



**MONITORING REPORT**

**January 2015**

Compiled by:

Nizar Kilale & Hans Lemm

## **Table of Contents:**

1	Introduction .....	3
1.1	20 Years Past, Present and Future .....	4
2	Monitoring .....	5
2.1	Plantation monitoring .....	5
2.1.1	Extent of the plantations .....	5
2.1.2	Permanent sample plots - PSP .....	8
2.1.3	Soil evaluation .....	10
2.1.4	Forest production .....	10
2.1.5	Forest inventory.....	11
2.1.6	Herbicide use .....	12
2.2	Environmental monitoring .....	12
2.2.1	Biological biodiversity .....	12
2.2.2	Water quality .....	13
2.2.3	Areas of Special Interest – ASI .....	15
2.2.4	Red data species protection .....	16
2.2.5	Performance auditing .....	17

## 1 Introduction

KVTC teak plantations are interlinked with natural indigenous areas; these include evergreen forests, open to dense miombo woodlands, rivers, wetlands and grasslands with scattered trees.

KVTC is committed to maintain a high level of biodiversity within its landholding and believes this represents a value both to the business and to the communities surrounding the project.

This report contains the various plantations, social and environmental monitoring activities and also reflects the present condition of the plantations.

This publication is public domain to allow interested persons to be informed on the achievements and the impact of activities on people and the environment at KVTC.

For and on behalf of

KILOMBERO VALLEY TEAK COMPANY LIMITED

Hans Lemm

General Manager

## 1.1 20 Years Past, Present and Future

In 2012 a new era was entered into after the company has evolved over two decades. This seemed therefore an opportune time to pause and reflect on progress and achievements over the last 20 years.

KVTC Timeline:

---

### 1990

In 1990 a joint Overseas Development Administration and the Commonwealth Development Corporation (CDC) reconnaissance mission generated the initiative for a plantation development in Tanzania. CDC and the forestry division of the Tanzania Government discussed the possibility of CDC taking over the management of the existing teak plantations in Tanzania. During these discussions it was decided that it would be preferable for CDC to develop its own plantations in accordance with the Tanzania Forest Action Plan which identifies the need for private sector investment in commercial hardwood plantations.

---

### 1992

In 1992 CDC, now CDC Group Plc, established the Kilombero Valley Teak Company (KVTC) Limited, based on a 99 year lease with the Government of Tanzania. KVTC obtained leasehold rights in 1992 to practice forestry on 28,132 ha of land. The first stand of *Tectona grandis* was planted in December 1992.

---

### 2001

The Finnish Fund for Industrial Cooperation Ltd. (Finnfund) acquired a 23% shareholding in KVTC.

---

### 2004

KVTC achieved certification to the ISO 14001:2004 environmental management system for the first time.

---

### 2008

100 Hectare of land for a processing plant, new nursery and residential developments was allocated to KVTC in 2008.

---

### 2009

Construction of the processing plant was completed and the production and exporting of lumber and value added products commenced in 2009. KVTC achieved certification compliancy to the SGS TLTV system for the first time.

---

### 2010

KVTC was the largest single exporter of wood products from Tanzania

---

### 2011

The Global Environment Fund acquired the 77% shareholding from CDC, and Finfund retained its 23% shareholding. The final establishment of teak compartments and the first re-planting of second rotation stands were completed in this year. ISO 14001 and OHSAS certification were integrated, re-certification was achieved and the company received OHSAS certification for the first time.

---

### 2012 onwards

To date a total area of 8,150ha has been established with teak since the establishment of the company. No new areas are being planted, only replanting of clear felled stands will continue.

The company continues to grow with annual volumes from the plantations and sales revenue increasing year on year. KVTC is committed to maintain its leading role in the wood industry in East Africa as well as further to consolidate its position as one of the largest commercial teak plantation projects in the world.

Progress did not stop in 2012 and in 2014 the company has continued to make forward strides and its commitment to conservation in combination with running a profitable business continues.

In 2014 KVTC underwent three separate FSC audits:

- 1) FSC Forest Management Main Assessment
- 2) FSC Chain of Custody Main Assessment (*FSC STD 40-004 V2-1: FSC standard for Chain-of-Custody certification and FSC STD 40-005 V2-1: Company Evaluation of Controlled Wood*)
- 3) FSC Controlled Wood Main Assessment (*FSC-STD-30-010 V2-0*)

As expected the company did not qualify for the main FSC certification due to its history of conversion but aside of this shows good compliance to the other Principles and Criteria of the FSC Standards.

From mid-2013 onwards timber supplied from KVTC's plantations has been in compliance with the FSC Controlled Wood Standard and will be sold with a Controlled Wood statement.

## **2 Monitoring**

Monitoring and evaluation of forest and environmental conditions is continuously and adapting to the approach of managing the plantations. KVTC implemented a range of plantation and environmental monitoring activities aimed at collecting different types of information, these methods are depending on the FSC, OSHAS18001 and ISO 140001 principles and guidelines.

### **2.1 Plantation monitoring**

The principle objective for the establishment of teak plantations was to establish teak on approximately 30% of the total land holding and to place the balance 70% of the land under a rigorous conservation regime.

To achieve this monitoring is undertaken in the plantations according to a set of standards and progress is measured over time. These subjects are covered in detail in the following paragraphs.

#### **2.1.1 Extent of the plantations**

Over time, since 1992, the teak compartments have been established in a mosaic pattern and are embedded into the natural landscape. The block design and mosaic pattern provides for wildlife corridors and buffer zones.



**Figure 1:** View of plantation and buffer mosaic from fire lookout tower.



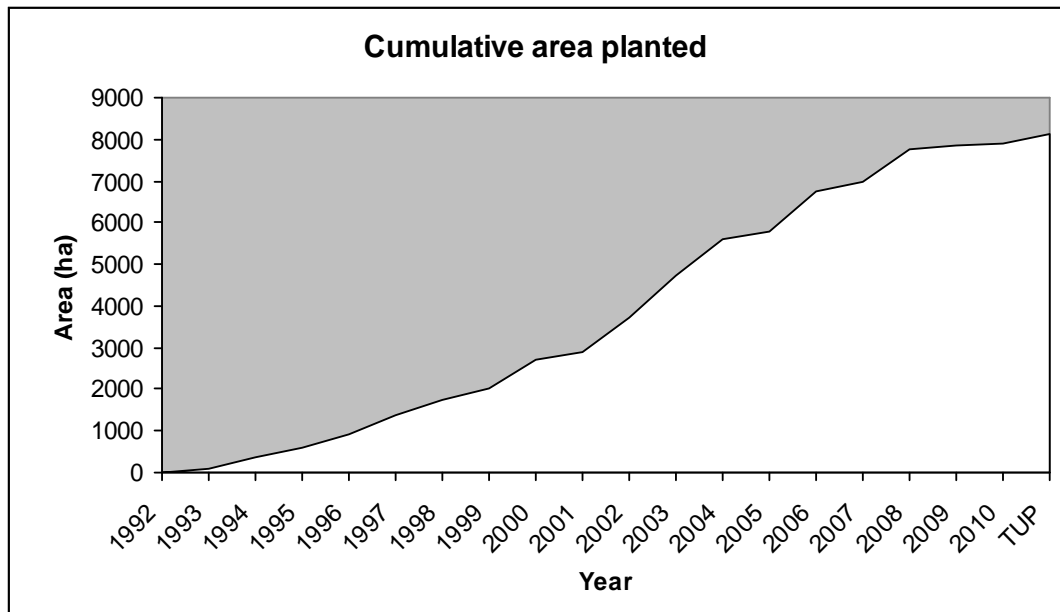
**Figure 2:** High biodiversity buffer zone neighbouring a teak stand in Mafinji plantation.

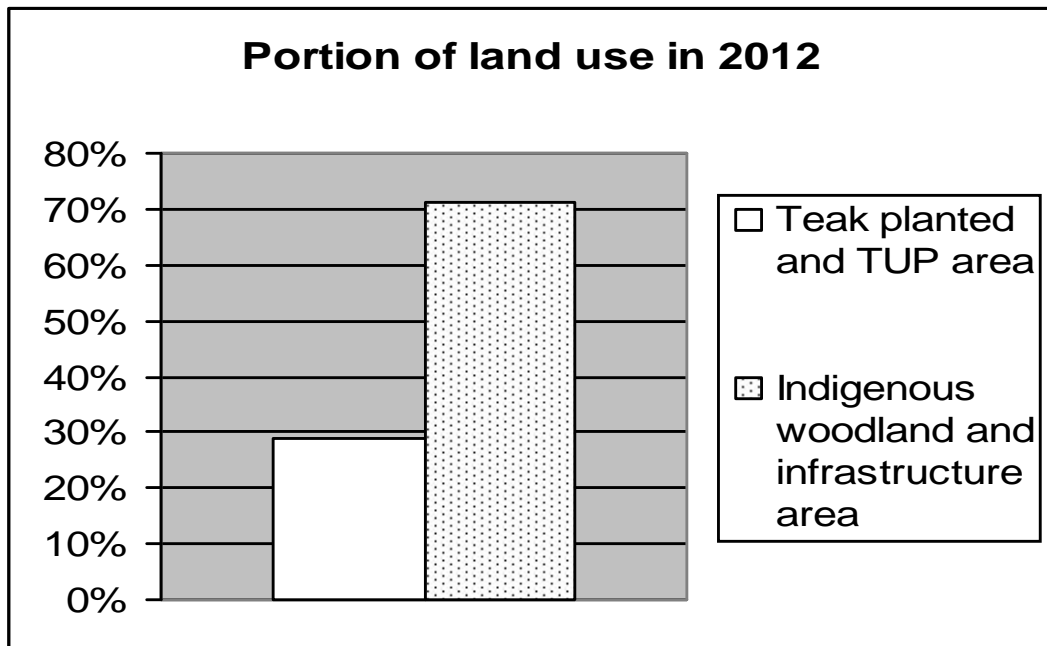
**Table 1:** Breakdown of land use of KVTC's landholdings per plantation.

Land use category	Blocks				Total
	Narabungo	Ichima	Nakafulu	Mafinji	
Established Teak Plantation	709	730	3,619	2,937	7,995
Other species research plots	6	13	0	3	21
Temporarily unplanted (TUP)	71	0	0	0	71
<b>Total</b>	<b>715</b>	<b>742</b>	<b>3,619</b>	<b>2,940</b>	<b>8,016</b>
Potential evergreen and riparian forests	174	255	490	880	1,799
Dense Miombo	452	807	1,591	930	3,780
Open Miombo	634	654	3,659	1,429	6,261
Grassland	72	156	5,686	1,966	7,880
Roads and other infrastructure	15	23	126	68	347
Power Lines (TANESCO)	49	0	0	0	49
<b>Total</b>	<b>1,396</b>	<b>1,895</b>	<b>11,552</b>	<b>5,273</b>	<b>20,116</b>

Summary	Narabungo	Ichima	Nakafulu	Mafinji	
Teak planted and TUP area	715	742	3,619	2,940	8,016
Indigenous woodland and infrastructure area	1,396	1,895	11,552	5,273	20,116
Certificate of occupancy	2,112	2,636	15,171	8,212	28,132

From the table and the graphs it becomes clear that the plantations of KVTC cover 29% of the total land holding and indigenous woodlands and other infrastructure areas cover 71%.





### 2.1.2 Permanent sample plots – PSP’s

In order to collect sufficient time series data on the growth of teak for use in the development and calibration of growth and yield models, KVTC has established a comprehensive system of PSP’s. A total of 122 PSP’s was established over the range of growing sites and age profile at KVTC.

An 11.28 meter circle plot (0.004 of a hectare) is established in the selected area in a compartment. All trees are marked individually with a permanent marking paint.

All trees are measured for DBH and 4 pairs of 4 trees each are assessed for height. The height pairs are selected for their height classes’ e.g. small, medium, large, and very large within the PSP plot. These plots are assessed and measured on a yearly basis and the data electronically captured and stored in a database for further analysis.

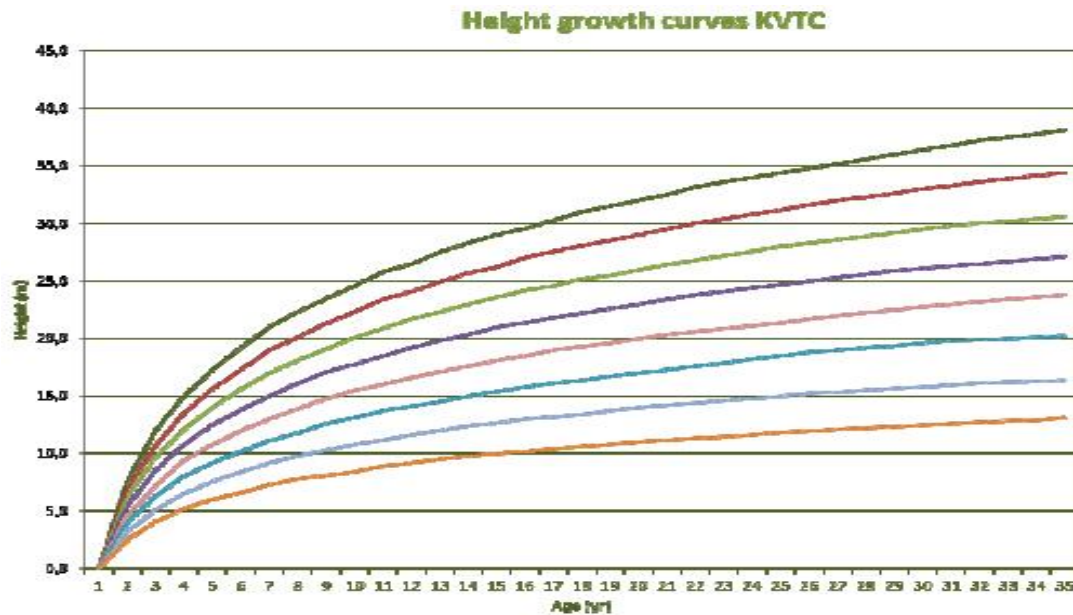




**Figure 3:** Marked trees forming part of a Permanent Sample Plot (PSP).

**Table 2:** Number of Permanent Sample Plots (PSPs) established per year at KVTC since initiation of operations in 1993.

Plant year	No. of PSP
1993	3
1994	9
1995	10
1996	8
1997	8
1998	8
1999	7
2000	8
2001	10
2002	10
2003	13
2004	9
2005	7
2006	7
2007	1
2008	4
<b>Total</b>	<b>122</b>



**Figure 4:** Growth curves based upon data collected from Permanent Sample Plots (PSPs) on eight different growth site classes.

### 2.1.3 Soil evaluation

When comparing the mean growth of teak between different sites, soil is the most influential factor to understand for further improved insight and management intervention.

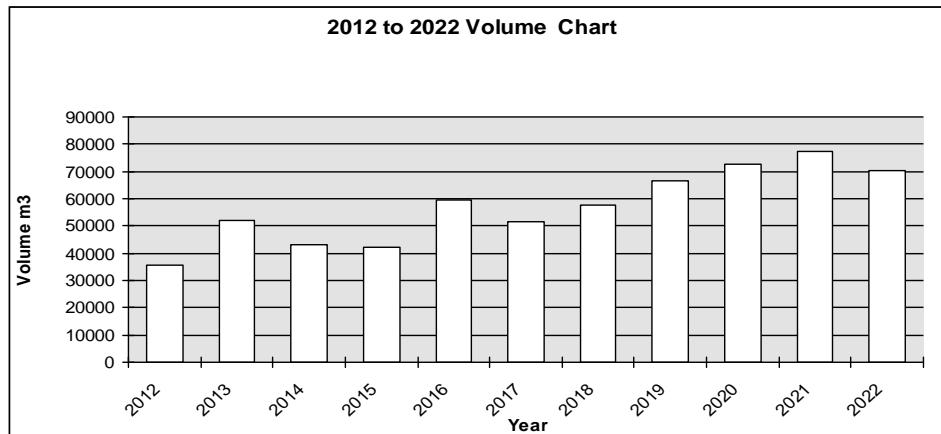
Teak being such a soil-sensitive tree, a soil monitoring and evaluation program was implemented in order to get a better understanding of growing site conditions and performance. The results of the ongoing evaluations lead to more accurate growth predictions, as well as better management regimes and fertilizer strategies.

Results of the soil analyses are in analytical report form and comparisons are done between different areas to identify factors influencing tree performance.

In 2014 the company undertook a larger soil study to develop a broader classification of growing zones. The result of this work has been incorporated in management plans.

### 2.1.4 Forest production

The annual allowable cut is determined through the Microforest system by running a simulation with the Harvest Scheduler Simulator - HSS. The annual allowable cut is the utilisable volume that can be harvested each year without compromising the long term sustainable timber supply. This is expressed as cubic meter (m<sup>3</sup>) per year and takes into consideration the current stands with their unique parameters and management regimes. The optimum sustained volume is an indication of business sustainability and maximum volume production.



**Figure 5:** Harvest Scheduler Simulator (HSS run - 26 March 2012) output showing annual allowable cut over the next 10 years.

### 2.1.5 Forest inventory

Forest inventory is a high precision operation. Future management decisions, forecasts and volume estimates are based on data that the enumeration teams collect. KVTC uses circular plots for forest inventory work, although special circumstances may require other types of inventory.

- The required radius of circular plots is 12.6 m (giving a 500 m<sup>2</sup> plot).
- A ratio of **two plots per hectare** is used giving a sampling intensity of 10%.
- All DBH's per plot are measured, excluding dead trees and regeneration.
- The minimum number of plots per compartment is equal to 10% of the area.
- At least 30 DBH/height pairs per compartment, or two pairs per plot (whichever is the greater) are measured. To ensure an unbiased selection of trees for height measurements, the two trees closest to the plot centre are selected.



**Figure 6:** Diameter at Breast Height (DBH) measurement being conducted using Masser Calliper during an enumeration exercise.

### **2.1.6 Herbicide use**

The use of chemicals is controlled and a process of authorisation has to be followed according to set procedures. Only chemicals on the company's chemical approved list may be used. All chemicals have to be legally registered within Tanzania and conform to the chemical policy guidelines of the Forest Stewardship Council (FSC). Chemical spillage emergency procedures are in place and reviewed periodically. Chemical usage is continuously monitored through the "Job Instruction" process and records are kept; actual vs. planned consumption is compared per liter per hectare according to the prescription.

## **2.2 Environmental monitoring**

Environmental impacts caused by KVTC operations are monitored through the ISO 14001 Environmental Management System with continuous assessments and corrections are followed with the "Internal Action Request" process.

### **2.2.1 Biological biodiversity**

The company quantifies, manages and measures the effects on biodiversity through the ISO procedures which are implemented and based on operations that are directly linked to the aspect register.



**Figure 7:** Member of a resident Elephant herd near a buffer zone within the plantation.

The monitoring of and research on Biodiversity studies conducted are;

- Evergreen (plant) studies
- Biodiversity studies

Biodiversity base line studies:

- Biodiversity survey
- Butterfly survey
- Bird survey
- Mammal studies
- Miombo forest studies
- Water quality and flow rate

A summary of research and base line monitoring projects are listed in Annexure A.

### 2.2.2 Water quality

River water quality monitoring is being carried out in compliance with the FSC and ISO 14001 requirements. The monitoring sites are located throughout water courses that pass through KVTC land or could be affected by KVTC operations.

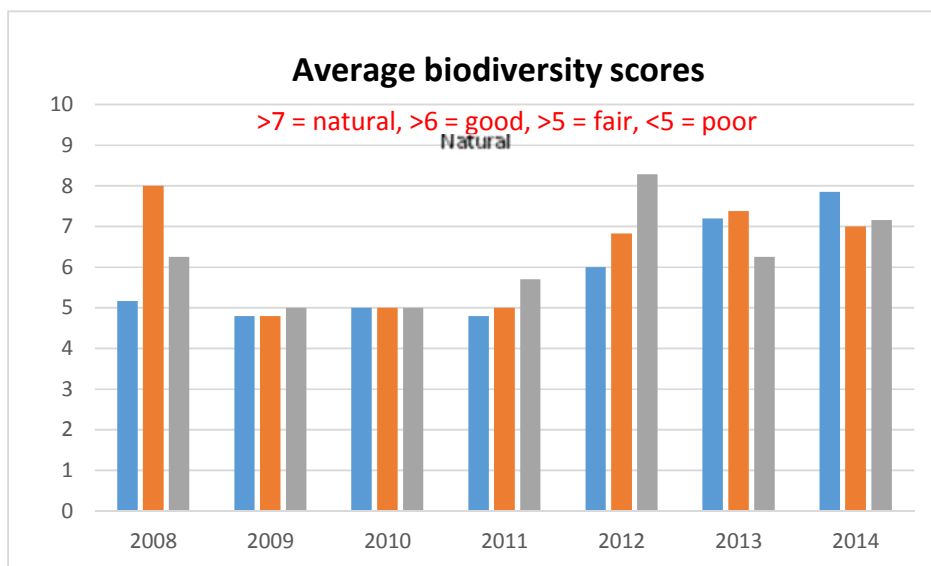


**Figure 8:** Identification of macro-invertebrates according to the Mini-SASS monitoring protocol.

Mini SASS (South African Scoring System) is used to measure the health of aquatic communities and the general quality of the water in those communities. Monitoring procedures based on the biota measure the health of a river and the ability of aquatic systems to support life, as opposed to simply characterizing the chemical and physical components of a particular system. Monitoring is done annually and the results of the rivers sampled in 2013 are tabled in Annexure C. The results of the monitoring between 2008 and 2014 at the Mafinji River appear in the graph below. Sampling has taken place at a different period each year as tabled below.

**Table 3:** Summary of timing of KVTC's river health sampling over last 7 years in terms of month and rainfall.

Year	Month	Season
2008	October	Dry
2009	November	Dry (end)
2010	December	Rains
2011	September	Dry
2012	May	Rains (end)
2013	June/July	Rains (end)
2014	September	Dry



**Figure 9:** Mini-SASS average scores of last five years of river health monitoring at three sites on Mafinji River.



**Figure 10:** Mini-SASS river sampling being carried out on Mafinji River.

### **2.2.3 Areas of Special Interest – ASI**

The KVTC Area of Special Interest (ASI) database is an archive of locations within the plantation that are significant for archaeological, historical, cultural, or environmental reasons. These locations warrant specific attention and/or management to preserve their integrity; annual monitoring is carried out in order to assess the status of each site, and to review the effectiveness of the prescribed management.

Monitoring was performed and the register updated during May and June 2012.



**Figure 11:** Potshards from a locality in Mafinji plantation designated as an ASI (Area of Special Interest) for its archaeological significance.

#### **2.2.4 Red data species protection**

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

Tanzania ratified the convention; and KVTC has identified species present on company land included on the CITES database.

The species included in Annexure B have been identified as species that are, or may be at risk of becoming extinct on a global or regional level. KVTC policies and procedures ensure that a safe habitat for all species living on company property is provided, whether they are at risk or not. This was achieved by limiting the modification of natural woodland only to areas where the impacts will be small and where mitigation is possible (such as leaving substantial natural corridors linking large habitat areas).

Comprehensive pre-felling assessments take all fauna and flora aspects of a particular area into consideration. This process has ensured that all species present has been able to continue living on KVTC land.

Individual trees identified within the property of KVTC for their aesthetic and genetic potential are protected and listed in the ASI register.





**Figure 12:** *Dalbergia melanoxylon* (Mpingo) tree in Narubungo plantation; this particular tree is listed in the ASI (Area of Special Interest) register.

### **2.2.5 Performance auditing**

#### **ISO14001 / OHSAS 18000**

ISO 14001: 2004 is an environmental management system that gives a clear commitment to environmental management of the organizations environmental impacts. In addition to setting the framework for monitoring, reporting and mitigation of all impacts, the system benchmarks KVTC with international standards.

OHSAS 18001:2007 is the International Occupational Health and Safety Management Standard, and is intended to address occupational health and safety (OH&S).

Implementation of OHSAS 18001 and integration with ISO 14001 has provided KVTC with a clear management structure with defined authority and responsibility, clear objectives for improvement, and with measurable results and a structured approach to environmental impacts and health and safety risk assessments.

This includes the monitoring of the environment and health and safety management failures, auditing of performance and review of procedures and policies and objectives.

#### **TLTV – Timber Legality & Traceability Verification**

Timber Legality & Traceability Verification (TLTV) is a concept of verification of compliance with agreed requirements in the forest and timber products industry and

trade sector. In comparison with Mandatory and Voluntary Legal Timber Validation , TLTV provides the “voluntary, company level” approach, which incorporates regular auditing, or continuous monitoring and verification of KVTC wood production and tracking information. Certification was first achieved in 2009 since the production of lumber and value added products commenced in the same year.

KVTC has discontinued using the TLTV Certification system from the end of 2013 following certification under the FSC Controlled Wood system.

### **FSC – Forest Stewardship Council**

The Forest Stewardship Council (FSC) is an international not for-profit, multi-stakeholder organization established in 1993 to promote responsible management of the world’s forests. Its main tools for achieving this are standard setting, certification and labelling of forest products. The organization aims “*to provide businesses and consumers with a tool to influence how forests worldwide are managed.*”

### **FSC –Forest Management**

FSC Forest Management certification confirms that a specific area of forest is being managed in line with the FSC Principles & Criteria. To achieve FSC Forest Management certification, the forest manager (or owner) contracts an FSC accredited certification body to carry out an assessment.

The main evaluation process is an in depth review of the forest management systems and their results on the ground. The certification body sends a team of experts to assess social, economic and environmental conditions at the forest being evaluated.

At the end of the evaluation, the assessment team reports to the forest manager any areas where management does not meet the applicable requirements, known as ‘non-conformities’. If these are minor non-conformities, the certification body can issue a certificate, on condition that actions will be taken to deal with the non-conformities. If these are major non-conformities, the certification body will not issue a certificate until the non-conformities have been solved.

KVTC strives to be in full compliance with the FSC FM standards however as a result of historic conversion it will not be possible to be certified under the FSC FM system.

### **FSC – Controlled Wood**

As an alternative to SGS’s TLTV system KVTC has adopted the FSC Controlled Wood system which is a system that ensures KVTC’s customers that forest products sourced from KVTC are from a legal origin.

Controlled Wood is material that can be mixed with certified material during manufacturing FSC mix products. This has enabled manufacturers to manage low and fluctuating supplies of FSC certified forest products, while creating demand for FSC certified wood.

Only materials from FSC-acceptable sources can be used as controlled. There are 5 categories of unacceptable material that cannot be mixed with FSC certified materials:

1. illegally harvested wood
2. wood harvested in violation of traditional and civil rights

3. wood harvested in forests in which High Conservation Values are threatened by management activities (HCVs are areas particularly worth of protection)
4. wood harvested in forests being converted to plantations or non-forest use
5. wood from forests in which genetically modified trees are planted.

### Audit Performance

Below table shows a historic overview of KVTC performance during various audits

System	CAR	2007	2008	2009	2010	2011	2012	2013	2014
ISO14001	Minor	0	2	0	5	N/A	N/A	N/A	N/A
	Major	0	0	0	0	N/A	N/A	N/A	N/A
OSHAS18001/ ISO1400	Minor	N/A	N/A	N/A	N/A	6	4	2	3
	Major	N/A	N/A	N/A	N/A	0	0	0	0
TLTV	Minor	N/A	5	4	0	6	0	N/A	N/A
	Major	N/A	0	0	0	0	1	N/A	N/A
FSC FM	Minor	N/A	N/A	N/A	N/A	N/A	N/A	13	5
	Major	N/A	N/A	N/A	N/A	N/A	N/A	3	3
FSC CoC	Minor	N/A	N/A	N/A	N/A	N/A	N/A	4	0
	Major	N/A	N/A	N/A	N/A	N/A	N/A	0	0
FSC CW	Minor	N/A	N/A	N/A	N/A	N/A	N/A	0	0
	Major	N/A	N/A	N/A	N/A	N/A	N/A	0	0
<b>Total</b>	<b>Minor</b>	<b>0</b>	<b>7</b>	<b>4</b>	<b>5</b>	<b>12</b>	<b>4</b>	<b>15</b>	<b>8</b>
	<b>Major</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>3</b>

## Annexure A

### Studies and base line monitoring projects performed at KVTC

#### Miombo

- Sustained forestry and harvesting on Miombo woodlands, Wildhorus Ltd.
- The establishment of the Miombo restoration research sites at KVTC, Wildhorus Ltd.
- Development of a system for evaluating the conservation value of the field layer flora, Wildhorus Ltd.
- Preliminary report on Miombo growth in the kilombero valley, Wildhorus Ltd
- The edge effect of teak plantations on surrounding Miombo woodland, Frontier (Tz).
- Literature review of the silviculture of suitable indigenous species for enrichment planting, Wildhorus Ltd.
- Edge effect & Permeability internal report (2004) Frontier (Tz).
- Miombo research information sheet, I-TOO.
- Classification of Miombo forest based on satellite images, I-TOO.
- KVTC-SAT-Inventory ( 2005), I-TOO.
- Indicators and tools for Miombo management, I-TOO.
- Field guide to trees and shrubs of KVTC , Frontier (Tz).

#### Wildlife

- Habitat selection of large mammals in evergreen forests, Miombo woodland and teak plantations Frontier (Tz)
- Large mammals and teak plantations in the Kilombero valley Frontier (Tz)
- The impacts of KVTC activities on wildlife Wildhorus Ltd
- Teak edge effect and permeability biodiversity and special variation descriptions Frontier (Tz)
- Permeability of the new fence design Frontier (Tz)

#### Hydrological

- Hydrological effects of the teak plantations of KVTC David F Scott

#### Social

- Community use of non timber forest products Frontier (Tz)
- Archaeological scoping assessment and heritage management practices for KVTC Mary Leslie & John Kimaro
- Archaeological heritage guidebook for protection and management of KVTC sites Mary Leslie
- The impact of KVTC on the livelihoods and hydrology of surrounding local communities Sokoine University
- Significance of forests in Tanzania (a KVTC study) Fran Sykes, Reading University

#### Commercial studies

- Assessing biodiversity in Miombo earmarked for teak plantations -2002 Frontier (Tz)
- Assessing biodiversity in Miombo earmarked for teak plantations -2003 Frontier (Tz)
- The ID and mapping of evergreen forest within areas earmarked for conversion to teak in 2004 Wildhorus Ltd
- Pests study 2003 TPCP
- Pre felling 2004 KVTC
- Teak growth models in Tanzania University of Stellenbosch
- Evergreen report 2005 Wildhorus Ltd
- Bio Diversity Report 2005 Wildhorus Ltd
- Pre Felling 2007 Frontier (Tz)

#### Monitoring

- Long term monitoring of large mammal movements Frontier (Tz)
- Social Economic Impact of KVTC Operations KVTC
- Habitat Quality Monitoring (Birds and Butterflies) Wildhorus Ltd
- Water quality monitoring at KVTC (mini SASS) Wildhorus Ltd
- Silviculture self assessments Doc. KVTC
- KVBS Pre-felling sites Audit Frontier (Tz)
- Baseline Biodiversity Survey In Miombo Woodland Frontier (Tz)
- Forest cover changes using satellite imagery dated 2002 and 2004 I-TOO

## Annexure B

Mammal Species		Cites list	Red data class
Latin name	Common Name		
<i>Orycteropus afer</i>	Aardvark	No	LC
<i>Papio cynocephalus</i>	Yellow Baboon, Nyani	Yes	LR/lc
<i>Cercopithecus mitis</i>	Blue monkey	Yes	LR/lc
<i>Syncerus caffer</i>	Buffalo, Nyati	No	LR/lc
<i>Potamocheru porcus</i>	Bush pig, Nguruwe poli	No	LR/lc
<i>Tragelaphus scriptus</i>	Bushbuck	No	LR/lc
<i>Madoqua sp</i>	Dik dik	No	LR/lc
<i>Cephalophus harveyi</i>	Harvey's Duiker	No	LR/lc,
<i>Taurotragus oryx</i>	Eland	No	LR/lc
<i>Loxodonta africana</i>	Elephant, Tembo	Yes	VU
<i>Crocuta crocuta</i>	Spotted hyena	No	LR/lc
<i>Panthera pardus</i>	Leopard, Chui	Yes	LC
<i>Hystrix cristata</i>	Porcupine	No	LC
<i>Redunca redunca</i>	Reedbuck	No	LR/lc
<i>Hippotragus niger</i>	Sable	Yes	LR/lc
<i>Phacochoerus aethiopicus</i>	Warthog, Ngiri	No	LR/lc
<i>Kobus ellipsiprymnus</i>	Waterbuck	No	LR/lc
<i>Kobus vardoni</i>	Puku anterope	No	LR/lc
<i>Equus quagga</i>	Zebra, Pundamilia	No	LC
<i>Panthera leo</i>	Lion, Simba	Yes	LC
<i>Redunca arundinum</i>	Southern Reedbuck	Yes	LR/lc
<i>Civettictis civetta</i>	civet	No	LR
<i>Hippopotamus amphibius</i>	Hippopotomus	No	LR/lc

Plant Species		Cites list	Red data class
Latin name	Common Name		
<i>Dalbergia melanoxylon</i>	African blackwood, Mpingo	No	LR
<i>Dombeya rotundifolia</i>	Mfukuluu	No	LR
<i>Khaya anthotheca</i>	Mkangazi,	No	VU
<i>Pterocarpus angolensis</i>	Mninga, African teak	No	LR

Bird Species		Cites list	Red data class
Latin name	Common Name		
<i>Balaeniceps rex</i>	Shoebill	Yes	VU
<i>Macherumphus alcinus</i>	Bat hawk	No	LR
<i>Polemaetus bellicus</i>	Martial eagle	No	LR
<i>Rhynchops flavirostris</i>	African skimmer	No	LR
<i>Poicephalus meyeri</i>	Meyer's parrot	Yes	LC
<i>Gallirex porphyreolopha</i>	Purple crested lourie	No	LR
<i>Tyto alba</i>	Barn owl	Yes	LR
<i>Asio capensis</i>	Marsh owl	Yes	LC
<i>Srix wosfortii</i>	African wood owl	No	LR
<i>Apalderma narina</i>	Narina trogon	No	LR
<i>Bycanistes bucinator</i>	Trumpeter hornbill	No	LC
<i>Bycanistes brevis</i>	Silvery cheeked hornbill	No	LC
<i>Campethera abigoni</i>	Golden tailed woodpecker	No	LR
<i>Campithera caulliautii</i>	Green backed woodpecker	No	LR
<i>Dendropicos frusescens</i>	Cardinal woodpecker	No	LR
<i>Dendropicos namaguus</i>	Bearded woodpecker	No	LR
<i>Ploceus burnieri</i>	Kilombero weaver	No	VU

Amphibian Species		Cites list	Red data class
Latin name	Common Name		
<i>Crocodylus niloticus</i>	Nile Crocodile	Yes	LC
<i>Chameleo dilepis</i>	Flap-Necked Chameleon	Yes	No
<i>Varanus albigularis</i>	White-Throated Savanna Monitor	Yes	No
<i>Varanus niloticus</i>	Nile Monitor	Yes	No
<i>Pelomedusa subrufa</i>	Helmeted Terrapin	Yes	No

### Annexure C

Sampling point											
2012		Mafinji Upper	Mafinji Middle	Mafinji Lower	Lumemo Upper	Lumemo Mddle	Lumemo Lower	Idete Middle	Idete Lower	Nakafulu Middle	Narungo Middle
Macro invertebrate group	Flatworms	-	-	-	-	-	-	-	-	3	-
	Worms	2	2	-	-	-	-	-	-	2	-
	Leeches	-	-	-	-	-	-	-	-	-	-
	Crabs/Shrimps	-	-	-	6	-	-	6	-	6	-
	Stoneflies	-	-	14	-	-	14	-	-	-	-
	Minnow mayflies	-	-	-	-	-	-	-	-	-	-
	Other mayflies	13	13	13	13	13	13	13	13	-	-
	Damselflies	4	4	4	-	-	4	4	4	4	4
	Dragonflies	6	6	6	6	6	6	6	6	6	6
	Bugs/beetles	7	7	7	7	7	7	7	7	7	7
	Caddisflies	9	9	9	-	-	9	9	9	-	-
	Trueflies	-	1	-	-	-	-	-	1	-	1
Snails	-	-	5	5	-	5	-	-	5	-	
Total score		41	42	58	37	26	58	45	40	33	18
Number of groups		6	7	7	4	3	7	6	6	7	4
Average Score		6.83	6.00	8.29	9.25	8.67	8.29	7.50	6.67	4.71	4.50
Ecological Modification Condition		Few	Few	Unmodified	Unmodified	Unmodified	Unmodified	Few	Few	Largely	Largely
		Good	Good	Natural	Natural	Natural	Natural	Good	Good	Poor	Poor