primary School Head Teacher	Calvin George
Lutheran Church Priest	Ole Kimaia

[5] Socio Economic Impact Assessment Report (1999; 2003; 2006; 2007), Stakeholders' awareness report (2008). All reports available upon request.

Chogo Primary School Assistants	Joseph Kinyunyu Robinson Lufyagile
Chogo Dispensary	Dr. Sanga
Chogo Village Chairman	Mr. Kitinusa
Chogo Village Executive Officer	Ayubu Kiwelu
Stakeholders at National and District level:	
Tanzania Tree Seed Agency (TTSA)	
Regional Water Supply Office	
Regional Forest Officer – Iringa	
Tanzania Electricity Supply Company (TANESCO) – Mafinga	
National Social Security Fund (NSSF) – Mafinga	
Tanzania Revenue Authority (TRA) – Mafinga	
District Commissioner – Mufindi	
District Executive Director (DED) – Mufindi	
Natural Resources Office – Mafinga	
Land Development Officer - Mafinga	
Mufindi Environmental Trust – Mafinga	
Sao Hill Forest Project (SHFP) - Mafinga	

Once a year, there is a celebratory day at each of the plantations. On this day in addition to providing a feast and entertainments, 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.

Community Benefits

As part of the agreements with the villages certain commitments have been made in relation to the support that would be provided to the village. 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.

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. The community monitoring plan will be executed in 2009.

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.

Table 4: A brief summary of GRL community support - Uchindile and Mapanda Villages.

Aspect of improvement	Activity/support/ Benefit
Education	- Supporting materials for building primary/secondary schools and teacher`s houses since 1998 - training
Health status	- building of dispensaries - providing medical equipments to hospitals - 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 and giving equal opportunities within GRL
Infrastructure	- Improved accessibility by bridges and road constructions/improvements
Environment	- Soil moisture conservation - Training on pests and diseases, and environmental awareness - Providing free seedlings

In addition to the support given to the communities described above, 10% of the revenues from the carbon credits will be given to support community projects once carbon credits are commercialized; this shall further ameliorate socio-economic conditions among other things. Tree planting and education campaigns shall raise awareness amongst the communities to protect their environment against fires (communities shall not start fires as they also have their own woodlots to protect). Education shall be disseminated to the communities to protect vulnerable species identified during the study.

Socioeconomic benefits are brought to the native rural poor: through project activity villagers 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 the 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 reduction of land degradation through fire. The project inspires and provides resources for villagers to 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.

Fire Risk – Applying the likelihood*significance approach

For 'fire risk' the risk likelihood x significance approach has been additionally applied at the request of TUV SUD

Fire is classified as a 'quantitative risk'.

The likelihood that a fire occurs without management interference of any type is once every 1 and <5 years (1/3), which is equivalent to an absolute risk of 0.3333.

The degree of risk relates to the whole project without management interference, and the degree of impact is scored as 3 (Damage possibly leading to almost complete failure)

Uchindile Forest Project has recorded 8 fire incidences and Mapanda 2 since their inception in 1997 and 1998 respectively. Details of the incidences are indicated in table 1 and table 2 below.

Table 5: Fire occurrence data for UFP

Year	Description of event	Area of forest damaged (ha)
1997	Year of first planting with no incidence	-
September 1998	Fire got out of control from a child of the Village preparing farm on village land	55
October 1999	During controlled burning, fire crew unable to control the fire	54
January 2000	Lightening	59.93
2001	No incidence	-
2002	No incidence	-
October 2003	Arson	115
August 2004	During controlled burning, fire crew unable to control the fire	661.05
2005	No incidence	-
2006	Arson	1.5
December 2007	Unknown	22
December 2007	Lightening	11
2008	No incidence	-
2009	No incidence as yet	-
Total		979.48

Table 6: Fire occurrence data for MFP

Year	Description of event	Area of forest damaged (ha)
1998	No incidence	
1999	No incidence	
2000	No incidence	
2001	No incidence	

2002	No incidence	
2003	No incidence	
2004	No incidence	
November 2005	Fire got out of control from neighboring farmer preparing his farm	188
December 2005	Fire got out of control from by farmer preparing his farm	198
2006	No incidence	
2007	No incidence	
2008	No incidence	
2009	No incidence as yet	
Total		386

Strategies for mitigating fire risk

Green Resources is implementing a comprehensive fire prevention strategy, which is multifaceted. We score ourselves 4 for the Risk Mitigation Strategy as we are implementing *'countermeasures using best-practices and adapted to the specific risk.'*

The prevention plans take into account traditional uses of fire, based on laws or regulations restricting fires and involve local community leaders and organizations. It also includes an emergency plan in case of fire outbreak, to eliminatingand containing fire outbreaks. The following strategies are currently employed for the two plantations:

1. *Compartmentation and sub Compartmentation*

Plantations is divided into compartments and sub compartments of manageable sizes where sufficient buffers(7.5 – 8m) are maintained to isolate operations and problems associated with each polygon.

2. Roads

In addition to the compartment and sub-compartment land marks, adequate road networks within the plantations also provide accessibility and easy mobilization of resources and equipment in the event of fire.

3. Fire breaks

Fire lines are put in place to either separate or bisect compartments. Some fire lines coincide with roads and when they do not, they are graded, and/ or hand screefed and burnt to about 15m wide for internal fire lines. For external boundaries the firebreak varies from 30 to 60 m depending on the vulnerability of the area.

4. *Fire Lookouts and Fire towers*

UFP has two fire towers and one lookout which are inter-visible with some of Sao Hill Forest plantations and plans to construct one more fire towers as planting advances. MFP has one fire tower and plans to construct one more as planting proceeds. These points are manned for 24 hours per day in 8 hours shifts i.e., 3 persons a day. The lookouts and fire towers are provided with the communication

systems such as base radios (for fire towers), walkie talkie radios and fire fighting equipments.

5. *Fire Patrolling*

A man is always kept on duty at the plantation office, fire towers, lookout and Kitete range (in the case of Uchindile). Fire patrolmen are set as follows: At UFP 6 people in the plantation which will be increased as planting increases, and at MFP 4 patrolmen which will be increased as planting expands. The patrol team are provided with bicycles and/or motor bikes, walkie-talkie radios, back pack pumps, machetes, etc. and are on duty for 8 hours.

6. Mapping

The preparation of effective fire plan maps covering all firebreaks, fire towers, lookouts and natural features is underway for all company plantations. Maps have strategic and tactical use in helping to locate fire occurrences so as to know the convenient route to access and the best approach to tackle them.

7. Community involvement in fire reporting and fighting

A good cooperation is maintained between the villager community around the project areas and the forest workers/staff. Chains of command have been established so as to provide quick responses to fire messages. In GRL, communication has been made easy through radio calls and walkie-talkie receivers. Sirens will be installed at the project offices and others mounted in fire vehicles. Relevant village government offices will also have sirens to alert communities. Villagers will be asked to report fire incidents to responsible persons.

8. Training fire fighters

Volunteer fire fighters, standby crews, fire tower men and any potential groups are given some training about fire prevention/fighting. Trainings are conducted before the dry season usually around April. Controlled burning is also another opportunity for training standby crew and other workers, which has been identified as a major cause of fire in plantations if poorly managed.

9. Fire fighting tools and equipment

Fire fighting tools and equipments have been put in place. These include back pack pumps, fire beaters, walkie-talkie radios, binoculars, water tanks, motor grader, water bowsers and tractors to pull bowsers, trucks to transporter fire fighters, etc. In case of large fires, more people involved will mean more tools and equipment have to be deployed.

10. Recording and replanting of damaged area

All fire incidences are properly recorded with detailed information regarding the incidence including cause/source of fire, species affected, areas destroyed, etc. In addition, plans are immediately put in place to replant all damaged areas if 30% or more of the area is destroyed.

11. Working with Local Community to Reduce Fire Risk

GRL has been working with community to provide training on the risk of fire, and encourage them to reduce their practices of starting fires for hunting purposes. This

is also in their best interests as it puts not only the GRL plantations at risk, but also their own community woodlots.

Mitigation measures
Mitigation measures being applied at UFP and MFT are considered best practices and adapted to the specific risk (fire), which carries a score of 4.

Management system
Uchindile and Mapanda Forest projects have in place a documented management system, capable of identifying risk with and established targets for reducing them. Procedures have been developed and responsibilities are well assigned with internal auditing, reviews and training in place. Hence the score for this parameter is 4 according the VCS AFOLU tool for non-permanence risk analysis and buffer determination.

Calculation of Total Risk

$R= L \times S \times [1 - (C \times M)/16]^{10}$

Uchindile
L= 0.4, S=3, C= 4, M= 4
$R = 0.4 \times 3x [1- (4 \times M)/16]^{10}$
R = 0

Mapanda
L= 0.1, S= 114,063t CO_2, C= 4, M= 4
$R= 0.1 \times 3x (1-(4 \times 4)/16)^{10}$
R= 0

Internal Audit Procedures for fire prevention and management:

Fire training is conducted annually by the fire brigades from Iringa. The plantation managers conduct routine inspections of the fire crew regarding the training that was given by the brigade. He also inspects the fire fighting tools and equipments and checks the fire lookouts are being properly manned. The manager inspects early controlled burning – to check that roads (when roads also serve as fire breaks) and other fire breaks are managed in a proper and timely manner as described in the management plan. He also inspects the standby fire crew and working tools and equipments are in proper working condition.

The GRL planning manager conducts internal audits as he visits the plantation to check what is written in the fire control plan does take place.

The fire plan has been reviewed to include new fire detection and reporting technique that uses compass direction translated into local language for easy communication. The fire crew can tell the direction and distance of where fire is burning and so help to direct resources to the right direction quickly.

Conclusion

Based on the above analysis and in light of our rapidly advancing fire fighting capability over the last three years, which virtually saw no incidence of fire, it is evident that fire risk likelihood is likely to be reduced to not more than once in 20 years (0.05) and with little or no significant impact due to the ability to suppress outbreak quickly and minimize damage to plantation stands caused. The calculation of risk for both UFP and MFP indicates zero, meaning the expected risk class for the plantations is **low**.

Natural Disturbances: Pest and Diseases

Description of the possible pest/diseases for plantations in the region.

The following aphids are found in Kilimbero and Mufindi regions and pose risk to plantation: Pine Needle Aphids (PNA), Pine Wooly Aphids (PWA) and Black Pine Aphids (BPA). Since planting started at UFP and MPF, aphids have only been observed at UFP, which was in 2004 in some of the pine stands. At MPF Black pine aphid were observed but there is no damage to the stand observed to date.

Description of pest/disease outbreak to date and how they were managed:

Uchindile Forest Project.

Giant Conifer aphids were observed in some of the pine plantations in July 2004. An expert was invited from Kenya Forestry Reserch Institute (KEFRI) and identified the aphids as Pine Needle Aphids (PNA), Pine Wooly Aphids (PWA) and Black Pine Aphids (BPA). In his report the expert advised that the aphids be checked again at the peak of drought in September/October. However, there was rain in August of the same year and during inspection in October, the aphids were not seen. Symptoms of Pine Needle Aphids (yellowish ring on different parts of leaves) were observed again in March 2006 but neither infestations nor aphids were observed. Monitoring of the aphids in the plantation is continuing on a daily basis by using plantation patrolmen and during PSP measurements. Whenever a situation is noticed, an external expert is invited for assessment to appraise and give advice.

Mapanda Forest Project.

Since the project started, only symptoms of Giant conifer aphids namely; Pine Needle Aphids (PNA), Pine Wooly Aphids (PWA) and Black Pine Aphids (BPA) were observed in 2006 without any damage to the plantations. Field check ups show that in some areas of the young eucalyptus plantation there is stunted growth in *E. saligna* especially on hilltops and flat lands. In such areas the trees' heights range from 0.7 to 1.8 or 2.0 m. This might be due to hardpans in the area or poor nutrient absorption caused by immobility of the soil nutrients due to hardpans. In *E.globulus* plantations the trees have leaf damage. The damage might be caused by fungus leading to botching. These are circular dry spots on the leaves. In the *P. patula* stand symptoms of black pine aphids were seen although there were no disease infestations. Monitoring at MFP is also continuing in the same vane as at UFP.

Measures in place to minimize/mitigate disease attack and pest outbreak.

Forest health is being monitored constantly through the following procedure:
The monitoring team that is responsible for data collection in the Permanent Sample Plots (PSPs) is also responsible for observation and detection of symptoms of pests and diseases as one of the monitoring parameters. Patrolmen are used to check the forest diseases and pests during the normal or routine works. When diseases or pests are detected, they are reported immediately to the Project Manager and the following is the chain of response:

- The Patrol Men report the incidence to Project Manager
- The Project Manager checks the situation and reports it to the Head Office
- From head office the Research Manager goes to the field to assess the situation of the infestations and informs Management of the steps to be taken
- If the infestations are not severe, the research manager informs management while more follow up of the disease is conducted
- If the infestation is severe the Research Manager reports to Management of the effect of the infestation and external expertise is sought as remedy to the situation.

Usually Tanzania Forest Research Institute (TAFORI) and/or Kenya Forestry Research Institute (KEFRI) experts (Entomologists or pathologists) are contracted to check the diseases or pests attacks.

To report and document disease outbreak, a special form called "Forest Health and Safety Monitoring" designed for that purpose is used. The form is also applicable for fire incidence reporting. Trained patrolmen are used to check the forest health during their routine work. When they sight any abnormality in the forest they report it to the project manager, who also goes to the place of the incident to assess the situation there. If it is found to be a serious case the project manager reports the occurrence to the head office at Mafinga. Then from head office a team of offiVCUs or the research manager goes to the respective project to assess the situation and if it is found to be a serious one he advises management to call in external experts to check the situation. The experts will then assess the situation and advise management accordingly. A document named 'Disease Control System for GRL Plantations' has been developed where the protocol for reporting and responding to disease is designed.

Overall the risk category is considered to be low, and the probability of incidents to be 10%. Following 10 years of implementation of the forest project at UFP/MFP there have been no incidences of pest and disease outbreak which has destroyed, or negatively impacted the growth of the forest stands. The only pests/ diseases which are know to occur in the area which effect forest plantations are described above, and none of these have a devasting effect on forest stands, rather they might affect the growth of the forest stand in the short term, until they are identified and treated.

Natural Disturbances: Extreme Climatic Events

In 2001, the Intergovernmental Panel on Climate Change (IPCC) did an assessment on the consequences of climate change and climate variability, namely the Third Assessment Report (TAR). The report stated that Africa is highly vulnerable to the various manifestations of climate change. This vulnerability assessment to climate

change is marked by high uncertainty. Table 1 summarizes the impacts of climate change on Africa.

Table 5: Summary of the most critical climate change impacts on Africa assessed by IPCC TAR

Affected systems	Impacts
Land degradation	- Arid and semi-arid areas are likely to increase in northern Sahara and southern Africa: by 5 – 8 % - 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 - Increase drought risk - Impacts enhanced by poor water management - Water stress
Natural resource management and biodiversity	- Forest ecosystems: species loss, extinction, dramatic shift or changes in species range and increased fire occurrence - Forest net primary production to decline in the long term
Human health	- Temperature rises: increased vectors of diseases such malaria - Sea level rises: increased cholera epidemics and other waterborne diseases

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

However, these impacts are based on Africa as a whole and are not specifically tailored to 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 assessment 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.
Possibly future climate change impacts to the region: erratic rainfall, prolonged droughts and severe winds etc. might affect growth and performance of trees. However, adaptive measures are always available through well-trained staff.

The probability of an extreme climatic event in the area which is damaging to the forest stands is 10 %. It is anticipated that the species being planted will be able to tolerate the range of predicted changes anticipated by the IPCC[6] due to wide genetic base. The pine and eucalyptus species which are being planted are quite resilient to probably changes in rainfall and temperature. The project is planting species which are robust in terms of adaptability and will be tolerant to changes in temperature and precipitation. The plantations are located in areas classified as dry forest with rainfall less than 1500 mm per annum. Most of these areas have short rainy season and long dry season with erratic rainfall patterns. The soil in these areas are mostly deep and fairly well drained but with good water holding capacity. The Eucalyptus species are

[6] IPCC Third Assessment Report, ch. 10, 2001.

known to have a deep root system. The species have survived in the environment for many decades. The species have also shown ability to withstand a long dry season of 2-3 years[7]. Hence, the potential to resist non-permanent drought at maturity is high, while the chance of permanent drought under the present climate change impact trend is unlikely in the next 20 years.

Natural Disturbances: Probability of geological risks

The African Plate is a tectonic plate which includes the continent of Africa, as well as oceanic crust which lies between the continent and various surrounding ocean ridges. This plate is rifting in the eastern interior along the East African Rift. This rift is a part of the larger Great Rift Valley – extending from Lebanon in the north to Mozambique in the southeast.
The East African Rift zone includes a number of active as well as dormant volcanoes[8]. As far as Tanzania is concerned the country is geographically located in a seismic zone and earthquakes occur periodically. The Ol Doinyo Lengai volcano is the only active volcano in Tanzania, and is located in the north close to Arusha (Geo Science World 2002).
There is no record of earthquake incidents, volcanic eruptions or landslides in the southern highlands of Tanzania during the last 100 years. However, minor mudslides on steep slopes as a consequence from heavy rains at the start of the rain season are anticipated but not of any major importance for the project activities.

Project Longevity and Commitment Period

The project has a long term commitment to reforestation. Reforestation and maintenance of productive and healthy plantations will take place at the UFP and MFP Forest Projects over 99 years which is the length of the lease for the land. As such covers the entire length of the carbon project (20 year commitment period which will be twice renewed). It is possible Green Resources will even be able to renew its lease beyond 99 years to keep the land reforested in perpetuity. Green Resources will reforest following harvesting, which will take place on after 11 years for pine and 13 years for eucalyptus.

Land ownership type

A summary of the land acquisition procedures in Tanzania as set out by government through the ministry of lands and human settlements, Tanzania

Mainland Tanzania is divided into 22 regions. Each region is administered under districts, responsible for developing a District Investment Profile, which is made

[7] *The Commercial Timbers of Tanzania*, J. M. Bryce, revised edition of 1999.

[8] *Seaward extension of the East African Rift*, letters to Nature 321, 599 - 603 (1986). *Location of the Nubia-Somalia boundary along the Southwest Indian Ridge*, Geology, Geo Science World 2002.

available to investors. The District is in charge of managing the Wards and Villages within its district boundaries.
All land is owned by the villages, divided into two main categories: general land, which is land that can be transferred for investment and; village land for own use. Each village is now required by the government to have its own Land Use Plan to ensure that all activities are allocated enough area and to ensure security of land tenure.
General Village Land can be given out for investment but should not be more than 33% of the total village land area. The following steps are followed in the acquisition of land by investors.
STEPS USED BY AN INVESTOR WHEN ACQUIRING LAND IN TANZANIA:

1. The investor sends an introductory letter to the District Commissioner (showing the company name, registration, total area requested in the district and land use). Copies of the letter are given to the District Executive Director, District Land Officer, District Land Surveyor, District Natural Resources Officer, District Agricultural Officer and the District Planning Officer (DPO) (has copies of the District Investment Profile). From the District Profile, the DPO will advise the investor of suitable land as per request.

2. The investor further submits an application letter to the Village Government Authority (VGA) through the Village Executive Officer (VEO). The letter will clearly state the total amount of land requested, company name, land use plan, etc.

3. The VGA will respond with comments/suggestions on the land use plan, area available and issues of community development. A discussion at this stage is initiated and an agreement reached on the suggested comments. Following this, the investor is invited to the Village General Assembly.

4. The Village General Assembly meeting has to be attended by the District Land Officer, Natural Resources Officer, District Land Surveyor, District Agricultural Officer, Ward Councilor, Ward Executive Officer, Division Secretary. A meeting is considered to have a quorum if 50% or more of all adults above 18yrs living in the village attends the meeting. (NB: Population figures are available at the DED office): The following are addressed in the Village General Assembly meeting:

    i) The VEO reads the application letter,

    ii) Minutes of the VGA meeting are read outlining the conditions/suggestions accepted by the would-be investor as well as how the project and community projects will be implemented,

    iii) Discussions and/or amendments as the case may be, development priorities setting, etc., are carried by the assembly,

iv) If an agreement is reached, a Village Land Allocation Committee (VLAC) is formed consisting of a maximum of 8 people, who will show the investor the land boundaries,

v) Minutes signed by all the villagers/participants and submitted to the DED and a copy to the investor.

5. A visit is then made to the area and an initial survey done producing a Sketch map and a rough estimate of the area. The visit is made by members of the VLAC, District Land Surveyor & the investors own Land Surveyor.

6. Following this initial survey, a District Valuer (DV) is sent by the District Land Officer to do a valuation of the land for compensation purposes. The visit is normally done in collaboration with the VLAC, who will confirm ownership of any properties in the land by the villagers. A valuation report will be given to the investor, who will be required to make payment to the District Land Office. The DC and DV in cooperation with the VLAC will then pay compensation to the displaced villagers/properties/crops. A receipt is then given to the investor as proof of compensation.

7. Following this, the investor then submits a letter to the DED copied to the DC, requesting that the District Land Acquisition Committee (DLAC) meet to discuss the application. (Minutes of all the above meetings as well as the sketch map and valuation report should be attached)

8. Following the DLAC meeting, a letter is written to the investor allowing for a full land survey. For land areas of more than 500ha, an approval has to be sought from the Commissioner of Lands requesting for a permission to survey the area. The letter has to be certified by the DED and District Land Officer, with attachments of the District Land Use Plan, business plan by the investor, a sketch map as well as minutes from all the above meetings.

9. Once permission to survey is granted, the job is given to a government registered land surveyor, who will after the survey, produce an approved survey plan (boundary map showing all the boundaries, beacons, etc.). NB: Following this, the investor can at this stage i) commission an ENVIRONMENTAL IMPACT ASSESSMENT, ii) start using the land as per the business plan.

10. The approved plan is then taken to the Land Officer for approval who then forwards it to the Commissioner of Lands to issue an offer. A letter of offer is issued and countersigned by the company Director or Lawyer. NB: The letter of offer should reflect the application and approved plan.

11. The last stage of the process is the submission of the offer to the Commissioner for Lands for a title deed. For forestry activities a title deed is normally valid for 99 years.

The main reference to this document is the Village Land Acts No.5 of 1999.

In conclusion Green Resources feels that the risk classification in relationship to land ownership type for this project is **low.** This is because of the complex, and thorough land acquisition process that must be followed, by both the district, national government, community and Green Resources Ltd to acquire the 99 year lease.

Financial Capacity

Due to equity private placements, the company is currently enjoying good solvency, guaranteeing that its long-term expansion plans and targets can be accomplished.

The following equity investments have been made during 2008 and 2009:
5.12.2008 equity private placement $ 22.7 millions by Phaunos Timber Fund
5.12.2008 convertible loan of 9.7 million by Phaunos Timber Fund
30.1. 2009 $2.18 m equity private placement

Please see enclosed press releases for further information, and also confirmation document from Price Waterhouse Coopers, the company auditors.

Equity capital of the company in March 2009 stands at: NOK 844 million. (see page 68 of company annual report) This shows last year's shareholders and equity and include that as well.

In addition the company has secured a loan from the International Finance Corporation (IFC) and is in the latter stages of discussions with Norfund to secure further investment.

Management Capacity

Green Resources has a well qualified and experienced management team in place to ensure that the Uchindile and Mapanda Forest Projects are implemented effectively. The company has senior local management with a track record in planting, forestry and carbon operations which are also supported by the management team at GRAS, who interact with them remotely, and visit the plantations every few months.

Below are the details of GRAS and local management team in place to run UFP and MFP.

Name and Job Title	**Summary of responsibilities, education and experience**
Mads Asprem *Managing Director GRAS*	**Responsibilities** Founder of Green Resources in 1995. Chairman 2004-6, Vice Chairman since 2006. Took over as Managing Director of Green Resources in 2006. **Education:** BSc in Economics Wharton School, USA, 1982. MBA University of Chicago, 1987. **Work Experience**: First VP, equity analyst and head of the

	global forest products and paper research team at Merrill Lynch 2000-2005. Managing Director and head of forest products and paper global research team of Morgan Stanley 1991-2000. Equity analyst CSFB 1990-1991.
Olav Bjella, Director *Forest Resource Management GRAS*	**Responsibilities:** In charge of the technical plantation development including support functions as seed procurement, nursery development, research, mapping, inventories and monitoring. Also in charge of FSC Certification, biological assets valuation and plantation reporting to the CEO and Board of Directors. **Education:** M.Sc. from the University Life Science in Norway from 1990 **Work Experience:** 20 years management and consultancy experience from Norway and East Africa.
Jenny Henman *Carbon Certification Manager GRAS*	**Responsibilities:** Oversees the carbon certification process for GRAS. This includes managing the research and writing of PDs, the validation process, implementation of monitoring plans and reporting, and verification. **Education:** Jenny holds a Masters in Environmental Studies from Brown University, USA, and a BA (Hons) in Geography from Durham University, UK. **Work Experience:** 5 years experience in development of forestry carbon projects and certification. • Joined GRAS in June 2008 • Sustainable Forestry Management (SFM) - Sustainable Development Programme Manager 2007-2008. • The Nature Conservancy – Climate Change Associate 2004-2006 • Research Institute of the Peruvian Amazon – 2003.
Maria Spink *Carbon Markets Manager GRAS*	**Responsibilities**: Joined GRAS June 2007 with responsibility for the Carbon Certification team, and sale of carbon credits. **Education:** MSc in Economics and Politics at the School of Economics, Helsinki Post Graduate Diploma in Geneva **Work Experience:** 1983-85 Assistant Lecturer at the School of Economics in the Department of Economics 1985-1990 capital markets group at Union Bank of Finland, Helsinki 1990 -2007 worked in capital markets and investment banking in London, mainly in positions related to Nordic client coverage
Jakob Sandven *Inventory and Monitoring Manager*	**Responsibilities:** Inventory and monitoring (costs, growth, etc,) of all our GRAS plantations in East Africa.

GRAS	**Education:** Msc in forestry science form the Norwegian University of Life Sciences. Masters research into plantations and growth and yield models in the Southern Highlands of Tanzania. **Work Experience:** 4 years in the Norwegian Army as an officer
Moses S. Ngegba *Carbon Manager GRL*	**Responsibilities:** Coordinates and supervises carbon certification processes for Green Resources in Tanzania including CDM, CCBA and VCS**.** Activities involve preparation of documentations relating to carbon certification including compilation PDs, preparation of PINs and general management of staff. **Education:** PhD Forestry, majoring in agroforestry and sustainable agriculture and MSc Forest influence and productivity- Sokoine University of Agriculture, Tanzania; BSc Agriculture- University of Sierra Leone **Work experience** - Joined GRL- Tanzania- January 2008 - *Director of Community Development*: Assemblies of God Church, Tanzania, 2006 -2007 - *Research Fellow*: Sokoine University of Agriculture, Tanzania (1999 – 2005) - *Conservator of Forest*: Division of Forestry, Ministry of Agriculture and Forestry, Government of Sierra Leone (1994 – 1998) - *Project Manager*:- Bread of Life Project, Freetown, Sierra Leone (1992 – 1994)
Aloyce Kimaryo *Project Manager Uchindile Forest Project, GRL*	**Responsibilities:** Manages human resource and coordinates project operations and preparation of documentations pertaining to forest management of UFP. Education: BSc Forestry- University of Dar Es Salaam and M.Ph from Bangor, University of Wales. **Work Experience:** - Joined GRL July 2007 - Programmes Manager, DANIDA –Mount Uluguru Biodiversity Programme- 2005 – 2007 - Monitoring and Evaluation Officer and Development Officer DANIDA Refugee Project, Tanzania- 2001 – 2005 - Project Coordinator- GTZ, Tanzania- 1998 – 2001 - Forest Manager in various projects in Tanzania, 1979 – 1998
Vincent Nambombe *Planning Manager, GRL, Tanzania*	**Responsibilities:** Planning and monitoring of project operations including the preparation of forest management plans for GRL and implementation of mini EIA (environmental impacts assessment); participates in land acquisition processes and community support and

	development activities of projects communities. **Education**: BSc Forestry (Hons)- University of Dar Es Salaam; Diploma in Training/Research in Agroforestry, ICRAF, Nairobi; Certificate in Planning and Implementation of Forest Projects for Developing Countries- Helsinki, Finland; Certificate of Training Techniques Course in London, UK **Work experience** - Join GRL in 2004 - *Consultant*:- in Energy, Environment and Land Use activities (2002-2003) - *Plantation Manager*:- Escarpment Forestry CO. Ltd (1997-2002) - *Technical Advisor/Specialist*:- in agroforestry and forest conservation:- Lushoto District, Tanga Region and Mbinga district, Ruvuma Region (1987-1994) - *Forest Planning Officer*: - Forest Department, Ministry of Natural Resources and Tourism, Dar Es Salaam (1983-1986) - *Lecturer*:- in Forest Management and Wood Technology:- Forestry Training Institute, Olmotonyi, Arusha (1977-1983
Sangito Sumari *Managing Director, GRL*	**Responsibilities:-** Overall in-charge of GRAS operations in Tanzania, managing human and material resources **Education**:- MSc Community Economic Development- Southern New Hampshire University, USA; BSc Forestry, Sokoine University of Agriculture; Diploma in Beekeeping, Tabora, Tanzania **Work experience:** - Join GRL in August 2008 as Managing Director - *Manager Director*- Sao Hill Forest Plantation, Tanzania (2 years) - *Project Manager*- Kilimajaro Forest Plantation, Tanzania (10 years) - *Lecturer*- Forest Training Institute, Olmotonyi, Tanzania (7 years)
Sylvester Luwagila Project Manager, GRL	**Responsibilities:-** Overall management of project operations and human resources including planning, implementation overall supervision of activities. **Education:-** MSc Forestry for Sustainable Development, ITC College, The Netherlands (2004), BSc Forestry- Sokoine University of Agriculture (1996) **Work experience** - Joined GRL 10 years ago and held various positions - Project Manager, Escarpment Forest Limited, Tanzania

	(1997 – 1999)
Mwaniki Gibuini *Group Development Director, GRL*	**Responsibilities:-** Leads the process of identifying and implementing new projects in the Group companies including acquisition of new areas for forestry projects, implementation of on going and new company projects as well as community development projects. **Education:-** MSc Forestry Dar es Salaam University; BSc Forestry Makerere University and several professional courses and training **Work experience** - *Managing Director* of Sao Hill Industries Ltd and Green Resources Ltd (2004 – 2008) - *Private Consultant* in forestry especially in the field of renewable energy (2000 – 2004) - *Director* of the largest wood industrial processing and marketing company in East Africa, a private company (1985 – 1999). - *Forester in* the Ministry of Environment and Natural Resources in Kenya. 1973 - 1985 - Responsibilities included conservation of forests, watersheds and wild life, establishment and management of industrial plantations, fire protection, establishment and maintenance of infrastructure and training of personnel.
Peter Mussami *Forest Plantations Research Manager, GRL*	**Responsibilities:-** Designs, manages and reports on all biophysical research projects pertaining to the plantations of GRL, including monitoring and inventory works. **Education:** Ph. D. in Plant Sciences at University of Budapest, Hungary; M. Sc Forestry, University of Forestry and Timber Industry, Sopron, Hungary. **Work experience** - 6 years working in plantation forest as Plantation Research Manager (2003 to date) - 19 years working in senior management positions in forest industries in Tanzania (1983 – 2002).
Peter Myegeta *Chief GIS & Mapping Officer: GRAS*	**Responsibilities:** Group-wide leader in GIS and Mapping operations for Tanzania, Uganda and Mozambique. Technical duties include developing and managing GIS in Forest Management, undertake land acquisitions for forest plantations in Tanzania and managing spatial manipulations for climate change Projects. **Education**:- BSc (Hons) Geomatics, University of Dar Es Salaam (1996 – 2000), with extensive knowledge of ESRI products, remote sensing techniques, spatial modeling, GPS surveying and computations and land information systems

Work experience

- Joined GRAS in May 2007
- GIS and Laboratory Manager: African Mining Consultancy – DR Congo: Dec 06 – Aug 07
- MIT Spatial Data Specialist: Barrick Gold Corporation, Tanzania, Dec, 2005 – Dec 2006
- GIS & Database Administrator: Geita Gold Mining Ltd, Tanzania: July20 01 to Sept 2005
- GIS Officer: Green Growth Ltd, Dar Es salaam, Tanzania Date: June, 2000 to July 2001

Future Income

GRL has management plans in place for Uchindile and Mapanda Forest Projects, namely:
Forest Management Plan for Uchindile Forest Project, Revised Edition 2007
Forest Management Plan for Mapanda Forest Project, Revised Edition 2007.

These are both being implemented, and have both been reviewed as part of the FSC certification process.

Future/ current opportunity costs -summary of baseline study for Uchindile/Mapanda

The past, current and likely alternative uses are unmanaged grassland – with no related income. The baseline assessment found two main alternative future land use scenarios:

a) Leaving the unmanaged grasslands undisturbed or;
b) Reforestation without carbon funding

The lands to be reforested within the project boundary are unmanaged grasslands occupied by scattered trees and shrubs. As elaborated in the VCS PD (see section C.5), due to the barriers in finance, technique and institutional barriers, the only realistic and credible alternative available to is to continue the current land use as grassland. No natural regeneration potential for trees or shrubs is identified within the project activity boundary. This is principally because of the continuous fire regimes which stop trees from regenerating, coupled with the degraded nature of the soil, and aggressive grasses which prevent trees from growing. As such there is no natural tree regeneration being experienced at Uchindile and Mapanda. .
As described in Section C.5 of the PD, the project lands are located in remote areas which are not attractive for timber markets especially for small scale ARR CDM project activity. The technical capability and economies of scale does not permit small farmers/individuals to carry out reforestation themselves. As described in Section C.5.2 of the PD it is difficult to secure commercial loans from commercial banks for reforestation activities due to a long moratorium period until harvesting. As such, the continuation of the current situation as unmanaged grassland is seen as the most likely alternative land use in the absence of the project.

Stakeholder Participation

As documented in the UFP/MFP PD there has been extensive stakeholder consultation. This is also discussed in the section on land acquisition, as this itself is a process which involves considerable community consultation.

The villagers have been involved since the early stages of the project development, and are continuously informed about project activities and plans. The project has followed the FSC procedures for stakeholder consultation, and additional monitoring is also being put in place in accordance with the CCBA PD Community Monitoring Plan.

Stakeholders have the opportunity to have their say and give suggestions. The project has carried out extensive stakeholder consultation[9] 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. Villagers employed by GRL are trained on environmental conservation, diseases, pests and other risks.

Table 6 Overview of Consulted Stakeholders.

Stakeholders at local level:	**Name:**
Uchindile Village Chairman	Humphrey Matimbwi
Uchindile Station Master	Mr. James
Uchindile Dispensary	
Mapanda Primary School Head Teacher	Calvin George
Lutheran Church Priest	Ole Kimaia
Chogo Primary School Assistants	Joseph Kinyunyu Robinson Lufyagile
Chogo Dispensary	Dr. Sanga
Chogo Village Chairman	Mr. Kitinusa
Chogo Village Executive Officer	Ayubu Kiwelu
Stakeholders at National and District level:	
Tanzania Tree Seed Agency (TTSA)	
Regional Water Supply Office	
Regional Forest Officer – Iringa	
Tanzania Electricity Supply Company (TANESCO) – Mafinga	
National Social Security Fund (NSSF) – Mafinga	
Tanzania Revenue Authority (TRA) – Mafinga	
District Commissioner – Mufindi	
District Executive Director (DED) – Mufindi	
Natural Resources Office – Mafinga	
Land Development Officer - Mafinga	
Mufindi Environmental Trust – Mafinga	
Sao Hill Forest Project (SHFP) - Mafinga	

[9] Socio Economic Impact Assessment Report (1999; 2003; 2006; 2007), Stakeholders' awareness report (2008). All reports available upon request.

Determination of Buffer

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

Green Resources AS (GRAS) pledges in its Annual report and mission statement that it will continue to plant and replant forest until the end of its 99-year lease period for the above forest projects.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The company at the time- then called Escarpment Forestry Company)- employed SGS at the start of the project in 1998 to undertake carbon modelling of the project.(see separate note on the inception of the project)

The SGS carbon verification report was finalised in 2006 with a SAVER of 234,000 t Co2eq for the period 1997-2005.These ERs have not been used as the company decided to work on CDM validation in the hope that the two known non-compliant factors could be overcome. These factors were the lack of a forest threshold definition in Tanzania and the start date of the forestry project. Both however have not been resolved for CDM and it is thus for these reasons the project is now entering VCS certification.

1.14 Project rejected under other GHG programs (if applicable):

Projects rejected by other GHG programs, due to procedural or eligibility requirements where the GHG program applied have been approved by the VCS Board; can be considered for VCU but project proponents for such a project shall:

- clearly state in its VCS PD all GHG programs for which the project has applied for credits and why the project was rejected, such information shall not be deemed commercially sensitive information;

Uchindile/ Mapanda Forestry project was put forward for CDM validation in 2007. The project was withdrawn from CDM Validation due to its ineligibility for CDM because of its early start date, and the fact that the DNA of Tanzania has not registered a forest definition with the UNFCCC. These constrains are not applicable under the

VCS, as documented in section 1.6 of the VCS PD, and in section C.1 of the CDM PD.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

1.17 List of commercially sensitive information (if applicable):

Any commercially sensitive information that has been excluded from the public version of the VCS PD that will be displayed on the VCS Project Database shall be listed by the project proponent.

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

Projects shall use one of the VCS program approved project methodologies and provide information relevant to methodology deviations or methodology revisions.

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

The project proponent shall select the most reasonable baseline scenario for the project. This shall reflect what most likely would have occurred in the absence of the project.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

The project proponent shall in the VCS PD, in addition to describing how the project meets the VCS methodology, demonstrate that the project is additional based on one of the tests, the project test, the performance test, and technology test.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

- *Purpose of monitoring*
- *Types of data and information to be reported, including units of measurement*
- *Origin of the data)*
- *Monitoring, including estimation, modelling, measurement or calculation approaches*
- *Monitoring times and periods, considering the needs of intended users*
- *Monitoring roles and responsibilities*
- *Managing data quality*

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Describe each data and parameter using this table.

Data / Parameter:	
Data unit:	
Description:	
Source of data to be used:	
Value of data applied for the purpose of calculating expected emission reductions	
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	

3.4 Description of the monitoring plan

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

4.3 Quantifying GHG emissions and/or removals for the project:

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

See ISO 14064-2: 5.2.k for quantifying GHG emission reductions or removal enhancements.

5 Environmental Impact:

A summary environmental impact assessment when such an assessment is required by applicable legislation or regulation

6 Stakeholders comments:

Relevant outcomes from stakeholder consultations and mechanisms for on-going communication.

7 Schedule:

Chronological plan for the date of initiating project activities, date of terminating the project, frequency of monitoring and reporting and the project period, including relevant project activities in each step of the GHG project cycle.

8 Ownership:

8.1 Proof of Title:

Provide evidence of proof of title through one of the following:

- *a legislative right;*
- *a right under local common law;*
- *Ownership of the plant, equipment and/or process generating the reductions/removals;*
- *A contractual arrangement with the owner of the plant, equipment or process that grants all reductions/removals to the proponent*

Please see section A.4.3. of the CDM PD.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Project proponents of projects that reduce GHG emissions from activities that:

- are included in an emissions trading Program; or
- take place in a jurisdiction or sector in which binding limits are established on GHG emissions;

shall provide evidence that the reductions or removals generated by the project have or will not be used in the Program or jurisdiction for the purpose of demonstrating compliance. The evidence could include:

- a letter from the Program operator or designated national authority that emissions allowances (or other GHG credits used in the Program) equivalent to the reductions/removals generated by the project have been cancelled from the Program; or national cap as applicable or;
- purchase and cancellation of GHG allowances equivalent to the reductions/removals generated by the project related to the Program or national cap.

This is not applicable to this project. Project Participants have signed a declaration stating that no double counting has or will take place.