



**A Critical Assessment of the
Economic and
Environmental
Sustainability of the
Namibian Indigenous
Forest/ Timber Industry**

**LITERATURE
REVIEW
REPORT**

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ACRONYMS AND ABBREVIATIONS

CF	Community Forest
CITES	Convention for international Trade in Endangered Species
DBH	Diameter at breast height
DoF	Directorate of Forestry
FAO	Food and Agriculture Organization
FINNIDA	Finnish Ministry of Foreign Affairs, Department of International Development Cooperation
GRN	Government of the Republic of Namibia
GRZ	Government of the Republic of Zambia
IDF	Institute for Forestry Development (Angola)
ILUA	Integrated Land Use Assessment (Zambia)
IRDNC	Integrated Rural Development and Nature Conservation
IUCN	International Union for the Conservation of Nature
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MRLGHRD	Ministry of Regional and Local Government and Rural Development
SADC	Southern African Development Community
SASSCAL	Southern African Science Service Centre for Climate Change and Adapted Land-use
SNDP	Sixth National Development Plan (Zambia)
TA	Traditional Authority
TESA	TRAFFIC East/Southern Africa
USAID	United States Agency for International Development
VAT	Value added tax
ZFC	Zambia Forestry Commission

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1. BACKGROUND

TRAFFIC has been contracted, through the Southern African Science Service Centre for Climate Change and Adapted Land-use (SASSCAL) to implement a project titled '*A Critical Assessment of the Economic and Environmental Sustainability of the Namibian Indigenous Forest/Timber Industry*'. The overall Project Objective to enhance the governance capacity of the Directorate of Forestry to better manage indigenous forests and hinder unsustainable and illegal resource utilisation through comprehensive and independent assessment of the current status of the industry, and specifically that based on the trade in Kiaat *Pterocarpus angolensis* produced in Namibia and sourced from Zambia and Angola.

The Project Outputs are to:

- Increase available knowledge on trade dynamics of timber, represented by Kiaat *Pterocarpus angolensis* extracted from miombo woodlands and associated socio-economic factors by collecting baseline data amongst primary industry stakeholders and through targeted field work.
- Increase available knowledge on trade dynamics of Kiaat *P. angolensis* derived from miombo woodlands in Angola and Zambia and traded through Namibia.

The key project research questions are:

- Are current forest and timber trade management strategies adequate for ensuring legal and sustainable timber trade?
- Is Namibia being used as a conduit for timber being harvested in neighbouring countries (Angola and Zambia) and if so, to what extent?
- What policy, capacity building, regulatory and monitoring changes are required to place the Namibian and regional (neighbouring countries) timber industry on a sustainable footing.

IRDNC has been contracted to conduct detailed field research, including stakeholder consultations, compilation and analysis of official statistics in Namibia, and corroboration of statistical information through independent field research in the primary timber production region of Kavango and Zambezi Regions and associated borders with Angola and Zambia. The focus of this research will be on Kiaat *P. angolensis* but information on other timber species, such as Rosewood *Guibourtia coleosperma*, will also be collected where pertinent to the overall Project Objective.

According to the Consultancy Contract: TRAFFIC East/Southern Africa (TESA) project (ESA164.00): *A Critical Assessment of the Economic and Environmental Sustainability of the Namibian Indigenous Forest/ Timber Industry*, the second deliverable due at the end of October 2014, is a review of the literature relevant to this study.

This literature review will focus on Namibia and where possible review information available for Zambia and Angola. The Research Methodology Report submitted in September 2014 highlighted the fact that documentation relevant to the policy and legislative framework for timber utilization will need to be collected for Angola and Zambia.

2. KEY TIMBER SPECIES

The forests of Namibia occur mainly in the deep Kalahari sands, in the north-central and north-eastern parts of the country and cover less than 10% of Namibia (Mendelsohn, 2005). Namibia's forests can rather be described as dry, semi-open to open woodlands. The most important factors affecting forests and woodlands in Namibia are the soils, the availability of moisture and fire (Mendelsohn, 2005). The region with the highest wood volume is Kavango (which is now two regions – Kavango West and Kavango East) which has 34% of Namibia's standing stock of wood (Pröpper, 2009).

Areas defined as forests are found mostly in the Kalahari Sands Woodlands where the dominant tree species belong, like in the dry Miombo Woodlands, to the subfamily Caesalpinioideae (DoF, 2011a). The Kalahari Sands Woodlands vegetation type (or sometimes referred to as North Eastern Kalahari Woodlands by Mendelsohn et al., 2005) is also found in Angola, northern Botswana, Zambia and Zimbabwe. The 'caesalpiniod' species typical of these ecosystems are Zambezi Teak *Baikiaea plurijuga*, Wild Syringa *Burkea africana*, Rosewood *Guibourtia coleosperma* and Mopane *Colophospermum mopane*. Species such as Kiaat *Pterocarpus angolensis*, Marula *Sclerocarya birrea*, Geelhout *Terminalia sericea* and Mangetti *Schinziophyton rautanenii* are also important (DoF, 2011a).

The vegetation of the central and southern SADC countries has a number of hardwood species that are heavily exploited for commercial use within these countries but also for export (Mendelsohn et al., 2005; Newton et al., 2002). One of the principal hardwoods that are removed in large quantities is Kiaat, *P. angolensis*, and the sustainability of these logging practices has been questioned (Caro et al., 2005; Moses, 2013; Pröpper, 2009). Commercially, the timber species that have been exploited from the dry woodlands have been mainly restricted to Kiaat *P. angolensis* which also occurs in the Miombo, and Zambezi Teak *B. plurijuga* which is confined to the Kalahari Sands Woodlands (DoF, 2011a).

2.1 Kiaat *Pterocarpus angolensis*

Kiaat *P. angolensis* is a medium to large sized deciduous tree that grows up to 30 m tall (Orwa et al., 2009) although in Namibia it generally reaches a height of 15 m. The distinctive fruit is a spherical pod, 70 - 120 mm in diameter. The central portion is raised with stiff bristly hairs encircled by a papery wing which is up to 50 mm broad (Mannheimer et al., 2009). It has a long period of leaflessness often from May to October (De Cauwer et al., 2014).

The information in the literature about the age which trees can reach and the associated growth rates appears to be contradictory. De Cauwer et al. (2014) give the life expectancy of 60 to 90 years but that under favourable conditions it can reach an age of 100 to 140 years. The growth rate (height) given by Orwa et al. (2009) is 50 to 70 cm/year. De Cauwer et al. (2014) state that the diameter at breast height (DBH) of mature trees of this species is 40 to 70 cm while Mendelsohn et al. (2005) state that Kiaat *P. angolensis* (as well as Zambezi teak, *Baikiaea plurijuga*) need to grow for 130 years before reaching DBHs of 45 cm and give the average growth rate (in diameter) for Kiaat *P. angolensis* as 0.33 cm/year. Moses (2013) explains these differences as being due to varying

environmental conditions in different countries and the 40 trees that he harvested had a mean height of 8 m and a mean DBH of 47 cm.

The distribution of Kiaat *P. angolensis* within Namibia is in the north-eastern sandy plains and dunes (Mendelsohn et al., 2003) east of the 400 to 450 mm rainfall isohyet (Figure 1). This includes the following regions: Zambezi, East Kavango, West Kavango, Ohangwena and parts of Oshikoto and Otjozondjupa regions. Most of the rainfall occurs in January and February (Mendelsohn et al., 2002). Within this range it is locally abundant and one of the dominant species in areas (Curtis et al., 2005).

Beyond Namibia, the distribution of Kiaat *P. angolensis* extends to South Africa, northern Botswana, Zimbabwe, Zambia, Mozambique, Swaziland, Malawi, Democratic Republic of the Congo and Tanzania (Anon. 2013). Kiaat *P. angolensis* trees tolerate a wide range of environmental conditions but generally they are limited to deep sandy soils (Mendelsohn et al., 2003) in areas where rainfall exceeds 400mm/year and where there is a dry season contrasting with a wet season (Mendelsohn et al., 2005). This species is light-demanding and remains as a suffrutex (low growing woody shrub) for many years if growing in shade (Curtis et al., 2005).

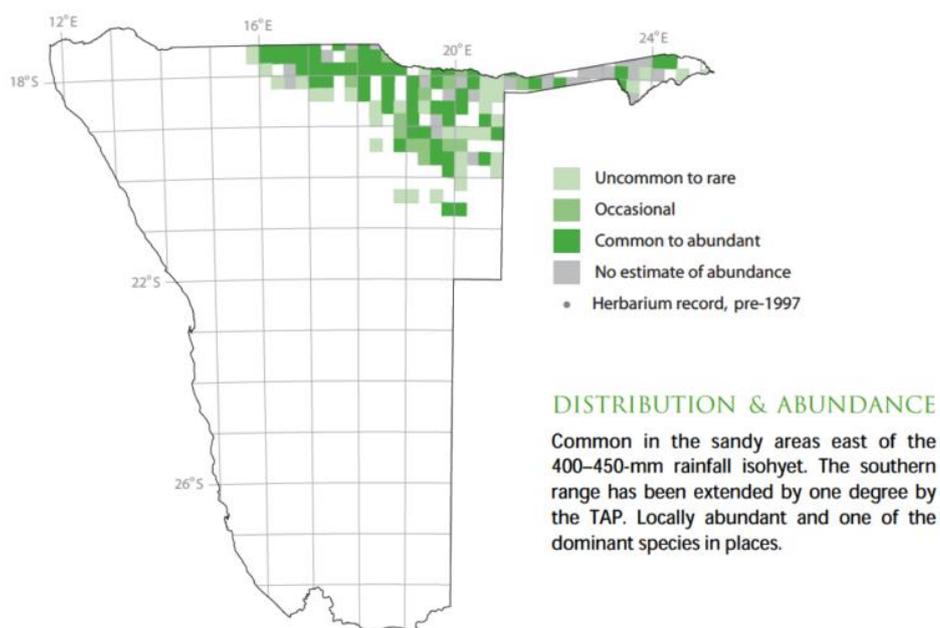


Figure 1: Distribution and estimates of abundance of Kiaat *Pterocarpus angolensis* in Namibia (From Mannheimer et al., 2009)

Populations of Kiaat *P. angolensis* are characterized by having more old trees and relatively fewer younger trees (Mendelsohn, 2005). Although a large number of seeds are produced, only 2% germinate under natural conditions (Moses, 2013). The woodlands where Kiaat *P. angolensis* are found are characterized by disturbances, especially fire (Mendelsohn et al., 2003) and shifting cultivation (De Cauwer et al., 2014). This species is generally thought to be able to withstand fire (Burke, 2006; Moses, 2013) since it dies back to the woody rootstock and then coppices during the next season. Seeds need fire to germinate and total protection from fire results in a decrease in

recruitment (Curtis et al., 2005). Repeated heavy burning produces a “staghead appearance” which also occurs if the tree is stressed as a result of unfavourable conditions such as poor soils or too much water (Orwa et al., 2009). This species is sensitive to frost (Burke, 2006) and the young trees are especially susceptible. Extreme cold events can have an effect on the flowering of Kiaat *P. angolensis* which takes place between September and December (Curtis et al., 2005).

De Cauwer et al. (2014) developed models to estimate the current distribution of this species and its environmental requirements in order to obtain a potential distribution (Figure 2). Their results showed that the environmental requirements for Kiaat *P. angolensis* are more detailed than those described in the literature. They found that the distribution of the species is mainly influenced by the amount of summer rainfall, by the minimum temperature in winter and by temperature seasonality. The potential and realised distribution for Kiaat *P. angolensis* are very similar, with the exception of Madagascar (the environmental conditions are suitable but the Indian Ocean is a dispersal barrier). De Cauwer et al. (2014) found that Kiaat *P. angolensis* is mainly found in areas with a fire frequency below 45%. This study concluded that climate change can decrease the species range considerably and threaten the species existence in Namibia and Botswana while increasing it in Zambia. Bjorkman (1999) conducted a study in two areas in Zambezi (then Caprivi) and Otjozondjupa regions and found that the loss of Kiaat *P. angolensis* due to fire during the two year study period was 8%.

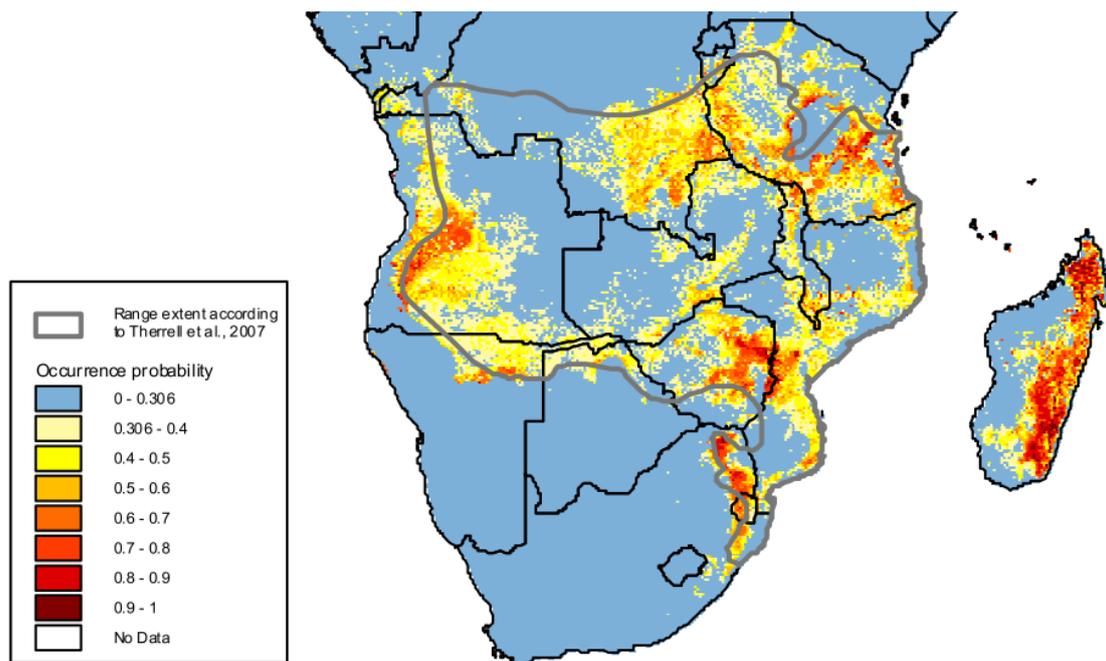


Figure 2: Map showing the most suitable areas and the occurrence probability for Kiaat, *Pterocarpus angolensis* (from De Cauwer et al., 2014)

Caro et al. (2005) conducted a study in western Tanzania to determine the natural recruitment rate of Kiaat *P. angolensis*. The recruitment rate was found to be low with only a third of parent trees generating any seedlings despite considerable seed production. Heavily protected wildlife conservation areas supported large parent trees but very few seedlings were recorded. They suggested that this mortality was caused by the high density of browsing wildlife. Outside the well

protected areas, cutting had removed most large trees and the remaining adults were small and produced relatively few seeds. They listed factors that affect recruitment:

- location and elevation indicative of higher precipitation
- competition for light since short grass and reduced parent canopy cover was associated with more seedlings
- whether the area has been burnt – burnt areas recorded fewer seedlings

This study concluded that Kiaat *P. angolensis* is being driven to local extinction in western Tanzania at a rapid rate since low recruitment was resulting in populations declining despite protection from harvesting.

Kiaat *P. angolensis* can be propagated by stem sprouts in the nursery, but the success rate for this method in the wild is low (Caro et al., 2005). Moses (2013) reports that little success has been achieved with the establishment of Kiaat *P. angolensis* plantations in Kenya, Mozambique and Tanzania.

This species is heavily utilised for a variety of purposes but mostly for timber on a commercial basis (Mendelsohn et al., 2005; Mendelsohn et al., 2006)). The wood from this species varies greatly in colour and weight. The sapwood is yellow while the heartwood ranges from light brown to dark reddish-brown (Figure 3). The sapwood is subject to borer (Mannheimer et al., 2009). The brown heartwood is resistant to borer and termites, is durable and polishes well, making it suitable for the production of furniture. The wood saws and planes easily, glues and screws well and shrinks very little when drying. When cut, it exudes a red, sticky sap which contains 77% tannin and is an effective dye (Orwa et al., 2009).



Figure 3: Kiaat *P. angolensis* planks showing the pale sapwood and the darker heartwood

Kiaat *P. angolensis* was declared a protected species in Namibia in 1952. According to the IUCN criteria, this species is considered “near threatened” (Loots, 2005). The threats to this species are

listed by Loots (2005) as fire, excessive logging, low recruitment, slow growth, clearing of land for agricultural and residential purposes, expanding human population and heavy browsing of small trees. This species is also protected in South Africa.

2.2 Rosewood *Guibourtia coleosperma*

Rosewood *Guibourtia coleosperma* is an evergreen tree that grows up to 20 m high and has a spreading crown with drooping branches. The main trunk usually forks fairly low down, above which there is large, rounded crown. These trees grow in deep Kalahari sands (Figure 4), usually in woodlands and their abundance varies locally (Mannheimer et al., 2009). Rosewood *G. coleosperma* is only found in areas with a mean annual rainfall of above 300 mm (Burke, 2006). This species is reported to have a low tolerance for fire (Burke, 2006).

These trees can be spotted by their patchy bark and distinctive shape (Mendelsohn et al., 2009). The seeds are covered by a bright red aril and are edible (Mannheimer et al., 2009). The reddish to yellow-brown bark is distinctive with rough, black patches on old trunks. The leaves are dark green and resemble those of mopane *Colophospermum mopane* hence the common name of False Mopane (Mannheimer et al., 2009).

The distribution of Rosewood *Guibourtia coleosperma* is limited to the deep Kalahari sands in north-eastern Namibia, southern Angola and Zambia and western Zimbabwe (Mendelsohn et al., 2005).

The sapwood is yellow-white and the heartwood is pink-red to red with deep red markings. The wood has a fine, straight grain but since the trunk usually forks fairly low down and the thicker stems and branches curve and twist, it is seldom possible to cut long, straight planks (Mendelsohn et al., 2005). It is often used for sleepers, canoes, construction and sometimes furniture in spite of it being rather heavy for furniture (Mannheimer et al., 2009). Recently, this wood is being used increasingly for carving crafts and for furniture.

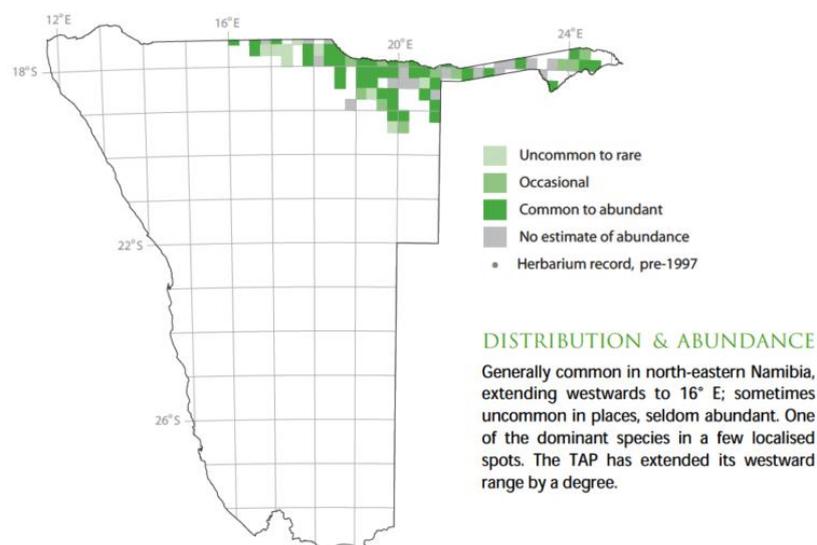


Figure 4: Distribution and estimates of abundance of Rosewood *Guibourtia coleosperma* in Namibia (From Mannheimer et al., 2009)

These conspicuous trees can be seen along roadsides and in villages since they are often saved when areas are cleared because of their usefulness – for shade and food.

2.3 Zambezi teak *Baikiaea plurijuga*

This tree is deciduous and grows up to 20 m high with a stem diameter of up to 75 cm. The flowers are conspicuous with their crinkly petals and bright colour (Mannheimer et al., 2009). It has a dense spreading crown (Mendelsohn et al., 2005). Zambezi teak *Baikiaea plurijuga* can be easily identified by its pink-purple flowers which are held above the canopy and the velvety woody pods which burst open loudly to scatter the seeds (Mannheimer et al., 2009; Mendelsohn et al., 2005).

Zambezi teak *Baikiaea plurijuga* has a similar distribution to that of *Guibourtia coleosperma* within Namibia but its abundance varies substantially from area to area. This species grows only in deep Kalahari soils (Figure 5) in areas with an annual average rainfall of above 300 mm (Burke, 2005). Patches where it is common include the Caprivi State Forest, north-western Kavango and eastern Ohangwena region (Mannheimer et al., 2009; Mendelsohn et al., 2005). Outside of Namibia, this species is found in south-eastern Angola, south-western Zambia, western Zimbabwe and northern Botswana. This species is reported to have a low tolerance for fire (Burke, 2006).

This species produces excellent wood which is dark red in colour, durable, hard and resistant to both rotting and insect attack, especially termites (Mannheimer et al., 2009). It is used in construction, for sleepers, furniture and mine props (Mannheimer et al., 2009). This species has been protected in Namibia since 1952 (Loots, 2005). The biggest threats to these populations come from fire, clearing lands for farming and from timber logging, which has now stopped in Namibia (Mendelsohn et al., 2005).

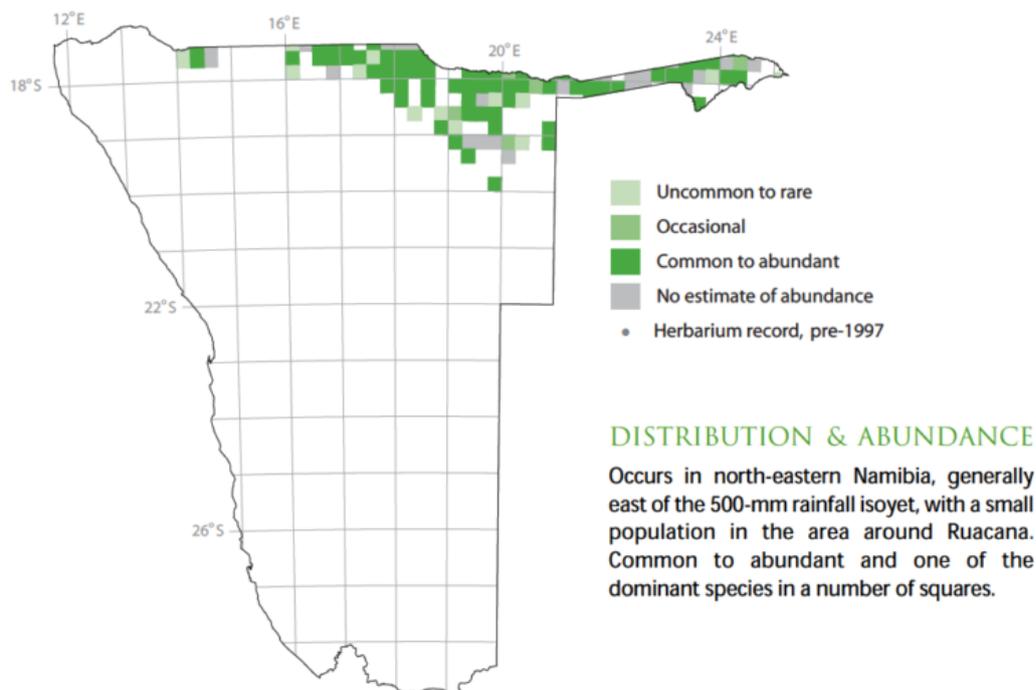


Figure 5: Distribution and estimates of abundance of Zambezi teak *Baikiaea plurijuga* in Namibia (From Mannheimer et al., 2009).

3. THE LEGISLATIVE AND POLICY FRAMEWORK

FAO (2003) in its Forestry Outlook Study for Africa, concludes that the main reasons for deforestation remain the same throughout Africa and these are:

- The expansion of agricultural activities
- Increased demand for forest products especially close to expanding urban areas and
- Fire which has been responsible for 31% of forest loss in southern Africa (Sebukeera et al., 2006)

While the reasons for the over-utilisation of forest resources may be similar, the way in which countries deal with these issues and utilise forest resources varies. Some interesting differences can be seen in southern Africa. The timber industry in South Africa is centred round the harvesting of timber products from plantations (Newton et al., 2002) while in Zambia, Angola and Namibia, natural forests are harvested.

This section of the report will provide an overview of the policy and legislative frameworks in Zambia, Angola and Namibia, covering the study area for the Kiaat *Pterocarpus angolensis*, Rosewood *Guibourtia coleosperma* and Zambezi teak *Baikiaea plurijuga* timber resources.

3.1 Legislative and policy framework for Namibia

The Directorate of Forestry (DoF) was part of the Ministry of Environment and Tourism (MET) from 1994 until 2005 when it once again became one of the Directorates within the Ministry of Agriculture, Water and Forestry (MAWF) (Mendelsohn et al., 2005).

The first policy document post-independence was the Namibia Forest Policy Statement of 1992 which was followed by the Forestry Strategic Plan which was developed in 1996. The Forestry Development Policy was formulated (DoF, 2001) the same year in which the new Forest Act was gazetted (GRN, 2001). In 2008, a new strategic focus for Forestry was developed as part of the Strategic Plan for MAWF for the period 2008 to 2012. A new strategic plan was approved in August 2014 (M. Otsub pers. comm.).

The Forest Act No. 12 gazetted in December 2001 replaced Proclamation no. 1 of 1923, ordinance No. 37 of 1952 and the Forest Act of 1968. This new Act made provision for the establishment of classified forests such as community forests (CF) (DoF, 2010; Hazam, 2009; Hazam, 2010; Jones, 2012; Mulofwa, 2005) and forest management areas. This is probably one of the biggest changes to the forestry legislation in Namibia (Mendelsohn et al., 2005). Clear guidelines are provided to communities for the registration process of a CF (DoF, 2010). Within CF areas, the members have exclusive commercial rights over the forest resources. This Act provides incentives to local harvesters and the sustainability of forest resources will ultimately depend on the extent to which these incentives encourage sustainable utilisation (Pröpper et al., 2013). However, the benefits generated by CFs are distributed according to a documented Benefit Distribution Plan which often results in only a small part of the benefits reaching the CF members.

A Forest Management Plan is required for each classified forest area (Mendelsohn et al., 2005).

The Forest Amendment Act (Act 13) of 2005 (GRN, 2005) redefined the composition of the Forestry Council which provides strategic guidance to the government of forestry related issues.

There is a list of tree species that are specially protected in terms of the Preservation of trees and Forests Ordinance of 1952 and the Proclamation of the SWA Administration no. 486 in 1972 (Mendelsohn et al., 2005). Protected species include Kiaat *Pterocarpus angolensis*, Zambezi teak *Baikiaea plurijuga*, Wild Syringa *Burkea africana*, Mopane *Colophospermum mopane* and Rosewood *Guibourtia coleosperma*.

The Traditional Authorities Act, Act 25 of 2000 outlines the structure of TAs and most TAs follow these structures since allowances are allocated accordingly by the Ministry of Regional and Local Government and Rural Development (MRLGHRD). Each TA is headed by a chief who has a traditional council usually consisting of 12 members. There is some perceived contradiction between stipulations of the Traditional Authorities Act, which confirms the role of TAs as custodians of the communal lands and the associated resources and the Forestry Act of 2001 (Mendelsohn, 2008). DoF uses a co-operative management approach including the TAs in decisions about allocation of timber resources on communal lands (Moses, 2013).

The SADC Protocol on Forestry (2002) remains the direct and over-arching policy framework for future forestry collaboration amongst Member States in the region. The Protocol states guiding principles on how to co-operate in protecting, managing and utilising forests to meet regional and national objectives (DoF, 2011a). The SADC Forestry Strategy (2010) has the vision within SADC of a “*vibrant and evolving forest sector that contributes significantly to rural development, poverty reduction and, industrial progress, while retaining the vital ecosystem services of forests such as, water supply, climate change mitigation, and protecting biological diversity*”. Its mission is to “*facilitate co-operation among member states to promote the active protection, management and sustainable use of forest resources, through sound policy guidance, the application of requisite skills and the best available technology, in order to enjoy the multiple benefits of forests in perpetuity.*”

The strategy is operationalised through eight strategic programme areas that include: i) climate change mitigation and adaptation; ii) protection of key catchment forests; iii) community-based forest management; iv) forestry and poverty reduction; v) enhanced trade within SADC; vi) cross-border co-operation in fire management and management of trans-boundary forest ecosystems; vii) forest assessment and management of a regional database; and viii) capacity improvement in SADC.

The Directorate of Forestry falls within the Ministry of Agriculture, Water and Forestry. The mission statement of the Directorate of Forestry is:

To promote a well organised forestry sector that is socially, environmentally and economically sustainable, while creating significant and equitable wealth and opportunities.

The Directorate of Forestry has two divisions – Forest Management and Forest Research (Figure 6).

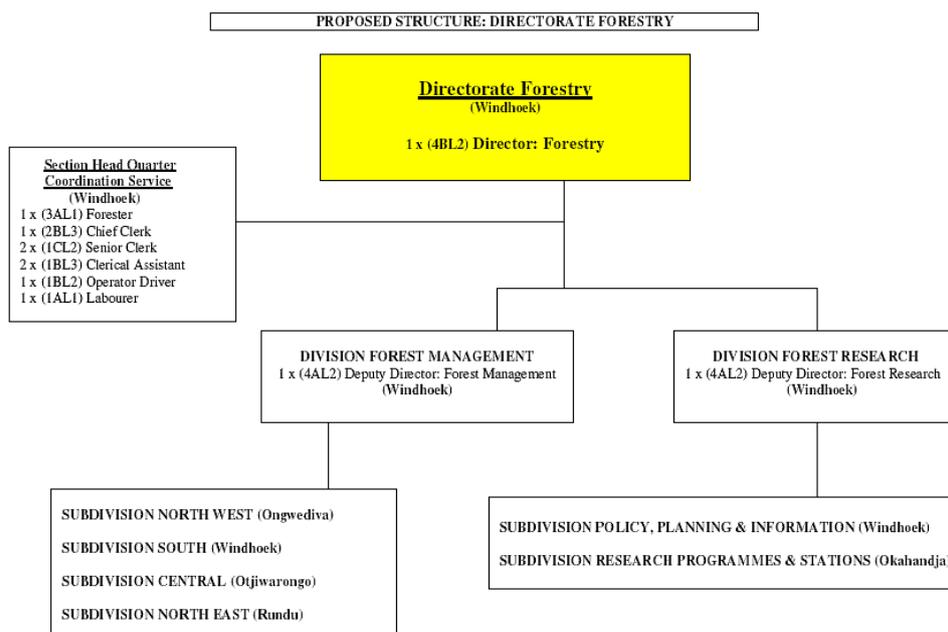


Figure 6: Organogram of Directorate of Forestry

A Forestry Research Strategy for Namibia: research in an era of sustainable economic development, biodiversity conservation and climate change (2011 - 2015) was formulated by DoF (DoF, 2011a). The strategy document identified seven strategic forest research areas as listed below:

- Vegetation (forest and rangeland) monitoring programme
- Forest products (value-added) research
- Ecological studies
- Growth and yield studies
- Silvicultural research
- Economic, policy and sociological research
- Management of information

The permit system for timber is administered by the regional offices within the Division Forest Management. Each region operates independently of other regions and no national system of permit data capture exists. There is one form for applying for a permit and only one form for issuing a permit. The various options required are indicated on the application and the permit form. The various types of permits that are issued by DoF are listed in Table 1. There is no report back required.

Table 1: Types of timber permits issued by DoF

Type		Description
Harvesting	Commercial	This permit would allow the harvesting of a quota allocated to a private company, an individual or a CF to harvest timber to sell
	Own use	This permit would allow for the harvesting of a quota allocated to an individual or a CF to harvest timber for own use – in most cases it would be used in the area where it is harvested.
Transport	Commercial	This permit would be issued for consignments of wood passing

		through Namibia i.e. in transit. For example, a load of teak harvested in Zambia that passes through Namibia en route to Botswana and then South Africa would be issued only with a transport permit. This permit would also be issued for wood being transported from point of harvest to point of sale within a region of Namibia. It would also be issued for wood harvested in one region being transported to another region where it will be sold.
	Own use	This permit allows a person harvesting timber for own use to transport it from the site of harvesting to the site of use.
Marketing		This permit allows a trader to undertake marketing activities to sell already harvested (and possibly processed) products
Export	Commercial	This permit allows for the harvesting of Namibian timber which will be transported to another country and sold there. This does not cover timber harvested in another country that has been transported through Namibia and then exported to a third country.
	Own use	The use of this option is still unclear

3.2 Legislative and policy framework in Angola

Angolan forest policy and laws largely date back to colonial days (Baptista, 2014). The first legislation on nature conservation and on the establishment of protected areas was issued on 20 January 1955 through the Decree nº 40 040 (published in the Official Bulletin on 9 February 1955). This Decree covered aspects related to soil, fauna and flora protection, conservation and use of game, establishment of national parks, nature reserves and controlled hunting areas. This Decree pioneered the establishment of an institution (*Conselho de Protecção à Natureza* – Nature Conservation Council) responsible for controlling the protected areas and developing important enabling legislation for this effect. This legislation included the Hunting Regulation (*Regulamento de Caça*, Decree nº 2 873 of December 11, 1957), Forestry Regulation (*Regulamento Florestal*, Decree 44 531) and National Parks Regulation (*Regulamento de Parques Nacionais*, Decree 10 375 of October 15, 1958). The sector is still using these Forest Ordinances which still remain the only judicial instrument regulating the forestry activities at national level. This instrument was twice submitted for revision in 1981-82 and in 1989 respectively, but still does not reflect the reality on the ground (FAO, 2000; USAID, 2011).

A Decree nº 43/77 of 5 May 1977 approved the structure of the Ministry of Agriculture and defined five different categories for protected areas, namely national park; strict nature reserve; partial reserve; regional nature park and special reserve. A new State Secretariat for the Environment was established in the 1990s. This new Secretariat developed new strategies and policy approaches leading to the formulation of the Environment Framework Law in 1998 (*Lei de Bases do Ambiente*), No. 5/98 of 19 June (USAID, 2011). This act is based on Articles 12 and 24 of the Angolan Constitutional Law. These laws have not been enforced due to the lack of trained personnel. There are at least 17 forestry reserves in the country, covering over 17 000 km². However, there has been no attempt to manage them on a sustainable basis (Mogaka et al., 2001).

A new law and policy governing forests, wildlife, and conservation areas has been drafted. The draft law allows for cutting trees and harvesting other forest products for purposes of subsistence, community use and enjoyment, as well as the exploitation of timber and non-timber forest products,

and also other special purposes such as individual consumption, conservation, and scientific investigation. The Institute for Forestry Development (IDF) drafted the law and policy, included opportunities for public comment and input, and submitted the law and policy to the Council of Ministers in 2006 (USAID, 2011).

The draft legislation governing forests and wildlife is described in the USAID report (2011) as proposing major changes with respect to tenure in Angola's conservation areas. If the legislation passes in its current form, support for local communities residing in conservation areas will for the first time be integrated into conservation area objectives. Unlike current law, the draft law recognizes the rights of local communities within conservation areas to hunt small game and harvest forest resources for subsistence purposes. Concessions in conservation areas would be limited to ecological tourism operations, while commercial forestry and hunting activities would be prohibited in these areas. It was not possible during this literature review process to determine whether this proposed draft legislation has become law. This will be further pursued during the course of this study.

From the institutional point of view, the forest sector is within the Ministry of Agriculture and Rural Development, under the Institute for Forestry Development responsibility (IDF) which is fully represented in all 18 administrative provinces of the country (FAO, 2000; USAID, 2011).

Timber being exported from Angola is usually requires a phyto-sanitary certificate, a permit from IFD as well as evidence of its purchase (invoice). Sometimes, a CITES permit is issued when *Kiaat Pterocarpus angolensis* planks are exported from Angola to Namibia. The legislative and policy framework as well as the permitting system need to be further investigated during this study.

3.3 Legislative and policy framework for Zambia

Forest resource management during pre-colonial times in Zambia, was effected by the traditional leaders. There were taboos on cutting fruit-bearing trees and some forest areas were set aside as royal forests and were off limits to everyone else. Individual trees were protected for products such as edible caterpillars, shade or medicinal purposes and it was accepted that there was ownership over valuable trees close to homesteads (Vinya et al., 2012).

During the colonial era in Zambia, the management of forest resources in Barotseland (now Western Province) involved local communities and the management activities were structured around the indunas (traditional leaders) who worked closely with the Provincial Forestry Officer (Vinya et al., 2012). At independence, a new forest policy was developed and the Forest Ordinance Cap 105 of 1965 was adopted by the new government. The key features of this ordinance were restrictions on the harvesting of forest products or opening up new land for cultivation, the need for a licence to do so and the role of local communities in the issuing these licences (Vinya et al., 2012).

Forest reserves in Zambia were established under the Forest Act 199 of 1973 which repealed the rights of local communities in the management of forest resources which became state owned. This act provided for the establishment of several main categories of forest reserves in the country: Local Forests (of which there are 306) and National Forests (of which there are 184) and joint forest management areas, which were aimed at improving community participation in forest management

but sadly did not achieve this. Although not significant in size, some portions of forests are designated as botanical reserves (Kalinda et al., 2008). The Forest Act 199 of 1973 was replaced by a new Forest Act of 1999. At the time, this Act could not be operationalised since the Statutory Instrument to activate the Act was not signed by the Minister and the Zambia Forestry Commission (ZFC) could not be formed. The main purpose of the ZFC was to enhance the contribution of the forestry sector to national development and would have superseded the Forestry Department in the management and monitoring of forest resources (Vinya et al., 2012). Community participation and forest management is a strong feature of the Act and a total of 80 595 km² of forests are intended to be managed with community participation. Vinya et al. (2012) however are of the opinion that the new Forest Act has never been fully activated and implemented resulting in unsustainable utilisation of forest resources, negligible management and no community participation.

Currently in Zambia, the Forestry Department falls under the Ministry of Lands, Natural Resources and Environmental Protection. The Forestry Sector legal and institutional framework is based on the National Forestry Policy of 1998 and the Forests Act Cap 119 of the Laws of Zambia (Vinya et al., 2012). Operations of the sector are planned through the Zambia Forestry Action Plan, the Sixth National Development Plan, the Vision 2030 and the Millennium Development Goals. Each of the ten provinces of Zambia has a Provincial Forestry Office and the department is also represented in 75 districts while new District Forest Offices are being set up in the newly created districts (USAID, 2011).

The Statutory Instrument of Forest (Amendment) Regulations of 2013 set fees and prices to be paid to government for the harvesting of indigenous forest produce. The price for Kiaat, *Pterocarpus angolensis*, wood is ZMK 1 250 per m³ (GRZ, 2013). Syampungani (2008) lists Kiaat *Pterocarpus angolensis* as the main timber species in the Miombo woodlands of northern Zambia where the timber is used for all sorts of applications including mine props (because of its durability).

In addition to the national legislative frameworks, Zambia has outlined its key development objectives to attaining its Vision 2030 most of which relate to accelerated and sustained economic growth. Since the entry of a new government in late 2011, a constitutional review process has begun and is on-going. It is intended that that the following legislation will be reviewed by the Ministry of Tourism, Environment and Natural Resources:

- Zambia Wildlife Act
- Forestry Act, and
- Wildlife Policy

Zambia also makes the following commitment in its Sixth National Development Plan (SNDP) 2011 – 2015, “...*The focus for SNDP will, therefore, be to reverse deforestation, wildlife depletion, heritage sites degradation, and land degradation. Further, the sector will enhance collaboration among players in natural resources management in order to ensure sustainable exploitation of natural resources...*”

Vinya et al. (2012) list several policies which directly or indirectly affect the management of forest resources and observe that the policy and legislative framework for Zambia with regard to the management of natural resources are not properly synergized and suggest that this has encouraged

the unsustainable use of forest resources. Forest offences are not recognised as serious crimes and the penalties for illegal actions relating to forest resources are much lighter than those implemented for wildlife offences.

The current forest statistics are based on the countrywide assessment carried out between 2005 and 2008 under the Integrated Land-Use Assessment (Kalinda et al., 2008). This study concluded that the sustainable management of natural forests depends largely on the land tenure system. Similar results were found by Vermeulen (1995) in Zimbabwe. Most of the forest resources are found on customary land which has become fragmented due to the conversion of customary land to leasehold tenure. The Integrated land-use Assessment (ILUA) Phase two was launched in 2010 and is expected to be completed in 2014 to provide the current outlook of forest statistics (GRZ, 2010). ILUA II is planned to take two types of assessments; (i) Biophysical assessment which incorporates forest and soil parameter measurements and (ii) Forest livelihood and economic survey which considers socio-economic, forest governance and informal forest economy measurements. It could not be determined whether this data has been collected or a report published.

Geldenhuys (2014) explains that rural small-scale farmers in the Miombo woodlands are marginalised when governments issue concessions for large-scale commercial enterprises (commercial timber concessions, plantation forestry and agricultural crops). Much of the timber exported from Zambia is sourced from the Western Province and there is a strong presence of logging companies, especially Chinese logging companies (Asanzi et al., 2014). This study in the Western Province of Zambia criticised the labour practices of the Chinese companies and also stated that corruption of authority remains a problem in Zambia (Asanzi et al., 2014).

Also of concern is the harvesting of Devil's Claw in Western Province, especially in the Sioma-Ngweze National park since no policy and regulations had been in place until recently (Nyambe, 2013). The Statutory Instrument introduced in 2013 (GRZ, 2013) set prices paid to government for the harvesting of various forest products. The price set for a kg of Devil's Claw is ZMK900 (this equates to about USD150 which is almost 50X more than the harvester would earn from selling a kg of Devil's Claw) while that for a cubic meter of Kiaat *Pterocarpus angolensis*, Rosewood *Guibourtia coleosperma* and Zambezi teak *Baikiaea plurijuga* timber is ZMK1 250 (about USD200).

Trade in timber in Zambia favours foreign companies at the expense of local entrepreneurs who struggle to acquire capital and access to international markets (Vinya et al., 2012). The Forestry Department have decreased timber concession periods from five years to two years and pitsaw licence periods from three years to one year, which according to Vinya et al. (2012) is inconsistent with the general philosophy of sustainable forest management. Because of the short concession period, no forest management plans are developed and interest is focussed on utilisation at the expense of forest management.

One of the aspects relating to forestry in Zambia that will need to be further investigated during this study, is the relationship between the quotas and permits issued for the harvesting of timber and the determination of total allowable offtake for these resources. Given the many challenges facing the Forestry Department in Zambia (Vinya et al., 2012), it seems unlikely that the management actions and associated monitoring activities are being undertaken by the staff in the District offices.

4. UTILIZATION OF TIMBER RESOURCES IN NAMIBIA

Namibia's arid environment and sparse tree cover is only one of the reasons that the timber resources are small (Mendelsohn et al., 2005). Many of Namibia's trees are not suitable for timber production because of their size and growth form. A tree is considered to be suitable for the production of planks if its DBH is 45 cm or more. Apart from the fact that there are not many trees that meet the requirements for timber production, those that are there are scattered widely making the commercial harvesting challenging (Mendelsohn et al., 2005).

Under German colonial rule, forestry policy in Namibia concentrated on nature conservation but this changed after 1925 (with the change to South African governance) towards forest exploitation. Exploitation has since continued but an effort was made to manage Namibia's forestry activities with the creation of the Directorate of Forestry after Namibia's independence in 1990 (Mogoka et al., 2001). The majority of Namibia's forestry resources are within communal lands, which also support 95% of Namibia's farming population. Mogoka et al. (2001) state that the main causes of forest destruction in Namibia relates to poverty and lack of alternatives. Mendelsohn et al. (2005) state that fire and the clearing of land destroys far more woodland annually, than any other activity.

4.1 Forest Resource Inventories

In the 1980s, rough forest inventories were carried out in parts of Kavango and Otjozondjupa regions. These were localised and focussed on Kiaat *Pterocarpus angolensis* and Zambezi teak *Baikiaea plurijuga*. Based on these inventories, concessions were awarded to commercial logging companies (MET, 1998b).

Starting in 1995 DoF, with support from FINNIDA and later the German Government, conducted a series of resource inventories of forestry areas using standardised methodology (MET, 1997a; MET, 1998b; Laamanen, 2003). The methodology is based on stratified systematic sampling. For example, in the Zambezi (then Caprivi) region, a total of 900 plots of 30 m radius were measured. Most of these areas are either community forests or state forests. Nkurenkuru and Tsumkwe are areas where timber concessions had previously been granted to commercial logging companies. These resource inventories have been reviewed and a summary of the % contribution of Kiaat *Pterocarpus angolensis* to the total species composition of the area is presented in Table 2.

Table 2: Contribution (%) of Kiaat *Pterocarpus angolensis* to species composition in forestry areas where resource inventories have been undertaken (MET, 1997b, 1998a, 1998b, 1998c, 2002a, 2002b; DoF 2000, 2002, 2003a, 2003b, 2003c, 2003d, 2004, 2011b and 2014)

Forestry Area	Name of Species	Composition of Trees (%)
KAVANGO REGION		
George Mukoya Community Forest	<i>Pterocarpus angolensis</i>	3
	<i>Terminalia sericea</i>	16
	<i>Burkea africana</i>	36
	<i>Baikiaea plurijuga</i>	2
	<i>Colophospermum mopane</i>	0
Hamoye State Forest	<i>Pterocarpus angolensis</i>	17

	<i>Terminalia sericea</i>	4
	<i>Burkea africana</i>	42
	<i>Baikiaea plurijuga</i>	9
	<i>Colophospermum mopane</i>	0
Hans Kanyinga Community Forest	<i>Pterocarpus angolensis</i>	14
	<i>Terminalia sericea</i>	4
	<i>Burkea africana</i>	35
	<i>Baikiaea plurijuga</i>	5
	<i>Colophospermum mopane</i>	0
Katope Community Forest	<i>Pterocarpus angolensis</i>	20
	<i>Terminalia sericea</i>	0
	<i>Burkea africana</i>	0
	<i>Baikiaea plurijuga</i>	74
	<i>Colophospermum mopane</i>	0
Mashare Forest	<i>Pterocarpus angolensis</i>	6
	<i>Terminalia sericea</i>	0
	<i>Burkea africana</i>	65
	<i>Baikiaea plurijuga</i>	16
	<i>Colophospermum mopane</i>	0
Ncamangoro Community Forest	<i>Pterocarpus angolensis</i>	13
	<i>Terminalia sericea</i>	6
	<i>Burkea africana</i>	52
	<i>Baikiaea plurijuga</i>	0
	<i>Colophospermum mopane</i>	0
Ncaute Community Forest	<i>Pterocarpus angolensis</i>	14
	<i>Terminalia sericea</i>	4
	<i>Burkea africana</i>	41
	<i>Baikiaea plurijuga</i>	6
	<i>Colophospermum mopane</i>	0
Nkurenkuru Area 1	<i>Pterocarpus angolensis</i>	30
	<i>Terminalia sericea</i>	3
	<i>Burkea africana</i>	13
	<i>Baikiaea plurijuga</i>	30
	<i>Colophospermum mopane</i>	0
Nkurenkuru Area 2	<i>Pterocarpus angolensis</i>	19
	<i>Terminalia sericea</i>	4
	<i>Burkea africana</i>	11
	<i>Baikiaea plurijuga</i>	44
	<i>Colophospermum mopane</i>	0
OHANGWENA REGION		
Ekolola Community Forest	<i>Pterocarpus angolensis</i>	3
	<i>Terminalia sericea</i>	15
	<i>Burkea africana</i>	18
	<i>Baikiaea plurijuga</i>	14
	<i>Colophospermum mopane</i>	0
Okongo Community Forest	<i>Pterocarpus angolensis</i>	18
	<i>Terminalia sericea</i>	6
	<i>Burkea africana</i>	11

	<i>Baikiaea plurijuga</i>	30
	<i>Colophospermum mopane</i>	0
OSHIKOTO REGION		
Oshikoto Region	<i>Pterocarpus angolensis</i>	2
	<i>Terminalia sericea</i>	23
	<i>Burkea africana</i>	16
	<i>Baikiaea plurijuga</i>	6
	<i>Colophospermum mopane</i>	1
OTJOZONDJUPA REGION		
East and South Tsumkwe	<i>Pterocarpus angolensis</i>	1
	<i>Terminalia sericea</i>	19
	<i>Burkea africana</i>	5
	<i>Baikiaea plurijuga</i>	0
	<i>Colophospermum mopane</i>	0
Western Tsumkwe	<i>Pterocarpus angolensis</i>	20
	<i>Terminalia sericea</i>	5
	<i>Burkea africana</i>	43
	<i>Baikiaea plurijuga</i>	2
	<i>Colophospermum mopane</i>	0
ZAMBEZI (CAPRIVI) REGION		
Burkea Terminalia Area	<i>Pterocarpus angolensis</i>	<1
	<i>Terminalia sericea</i>	36
	<i>Burkea africana</i>	24
	<i>Baikiaea plurijuga</i>	2
	<i>Colophospermum mopane</i>	4
Kwando Community Forest	<i>Pterocarpus angolensis</i>	3
	<i>Terminalia sericea</i>	3
	<i>Burkea africana</i>	4
	<i>Baikiaea plurijuga</i>	38
	<i>Colophospermum mopane</i>	0
Zambezi Region	<i>Pterocarpus angolensis</i>	2
	<i>Terminalia sericea</i>	12
	<i>Burkea africana</i>	13
	<i>Baikiaea plurijuga</i>	15
	<i>Colophospermum mopane</i>	22

The Forestry Sector in Namibia received NAD 159 million in foreign assistance during the period 1991 to 2005 (Mendelsohn et al., 2005).

4.2 Utilization of timber resources in Namibia

In 1894 the German government issued the first regulations to control the cutting of trees in the Windhoek area. In 1900 a forestry station was started at Brakwater outside Windhoek and Kurt Dinter, a well-known botanist was appointed to the post. Most of the forestry activities focussed on meeting the demands of the German settlers for wood and on providing wood for the development of infrastructure such as railways and mines (Mendelsohn et al., 2005). In 1914 another ordinance prevented farmers from undertaking commercial logging.

The colonial policy of forest exploitation started in the 1930s in the Tsumeb and Grootfontein areas when South Africa was in control of Namibia (Chakanga et al., 2001). For example, in 1926 42 000 m³ were harvested (Mendelsohn et al., 2005). The first permit to cut 1 000 trees in Kavango was issued in 1933 and it is thought that during this time there was already illegal harvesting of timber taking place (Mendelsohn et al., 2005). In 1972, 28 000 m³ of timber were cut. From the early 1970s to the late 1980s, the liberation struggle prevented the implementation of forestry development activities in northern Namibia (Chakanga et al., 2001). By the early 1990s, timber harvesting had declined. In 1990, 8 850 m³ of timber were processed by the three sawmills in Katima Mulilo, Rundu and Tsumkwe (Mendelsohn et al., 2005). These three sawmills remained operational until 2003 (Moses, 2013). Figures of total amounts harvested during the colonial period are not available.

Historically, the harvesting of timber products was done within concession areas where a particular quota was allocated to a defined area and the concession awarded to an individual or company. The government derived revenue from the concession. Much of the timber harvested in these concessions was processed at sawmills in Katima Mulilo, in Rundu and in Tsumkwe (Bjorkmann, 1999). The Directorate of Forestry within the MET stopped the cutting of timber for export in 1996 and then stopped all commercial timber production in Namibia in 2003 (Mendelsohn et al., 2005). This was done in order to provide an opportunity for Namibia to complete resource inventories to ensure that offtake is sustainable.

The forest resource inventory informs the forest management plan according to which permits are issued for the utilization of forest resources. According to the resource inventories (Table 2) the areas with the highest % Kiaat *Pterocarpus angolensis* (species composition) are found in the eastern Ohangwena and western Kavango community forests of Okongo CF and Katope CF. It is in these areas where harvesting of Kiaat *P. angolensis* is still taking place. When all the areas which have been inventoried are considered collectively, Kiaat *Pterocarpus angolensis* contributes 3.49% to the species composition (FAO, 2010). Based on these forest resource inventories, annual offtakes were calculated (Table 4) and included in the forest management plans for each area (MET, 1997a). For example, for Okongo CF, the volume of Kiaat *P. angolensis* was estimated to be 48 100 m³ or 0,86 m³/ha and the estimated sustainable annual offtake of Kiaat *P. angolensis* was set at 324 trees for DBH class 15 to 25 cm and 592 trees for DBH class 25 to 25 cm (MET, 2003).

Table 4: Total Allowable Offtake as determined by Forest Resource Inventories. Only those areas with Kiaat *P. angolensis* are shown in the table (data from MET, 2003 and DoF, 2011b)

Area	Species	Total Allowable Offtake (Number of trees over 10 years)
KAVANGO REGION		
George Mukoya Community Forest	<i>Pterocarpus angolensis</i>	8,700
OHANGWENA REGION		
Okongo Community Forest	<i>Pterocarpus angolensis</i>	9,170
	<i>Terminalia sericea</i>	310,043
	<i>Burkea africana</i>	12,815
	<i>Baikiaea plurijuga</i>	88,909

Pröpper (2009) reviewed five of the CF resource inventories from Kavango region and concluded that the majority of all the available timber trees in these CFs are small trees and that stem or tree numbers peak in the lower DBH classes. This means that there are extremely few harvestable sized trees in the CFs. Pröpper (2009) cites the example of Ncumcara CF where the sustainable yield for the CF which is 15 218 ha is 30 trees a year.

Once the Resource Inventories have been completed by DoF, then a management plan is drafted and the total allowable offtake of the area is calculated and documented. Currently, only a few of the management plans for the CFs have been accessed. More management plans will be accessed, and once this is done the total allowable offtake, quotas set by community forests and government, as well as total usage of the quotas given will be summarized and evaluated.

In July 2012, The Director of DoF sent out a letter to all regional offices instructing that all issuance of permits for sawn timber be stopped in commercial areas, community forests and non-declared community forests (G. Maggs-Kolling pers. comm.).

Kojwang (2000) states that Namibia is a net importer of industrial wood and wood products and predicted that this would not change. Because of the limited timber resources in Namibia, all timber used to build and furnish modern houses is imported, mostly from South Africa and is either pine or processed chipboard, both of which are cheaper than indigenous timber (Mendelsohn et al., 2005). In 2003, Namibia imported 25 210 t of wood products.

Chakanga et al. (2001) describe the process of administering the forest revenue system in Namibia where the income from forest resources is collected through the permitting system. Charges for these permits are set by DoF and collected by the District Forest officers. CFs obtain a block permit from DoF and then issue their own harvesting permits (Pröpper, 2009). The money is sent to the Regional Headquarters of DoF and then to the Ministry of Finance. The charges on processed forest products include the cost of the permit, income tax paid by the harvester (if eligible) and VAT. The current costs of permits issued by DoF are given in Table 3 below.

Table 3: Costs of DoF permits

Type of permit	Cost
Harvest own use	NAD10
Transport own use	NAD10
Harvest commercial	NAD20
Transport commercial	NAD20
Marketing	NAD20
Export	NAD20
Poles own use	40 free then NAD2/pole
Poles commercial	NAD2/pole
Firewood own use	1 t free then NAD40/t
Firewood commercial	NAD40/t
Droppers own use	40 free then NAD0.50/dropper
Droppers commercial	NAD0.50/dropper

In 2001, the forest revenue collected by DoF was NAD 420 000 compared to the budget of the Directorate which was NAD 14 849 000 (Chakanga et al., 2001). The bulk of the revenue was generated in Kavango Region from the sale of timber. The operational budget for DoF for the 2005/2006 financial year was NAD 23 727 000 (Mendelsohn et al., 2005).

The first forest resource accounts were done for a two year period (1997-1998) for two areas in Namibia by Bjorkman (1999). This report indicates that permits were issued for the harvesting of 67 tons or 485 m³ of Kiaat *Pterocarpus angolensis* in the study area and that illegal logging in 1997 was estimated at 21 929 m³. This study concluded that physical forest stock in Zambezi (then Caprivi) region decreased during these two years indicating that the forestry sector in this region was unsustainable. The completion of the forest resource inventory enabled a set of preliminary forest resource accounts to be developed for the whole country (Barnes et al., 2005; Barnes et al., 2010). The total woody volume for Namibia in 2004 was estimated to be 257 million m³ with a value of current forest use of NAD 1.2 billion and a contribution of 3% to the GDP. Namibia's standing forest assets were estimated to have a value of NAD19 billion (Barnes et al., 2005; Barnes et al., 2010).

Kojwang (2000) estimated the economic value of forest resources in Namibia at NAD 1 058 million annually with firewood and charcoal having the largest value of all the categories considered. Commercial logging of Kiaat *Pterocarpus angolensis* and Wild Syringa *Burkea africana* contributed NAD 2.4 million.

Availability of statistics on production, consumption and trade of wood products in Namibia is scanty and to a certain extent non-existent (Chakanga, 2003). In none of the reports reviewed could any data be obtained with regard to the total amount of wood removed or the total volume of wood for which permits have been issued. In the FAO (2010) report Global Forests Resource Assessment Report: Country Report Namibia, the section on amount of wood removed indicates that no detailed data is available. Mendelsohn et al. (2005) also indicates that no data for the amount of timber harvested in Namibia since 1990 is available.

In Namibia, a live Kiaat *Pterocarpus angolensis* tree is sold at NAD200 on the stump and a dead one at NAD110 irrespective of the size or age of the tree (Moses, 2013). Prices for poles are from NAD20 to NAD40 (depending on the length) while droppers go for NAD2 to NAD5 per dropper. If planks are purchased from informal traders, the costs for machine cut planks are as follows: NAD190 for a Kiaat *Pterocarpus angolensis* plank; NAD150 for a Zambezi teak *Baikiaea plurijuga* plank and NAD160 for a Rosewood *Guibourtia coleosperma* plank. Hand sawn planks are cheaper.

The study undertaken in Kavango Region by Moses (2013) found that Kiaat *Pterocarpus angolensis* planks were identified as the most important wood product. The average plank was found to have a length of 258 cm, width of 24 cm and thickness of 3.7 cm with a volume of 0.023 m³. The average volume of the 40 Kiaat *Pterocarpus angolensis* logs harvested by Moses (2013) was 0.4 m³ and yielded 11 planks. The average total tree volume was 1.63 m³ which constitutes only 23% of the above ground tree. Heartwood only planks were sold for NAD15 more than planks with mixed heartwood and sapwood. The finished products produced by local carpenters included beds, doors, chairs and tables (Moses, 2013). Some of the main products manufactured in registered joinery

businesses in Namibia are government office furniture and school furniture made from Kiaat *Pterocarpus angolensis* (Chakanga, 2003).

Kojwang (2011) developed a method for estimating log volume and provided a log volume table that could be used by forestry staff to estimate the volume of confiscated and other logs. A simple volume table based on diameter at 1 m from the large end of a log and log length has been produced and is not species specific. The need to develop more species-specific saw log volume tables was identified. Since law enforcement staff members are often dealing with planks rather than logs, and many find it difficult to use the tables, wood volume is seldom used as a measure.

4.3 Illegal use of timber resources in Namibia

The Forest Act No. 12 gazetted in December 2001 (GRN, 2001) replaced Proclamation no. 1 of 1923, ordinance No. 37 of 1952 and the Forest Act of 1968. The Forest Act states:

The Minister may, by regulation, declare any plant or species of any plant to be a protected plant and shall impose conditions under which that protected plant shall be conserved, cultivated, used or destroyed by any person.

The Forest Act No. 12 gazetted in December 2001 (GRN, 2001) clearly describes the importance of the Forest Management Plan as the basis for all management and utilisation actions.

In 1972, Proclamation no. 486 of the SWA Administration proclaimed 50 trees species as protected. The three species being considered in this study Kiaat *Pterocarpus angolensis*, Rosewood *Guibourtia coleosperma* and Zambezi teak *Baikiaea plurijuga* are included on that list of protected tree species (Mendelsohn et al. 2005). Schedule 9 of the MET ordinance lists protected plant species. Kiaat *Pterocarpus angolensis*, Rosewood *Guibourtia coleosperma* and Zambezi teak *Baikiaea plurijuga* are not included on Schedule 9 (GRN, 1975). It is thus the interpretation of the forestry regulations that are important for determining how protected species are utilised and what constitutes illegal use of timber resources. Forestry regulations are implemented through the permit system where permits are issued according to the specifications in the management plan for the forestry area. In spite of the co-operative management approaches between DoF and the TAs and the devolution of management and benefits to members of CFs, Moses (2013) states that illegal logging is widespread in both gazetted CFs and well as in non-gazetted communal lands.

The impact of targeted saw-timber harvesting on the forest resources of Namibia has long been of concern (Pröpper, 2009), especially with regard to Kiaat *Pterocarpus angolensis* (Mendelsohn et al., 2005; Moses, 2013). Over-exploitation of timber resources, including Kiaat *Pterocarpus angolensis*, Rosewood *Guibourtia coleosperma* and Zambezi teak *Baikiaea plurijuga*, led to 50 tree species being proclaimed as protected species in 1952 (Moses, 2013). Since commercial logging is no longer allowed in Namibia, harvesting of timber is illegal in most cases and generally non-optimal utilisation since only the main stem is removed (Moses, 2013).

Since old-fashioned and mobile processing technology (Figure 7) is used by illegal loggers, the resulting products are of low quality and traded in the informal market at low prices (Moses, 2013).

Kiaat *Pterocarpus angolensis* are targeted by illegal loggers since the wood is a valuable timber species but it is light enough that it can be felled and processed using basic mobile equipment and can also be transported more easily than Zambezi teak *Baikiaea plurijuga* (J. Mwikinghi pers. comm.).



Figure 7: Pit sawing of Kiaat *Pterocarpus angolensis* logs

DoF officials became concerned about illegal harvesting practices and undertook an investigation into illegal practices in the Kavango Region (DoF, 2012). During the period of one week the law enforcement team observed eight instances of illegal timber practices – mostly local residents harvesting planks (mostly Kiaat *Pterocarpus angolensis*) to supply to commercial operators. In July 2012, the Director of DoF sent out a letter to all regional offices instructing that all issuance of permits for sawn timber be stopped in commercial areas, community forests and non-declared community forests (G. Maggs-Kolling pers. comm.). Currently, there does not seem to be clarity as to whether the moratorium is still in place or whether it has been lifted.

5. UTILIZATION OF TIMBER RESOURCES IN NEIGHBOURING COUNTRIES

Initial review of the Namibian permit data indicates that much of the timber harvested in Zambia and Angola is transported through Namibia to Walvis Bay for export to China. Weng et al. (2014) indicate that China is the destination of more than 75% of Africa's timber exports. Illegally harvested timber finds its way to China through complex networks of companies and local loggers operating in largely informal local timber markets with local elites connected to the trade (Weng et al., 2014).

5.1 Utilisation of timber resources in Angola

In the literature study undertaken by Baptista (2014) reports that from Angola, the annual export of logs and sawn wood was about 6 t in 1918 but increased to 1 000 t in 1921 due to the First World War. Export volumes decreased in the 1930s due to the economic recession but reached 3 000 t by the mid-1930s. In 1946 about 9 000 t of timber was exported with annual amounts increasing steadily to 27 000 t in 1950 (Baptista, 2014). Sawmills were established in Angola in the 1950s and wood was exported to Holland, Portugal, Germany and South Africa (where it was used as railway sleepers). By 1951, 42 000 t of wood was being exported from Angola and by 1965 this had increased to 88 000 t. During the 5 year period from 1963 to 1967, a total of 976 874 t of Kiaat *Pterocarpus angolensis* wood was exported from Angola. This is an average of 195 375 t of wood being exported each year.

While much data is available about resources during the colonial era, there are no recent forest inventory data available for the Kuando Kubango Province, as is the case for many of the other provinces as well (Zweede et al., 2006).

Zweede et al. (2006) documented that key threats to forest biodiversity, especially in the in Kuando Kubango province (where much of the Kiaat *P. angolensis* resources are found) are uncontrolled burning, charcoal production and slash-and-burn agriculture. Although Angola's forests in the Kuando Kubango Province are fire adapted savanna-type ecosystems there is an increasing use of fire during the dry season, which will have an impact on biodiversity (Zweede et al., 2006).

The FAO (2000) reported that there is an acute scarcity of human resources such administrative and professional personnel to ensure the optimal management and planning and organisational aspects of the sector. There is a large dependency of the sector on the government budget, which often provides just enough for staff salaries. While this may have improved somewhat with time, it remains a challenge. A report by Kuedikuenda et al. (2009) states that "Today, there is lack of a systematic control of this activity (management of the forestry sector), as well as the absence of urgent measures to reforest the exploited areas. In some provinces, IDF has no control over timber harvesting, and the type of species and their conservation status are unknown".

The Ministry of Environment in Angola recognises that forest biomes are under pressure from various forms of utilisation (Kuedikuenda et al., 2009). The factors contributing to the degradation and loss of habitats include urbanization, disorderly occupation of conservation areas, shifting agriculture and logging (both legal and illegal). Post-war, the Angolan government focussed on rebuilding infrastructure which included roads and key buildings (schools, clinics, police stations,

government administration offices). New licenses for timber harvesting were awarded and there is also illegal forestry activity taking place. Forest resources are being utilised or cleared by people returning to previously abandoned areas. Fragmentation of forest areas results from road construction and urban developments (Kuedikuenda et al., 2009).

People living in urban areas are dependent on wood and charcoal for cooking (Kuedikuenda et al., 2009). It is estimated that nearly 80% of the Angolan population depends on firewood and charcoal to meet their energy needs. Firewood is mostly used in rural areas, while charcoal is used in the cities. The excessive and growing demand for this raw-material has a strong negative impact on biodiversity. FAO (2004) estimates that firewood consumption in Angola amounts to 5 million m³ per year, against 7.2 million m³ of charcoal. Charcoal and firewood consumption is likely to increase over time.

Kuedikuenda et al. (2009) reported that the volume of harvesting allowed in Angola in 2004 was estimated at 326 000 m³/year, while deforestation rate was estimated at 0.4% per year. The Ministry of Agriculture reported that the exploited quantity was below the authorized volume, and that the most significant authorized logging was taking place in the Mayombe Forest. However, there is limited control over timber harvesting, and the type of species and their conservation status are unknown.

5.2 Utilisation of timber resources in Zambia

Export of timber from Zambia to China started in 2006 and by 2012 the export value of the timber reached USD 4 250 000 (Weng et al., 2014). The logging companies in Zambia usually have concessions of between 5 000 ha and 10 000 ha and several of these are Chinese logging companies. In addition to the Chinese logging companies, there are also Chinese trading companies which tend to be small and family run. These private companies use their own sources of funding i.e. not Chinese government funding (Weng et al., 2014). Concessions are acquired by purchasing existing companies with concession titles or by entering into agreements with existing concession holders and getting them to transfer their concessions. The Chinese logging companies are dependent on the involvement of local small-scale loggers who are an important part of the supply chain.

Weng et al. (2014) observed illegal practices by Chinese logging companies in Zambia – these included Chinese companies not implementing management plans, logging before receiving approval, encroaching on other concessions and customary land and smuggling of round logs via routes with fewer monitoring facilities. The complicity of government officials and the crucial role they play in enabling illegal activities is recognised by Weng et al. (2014). Poorly remunerated officials reportedly accept bribes at various checkpoints and allow illegally harvested timber to pass through.

The sustainability of the Chinese investment and trade in Zambia is questioned by Weng et al. (2014). It is often the case that management plans are not implemented. Chinese companies are attempting to undertake clear cutting to lower production costs.

6. CONCLUDING REMARKS

The literature reviewed is consistent with regard to the fact there is little recent timber trade data available from the study area. Recent publications from both Namibia and Zambia indicate an awareness about unsustainable utilisation of timber sources and highlight the likelihood of illegal activities even though little quantitative information is available. This does not seem to be the case for Angola.

Through this literature review the following information needs have been identified:

- All the available forest management plans for Namibia need to be accessed and reviewed
- Since no trade data is currently available for Namibia, the data obtained from the permit issuance will be the best indication of what trade is currently taking place and will guide the focus of this study
- The legislative and policy framework as well as the permitting system for Angola need to be further investigated
- Some of the trade data for Zambia and Angola will be acquired from the transport permit data and the analysis of this will indicate how this should be addressed.

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