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Two surveys of the plants, birds and forest condition of Pugu and Kazimzumbwi Forest Reserves in 2011 and 2012

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Cover photographs by Justine Gwegime (views of Pugu and Kazimzumbwi) and Elia Mulungu (African Pitta).

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EXECUTIVE SUMMARY

Tanzania's Coastal Forests are of global importance supporting 37 endemic vertebrate species and 554 endemic plants (Burgess, 2000). Among these coastal forests are Pugu and Kazimzumbwi, two forest reserves which lie on the outskirts of Dar es Salaam. Nearby protected areas are Pande GR (to the north) and Ruvu South FR (to the southwest). Together, these four forests form Dar es Salaam's "Greenbelt", encompassing 38,995 hectares and extending from 100-300 metres a.s.l. They are remnants of some of the most ancient forests in the world, and represent the main water catchments for the Msimbazi, Kimani, Nzasa and Nyeburu Rivers. They offer enormous potential for education and recreation for the citizens of Dar es Salaam.

As part of the Forest Justice in Tanzania project, TFCG has been carrying out biodiversity and forest condition surveys in selected forests in the Eastern Arc Mountains and Coastal Forests. The overall aims of the surveys are to document the biodiversity value of the forests and to assess levels of human resource use and disturbance.

This report describes the findings from a series of TFCG surveys conducted in 2011 and 2012 in Pugu and Kazimzumbwi forests. Surveys in 2011 were carried out in June and July over 17 days, followed by a 14-day survey in May and June of 2012. Surveys focused on describing the forests' plant and avian communities, and extent of human disturbance. Survey sites were selected on the basis of vegetation cover, including sample points within relatively dense forest.

Plants

In total, 343 plant species in 234 genera and 70 families were recorded during the botanical surveys, conducted at four sites including Buyuni (site 1, Table 1), a recently cleared site in Kazimzumbwi forest and three sites in Pugu: Mambisi and Pugu Relini (site 2), historically and recently deforested; Pugu Dunda and Kimani (site 3), recently degraded and being cleared; and Pugu Mpakani and Minaki Bwawani (site 4), less disturbed forest. Of these four sites, Buyuni had the most distinct species assemblage, with a Sorensen shared species index of 0.31-0.36 with the three sites in Pugu forest, while the three sites in Pugu had many species in common with a similarity index of 0.70-0.85. The most species-rich site with 260 species was the less disturbed forest at Pugu Mpakani and Minaki Bwawani.

Of the plant species recorded, 18 are IUCN Red-Listed species above the category "Least Concern" with four Near Threatened, ten Vulnerable, three Endangered, and one Critically Endangered species (Table 1).

Table 1. Red-Listed plant species above Least Concern (LC) category recorded during the botanical surveys. Endemic species are bolded, including one endemic at LC level and one data-deficient species.

DD = Data Deficient; NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered.

Family	Scientific name	Red List Category	Site1	Site 2	Site 3	Site 4
Annonaceae	<i>Monanthotaxis</i>	LC	x			
Annonaceae	<i>Uvaria kirkii</i>	NT	x			x
Annonaceae	<i>Xylopia arenaria</i>	VU	x			
Annonaceae	<i>Xylopia collina</i>	EN		x	x	x
Bignoniaceae	<i>Fernandoa sp.*</i>	EN*	x			
Caesalpiniaceae	<i>Dialium holtzii</i>	VU	x		x	x
Euphorbiaceae	<i>Mildbraedia carpinifolia</i>	VU	x	x	x	x
Flacourtiaceae	<i>Bivinia jalbertii</i>	NT			x	x
Moraceae	<i>Milicia excels</i>	NT		x		
Papilionaceae	<i>Angylocalyx braunii</i>	VU		x	x	x
Papilionaceae	<i>Baphia puguensis</i>	EN	x	x	x	x
Papilionaceae	<i>Dalbergia melanoxydon</i>	NT	x	x	x	x
Papilionaceae	<i>Dalbergia vacciniifolia</i>	VU		x		x
Papilionaceae	<i>Millettia bussei</i>	VU		x		x
Rubiaceae	<i>Gardenia transvenulosa</i>	VU	x	x		x
Rubiaceae	<i>Rothmania macrosiphon</i>	VU		x	x	x

Family	Scientific name	Red List Category	Site1	Site 2	Site 3	Site 4
Sapindaceae	<i>Chytranthus obliquinervis</i>	VU		x		x
Sterculiaceae	<i>Dombeya acutangula</i>	CR		x		x
Tiliaceae	<i>Grewia goetzeana</i>	DD		x	x	
Verbenaceae	<i>Vitex zanzibarensis</i>	VU		x		x

*If *Fernandoa lutea*, then this is an endangered Tanzania endemic species.

Six other endemic, but not Red-Listed species, were recorded (Table 2).

Table 2. Six coastal forest endemic, but not Red-Listed, plant species recorded on botanical surveys.

Family	Scientific name	Site 1	Site 2	Site 3	Site 4
Acanthaceae	<i>Whitfieldia orientalis</i>		x		x
Celastraceae	<i>Pristimera graciflora</i>	x			
Papilionaceae	<i>Millettia puguensis</i>		x		x
Sapotaceae	<i>Manilkara sansibarensis</i>	x	x		
Sterculiaceae	<i>Nesogordonia holtzii</i>		x		x
Violaceae	<i>Rinorea welwitschii</i>		x		

During the surveys, ten endemic plant species (Tables 1-2) were recorded, including two, the liane *Millettia puguensis* and tree *Baphia puguensis*, that are endemic to the Pugu Hills, and six of which, *Xylopia arenaria*, *Manilkara sansibarensis*, *Monanthotaxis trichocarpa*, *Pristimera graciflora*, *Rinorea welwitschii*, and *Nesogordonia holtzii*, are endemic to Tanzania's coastal forests. Two further endemic species, *Haplocoelopsis africana* and *Cissus quadrangularis*, were recorded opportunistically during the survey. One invasive plant species, *Lantana camara*, was recorded with regularity at each of the survey sites.

Birds

The forests continue to be of utmost importance to coastal Tanzania's avifauna. The avian survey yielded a checklist of 105 species in 79 genera and 37 families. Among these were four Red-Listed species above LC level. These were the African crowned eagle, *Stephanoaetus coronatus*, and bateleur, *Terathopius ecaudatus*, both NT; spotted ground thrush, *Zoothera guttata*, (EN); and the east coast akalat, *Sheppardia gunningi* (NT).

Forest condition

Pole and timber extraction, fire, charcoal production, and cultivation continue to be major threats to both forests. While the 2011 disturbance surveys detected more cutting (poles and timber per hectare) than surveys carried out in 2012, in both years, more cut than live trees were recorded. The difference between years could in part be explained by increased protection efforts but also by the virtue of there being less poles and timber available in 2012 than 2011. All transects had at least a few poles (<15cm dbh) still standing; however, six transects contained no live trees (>15cm dbh), only stumps. Charcoal kilns pockmark both reserves. In total, 107 and 72 charcoal kilns or kiln scars were counted along 9 transects in Pugu in 2011 and 2012 respectively; 114 and 48 charcoal kilns or kiln scars were found along 9 transects in Kazimzumbwi in 2011 and 2012 respectively. Fire is a widespread problem in Kazimzumbwi where 169 events of fire were recorded in 2011-2012, while in Pugu, 115 fire events were recorded. Only six snares or traps were found across both survey years suggesting that most of the forests' small mammals may have already been hunted out.

At current rates of deforestation, assessed on the basis of surveys and satellite image analysis carried out by TFCG, the forests of Kazimzumbwi and Pugu will vanish by 2014 and 2017, respectively. Coordinated conservation efforts are urgently needed to save these important and unique forests. This requires a different approach with high level political support and a commitment to enforcing the Forest Act. The Tanzania Forest Service have not demonstrated a capacity to implement this and it is recommended that TANAPA be called in to assist in the conservation of these irreplaceable forests.



Visimia orientalis in Kazimzumbwi FR



Millettia puguensis, only known from Pugu FR



Justine Gwegime, Team Leader for the TFCG surveys conducting disturbance surveys.



Coastal forest in Pugu Forest Reserve



Deforestation in Kazimzumbwi



Deforestation in Kazimzumbwi

Figure 1. Photographs of Pugu and Kazimzumbwi during the TFCG Surveys. Photos by Justine Gwegime and Moses Mwangoka.

Tanzania Forest Conservation Group

The Tanzania Forest Conservation Group (TFCG) is a Tanzanian non-governmental organization that has been promoting the conservation of Tanzania's forests since 1985. TFCG's mission is to conserve and restore the biodiversity of globally important forests in Tanzania for the benefit of present and future generations. We achieve this through capacity building, advocacy, research, community development and protected area management, in ways that are sustainable and foster participation, cooperation and partnership.

TFCG supports field-based projects promoting participatory forest management, environmental education, community development, advocacy and research in the Eastern Arc and Coastal Forests. TFCG also supports a community forest conservation network that facilitates linkages between communities involved in participatory forest management. To find out more about TFCG please visit our website <http://www.tfcg.org>.

Forest Justice in Tanzania

Forest Justice in Tanzania (FJT) is a three year project (2011-2013) that aims to promote improved governance and increased accountability in Tanzania's forest sector. The initiative is a partnership between the Community Forest Conservation Network of Tanzania, known as MJUMITA and the Tanzania Forest Conservation Group (TFCG). The project is working through four inter-related strategies, which include 1) monitoring forest governance and forest condition; 2) promoting enforcement; 3) conducting research, analysis and communication; and 4) setting standards. The project is financed by DfID through the Accountability in Tanzania programme (AcT). For more information about the project, please visit <http://www.tfcg.org/ForestJusticeTanzania.html>.

Abbreviations and Acronyms

a.s.l.	above sea level
dbh	diameter at breast height
DSM	Dar es Salaam
FBD	Forestry and Beekeeping Division
FJT	Forest Justice in Tanzania
FR	Forest Reserve
GR	Game Reserve
IUCN	International Union for the Conservation of Nature
TFCG	Tanzania Forest Conservation Group
TFS	Tanzania Forest Service
WCST	Wildlife Conservation Society of Tanzania

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Permission

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Report writing

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1) Introduction

1.1 Background to the surveys

As part of the Forest Justice in Tanzania project, the Tanzania Forest Conservation Group (TFCG) has been carrying out biodiversity and forest condition surveys in selected forests in the Eastern Arc Mountains and Coastal Forests. The aim of the surveys is to document the biodiversity values of target forests and to assess levels of resource use and disturbance within them.

The overall purpose of the surveys in Pugu and Kazimzumbwi Forest Reserves was to assess the biodiversity value and forest condition of these two forests. The specific objectives were: **1)** To assess the level of disturbance in Pugu and Kazimzumbwi forests; **2)** To document the extent of enduring plant endemism in the forests despite disturbance; and **3)** To provide an up to date checklist of the forests' birds.

The surveys were carried out between 7th to 17th June 2011 and between 25th May and 11th June in 2012. During the 2011 survey only Objective 1 was assessed. Some botanical observations were also made but no botanical specimens were collected. During the 2012 survey, the team addressed all three objectives. During both surveys, the team leader was Justine Gwegime.

1.2 Report structure

The report is organized into 7 sections. The report begins with an executive summary followed by an introduction which includes a description of Pugu and Kazimzumbwi Forest Reserves, their value and status. This section also includes a review of previous biological surveys and conservation efforts conducted in these two forests. Finally, this section summarizes the major threats faced by these forests. Section 2 provides more detailed descriptions of both forest reserves, including their location and management. Section 3 describes the botanical survey, Section 4 the avian survey, and Section 5 the disturbance survey, with each of these sections containing background information, objectives, methods, results and discussion. In Section 6, a summary of conclusions and recommendations are given. Section 7 contains a bibliography of references cited within the text, and Section 8 contains the Appendices, made up of transect survey results.

Scientific names of animal and plant species are given, along with their IUCN Red List category of threat, if the species has been evaluated for the Red List (IUCN, 2012). These categories are abbreviated as follows: LC for Least Concern, DD for Data Deficient, NT for Near Threatened, VU for Vulnerable, EN for Endangered and CR for Critically Endangered (*ibid.*).

1.3 An overview of Pugu and Kazimzumbwi Forest Reserves

Pugu and Kazimzumbwi forests in Kisarawe District, Coast Region of Tanzania, are globally important coastal forests. Pugu Forest (previously known as Mogo Forest) became a Reserve in 1947 (Clarke & Dickinson, 1995). It lies in the northeastern part of the Pugu Hills, approximately 25 km southwest of Dar es Salaam and 20 km inland from the Indian Ocean, and adjacent to the Kazimzumbwi Forest Reserve (FR) (gazetted in the 1930s) (*ibid.*). These two forests, thought to be remnants of among the oldest surviving forests in the world, are among East Africa's "Coastal Forests" which once covered the entire Tanzanian coast (Dallu, 2004). Today, there are 66 patches of coastal forest in Tanzania, most of which, like Pugu and Kazimzumbwi, have areas of less than 50 km² (Burgess *et al.* 2000a).

Pugu and Kazimzumbwi were originally gazetted as Forest Reserves with the intention of supplying fuelwood and timber to the growing, nearby city of Dar es Salaam (Dallu 2004). They were once contiguous, but became separated by c. 1968, when aerial photos were taken of the area (Clarke & Dickinson, 1995). In Kazimzumbwi, commercial logging occurred up to the mid-1970s, when most commercial timber tree species became too rare to warrant further harvesting. The Kisarawe Forestry Office trialed small plantations of *Cassia* and *Eucalyptus*, as well as rubber *Hevea brasiliensis*, teak *Tectona grandis* and pine *Pinus* sp. but because of

minimal management of these plantations from 1980-1995, they lost commercial value (*ibid.*). Native trees have been intensively felled for charcoal production throughout this period despite efforts by the Wildlife Conservation Society of Tanzania (WCST) to increase enforcement and protection. Cultivation inside the reserve has also been an ongoing issue resulting in the eviction of illegal squatters in 1994 and 1995, and again in 2010. In Pugu, most trees of commercial value such as *Milicia exelsa* (NT), *Newtonia paucijuga* (VU), *Hymenaea verrucosa*, *Khaya nyasica*, *Brachylaena huillensis* (NT) and *Baphia kirkii* (VU) were removed during the colonial era. Like in Kazimzumbwi, exotics were planted in the place of existing native vegetation, of which >500 ha were cleared in Pugu to make space for plantations. One of the largest kaolin deposits in the world is found inside Pugu, where kaolin has been mined since the 1950s.

The forests still support rare coastal animal and plant species, and are considered, along with Ruvu South FR and Pande Game Reserve (GR) to form Dar es Salaam's "Greenbelt Forests", with great recreational and educational potential. Both forests still play an important role in protecting the catchment area for streams flowing through Dar es Salaam.

1.4 Biodiversity and ecological value of Pugu and Kazimzumbwi Forest Reserves

Within the Eastern African Coastal Forest biodiversity hotspot, Pugu and Kazimzumbwi forests are recognized as important sites for endemic fauna and flora (FBD, 2006; Clarke & Dickinson, 1995). Four key studies which describe the biodiversity value of Pugu and Kazimzumbwi forests include Howell (1981), Clarke and Dickinson's (1995) study of biodiversity in eleven coastal forests in the Coast Region, Hall *et al.*'s (2002) biodiversity survey in Kazimzumbwi Forest Reserve, and Ahrends's (2005) work on patterns of degradation in lowland coastal forests. Burgess and Clarke's 2000 book on the Coastal Forests of Eastern African also provides a valuable synthesis of biodiversity data from Pugu Kazimzumbwi. Other biodiversity research on the area includes work on the bat fauna, particularly around the Kaolin mine (Howell 1976, 1977 and 1979); botanical work in Pugu (Mwasumbi and Middleton 1992 and Halue *et al.*, 1995). Relative to Pugu, Kazimzumbwi Forest Reserve has received less attention from biologists (Mlingwa *et al.*, 1993).

Hall *et al.*'s 2002 study documented eight species of amphibians not previously recorded in Kazimzumbwi forest including *Leptopelis barbouri* (VU), recorded only in selected Eastern Arc forests. The same study also detected seven near-endemic amphibian species, one endemic to coastal and Eastern Arc forests and five endemic to coastal forests.

All of Tanzania's coastal endemic bird species use these two forests including the Fischer's greenbul *Phyllastrephus fischeri* (LC), spotted ground thrush *Zoothera guttata* (EN), east coast akalat *Sheppardia gunningi* (NT), and the southern banded snake-eagle *Circaetus fasciolatus* (NT) (Clarke & Dickinson, 1995; Baker & Baker, 2002; Liz Baker, pers. comm., 2012). Pugu was once ranked 32nd of 75 most important forests for threatened bird species in the tropical African and Malagasy region (Collar & Stuart, 1988). At Pugu, at least 83 forest bird species have been recorded including a Pugu endemic sub-species of the pale-breasted illadopsis *Trichastoma rufipennis puguensis* (Mlingwa *et al.* 2000), and coastal forest endemics, Fischer's greenbul *Phyllastrephus fischeri* (LC), little yellow flycatcher *Erythrocerus holochlorus* (LC) and the rare sokoke pipit *Anthus sokokensis* (EN) (Clarke & Dickinson, 1995); at the less-studied Kazimzumbwi, 58 forest birds were recorded by Mlingwa *et al.* in 1993 including the east coast akalat, southern banded snake-eagle and Uluguru violet-backed sunbird *Anthreptes neglectus* (LC). This number is well above the species richness recorded for many other Tanzanian coastal forests such as Kiono, Pande, Kisiju, Rondo, and Litipo (Mlingwa *et al.*, 1993).

A survey by Hall *et al.* (2002) recorded 32 mammal species in Kazimzumbwi FR, of these 7 (22%) are forest-dependent and 11 (34%) are forest dwelling. Rare species that inhabit these forests include the black and rufous elephant shrew *Rhynchocyon petersi petersi* (VU), the Zanzibar galago *Galagoides zanzibaricus* (LC) and the leopard (*Panthera pardus*) (NT).

At least one population of the endemic, critically endangered Rondo galago *G. rondoensis* is still present in these forests, making Pugu and Kazimzumbwi among 9 forests in Tanzania that support the Rondo galago (Perkin, 2004), which relies on evergreen forest patches within Tanzania's coastal forest zone. In Pugu and Kazimzumbwi, this species' estimated abundance is 8 individuals/hectare (*ibid.*); however, this apparent high density may be due to habitat compression, as in Ruvu South. The number per hectare tends to be lower in less disturbed forests like Noto (Perkin, pers. comm., 2012).

Kazimzumbwi and Pugu forests also harbor endemic plant species. Hall *et al.* (2002) recorded *Millettia puguensis* (not yet assessed by the IUCN) and *Baphia puguensis* (EN), endemic to Pugu and Kazimzumbwi forests. Other plant species such as *Dialium holtzii* (VU), *Grewia canocarpa*, *Manilkara sulcata*, *Manilkara sansibarensis*, *Diospyros verrucosa* and *Hyplocoelopsis africana* have been recorded in Pugu and Kazimzumbwi forests and are endemic to the Swahili Regional Centre of Endemism (they have not yet been assessed for the IUCN Red List but are listed in the [Catalogue of Life](#)). These species are increasingly threatened by human disturbance to both forests.

Given the forests' many endemic species, Pugu FR was ranked as a priority area in Ahrend's 2005 study. Both Pugu and Kazimzumbwi support the main water catchment for rivers flowing into Dar es Salaam including the Msimbazi, Kimani, Nzasa and Nyeburu rivers, as well as Minaki, Ng'azi and Dalu dams. The forest reserves are thus considered to be the "mother" of Kisarawe District and play a critical ecological role in relation to the sustainability of Dar es Salaam city (Hall *et al.*, 2002).

1.5 Major threats and disturbances to Pugu and Kazimzumbwi Forest Reserves

Pugu and Kazimzumbwi Forest Reserves are experiencing high levels of disturbance relative to other patches of coastal forest. Pugu, just 40 years ago, was a much larger forest extending to within 10 km of Dar es Salaam. Despite the 2010 eviction of illegal squatters by the government from both Pugu and Kazimzumbwi Forest Reserves, there has continued to be a steady increase in charcoal production. Timber extraction is limited now as few timber-sized trees remain.

For several decades, particular plant species have been targeted for pole and timber extraction, and charcoal production (Hall and Rodgers 1986). For instance, Ahrends's 2005 study documented the following species as being targeted for charcoal and timber extraction: *Dialium holtzii* (VU), *Albizia* sp., *Antiaris toxicaria*, *Manilkara* sp., *Diospyros* sp. and *Scorodophloeos fischeri*. Some tree species such as *Milicia excelsa* (NT) and *Dalbergia melanoxyton* (NT) were already considered rare in 2002 (Hall *et al.*, 2002).

Meanwhile, other surveys in Pugu and Kazimzumbwi that have highlighted the rapid increase in human disturbance to both forests show how forest fragmentation is leading to the loss of habitat with consequences for both fauna and flora (e.g., WCST, 1999). Agricultural encroachment is a major cause of deforestation, especially in the southern part of Kazimzumbwi Forest Reserve near Chanika village such that there is no forest left in the southern half of the reserve, only thicket. This loss may be due to the close proximity of the Kazimzumbwi border to existing agricultural land and the lack of a buffer zone. Hunting has been reported in Kazimzumbwi forest by Hall *et al.* (2002) with the most commonly trapped species being duiker, suni, dikdik and bush pig. Development of the kaolin mine within Pugu forests has also posed a threat to the forest (Howell 1981 and Richards 1988).

In 2011, WCST and partners initiated a 4-year project, "Piloting REDD in the Pugu and Kazimzumbwi Forests" with the aim of reducing carbon dioxide by curbing deforestation through improved forest management. WCST and partners have engaged with the government and communities; however, the forests continue to face very high deforestation and degradation. In 2013, the WCST-led REDD project was canceled as it became clear that the project partners were unable to implement the complex project. This leaves the forests ever more vulnerable. Forest cover in the reserves is currently estimated at less than 20% (TZ-REDD Newsletter, 2012). Meanwhile, long standing conflicts between the central government (the statutory owner of the protected

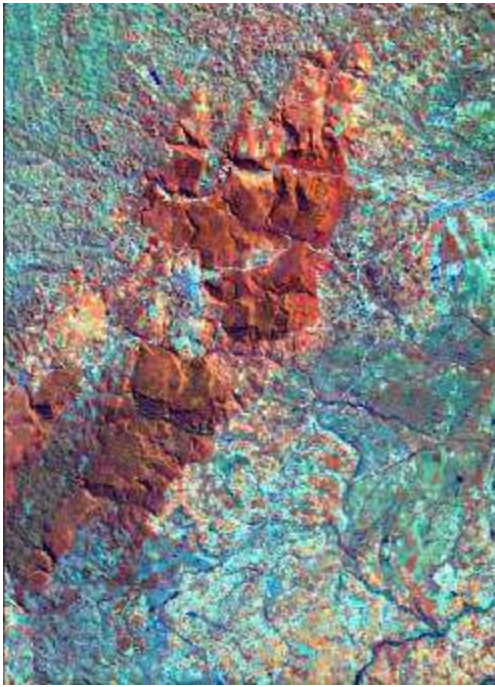
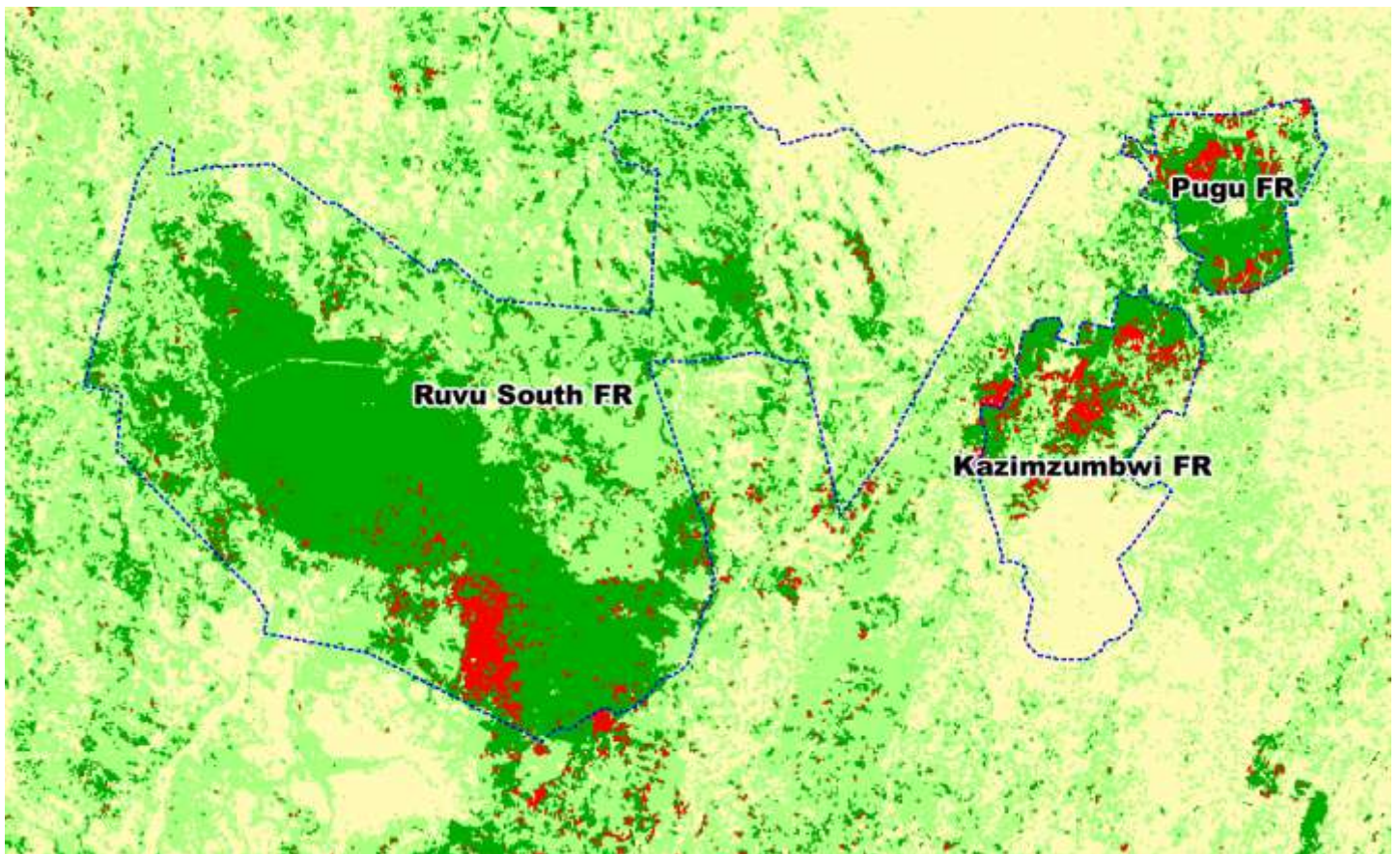


Figure 2. Satellite image of Pugu and Kazimzumbwi in 1984.

areas) and local communities, who claim customary rights to the forests, continues and presents an additional challenge (*ibid.*).

At current rates of deforestation, evaluated on the basis of surveys and satellite image analysis by TFCG, forest within Kazimzumbwi Forest Reserve will have been entirely cleared by 2014 and in Pugu Forest Reserve by 2017. This report therefore aims to highlight some key data to be used by relevant stakeholders in coordinated conservation efforts to prioritize and save these forests. These surveys, of plant and avian communities and of human disturbance, were carried out by the Forest Condition Monitoring Officer, Justine Gwegime; botanist, Moses Mwangoka; birder, Elia Mulungu; and Habibu Said, from TFCG through the Forest Justice in Tanzania (FJT) project.

Figure 3. Forest cover change analysis using remote sensing images from 2008 and 2010 for three of Dar's greenbelt forests.



Key	
Red = deforestation between 2008 – 2010,	Dark Green = woodland / forest;
Light green = thicket	Yellow = agricultural / grass land.

2) Forest Reserve Descriptions

This section provides descriptions of the two forest reserves, pictured in Figure 3.

2.1 General description

Names: Pugu and Kazimzumbwi Forest Reserves
Kisarawe District, Coastal Region, Tanzania

Size: Pugu Forest Reserve: 2179 hectares (21.8 km²)
Kazimzumbwi Forest Reserve: 3550 hectares (35.5 km²)

Management: Management of the two forests is the responsibility of the Tanzania Forest Service.

NGOs active in the area in 2012: WCST, MJUMITA and TFCG

Status: Protective Forest Reserves with declaration orders as follows:
Pugu FR: Declaration Order Cap. 132 of 1947; superseded by Cap. 389 of 1959
Kazimzumbwi FR: Declaration Order 306 of 24/6/1954; superseded by Cap. 389 of 1959

Land tenure: Reserved Land under the authority of the Tanzania Forest Service
The forests are surrounded by seven villages: Pugu kajiungeni, Pugu station, Buyuni, Chanika, Kazimzumbwi, Vigama and Kisarawe

2.2 Location

Coordinates (Lat/Long): Pugu Forest Reserve: 6°52'S-6°55'S, 39°04'E - 39°07'E.
Kazimzumbwi Forest Reserve: 6°55'S-7°00'S, 39°01'E-39°05'E.

Elevation: Pugu Forest Reserve: 100-305 m a.s.l
Kazimzumbwi Forest Reserve: 120-280 m a.s.l

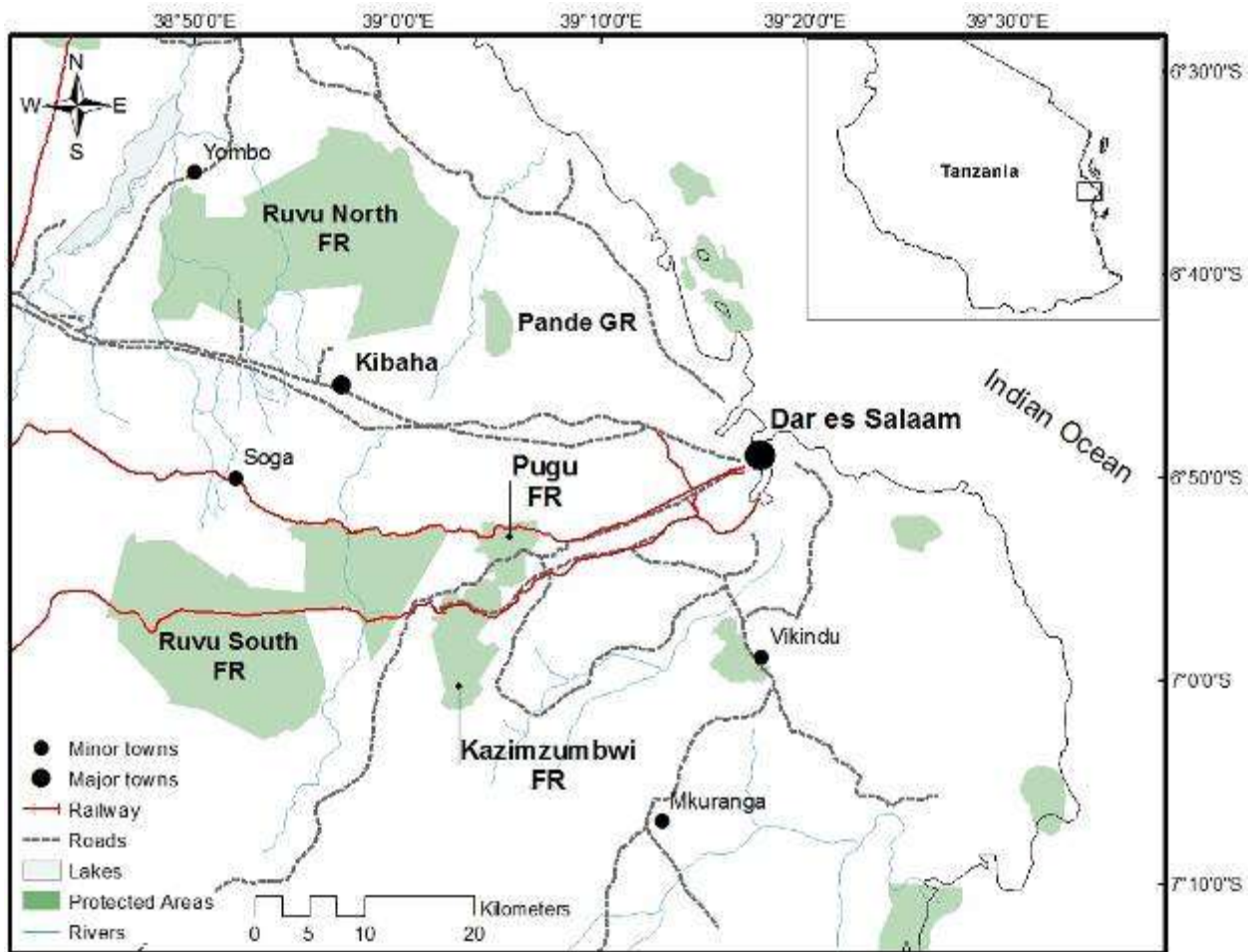


Figure 4. Map showing the location of Pugu and Kazimzumbwi Forest Reserves.

2.3 Climate

Both forests are influenced by the tropical monsoon climate of the Indian Ocean. Temperatures range from 24-31°C varying with elevation. Rainfall has a bimodal pattern, with the annual average exceeding 1000 mm and falling primarily from March to June (Clarke & Dickinson, 1995; Hall et al., 2002).

2.4 Vegetation types

The two forests consist of dry forest, dense impenetrable thicket found mainly on ridgetops, and open grassland with poor tree cover (Clarke & Dickinson, 1995). Kazimzumbwi had, at the time of Clarke and Dickinson's 1995 survey, some riverine and groundwater forest along watercourses and steeper-sided valleys, while Pugu had plantation forest of *Cassia siamea*, *Eucalyptus* sp., *Grevillea robusta* and a few teak, *Tectona grandis*, which was being re-colonized by indigenous species.

3) Botanical Survey

3.1 Background

Botanical surveys in Pugu and Kazimzumbwi Forest Reserves have previously been conducted by, amongst others, by Clarke and Dickinson in 1995, and by Hall *et al.* in 2002. Hall *et al.* found 111 plant species of which 21 were endemics in Kazimzumbwi FR, and Clarke and Dickinson found 25 and 9 endemic species in Pugu and Kazimzumbwi respectively.

3.2 Objectives

The objectives of this botanical survey were as follows:

1. To document the current status of the botanical species composition of Pugu and Kazimzumbwi forests.
2. To document the presence of plant species endemic to the East African coastal forests or to Pugu and/or Kazimzumbwi forests.
3. To identify invasive plant species present in Pugu and Kazimzumbwi forests.

3.3 Methods

3.3.1 Botanical survey methods

Surveys were carried out using a combination of botanical collections and field identifications. During the 2011 survey, records are based on observations only and no botanical collections were made. During the 2012 survey specimens were collected from most restricted range or threatened plant species and for those plants where the identification was uncertain. During both surveys most of the survey work was carried out in the vicinity of the disturbance transects described in the following section.

The following analyses are based on presence-absence data for each site. No attempt was made to assess abundance.

3.3.2 Sampling intensity

Botanical surveys were carried out over 10 days in 2011 between 7th to 17th June. In 2012, surveys were carried out over 10 days between 26th May and 4th June 2012 in Pugu Forest Reserve.

Surveys were carried out in six sites, three in Pugu and three in Kazimzumbwi. These are summarized in Table 3. More detailed descriptions of the six sites are provided in Appendix 39.

Table 3 Summary description of the botanical survey sites.

Site Number	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Forest Reserve	Pugu			Kazimzumbwi		
Site Name(s)	Mambisi and Pugu Relini	Dunda and Kimani	Pugu Mpakani and Minaki Bwawani	Kazimzumbwi Jeshini and Buyuni	Vibura	Chanika
Vegetation category	Mambisi = Historically degraded and Pugu Relini = recently degraded	Dunda = Recently degraded and Kimani = being cleared	Pugu Mpakani and Minaki Bwawani = Less disturbed forest	Kazimzumwi Jeshini = Less disturbed forest and Buyuni = recently deforested	Vibura = Degraded thicket and farmland	Abandoned agricultural land

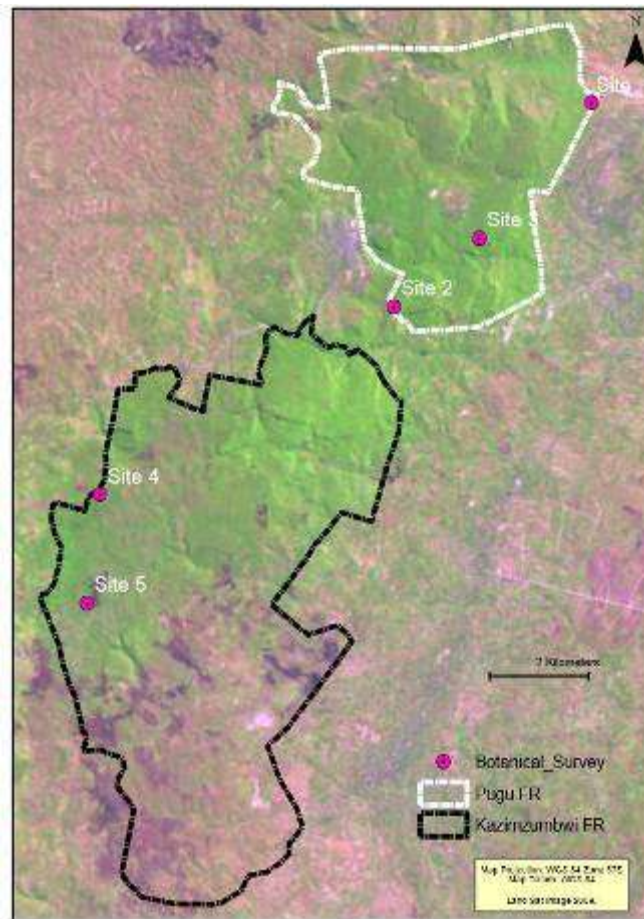


Figure 5. Map showing location of botanical surveys.

A total of 202 botanical collections were made in 2012. These are between collection numbers 7810 and 8012 in Moses Mwangoka's collecting series. Duplicate specimens have been deposited at the Missouri Botanical Gardens, the National Herbarium of Tanzania and the Herbarium at the Forestry Training Institute at Olmotonyi. Collections and provisional identifications have been provided by Moses Mwangoka. These are still awaiting confirmation by Roy Gereau of the Missouri Botanical Gardens. No collections were made during the 2011 survey.

3.4 Results

3.4.1 Endemism

A total of 31 plant species endemic to the Swahilian Regional Centre of Endemism *sensu lato* (Burgess 2000) were recorded. Of these, two species, *Millettia puguensis* and *Baphia puguensis*, are endemic to Pugu and Kazimzumbwi Forest Reserves and *Uvaria puguensis* is found in both Pugu and the nearby Pande Game Reserve, a small game reserve in the suburbs of Dar es Salaam. In addition the shrub, *Whitfieldia orientalis* that is endemic to the Eastern Arc Mountains and Coastal forests was also recorded at the Mambisi and Pugu Relini site in 2012.

Overall more endemic species were recorded from Pugu (30) than from Kazimzumbwi (16). Only one of the three species endemic to Pugu and nearby forests was found in Kazimzumbwi. The recently degraded forest at Mambisi and Pugu Relini had the most restricted range species (28). A comparable number of restricted range species was found at Pugu Mpakani and Minaki (25). All three Pugu endemic plant species were found at both Pugu Mpakani / Minaki and Pugu Mambisi/ Pugu Relini.

Table 4. Plant species endemic to the Swahilian Regional Centre of Endemism *sensu lato* recorded in Pugu and Kazimzumbwi Forest Reserves in 2011 and 2012.

	Family	Species	Range	Pugu Sites			Kazimzumbwi Sites			Collection Number
				1	2	3	4	5	6	
1	Amaranthaceae	<i>Celosia hastata</i> Lopr.	E CF			1				No coll
2	Annonaceae	<i>Monanthes trichocarpa</i> (Engl. And Diels) Verdc.	E CF	1			1			No coll
3	Annonaceae	<i>Uvaria acuminata</i> Oliv.	E CF	1	1	1	1			No coll
4	Annonaceae	<i>Uvaria kirkii</i> Hook. F.	E CF	1			1	1		No coll
5	Annonaceae	<i>Uvaria puguensis</i> D.M. Johnson	E Pugu	1		1				No coll
6	Annonaceae	<i>Xylopia arenaria</i> Engl.	E CF	1		1	1			No coll
7	Annonaceae	<i>Xylopia collina</i> Diels	E CF	1	1	1				MM7883
8	Bombacaceae	<i>Bombax rhodognophalon</i> Engl.	E CF	1		1				No coll
9	Euphorbiaceae	<i>Mildbraedia carpinifolia</i> (Pax) Hutch.	E CF	1	1	1	1			MM7956
10	Fabaceae subfamily Caesalpinioideae	<i>Dialium holtzii</i> Harms	E CF	1	1	1	1	1		No coll
11	Fabaceae subfamily Caesalpinioideae	<i>Scorodophloeus fischeri</i> Harms	E CF	1		1	1			No coll
12	Fabaceae subfamily Faboideae	<i>Angylocalyx braunii</i> Harms	E CF	1	1	1				MM7928
13	Fabaceae subfamily Faboideae	<i>Baphia puguensis</i> Brummitt	E Pugu	1	1	1	1			No coll
14	Fabaceae subfamily Faboideae	<i>Dalbergia vacciniifolia</i> Vatke	E CF	1		1				MM7908
15	Fabaceae subfamily Faboideae	<i>Millettia puguensis</i> Gillett	E Pugu	1		1				MM7917
16	Loganiaceae	<i>Strychnos panganensis</i> Gilg.	E CF	1	1	1	1	1		MM7887
17	Malpighiaceae	<i>Acridocarpus chloropterus</i> Oliv.	E CF				1	1		No coll
18	Malpighiaceae	<i>Acridocarpus zanzibaricus</i> A. Juss.	E CF	1	1	1				MM7862 and 8007
19	Malvaceae	<i>Gossypioides kirkii</i> (Mast.) Skovst. ex J.B.Hutch.	E CF	1	1	1				MM7885
20	Rubiaceae	<i>Canthium mombazense</i> Baill.	E CF	1	1	1				MM7824
21	Rubiaceae	<i>Gardenia transvenulosa</i> Verdc.	E CF	1		1	1			MM7955
22	Rubiaceae	<i>Rothmannia macrosiphon</i> (Engl.) Bridson	E CF	1	1	1				MM7865
23	Sapindaceae	<i>Chytranthus obliquinervis</i> Engl.	E CF	1		1				MM7860
24	Sapindaceae	<i>Haplocoelopsis africana</i> F.G. Davies	E CF			1	1			No coll
25	Sapotaceae	<i>Manilkara sansibarensis</i> (Engl.) Dubard	E CF	1			1			No coll
26	Sterculiaceae	<i>Nesogordonia holtzii</i> (Engl.) Capuron	E CF	1		1			1	No coll
27	Tiliaceae	<i>Grewia conocarpa</i> K. Schum	E CF	1	1	1	1	1		MM7886
28	Tiliaceae	<i>Grewia forbesii</i> Harv. ex Mast.	E CF	1	1	1	1	1		No coll
29	Tiliaceae	<i>Grewia goetzeana</i> K.Schum	E CF	1	1					MM7947
30	Verbenaceae	<i>Vitex zanzibarensis</i> Vatke	E CF	1		1				No coll

	Family	Species	Range	Pugu Sites			Kazimzumbwi Sites			Collection Number
				1	2	3	4	5	6	
31	Vitaceae	<i>Cissus quinquangularis</i> Chiov.	E CF	1						No coll
	Total			28	14	25	15	6	1	

Key to Table 4

Site 1 = Mambisi and Pugu Relini
Site 4 = Buyuni

Site 2 = Pugu Dunda and Kimani
Site 5 = Vibura

Site 3 = Pugu Mpakani and Minaki
Site 6 = Chanika

Geographical range

E CF = Endemic plants of the Swahilian Regional Centre of Endemism sensu lato (including coastal forests) based on Appendix 3. Of Burgess and Clarke 2000.

Collection

MM = Numbering in Moses Mwangoka's botanical collection series.

No coll = No collection made.

3.4.2 Threatened species

Thirteen threatened plant species were recorded during the survey of which all species were recorded in Pugu and five were also recorded in Kazimzumbwi. An additional three species considered by IUCN to be near-threatened and seven species considered as least concern were also recorded. It should be noted that there has been an ongoing evaluation of the red list status of Tanzania's plants however the new assessments have not yet been published for all species, and some assessments have not been carried out. As such this does not provide a full picture of the threatened status of the plants found in Pugu and Kazimzumbwi. For example, *Millettia puguensis* is endemic to Pugu and Kazimzumbwi but no assessment has been published for this species although its range is comparable with the Endangered *Baphia puguensis*.

Table 5. List of threatened plant species recorded in Pugu and Kazimzumbwi.

Family	Scientific name	Red List	Pugu			Kazimzumbwi			Coll No
			1	2	3	4	5	6	
Annonaceae	<i>Uvaria puguensis</i> D.M. Johnson	CR	1		1				No coll
Annonaceae	<i>Xylopia collina</i> Diels	EN	1	1	1				MM7883
Fabaceae subfamily Faboideae	<i>Baphia puguensis</i> Brummitt	EN	1	1	1	1			No coll
Annonaceae	<i>Xylopia arenaria</i> Engl.	VU	1		1	1			No coll
Euphorbiaceae	<i>Mildbraedia carpinifolia</i> (Pax) Hutch.	VU	1	1	1	1			MM7956
Fabaceae subfamily Caesalpinioideae	<i>Dialium holtzii</i> Harms	VU	1	1	1	1	1		No coll
Fabaceae subfamily Faboideae	<i>Angylocalyx braunii</i>	VU	1	1	1				MM7928
Fabaceae subfamily Faboideae	<i>Dalbergia vacciniifolia</i> Vatke	VU	1		1				MM7908
Fabaceae subfamily Faboideae	<i>Millettia bussei</i> Harms	VU	1		1				MM7870
Rubiaceae	<i>Gardenia transvenulosa</i> Verdc.	VU	1		1	1			MM7955
Rubiaceae	<i>Rothmannia macrosiphon</i> (Engl.) Bridson	VU	1	1	1				MM7865
Sapindaceae	<i>Chytranthus obliquinervis</i> Engl.	VU	1		1				MM7860
Verbenaceae	<i>Vitex zanzibarensis</i> Vatke	VU	1		1				No coll
Annonaceae	<i>Uvaria kirkii</i> Hook. F.	NT	1			1	1		No coll
Fabaceae subfamily Faboideae	<i>Dalbergia melanoxyton</i>	NT	1	1	1	1	1	1	MM7899
Moraceae	<i>Milicia excelsa</i>	NT			1	1	1		No coll
Flacourtiaceae	<i>Bivinia jalbertii</i>	LR/nt		1	1				MM8009

Family	Scientific name	Red List	Pugu			Kazimzumbwi			
Annonaceae	<i>Monanthes trichocarpa</i> (Engl. And Diels) Verdc.	LC	1			1			No coll
Annonaceae	<i>Uvaria acuminata</i> Oliv.	LC	1	1	1	1			No coll
Apocynaceae	<i>Holarrhena pubescens</i>	LC	1	1	1		1		No coll
Cyperaceae	<i>Cyperus glaucophyllus</i>	LC	1	1	1				MM7876 and MM 7949
Cyperaceae	<i>Cyperus rotundus</i> L.	LC	1		1				MM7991
Cyperaceae	<i>Scleria foliosa</i>	LC	1		1				MM7866 and MM 8008
Tiliaceae	<i>Grewia goetzeana</i> K.Schum	DD	1	1					MM7947
Total			22	12	21	10	5	1	

Key to Table 5

Site 1 = Mambisi and Pugu Relini
Site 4 = Buyuni

Site 2 = Pugu Dunda and Kimani
Site 5 = Vibura

Site 3 = Pugu Mpakani and Minaki
Site 6 = Chanika

Threat status

CR = Critically Endangered
NT = Near threatened

EN = Endangered
LC = Least Concern

VU = Vulnerable
DD = Data Deficient

Collection

MM = Numbering in Moses Mwangoka's botanical collection series.

No coll = No collection made.

In both Mambisi / Pugu Relini and Pugu Mpakani / Minaki Bwawani sites, all thirteen threatened species were recorded. In contrast at Chanika no threatened species were recorded

Table 6. Number of threatened plant species recorded at each sample site.

Threat status	Pugu Sites			Kazimzumbwi Sites			Total
	1	2	3	4	5	6	
Critically Endangered	1	0	1	0	0	0	1
Endangered	2	2	2	1	0	0	2
Vulnerable	10	4	10	4	1	0	10
Total	13	6	13	5	1	0	13

3.4.3 Plant species richness

In total, 414 plant species in 71 families were recorded during the botanical surveys. These are listed in Appendix 40. The identifications of those plants for which specimens were taken is provisional. Overall more than twice as many species were recorded in Pugu (371 species) than in Kazimzumbwi (175).

Pugu Mpakani and Minaki Bwawani (less disturbed forest) was the most species rich site with 321 species, followed by Mambisi and Pugu Rellini (historically and recently degraded) with 305 species (Table 7). The least diverse site was Chanika with only 63 species.

Table 7. Comparison of plant species richness between sites.

Site name	Site number	Forest Reserve	Forest condition historical	Species richness
Mambisi & Pugu Rellini	1	Pugu	Historically degraded and recently degraded	305
Pugu Dunda & Kimani	2	Pugu	Recently degraded and being cleared	175
Pugu Mpakani & Minaki Bwawani	3	Pugu	Less disturbed forest	321

Site name	Site number	Forest Reserve	Forest condition historical	Species richness
Buyuni	4	Kazimzumbwi	Recently degraded.	111
Vibura	5	Kazimzumbwi	Historically degraded	79
Chanika	6	Kazimzumbwi	Abandoned agricultural land	63

3.4.4 Invasive species

Two invasive alien species were recorded *Lantana camara* and *Stachytarpheta jamaicensis*. *Lantana camara* was recorded in all sites except Site 6 whilst *Stachytarpheta jamaicensis* was recorded in Sites 1 and 3 only.

3.5 Discussion

A checklist of 414 plant species was compiled. Of the four survey sites, The most species-rich site with 321 species was the less disturbed forest at Pugu Mpakani and Minaki Bwawani. Of the plant species recorded, 13 are considered threatened according to the IUCN Red-Listed ten Vulnerable, two Endangered, and one Critically Endangered species. 31 plant species endemic to the Swahilian Regional Centre of Endemism *sensu lato* (Burgess 2000) were recorded. Unexpectedly, in Pugu forest, Pugu mpakani, a site found just near the main road, was found to have a high level of endemism relative to other sampling locations; however, the endemic *Millettia puguensis* was recorded cut at this site. The endemic *Baphia puguensis* was recorded frequently at Buyuni site in Kazimzumbwi FR.

The status of several of the Red-Listed species recorded during the surveys need updating. These include *Angylocalyx braunii*, a vulnerable species that is restricted to patches of riverine and moist forest (Lovett & Clarke, 1998a); *Dalbergia vacciniifolia*, a scandent shrub that occurs in patches of dry coastal forest at unusually high altitudes (Lovett & Clarke, 1998b); *Millettia bussei*, restricted to areas of dry coastal forest (Lovett & Clarke, 1998d); *Rothmania macrosiphon*, described as a sometimes scrambling shrub or small tree growing in moist coastal forests (Lovett & Clarke, 1998e); *Chytranthus obliquinervis*, restricted to localised populations on the East African coast and under pressure from cultivation (IUCN, 1998); *Vitex zanzibarensis*, a vulnerable large tree of coastal forest, woodland and thicket found in remaining forest patches in Tanzania and only two sites in Kenya (Lovett & Clarke, 1998f).

Areas in the vicinity of both Pugu and Kazimzumbwi were found to have high fire damage, with one dominant plant species recorded, *Trema orientalis*. This suggests a poor prognosis for the future condition of these two forest reserves and the endemic and threatened species they support. Our findings at Pugu mpakani are consistent with those of Hall *et al.* (2002), who recorded that the Pugu and Kazimzumbwi endemic plant *Baphia puguensis* suffers from pole extraction. In both Pugu and Kazimzumbwi, three further plant species were recorded to be highly extracted for timber and charcoal: *Pterocarpus angolensis*, *Brachystegia sp.* and *Albizia versicolor*. Of these, two (*Brachystegia sp.* and *Pterocarpus angolensis*) were also documented by Hall *et al.* (2002) in Pugu FR. One main invasive species, *Lantana camara*, was recorded with regularity at each of the four sites in our survey. This plant species is capable of preventing all other plants from growing under and near it and can form single-species stands that exclude all other plants as well as all land uses (IUCN Invasive Species Initiative).

4) Bird Survey

4.1 Background

Pugu and Kazimzumbwi forests are rich in avifauna, including forest and highland species (Baker & Baker, 2002). Both sites are likely feeding stop-over areas between breeding sites such as Rondo, south of the Rufiji, and Kenya's coastal forests where birds overwinter and moult (Neil Baker, Tanzania Bird Atlas, 2012; Baker & Baker, 1992; Baker & Howell, 1992). Records in the Pugu Hills include the white-starred forest robin (LC), a highland species, likely a scarce migrant breeder to the area (Baker, 1984), and observations of distinct behavior, for example the use of tree holes for bathing by forest birds such as the Eastern bearded scrub robin (LC) (Baker, 1983).

4.2 Objectives

To provide an updated check-list of birds in Pugu and Kazimzumbwi Forest Reserves and compare it with existing data from other sources.

4.3 Methods

Five sites were opportunistically surveyed for birds over 16 days in 2012 by Elia Mulungu.

Site Number	Site 1	Site 2	Site 3	Site 4	Site 5
Forest Reserve	Pugu FR			Kazimzumbwi FR	
Site Name(s)	Mambisi and Pugu Relini	Pugu Dunda and Kimani	Pugu Mpakani and Minaki Bwawani	Kazimzumbwi Jeshini and Buyuni	Vibura
Vegetation category	Mambisi = Historically degraded and Pugu Relini = recently degraded	Dunda = Recently degraded and Kimani = being cleared	Pugu Mpakani and Minaki Bwawani = Less disturbed forest	Kazimzumwi Jeshini = Less disturbed forest and Buyuni = recently deforested	Vibura = Degraded thicket and farmland

4.4 Results

102 species in 79 genera in 37 families were recorded including four Red-Listed species above LC level. These were the African crowned eagle and Bateleur, both NT, the Spotted ground thrush (EN) and the East Coast akalat (NT).

Table 8. Bird checklist for Pugu and Kazimzumbwi FRs. Habitat (H): F = X, FF = Forest Dependent, O = Non forest. Range (R): W = Widespread, CFN = Endemic to the East African Coastal Forests and neighbouring forests including the Eastern Arc Mountains; RL = Red List status. Numbers 1-5 refer to sites with “1” denoting “first recorded at this site”. Site 1=Mambisi and Pugu relini (historically deforested & recently deforested); Site 2=Pugu Dunda and Kimani (recently degraded and being cleared); Site 3=Pugu Mpakani and Minaki bwawani (good forest); Site 4=Kazimzumbwi jeshini and Buyuni (good forest and recently cleared); and Site 5=Vibura and Chanika (degraded and shamba). Red-listed species are in red.

Family	Genus species	Common name	Author	H	R	RL	1	2	3	4	5
ACCIPITRIDAE	<i>Aquila nipalensis</i>	Steppe eagle	Daudin 1800			LC		1			
ACCIPITRIDAE	<i>Aquila rapax</i>	Tawny eagle				LC				1	
ACCIPITRIDAE	<i>Buteo augur</i>	Augur buzzard	Ruppell 1836	F	W	LC		1			
ACCIPITRIDAE	<i>Buteo buteo</i>	Common buzzard	Temminck 1828	O	W	LC			1		
ACCIPITRIDAE	<i>Gypohierax angolensis</i>	Palm-nut vulture	Gmelin 1788	F	W	LC			1		
ACCIPITRIDAE	<i>Hieraaetus spilogaster</i>	African hawk-eagle	Bonaparte 1850	O	W	LC			1		
ACCIPITRIDAE	<i>Lophaetus occipitalis</i>	Long-crested eagle	Daudin 1800	O	W	LC	1				
ACCIPITRIDAE	<i>Stephanoaetus coronatus</i>	African crowned eagle	Linnaeus 1766	F	W	NT		1			
ACCIPITRIDAE	<i>Terathopius ecaudatus</i>	Bateleur	Daudin 1800	O	W	NT		1			
ALCEDINIDAE	<i>Alcedo cristata</i>	Malachite kingfisher	Pallas 1764	O	W	LC		1			
ALCEDINIDAE	<i>Ceryle rudis</i>	Pied kingfisher	Linnaeus 1858	O	W	LC		1			
ALCEDINIDAE	<i>Halcyon albiventris</i>	Brown-hooded kingfisher	Scopoli 1786	O	W	LC		1			
APODIDAE	<i>Apus affinis</i>	Little swift	Gray 1830	O	W	LC			1		
APODIDAE	<i>Apus caffer</i>	White-rumped swift	Lichtenstein 1823	O	W	LC			1		
BUCEROTIDAE	<i>Tockus alboterminatus</i>	Crowned hornbill	Buttikofer 1889	F	W	LC			1		
BUCEROTIDAE	<i>Tockus nasutus</i>	African grey hornbill	Linnaeus 1766	O	W	LC				1	
CAPITONIDAE	<i>Pogoniulus bilineatus</i>	Yellow-rumped tinkerbird	Sundevall 1850	F	W	LC	1				
CAPITONIDAE	<i>Pogoniulus leucomystax</i>	Moustached green-tinkerbird	Sharpe 1892	F	W	LC			1		
CAPITONIDAE	<i>Stactolaema olivacea</i>	Green barbet	Shelley 1880	F	CFN	LC		1			
CAPRIMULGIDAE	<i>Caprimulgus pectoralis</i>	Fiery-necked nightjar	Cuvier 1817	O	W	LC			1		
COLIIDAE	<i>Colius striatus</i>	Speckled mousebird	Gmelin 1789	O	W	LC	1				
COLUMBIDAE	<i>Columba arquatrix</i>	Olive pigeon	Temminck 1809	F	W	LC		1			
COLUMBIDAE	<i>Columba delegorguei</i>	Eastern bronze-napped pigeon	Delegorgue 1847	F	W	LC		1			
COLUMBIDAE	<i>Streptopelia semitorquata</i>	Red-eyed dove	Ruppell 1837	F	W	LC		1			
COLUMBIDAE	<i>Treron calvus</i>	African green-pigeon	Temminck 1808	F	W	LC	1				
COLUMBIDAE	<i>Turtur chalcospilos</i>	Emerald-spotted wood-dove	Walglar 1827	O	W	LC			1		

Family	Genus species	Common name	Author	H	R	RL	1	2	3	4	5
COLUMBIDAE	<i>Turtur tympanistria</i>	Tambourine dove	Temminck 1809	F	W	LC		1			
CORVIDAE	<i>Corvus albus</i>	Pied crow	Muller 1776	O	W	LC			1		
CUCULIDAE	<i>Centropus superciliosus</i>	White-browed coucal	Hemprich & Ehrenberg 1833	O	W	LC			1		
CUCULIDAE	<i>Ceuthmochares aereus</i>	Yellowbill	Vieillot 1817	F	W	LC	1				
CUCULIDAE	<i>Centropus burchelli</i>	Burchell's coucal	Hemprich & Ehrenberg 1833			LC				1	
CUCULIDAE	<i>Chrysococcyx caprius</i>	Diederik cuckoo	Boddaert 1792			LC			1		
CUCULIDAE	<i>Chrysococcyx klaas</i>	Klaas` cuckoo	Stephens 1815	O	W	LC			1		
CUCULIDAE	<i>Cuculus clamosus</i>	Black cuckoo	Latham 1801	F	W	LC		1			
DICRURIDAE	<i>Dicrurus ludwigii</i>	Square-tailed drongo	Smith 1834	F	W	LC		1			
EMBERIZIDAE	<i>Emberiza cabanisi</i>	Cabanis`s bunting	Reichenow 1875	O	W	LC				1	
EMBERIZIDAE	<i>Estrilda quartinia</i>	Yellow-bellied waxbill	Bonaparte 1850	O	W	Not listed		1			
EMBERIZIDAE	<i>Pytilia meba</i>	Green-winged pytilia	Linnaeus 1758	O	W	LC	1				
EMBERIZIDAE	<i>Vidua cholybeata</i>	Village indigobird	Müller, 1776			LC				1	
EMBERIZIDAE	<i>Vidua codringtoni</i>	Twinspot Indigobird	Neave, 1907			LC				1	
EMBERIZIDAE	<i>Vidua macroura</i>	Pin-tailed whydah	Pallas 1764	O	W	LC				1	
EURLAIMIDAE	<i>Smithornis capensis</i>	African broadbill	Smith 1840	F	W	LC			1		
HIRUNDINIDAE	<i>Hirundo abyssinica</i>	Lesser striped-swallow	Guerin Meneville 1840	O	W	LC		1			
HIRUNDINIDAE	<i>Psolidoprocne holomelas</i>	Black saw-wing	Sundevall 1850	F	W	Not listed	1			1	
MALACONOTIDAE	<i>Dryscopus cubla</i>	Black-backed puffback	Shaw 1809	F	W	LC			1		
MALACONOTIDAE	<i>Laniarius aethiopicus</i>	Tropical boubou	Gmelin 1788	O	W	LC	1				
MALACONOTIDAE	<i>Malaconotus blanchoti</i>	Grey-headed bush-shrike	Stephens 1826	O	W	LC		1			
MALACONOTIDAE	<i>Malaconotus quadricolor</i>	Four-coloured shrike				Not listed					1
MALACONOTIDAE	<i>Prionops retzii</i>	Retz`s helmet-shrike	Wahlberg 1856	O	W	LC			1		
MALACONOTIDAE	<i>Tchagra senegala</i>	Black-crowned tchagra	Linnaeus 1766	O	W	Not listed	1				
MALACONOTIDAE	<i>Telophorus nigrifrons</i>	Black-fronted bush-shrike	Reichenow 1896	O	W	LC			1		
MALACONOTIDAE	<i>Telophorus sulfureopectus</i>	Sulphur-breasted bush-shrike	Lesson 1831	O	W	LC			1		
MONARCHIDAE	<i>Terpsiphone viridis</i>	Paradise flycatcher	Statius Muller 1776	F	W	LC	1				
MONARCHIDAE	<i>Trochocercus cyanomelas</i>	Blue-mantled flycatcher	Vieillot 1818	F	W	LC			1		
MUSCICAPIDAE	<i>Muscicapa adusta</i>	African dusky flycatcher	Boie 1828	O	W	LC			1		
MUSCICAPIDAE	<i>Muscicapa striata</i>	Spotted flycatcher	Pallas 1764	O	W	LC			1		
MUSOPHAGIDAE	<i>Tauraco livingstonii</i>	Livingstone`s turaco	Gray 1864	F	W	LC			1		

Family	Genus species	Common name	Author	H	R	RL	1	2	3	4	5
NECTARINIIDAE	<i>Nectarinia olivacea</i>	Olive sunbird	Smith 1840	F	W	LC		1			
NECTARINIIDAE	<i>Anthreptes collaris</i>	Collared sunbird	Viellot 1819	F	W	LC	1				
NECTARINIIDAE	<i>Nectarinia veroxii</i>	Mouse-coloured sunbird	Smith 1831			LC			1		
NECTARINIIDAE	<i>Nectarinia amethystina</i>	Amethyst sunbird	Shaw 1812	O	W	LC		1			
NUMIDIDAE	<i>Guttera pucherani</i>	Crested guineafowl	Hartlaub 1861	F	W	LC		1			
ORIOLOIDAE	<i>Oriolus chlorocephalus</i>	Green-headed oriole	Shelley 1896	F	CFN	LC			1		
PASSERIDAE	<i>Lonchura bicolor</i>	Black-and-white mannikin	Fraser 1843	F	W	LC		1			
PASSERIDAE	<i>Lonchura cucullata</i>	Bronze mannikin	Swainson 1837	O	W	LC			1		
PHOENICULIDAE	<i>Phoeniculus purpureus</i>	Green wood-hoopoe	Miller 1784	O	W	LC			1		
PICIDAE	<i>Campethera abingoni</i>	Golden-tailed woodpecker	Smith 1836	F	W	LC		1			
PICIDAE	<i>Dendropicos fuscescens</i>	Cardinal woodpecker	Viellot 1818	O	W	LC		1			
PLOCEIDAE	<i>Amblyospiza albifrons</i>	Grosbeak weaver	Vigors 1831	O	W	LC			1		
PLOCEIDAE	<i>Euplectes axillaris</i>	Fan-tailed widowbird	Smith 1838	O	W	LC			1		
PLOCEIDAE	<i>Euplectes hordeaceus</i>	Black-winged red bishop	Linnaeus 1758	O	W	LC				1	
PLOCEIDAE	<i>Ploceus bicolor</i>	Forest weaver	Viellot 1819	F	W	LC	1				
PLOCEIDAE	<i>Ploceus cucullatus</i>	Black-headed weaver	Muller 1776	O	W	LC			1		
PLOCEIDAE	<i>Ploceus ocularis</i>	Spectacled weaver	Smith 1839	O	W	LC	1				
PLOCEIDAE	<i>Vidua obtusa</i>	Broad-tailed paradise-whydah	Chapin 1922			LC				1	
PYCNONOTIDAE	<i>Nicator gularis</i>	Eastern nicator	Hartlaub & Finsh 1870	F	W	LC		1			
PYCNONOTIDAE	<i>Phyllastrephus debilis</i>	Tiny greenbul	Sclater 1899	F	W	LC			1		
PYCNONOTIDAE	<i>Phyllastrephus flavostriatus</i>	Yellow-streaked greenbul	Sharpe 1876	F	W	LC			1		
PYCNONOTIDAE	<i>Pycnonotus barbatus</i>	Common bulbul	Desfontaines 1789	O	W	LC			1		
PYCNONOTIDAE	<i>Andropadus virens</i>	Little greenbul	Cassin 1858	F	W	LC	1				
SCOPIIDAE	<i>Scopus umbretta</i>	Hamerkop	Gmelin 1789	O	W	LC			1		
STRIGIDAE	<i>Bubo lacteus</i>	Verreaux's eagle owl	Temminck 1820	F	W	LC			1		
STURNIDAE	<i>Lamprotornis corruscus</i>	Black-bellied starling	Nordmann 1835	F	W	LC			1		
STURNIDAE	<i>Poeoptera kenricki</i>	Kenrick's starling	Shelley 1894	F	CFN	LC	1				
SYLVIIDAE	<i>Apalis melanocephala</i>	Black-headed apalis	Fischer & Reichenow 1884	F	W	LC			1		
SYLVIIDAE	<i>Camaroptera brevicaudata</i>	Grey-backed camaroptera	Cretschmar 1830	F	W	Not listed	1				
SYLVIIDAE	<i>Cisticola chinianus</i>	Rattling cisticola	Smith 1843	O	W	Not listed			1		
SYLVIIDAE	<i>Macrosphenus kretschmeri</i>	Kretschmer's longbill	Reichenow &	F	W	LC		1			
SYLVIIDAE	<i>Phylloscopus ruficapilla</i>	Yellow-throated woodland-warbler	Sundevall 1850	F	W	LC			1		

Family	Genus species	Common name	Author	H	R	RL	1	2	3	4	5
SYLVIIDAE	<i>Prinia subflava</i>	Tawny-flanked prinia	Gmelin 1789	O	W	LC		1			
TIMALIIDAE	<i>Illadopsis rufipennis</i>	Pale-breasted illadopsis	Sharpe 1872	F	W	LC			1		
TROGONIDAE	<i>Apaloderma vittatum</i>	Bar-tailed trogon	Shelley 1882	F	W	LC			1		
TURDIDAE	<i>Cossypha anomala</i>	Olive-flanked robin-chat	Shelley 1893	F	W	LC		1			
TURDIDAE	<i>Cossypha natalensis</i>	Red-capped robin-chat			W	LC	1				
TURDIDAE	<i>Neocossyphus rufus</i>	Red-tailed ant-thrush	Fischer & Reichenow 1884	F	W	LC			1		
TURDIDAE	<i>Pogonocichla stellata</i>	White-starred robin	Vieillot 1818	F	W	LC			1		
TURDIDAE	<i>Sheppardia gunningi</i>	East coast akalat	Haagner 1909		NE	NT			1		
TURDIDAE	<i>Zoothera guttata</i>	Spotted ground thrush	Vigors 1831		W	EN					1
UPUPIDAE	<i>Upupa africana</i>	African hoopoe	Bachstein 1811	O	W	Not listed		1			
ZOSTEROPIDAE	<i>Cyanomitra veroxii</i>	Mouse coloured sunbird	Smith 1831			LC			1		
ZOSTEROPIDAE	<i>Zosterops senegalensis</i>	Yellow white-eye	Bonaparte 1850	F	W	LC	1				

4.6 Discussion

Our 11-day survey corroborated the richness and distinctiveness of avifauna in Pugu-Kazimzumbwi and the importance of the Pugu Hills to bird conservation along the coast. Of the 102 species we recorded, four are Red-Listed birds including closed moist forest and coastal forest species such as the East Coast akalat (NT) and Spotted ground thrush (EN), and two birds of prey, the African crowned eagle (NT) and Bateleur (NT). We did not record the Southern banded snake-eagle (NT) and Uluguru violet-backed sunbird (LC) previously recorded by Mlingwa et al. (1993).

Mlingwa et al. (1993) recorded 58 bird species in Kazimzumbwi FR on their survey, while the better-studied Pugu FR is said to contribute substantially to supporting the 470 birds in and around Dar es Salaam (within a 50 km radius) of the ~1100 bird species recorded in Tanzania (Wium-Andersen & Reid, 2000).

The invasive Indian house crow *Corvus splendens* (introduced to Zanzibar in the late 19th century) and habitat fragmentation along the Tanzania coast are responsible for the decline of birds along the Tanzanian coast. The effectiveness of recent efforts to eradicate the house crow may in part be substantiated in our survey, which did not detect Indian house crows at our specific survey sites in the Pugu Hills although they were observed flying over the forest. As the following section on habitat disturbance details, however, destruction of natural habitat for charcoal production, poles and timber will threaten and displace birds of the Pugu Hills forests perhaps irretrievably.

5) Disturbance Survey

5.1 Background

Kazimzumbwi and especially Pugu Forest Reserves are well studied forests given their proximity to Dar es Salaam. Also because of their proximity to Tanzania's major urban centre, Ahrends (2005) described Pugu Forest Reserve as one of the most highly disturbed forests in Tanzania's Coast Region. Parts of Kazimzumbwi have been largely deforested.

5.2 Objectives

The disturbance surveys were carried out to achieve the following aims:

1. To assess the level of disturbance in Pugu and Kazimzumbwi Forest Reserves by documenting all observations of disturbance and their intensities.
2. To get a general understanding of the level of threats to Pugu's and Kazimzumbwi's endemic plant species.
3. To identify site-specific priorities for conservation and management.

5.3 Methods

5.3.1 Sampling intensity

Forest disturbance was measured in 2011 and 2012 at sites classed into six categories: "relatively undisturbed forest" (Pugu mpakani, Minaki bwawani, Kazimzumbwi jeshini, Kimani and portion of Mambisi), "recently deforested" (Pugu relini, part of Mambisi and Pugu-dunda), "historically deforested" (part of Mambisi site), "being cleared" (part of Kimani), "degraded" (Vibura) and "shamba" or farm (Chanika). Sites were classified based on an analysis of remote sensing images including images available on Google Earth. Two sets of 18 1-km disturbance transects encompassing the above disturbance categories or strata were conducted at both Pugu and Kazimzumbwi (Table 9; Appendices 1 and 20). Transects in Pugu forest were named T_nP, while those in Kazimzumbwi forest are referred to as T_nK, where, T is transect, n is the transect number, K and P is Kazimzumbwi and Pugu respectively (see Appendices for raw data from each transect). GPS points were recorded at the beginning and end of each transect.

Table 9. Number of disturbance transects walked in Pugu and Kazimzumbwi Forest Reserves in 2011 and 2012.

S/ N	Disturbance category	Number of transects 2011	Number of transects 2012	Site name
Pugu Forest Reserve				
1	Relatively undisturbed forest	3 (T1P, T4P, T9P)	2	Pugu mpakani & Minaki bwawani
2	Recently degraded	3 (T2P, T3P, T17P)	3	Pugu dunda & Pugu relini
3	Historically deforested	2 (T6P, T15P, T 16 P)	3	Portion of Mambisi
4	Being cleared	1 (T5P)	1	Portion of Kimani
Kazimzumbwi Forest Reserve				
5	Good forest	2 (T18K)	2	Kazimzumbwi jeshini
6	Recently cleared	2 (T11K, T12 K)	2	Buyuni
7	Degraded	2 (T8K, T14K)	2	Vibura
8	Shamba	3 (T10K, T13K, T7K)	3	Chanika

5.3.2 Transect method

A rope of 50 m long was used to measure 50 m segments along each 1 km transect line. The disturbance transect was therefore sub-divided into 20 50-m segments and data were recorded separately for each segment. The longitude, latitude and altitude of the start and end points of each disturbance transect were recorded using a hand-held GPS (see Appendices). Compass bearing / direction followed was also recorded.

The level of disturbance was assessed for each 50 m segment in terms of the number of incidents of pole cutting, timber cutting, traps and other disturbances in a 10 m strip (5 m on either side of the transect line). For the purpose of this survey, poles were defined as all trees with a diameter at breast height (DBH) of 5-15 cm. Timber trees were defined as all trees exceeding 15 cm DBH. The total area surveyed along each line was 10,000 m² or 1 hectare, for a sum of 18 hectares for 18 disturbance transects conducted (9 at each site) for each of the two years.

Other forms of anthropogenic disturbance within 5 m either side of each transect were also recorded for every 50m segment. These were defined as follows:

1. Fire damage: area affected by fire; evidence included burnt trees and ground vegetation.
2. Charcoal: area where charcoal was burned in the forest, evidence included small patches of burnt ground with charcoal remains as well as active kilns or kilns under preparation.
3. Pitsaw: an area obviously cleared for pitsaw activities, with pitsaw platform, or remains.
4. Timber/planks/poles: cut timber, planks or cut poles lying on the ground ready for transport.
5. Trapping: animal traps of all varieties whether set or sprung.
6. Cultivation: evidence of crop cultivation (past or present).
7. Grazing: direct evidence or remains of cattle or goat grazing.
8. Footpath: all human used footpaths.
9. Clearing: well-established clearings within the forest created by humans (usually short grassland, potentially previous settlement).

5.4 Results

5.4.1 Pugu Forest Reserve

The main form of disturbance detected in Pugu was pole cutting. In 2011, Minaki bwawani (T₄P) and Pugu– dunda (T₃P) had the most old cut poles. Mambisi area had the highest relative fire damage evinced by the presence of *Trema orientalis*, a pioneer plant species. In some areas such as on transects T₅P, T₁₂K, and T₁₆P, we recorded a few snares which suggests that there is still some trapping in Pugu and Kazimzumbwi forests. The botanical survey at Minaki bwawani suggests rapid extraction of several different water-supporting plants surrounding the Minaki dam (transect T₄P).

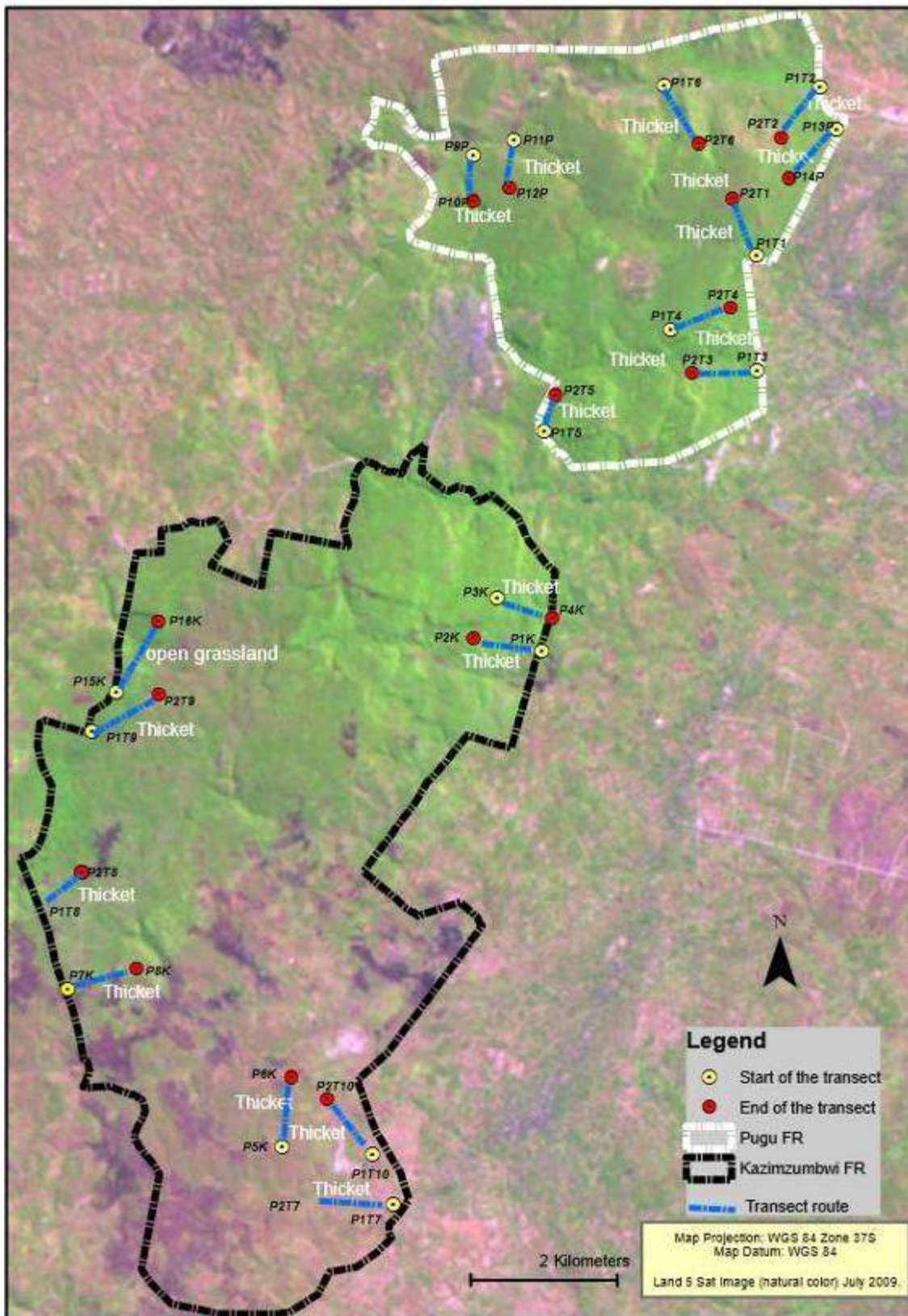


Figure 6. Map of the location of disturbance transects in Pugu and Kazimzumbwi.

5.4.1.1 Pole extraction

A total of 6641 poles were recorded on transects, 4403 poles in 2011 and 2638 poles in 2012. Less poles were recorded in 2012, however a greater proportion of poles were live than in 2011. In 2011, 64% were old cut poles while in 2012, 60% were live poles (Table 12 and Figure 7).

Table 10. Number of live, naturally dead, old cut and fresh cut poles recorded in Pugu FR.

Year	S/N	Transect no.	Transect map label	Total no. of poles sampled	Live poles	Naturally dead poles	Old cut poles	Fresh cut poles	Forest category
2011	1	T ₁ P	P1T1 -P2T1	250	109	4	78	59	Relatively undisturbed forest
	2	T ₂ P	P1T2-P2T2	513	197	5	296	15	Recently deforested
	3	T ₃ P	P1T3-P2T3	726	176	5	538	7	Recently deforested
	4	T ₄ P	P1T4-P2T4	931	253	8	659	11	Relatively undisturbed forest
	5	T ₅ P	P1T5-P2T5	417	293	10	113	1	Good forest & being
	6	T ₆ P	P1T6-P2T6	237	35	6	194	2	Recently deforested
	7	T ₁₅ P		212	79	5	111	17	Historically deforested
	8	T ₁₆ P		288	97	5	168	18	Historically deforested
	9	T ₁₇ P		429	27	0	386	16	Recently deforested
			Subtotal		4403	1266	48	2543	146
2012	10	T ₁ P		180	120	3	55	2	Good forest
	11	T ₂ P		215	144	2	67	2	Recently degraded
	12	T ₃ P		470	298	3	169	0	Good forest
	13	T ₄ P		259	255	4	0	0	Being cleared
	14	T ₅ P		418	154	0	250	14	Recently deforested
	15	T ₆ P		281	112	0	166	3	Recently deforested
	16	T ₇ P	P9P-P10P	292	154	0	138	0	Historically deforested
	17	T ₈ P	P11P-P12P	208	136	0	60	12	Historically deforested
	18	T ₉ P	P13P-P14P	315	200	0	87	28	Historically deforested
			Subtotal		2638	1573	12	992	61
		Total		6641	2839	60	3535	207	

NB: TnP; T=Transect, n=Transect number, P= Pugu

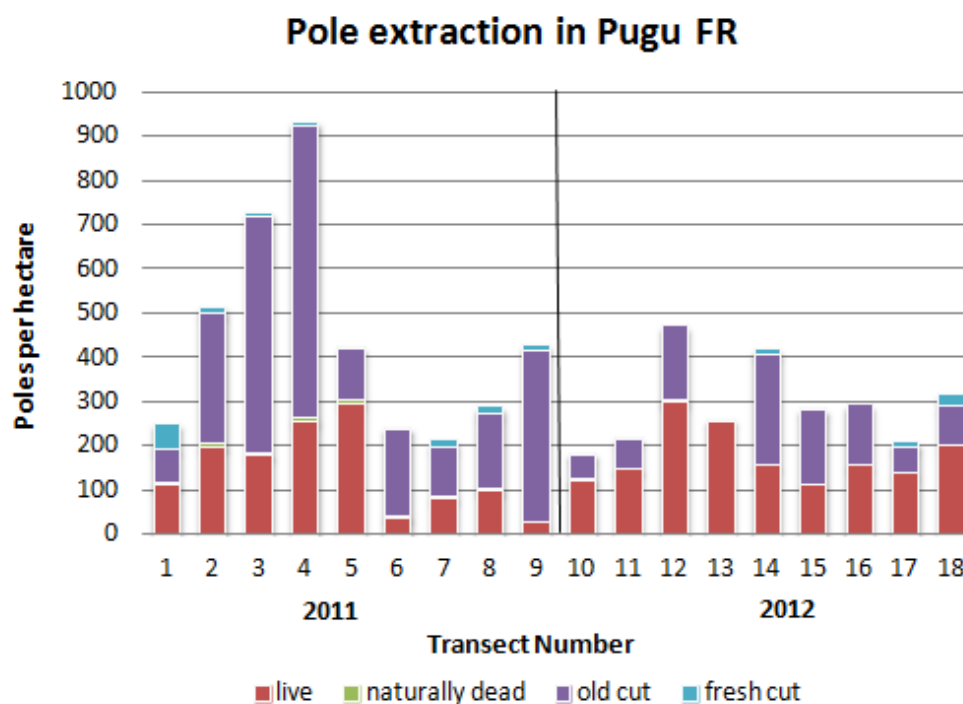


Figure 7. Number of live, naturally dead, old cut and fresh cut poles per hectare in Pugu FR.

5.4.1.2 Timber extraction in Pugu Forest Reserve

A total of 1433 timbers were recorded in Pugu FR, 718 in 2011 and 715 in 2012. Of these, 78% were old cut timber in 2011 and 82% were old cut timber in 2012 (Table 13 and Figure 8); whilst 3.3 % were fresh cut in 2011; and 0.5 % were fresh cut in 2012.

Table 11. Number of live, naturally dead, old cut and fresh cut timber recorded in Pugu FR.

Year	S/N	Transect no.	Total no. of timber recorded	Live timber	Naturally dead timber	Old cut timber	Fresh cut timber	Forest category
2011	1	T ₁ P	56	7	0	37	12	Good forest
	2	T ₂ P	26	0	0	23	3	Recently deforested
	3	T ₃ P	30	11	0	17	2	Recently deforested
	4	T ₄ P	50	15	1	34	0	Good forest
	5	T ₅ P	69	43	3	20	3	Good forest & being cleared
	6	T ₆ P	30	0	0	29	1	Recently deforested
	7	T ₁₅ P	102	14	0	88	0	Historically deforested
	8	T ₁₆ P	97	33	3	60	1	Historically deforested
	9	T ₁₇ P	258	1	0	255	2	Recently deforested
	Subtotal	718	124	7	563	24		
2012	10	T ₁ P	39	6	3	30	0	Good forest
	11	T ₂ P	99	24	2	73	0	Recently degraded
	12	T ₃ P	116	10	1	105	0	Good forest
	13	T ₄ P	48	46	1	0	1	Being cleared
	14	T ₅ P	137	1	0	136	0	Recently deforested
	15	T ₆ P	117	1	0	116	0	Recently deforested
	16	T ₇ P	50	2	0	48	0	Historically deforested
	17	T ₈ P	44	13	0	28	3	Historically deforested
	18	T ₉ P	65	14	1	50	0	Historically deforested
		Subtotal	715	117	8	586	4	
	Total	1433	241	15	1149	28		

Note: LP, OCP, CFP and NDP represents: live pole, old cut pole, cut fresh pole and naturally dead pole respectively.

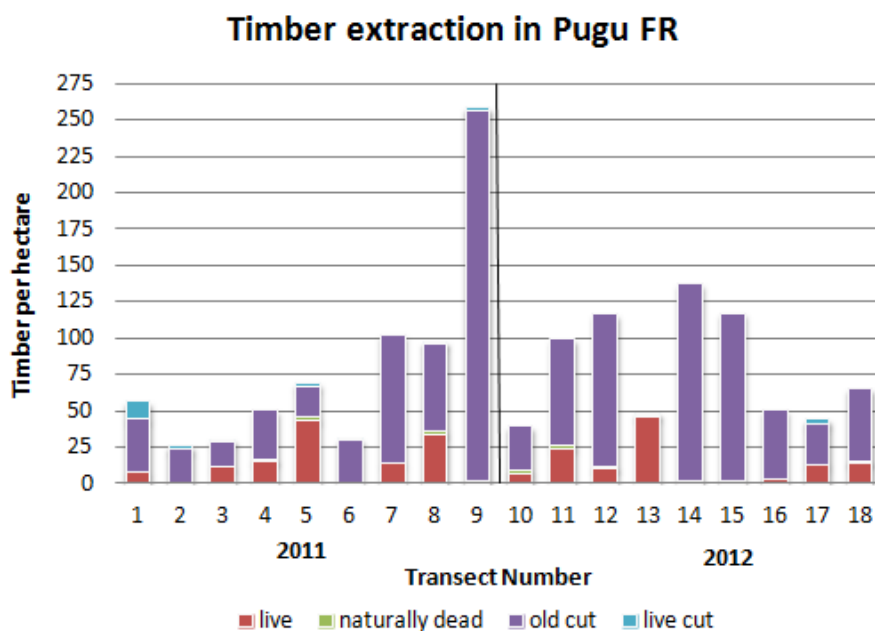


Figure 8. Number of live, naturally dead, old cut and fresh cut timber per hectare in Pugu FR.

5.4.2 Kazimzumbwi Forest Reserve

Kazimzumbwi Forest Reserve, in contrast to Pugu, shows high levels of human disturbance in the form of fire damage and agricultural encroachment. Before people were evicted from the Forest Reserve in 1998 and 2010, large portions of the forest were cleared for agriculture. Cultivation, which was recorded on transects T₇K and T₁₀K in 2011, provides an example of this (refer to Appendices 7 and 10). Fire, recorded on most transects in 2011 and 2012, has emerged as a serious obstacle to conserving Kazimzumbwi forest. Sand mining, detected on transects T₇K and T₁₀K (see Appendices 7 and 10) in 2011, is another form of disturbance in this Forest Reserve. We recorded only a few snares, suggesting that there is still some hunting activity in the forest but that, most likely, the target species have been near-extirpated.

5.4.2.1 Pole extraction in Kazimzumbwi Forest Reserve

A total of 2800 poles were recorded, 1634 in 2011 and 1166 in 2012. In 2011, 66% were old cut and 24% were live poles while in 2012, 54% were live and 43% were old cut (Table 14, Figure 10).

Table 12. Number of live, naturally dead, old cut and fresh cut poles in Kazimzumbwi FR.

Year	S/N	Transect no.	Transect map label	Total no. of poles sampled	Live poles	Naturally dead poles	Old cut poles	Fresh cut poles	Forest category
2011	1	T ₇ K		222	40	0	166	16	Shamba
	2	T ₈ K		183	44	20	113	6	Degraded
	3	T ₉ K		267	43	12	191	21	Good forest
	4	T ₁₀ K	P1T7-P2T7	145	27	0	110	8	Shamba
	5	T ₁₁ K	P1T8-P2T8	185	46	8	104	27	Recently cleared site
	6	T ₁₂ K	P1T9-P2T9	142	20	3	112	7	Recently cleared
	7	T ₁₃ K	P1T10-	175	67	0	101	7	Shamba
	8	T ₁₄ K	P1K-P2K	121	31	3	86	1	Degraded
	9	T ₁₈ K	P15K-P16K	194	70	10	100	14	Good forest
		Subtotal		1634	388	56	1083	107	
2012	10	T ₁ K		185	65	4	116	0	Good forest
	11	T ₂ K		143	88	8	47	0	Good forest
	12	T ₃ K		151	109	4	38	0	Degraded
	13	T ₄ K		78	37	0	41	0	Degraded
	14	T ₅ K		160	61	0	86	13	Shamba
	15	T ₆ K	P3K-P4K	111	45	0	64	2	Shamba
	16	T ₇ K	P5K-P6K	75	75	0	0	0	Shamba
	17	T ₈ K	P7K-P8K	170	74	0	96	0	Recently cleared
	18	T ₉ K		93	73	6	8	6	Recently cleared
		Subtotal		1166	627	22	496	21	
		Total		2800	1015	78	1579	128	

Pole extraction in Kazimzumbwi FR

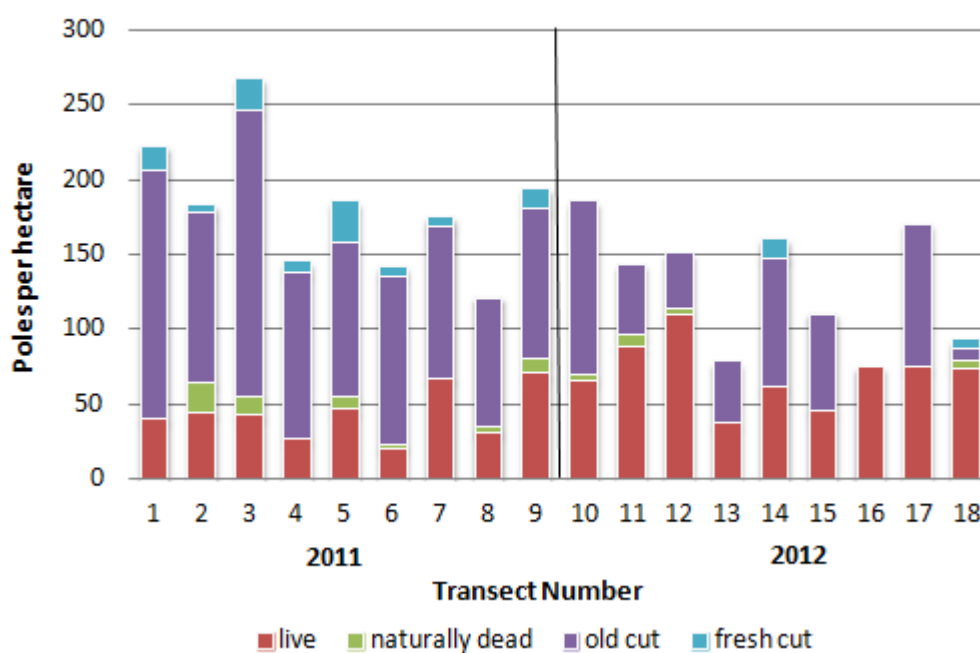


Figure 9. Number of live, naturally dead, old cut and fresh cut poles per ha in Kazimzumbwi FR.

5.4.2.2 Timber extraction in Kazimzumbwi Forest Reserve

In Kazimzumbwi Forest Reserve, a total of 904 timbers were recorded, 530 in 2011 and 374 in 2012. Over 82% of timber was old cut in both years (Table 15, Figure 11). The rate of freshly cut trees reduced from 6.6 % in 2011 to 1.6 % in 2012.

Table 13. Number of live, naturally dead, old cut and freshly cut timber in Kazimzumbwi FR.

Year	S/N	Transect No. (transect name)	Total no. of timber sampled	Live timber	Naturally dead timber	Old cut timber	Fresh cut timber	Forest category
2011	1	T ₇ K	8	3	0	4	1	Shamba
	2	T ₈ K	31	12	3	16	0	Degraded
	3	T ₉ K	184	18	0	139	27	Good forest
	4	T ₁₀ K	9	0	0	8	1	Shamba
	5	T ₁₁ K	78	0	0	75	3	Recently cleared
	6	T ₁₂ K	62	0	0	62	0	Recently cleared
	7	T ₁₃ K	13	2	0	8	3	Shamba
	8	T ₁₄ K	41	5	0	36	0	Degraded
	9	T ₁₈ K	104	16	3	84	1	Good forest
		Subtotal	530	56	6	432	36	
2012	10	T ₁ K	146	3	0	143	0	Good forest
	11	T ₂ K	44	10	1	33	0	Good forest
	12	T ₃ K	29	8	3	18	0	Degraded
	13	T ₄ K	24	6	0	18	0	Degraded
	14	T ₅ K	21	1	0	20	0	Shamba
	15	T ₆ K	27	6	0	21	0	Shamba
	16	T ₇ K	5	5	0	0	0	Shamba
	17	T ₈ K	53	0	0	53	0	Recently cleared

Year	S/N	Transect No. (transect name)	Total no. of timber sampled	Live timber	Naturally dead timber	Old cut timber	Fresh cut timber	Forest category
	18	T ₉ K	25	6	6	7	6	Recently cleared
		Subtotal	374	45	10	313	6	
		Total	904	101	16	745	42	

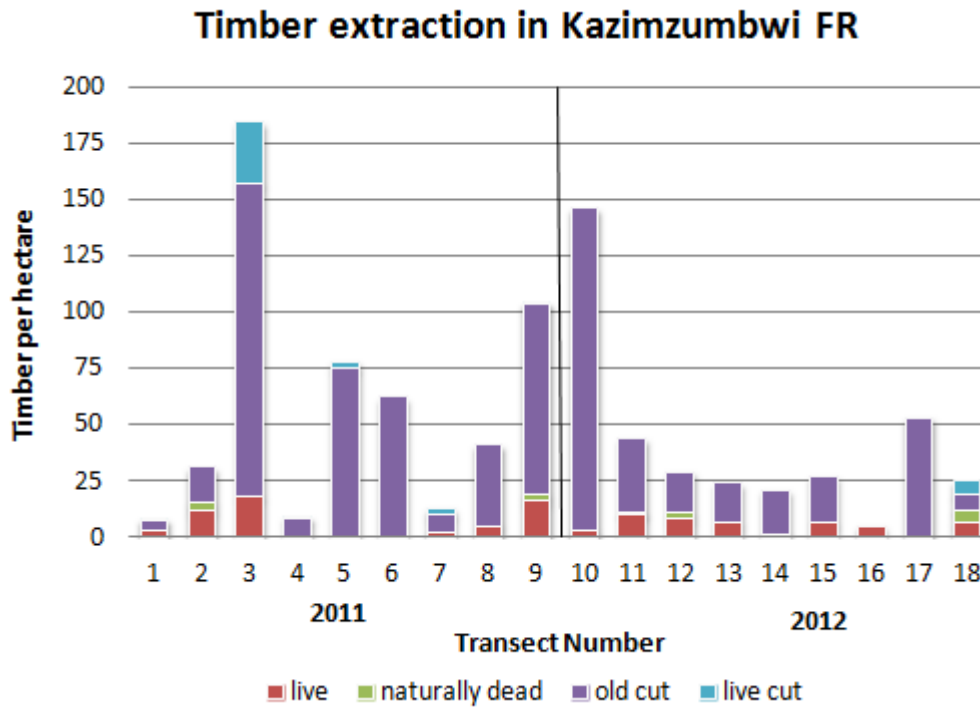


Figure 10. Abundance of live, naturally dead, old cut and fresh cut timber in Kazimzumbwi FR.

5.4.3 Other disturbances

During this survey, other anthropogenic disturbance such as fire damage, paths, cultivation, snares/traps, charcoal kilns, and mining were also recorded. Nearly double the amount of disturbance events were observed in 2011 than 2012 in both forest reserves. In total, 107 and 72 charcoal kilns or kiln scars were counted along 9 transects in Pugu in 2011 and 2012 respectively; 114 and 48 charcoal kilns or kiln scars were found along 9 transects in Kazimzumbwi in 2011 and 2012 respectively. Fire is a widespread problem in Kazimzumbwi where 169 events of fire were recorded in 2011-2012, while in Pugu, 115 fire events were recorded. Only six snares or traps were found across both survey years suggesting that most of the forests' small mammals have been hunted out.

Table 14. Summary of other disturbance events in Pugu FR and Kazimzumbwi FR.

S, R, K, F, P, M, N, C, T and O represent settlement, road/path, charcoal kiln, fire, pitsaw, mining, snares, cultivation, planks/timber/poles and other respectively.

Year	Site	Transect	S	R	K	F	P	M	N	C	T	O	Total	
2012	Pugu	T1P	11	7	6	3						3	30	
		T2P	4			11								15
		T3P	5	20			1							26
		T4P	1				1							2
		T5P	7	16										23
		T6P	3	4	3			1						11
		T7P		4	17									21
		T8P	1	11	3									15
		T9P	8	10	13									31
	Subtotal	0	40	72	53	5	1	0	0	0	0	3	174	
	Kazi	T1K	1	18	14									33
		T2K		11	9				1					21
		T3K	2	6	14									22
		T4K	1	6	9						6			22
		T5K	1		2	5	2				9			19
		T6K									11			11
		T7K	1		5						2			8
		T8K		7	16									23
		T9K			16									16
	Subtotal	1	5	48	85	5	2	1	28	0	0	0	175	
	Total	1	45	120	138	10	3	1	28	0	3	3	349	
2011	Pugu	T1P	4	16	9	1							30	
		T2P	6	10	2									18
		T3P	2	5	9									16
		T4P	10	13	1									24
		T5P	3		2				1					6
		T6P	1	5	20									26
		T15P		14	7									21
		T16P		17	12					1				30
		T17P	16	27										43
	Subtotal	0	42	107	62	1	0	2	0	0	0	0	214	
	Kazi	T7K	2	1				2		20				25
		T8K	1	8	20									29
		T9K		24	6									30
		T10K	3	1				7		13				24
		T11K		17	20							1		38
		T12K	1	31	12					3				47
		T13K		5	9					18	1			33
		T14K		6	9					16				31
		T18K		21	8					1				30
	Subtotal	0	7	114	84	0	9	3	68	2	0	0	287	
	Total	0	49	221	146	1	9	5	68	2	0	0	501	
'11-'12	Grand Total	1	94	341	284	11	12	6	96	2	3	3	850	

5.5 Discussion

Both Pugu and Kazimzumbwi forests are undergoing high levels and rates of disturbance. In 2005, Ahrends described the extent of protection in Pugu FR as “medium”. Given our extensive records of human presence and disturbance, the effectiveness of protection seems low. The dominant types of human activity included pole cutting, fire damage, charcoal making and paths. Relative to a previous survey conducted by Hall *et al.* (2002), the total number of poles we sampled in Kazimzumbwi forest was less. This can probably be explained by the harvesting of pole-sized trees for charcoal production and building materials over the last decade.

Pole cutting is still high in Pugu forest, particularly in Pugu dunda (T₃P) and Minaki bwawani (T₄P). Signs of agricultural activities were evident in Kazimzumbwi forest, despite the recent 2010 eviction of farmers from the area by the government. Pugu-relini site in Pugu forest shows high rates of timber cutting, perhaps directly related to the fact that the site is found in the vicinity of the forest and is dense with pathways from Pugu Kajiungeni leading into the forest. In Pugu Forest Reserve, the only good forest is found alongside the Dar es Salaam Kisarawe main roads. Effort should be made to strengthen protection in these areas.

Valuable commercial tree species such as *Millicia excelsa* have been overexploited to the extent that, in effect, very few resources remain. Our findings are also consistent with the study of Ahrends (2005), who recorded that *Antiaris toxicaria*, *Manilkara spp.* and *Albizia spp.* have been especially affected by charcoal burning.

In ascending order, the rate of charcoal making was found to be high in four sites: Minaki bwawani, Kazimzumbwi jeshini, Pugu relini and Buyuni site. The distribution of fire incidents differs from one site to another in both Pugu and Kazimzumbwi forests, based on the survey results. For example, Buyuni (T₁₁K), Mambisi (T₆P), and Vibura (T₈K) show high rates of fire damage relative to other transects. From discussions with members from the surrounding community, it appears that the incidents of fire damage increases in the early season of farming activities. Meanwhile, also according to the community, occasional arson is a big problem especially in Mambisi areas. The survey team found *Trema orientalis* to be the dominant plant species in the fire damaged areas. This species is likely to dominate if no immediate efforts are taken to reduce fire incidents.

Little evidence of hunting activity was recorded in the vicinity of both forest reserves. Guinea fowl and elephant shrew snares were seen near Kazimzumbwi in Buyuni site. In Pugu forest, a few snares were seen at Mambisi sites. However, there appear to be few small mammals left to trap in these forests.

Opportunistically, pit sawing was also recorded at Minaki bwawani alongside Minaki dam accounting for the loss of a number of plant species valuable to conserving the water catchment areas of Minaki dam. In Kazimzumbwi forest, findings by Hall *et al.* (2002) highlighted evidence of pitsaws in Buyuni areas consistent with our findings that Buyuni sites now have a dearth of timber. Finally, in several areas at Pugu relini and Minaki bwawani, we recorded a few cases of root harvesting, perhaps for medicinal use.

6) Summary of Conclusions and Recommendations

Our plant and bird surveys suggest a rich flora and fauna in spite of ongoing disturbance; however, the loss of forest cover will most certainly endanger the birds that rely on Pugu Hills for breeding and stop-over during migration, and endemic and rare plant species could disappear.

Our botanical surveys yielded a checklist of 343 plant species, including coastal forest and local endemics and IUCN Red-Listed and threatened species. These findings thus corroborate previous ones (e.g., Clarke & Dickinson, 1995; Hall *et al.*, 2002), which upheld these forests as priority sites. 105 bird species were recorded during 16 days of opportunistic avian surveys, including five IUCN Red-Listed species.

Results from 36 disturbance transects indicate high levels of disturbance in the form of logging, fire damage, charcoal making and, to some extent, agricultural encroachment. These activities have resulted in a rapid decline of several endemic plant species and, possibly, an increase in the abundance of invasive species such as *Lantana camara*.

Attempts to establish joint forest management for Pugu and Kazimzumbwi Forest Reserves have largely failed to address the ongoing deforestation and degradation in the reserves. Community engagement in forest management has been eroded by a number of factors including the peri-urban nature of the surrounding communities; the extreme level of pressure; perceived government indifference and / or powerlessness to apply the law within the reserves.

It is our contention that the only hope for these reserves rests with the intervention of the President and Prime Minister to provide explicit political support for law enforcement for the reserves. Stakeholders at District, Regional and even Ministerial level are neither motivated, nor politically empowered to enforce the law to the degree that is necessary to conserve these forests, given the intense pressures and vested interests in the destruction of the forests. The Tanzania Forest Service does not have the institutional experience nor trained staff to undertake sufficiently effective law enforcement required to conserve these peri-urban forests. This requires an approach more familiar to TANAPA or Wildlife Division.

And finally, we also recommend sustained research and monitoring of the trends of changes in biodiversity and forest condition within these forests.

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8) Appendices

Appendix 1. Disturbance Transect Details, 2011 Surveys

Transect number	Transect length (m)	Start point (Lat/Long UTM)	End point (Lat/Long UTM)	Survey date	Transect direction	Habitat type
PUGU FOREST RESERVE						
T1P	1000	0511789/9237855	0511719/9238866	8/6/2011	SW	Forest / Thicket
T2P	1000	0512770/9239914	0512120/9239230	9/6/2011	SE	Thicket / Disturbed forest
T3P	1000	0511910/9236054	0510950/9236284	10/6/2011	SW	Disturbed forest
T4P	1000	0510736/9236601	0511652/9236981	11/6/2011	N	Forest
T5P	1000	0508906/9235479	0509073/9236078	13/6/2011	SW	Thicket / Disturbed forest
T6P	1000	0510577/9240252	0511025/9239404	14/6/2011	SE	Grassland / <i>Trema orientalis</i> (Dominant)
T15P	1000	0508047/9238983	0508828/9238468	12/7/2011	N	Disturbed forest / Thicket
T16P	1000	0508601/9239193	0509499/9239255	13/7/2011	NE	Disturbed forest
T17P	1000	0512998/9239337	0512290/9238668	14/7/2011	SW	Thicket / Disturbed forest
KAZIMZUMBWI FOREST RESERVE						
T7K	1000	0506962/9224849	0506351/9225650	15/6/2011	SW	Fallow
T8K	1000	0502118/9228864	0502824/9229240	15/6/2011	NE	Wooded grassland / Disturbed forest
T9K	1000	0502716/9231413	0503518/9231983	16/6/2011	N	Forest / Disturbed forest
T10K	1000	0506599/9225619	0505859/9226287	17/6/2011	SW	Fallow / Grassland
T11K	1000	0508980/9232226	0508061/9232650	9/7/2011	S/SW	Disturbed Forest / Thicket
T12K	1000	0509016/9232309	0508369/9232942	10/7/2011	SE	Thicket / Disturbed forest
T13K	1000	0505486/9225452	0505610/9226445	11/7/2011	SW	Wooded grassland
T14K	1000	0502515/9227607	0503457/9227947	11/7/2011	NW	Wooded grassland
T18K	1000	0503092/9231433	0503576/9232175	15/7/2011	SW	Thicket / Disturbed forest

Appendix 2. Disturbance Transect no. 1 (2011)

Names of recorders: Justine Gwegime

Date of survey: 8/6/2011

District: Kisarawe

Village: Pugu Mpakani

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve

Transect Number: T₁P

Dominant vegetation: Shrubs

Bearing: SW

Start point Longitude: 0511789

Latitude: 923785

Altitude (m): 133m

End point Longitude: 0511719

Latitude: 9238866

Altitude (m): 244m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

Section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			Old	fresh		
0-50	9	-	-	4	5	-	2	2	K(2)	-
50-100	9	-	-	5	-	-	2	1	K(1)	-
100-150	14	1	2	-	2	-	-	1	K(2)	K(1)
150-200	16	-	2	5	-	-	-	-	R(1)	-
200-250	10	-	2	2	-	-	3	-	K(1)	-
250-300	4	-	2	7	-	-	1	1	R(1) & K(1)	K(1)
300-350	27	-	6	23	-	-	5	-	K(4)	-
350-400	4	-	2	4	-	-	1	-	-	-
400-450	2	-	1	1	-	-	17(Art)	4(Art)	K(1)	K(2)
450-500	-	-	-	-	-	-	2	2	-	-
500-550	-	-	-	-	-	-	-	-	K(1) & R(1)	-
550-600	-	-	-	-	-	-	-	-	K(1) & F(2)	F(1)
600-650	1	-	32	-	-	-	-	-	K(2) & P(1)	-
650-700	1	-	1	-	-	-	1	-	F	F
700-750	1	1	3	2	-	-	-	-	F	F
750-800	4	-	3	5	-	-	2	-	F	F
800-850	-	-	5	1	-	-	-	-	F	F
850-900	1	-	10	-	-	-	-	-	F&R (1)	R(1) & F
900-950	6	2	5	-	-	-	-	-	F	F
950-1000	-	-	2	-	-	-	1	1	F	F
Total	109	4	78	59	7	0	37	12	R(4), K(16) F(9), P(1)	K(4), F(8) & R(1)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	3	3	3	LC	-	-
50-100	GUS	3	3	3	LC	-	-
100-150	GUS	2	3	3	LC	-	-
150-200	GLS	2	3	2	LC	-	-
200-250	GUS	2	3	2	-	-	Snake(green
250-300	GUS	1	3	2	LC	-	-
300-350	GUS	1	2	2	-	-	Rodent path, dikdik pellets
350-400	GUS	1	2	2	LC	-	-
400-450	GUS	3	2	2	LC	-	-
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	1	3	-	-	-
550-600	GUS	2	1	3	-	-	-
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	2	-	-	-
750-800	GUS	3	2	2	-	-	-
800-850	GUS	3	2	2	-	-	-
850-900	GUS	3	2	2	-	-	-
900-950	GUS	3	2	3	LC	-	-
950-1000	GUS	3	2	3	LC	-	-

Appendix 3. Disturbance Transect no. 2

Names of recorders: Justine Gwegime

Date of survey: 9/6/2011

District: Kisarawe

Village: Pugu relini

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve

Transect Number: T₂P

Dominant vegetation: Forest (degraded)

Bearing:

Start point Longitude: 0512770

Latitude: 9239914

Altitude (m): 98m

End point Longitude: 0512120

Latitude: 9239230

Altitude (m): 180m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

Section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	20	-	10	8	-	-	3	2	R	R
50-100	10	-	24	3	-	-	2	-	R & K(1)	R
100-150	3	-	21	-	-	-	-	-	K(1)	-
150-200	73	-	12	-	-	-	-	-	R	-
200-250	5	-	28	-	-	-	-	-	-	-
250-300	10	-	22	-	-	-	-	-	R	R
300-350	6	-	57	-	-	-	-	-	-	-
350-400	1	-	9	-	-	-	-	-	R & K(1)	R
400-450	4	1	9	-	-	-	-	1	K(1)	-
450-500	9	4	3	-	-	-	3	-	-	-
500-550	3	-	3	-	-	-	-	-	R	-
550-600	2	-	2	-	-	-	2	-	-	-
600-650	5	-	-	1	-	-	1	-	-	-
650-700	6	-	19	2	-	-	-	-	-	-
700-750	7	-	15	-	-	-	-	-	-	-
750-800	6	-	13	-	-	-	2	-	-	-
800-850	10	-	28	-	-	-	7	-	K(1)	-
850-900	6	-	7	-	-	-	2	-	K(2) & F	-
900-950	10	-	9	1	-	-	1	-	K(1) & F	-
950-1000	1	-	5	-	-	-	-	-	K(2)	-
Total	197	5	296	15	0	0	23	3	K(10), F(2) & R(6)	R(6)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	2	3	2	-	-	-
50-100	GLS	2	3	2	LC	-	-
100-150	GLS	2	3	2	-	-	-
150-200	GLS	2	3	2	LC	-	Rodent pit
200-250	GLS	2	3	2	-	-	-
250-300	GUS	2	3	2	LC	-	-
300-350	GUS	2	3	2	-	-	-
350-400	GUS	2	2	3	-	-	-
400-450	GUS	2	2	3	-	-	-
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	2	3	-	-	Animal path
550-600	GUS	2	2	3	-	-	-
600-650	GUS	2	3	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	-
750-800	GUS	2	3	3	-	-	Animal path
800-850	GUS	2	3	2	-	-	Animal path(2)
850-900	GUS	2	3	2	-	-	-
900-950	GUS	2	3	2	-	-	-
950-1000	GUS	2	3	2	-	-	-

Appendix 4. Disturbance Transect no. 3

Names of recorders: Justine Gwegime

Date of survey: 10/6/2011

District: Kisarawe

Village: Pugu Dunda

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve **Transect Number:** T₃P

Dominant vegetation: Forest

Bearing: SW

Start point Longitude: 0511910

Latitude: 9236054

Altitude (m): 123m

End point Longitude: 0510950

Latitude: 9236284

Altitude (m): 205m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	14	-	31	-	1	-	1	-	K(1)	-
50-100	10	-	43	-	-	-	-	-	R	-
100-150	15	-	35	1	-	-	-	-	K(1)	-
150-200	29	-	40	5	-	-	-	-	-	-
200-250	19	-	54	-	-	-	-	-	-	-
250-300	16	-	39	1	-	-	-	-	K(1)	-
300-350	7	-	34	-	-	-	-	-	R & K(1)	-
350-400	12	-	48	-	-	-	1	-	K(1)	-
400-450	13	-	61	-	-	-	1	-	-	-
450-500	1	-	37	-	1	-	-	-	F	F
500-550	1	-	25	-	-	-	1	-	-	-
550-600	-	-	34	-	-	-	-	-	F	F
600-650	5	-	18	-	-	-	1	-	F	F
650-700	9	1	6	-	9	-	6	-	F	F
700-750	7	1	6	-	-	-	1	1	F	F
750-800	8	-	10	-	-	-	1	-	F	F
800-850	7	-	6	-	-	-	2	1	F	F
850-900	-	-	4	-	-	-	1	-	F	F
900-950	-	-	7	-	-	-	-	-	F	F
950-1000	3	3	-	-	-	-	1	-	-	-
Total	176	5	538	7	11	0	17	2	F(9), K(5) & R(2)	F(9)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	3	2	2	-	-	-
50-100		3	2	2	-	-	-
100-150	GUS	3	2	2	-	-	Pit, animal path
150-200	GUS	3	2	2	-	-	Dung /pellets
200-250	GUS	2	2	2	-	-	-
250-300	GUS	2	2	2	-	-	-
300-350	GUS	2	2	2	-	-	Path(2),mushroom,
350-400	GUS	2	2	2	-	-	Path,mushroom, animal dung
400-450	GUS	3	2	2	-	-	Animal pit, animal path(2)
450-500	GUS	2	2	2	-	-	-
500-550	GUS	2	2	2	-	-	-
550-600	GUS	2	2	2	-	-	-
600-650	GUS	2	2	2	-	-	-
650-700	GUS	2	2	2	-	-	-
700-750	GUS	2	2	2	-	-	-
750-800	GUS	2	2	2	-	-	-
800-850	GUS	2	2	2	-	-	-
850-900	GUS	2	2	2	-	-	-
900-950	GUS	2	2	2	-	-	Nest
950-1000	GUS	2	2	2	-	-	-

Appendix 5. Disturbance Transect no. 4

Names of recorders: Justine Gwegime

Date of survey: 11/6/2011

District: Kisarawe

Village: Minaki Bwawani

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve **Transect Number:** T₄P

Dominant vegetation:

Bearing:

Start point Longitude: 0510736

Latitude: 9236601

Altitude (m): 156m

End point Longitude: 0511652

Latitude: 9236981

Altitude (m): 160m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	32	-	14	-	2	-	-	-	-	-
50-100	22	1	15	-	8	-	1	-	-	-
100-150	17	-	10	1	2	-	-	-	-	-
150-200	23	2	3	-	1	-	-	-	F	F
200-250	24	-	7	-	-	-	1	-	-	-
250-300	11	-	2	-	1	-	1	-	K(1)	-
300-350	10	2	11	-	-	1	1	-	K(1)	-
350-400	10	-	15	6	1	-	9	-	K(2)	-
400-450	11	-	17	3	-	-	4	-	K(1)	-
450-500	10	-	16	-	-	-	6	-	-	-
500-550	3	-	72	-	-	-	4	-	R & K(1)	-
550-600	3	-	60	-	-	-	1	-	K(2)	-
600-650	9	1	97	-	-	-	4	-	R(2)	-
650-700	5	-	50	-	-	-	1	-	R(2)	-
700-750	3	1	55	-	-	-	-	-	R & K(1)	-
750-800	5	1	33	-	-	-	-	-	K(1)	-
800-850	12	-	50	-	-	-	-	-	R	R
850-900	14	-	61	-	-	-	1	-	R(3)	-
900-950	20	-	41	1	-	-	-	-	K(1)	-
950-1000	9	-	30	-	-	-	-	-	K(2)	-
Total	253	8	659	11	15	1	34	0	K(13), R(10) & F(1)	F(1) & R(1)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	3	2	2	-	-	-
50-100		3	2	2	-	-	-
100-150	GUS	3	2	2	-	-	-
150-200	GUS	3	2	2	-	-	-
200-250	GUS	2	2	2	-	-	Millipedes
250-300	GUS	2	2	2	-	-	Bird
300-350	GUS	2	2	2	-	-	Rodent path
350-400	GUS	2	2	2	LC	-	Elephant shrew path
400-450	GUS	2	2	2	LC	-	Bird
450-500	GUS	2	2	2	-	-	-
500-550	GUS	2	1	2	-	-	Millipedes(2)
550-600	GUS	2	1	2	-	-	-
600-650	GUS	2	2	2	-	-	Animal pit
650-700	GUS	2	2	2	-	-	Shrew path
700-750	GUS	2	2	2	-	-	Dikdik pellets
750-800	GUS	2	2	2	-	-	Dikdik foot print
800-850	GUS	2	2	2	-	-	Path
850-900	GUS	2	2	2	-	-	Foot print
900-950	GUS	2	2	2	-	-	-
950-1000	GUS	2	2	2	-	-	-

Notes: Invasive species *Lantana camara* (LC)

Appendix 6. Disturbance transect no. 5

Names of recorders: Justine Gwegime

Date of survey: 13/6/2011

District: Kisarawe

Village: Kimani

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve **Transect Number:** T₅P

Dominant vegetation:

Bearing: SW

Start point Longitude: 0508906

Latitude: 9235479

Altitude (m): 163m

End point Longitude: 0509073

Latitude: 9236078

Altitude (m): 203m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	8	1	6	-	15	1	-	-	R	R
50-100	5	-	1	-	1	-	1	-	-	-
100-150	4	-	4	-	-	-	-	-	F	F
150-200	2	-	1	-	2	-	-	-	F	F
200-250	20	1	1	-	3	-	1	-	-	-
250-300	30	-	7	-	1	-	-	-	-	-
300-350	24	2	5	-	1	-	-	-	N	-
350-400	26	-	9	-	2	-	4	-	-	-
400-450	25	-	6	-	1	-	-	-	-	-
450-500	28	2	13	-	-	-	-	-	-	-
500-550	29	1	9	-	-	-	-	-	-	-
550-600	13	2	13	-	1	-	-	-	-	-
600-650	18	-	14	-	1	1	3	-	-	-
650-700	5	-	1	-	1	-	1	-	-	-
700-750	8	-	3	-	3	-	2	1	-	-
750-800	10	-	6	-	2	-	2	-	-	-
800-850	12	-	4	-	2	1	1	-	R	R
850-900	12	1	4	-	4	-	2	-	R	R
900-950	4	-	2	-	-	-	1	1	-	-
950-1000	10	-	4	1	3	-	2	1	-	-
Total	293	10	113	1	43	3	20	3	R(3), N(1) & F(2)	R(3), F(2)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	3	2	2	-	-	Insect (unidentified)
50-100	GUS	3	2	2	-	-	-
100-150	GUS	3	1	2	-	-	Hyena pit and path
150-200	GUS	2	1	2	-	-	Hyena path
200-250	GUS	2	1	2	-	-	Hyena footprint
250-300	GUS	2	1	2	-	-	Animal path
300-350	GUS	2	1	2	-	-	Rodent path, Animal footprint
350-400	GUS	2	1	2	-	-	Animal footprint
400-450	GUS	2	1	2	-	-	Footprint, dikdik pellets, millipede, hyena path
450-500	GUS	3	1	2	-	-	millipede, animal path
500-550	GUS	3	1	2	-	-	dikdik pellets, animal path
550-600	GUS	3	1	2	-	-	-
600-650	GUS	3	1	2	-	-	Millipede(2)
650-700	GUS	3	1	2	-	-	Animal path & footprint
700-750	GUS	3	1	2	-	-	Animal path
750-800	GUS	3	1	2	-	-	Millipedes
800-850	GUS	3	1	2	-	-	Animal path
850-900	GUS	3	1	2	-	-	-
900-950	GUS	3	1	2	-	-	-
950-1000	GUS	3	1	2	-	-	Animal path

Appendix 7. Disturbance transect no. 6

Names of recorders: Justine Gwegime

Date of survey: 14/6/2011

District: Kisarawe

Village: Mambisi

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve

Transect Number: T₆P

Dominant vegetation: Herbs-Grassland

Bearing:

Start point Longitude: 0510577

Latitude: 9240252

Altitude (m): 107m

End point Longitude: 0511025

Latitude: 9239404

Altitude (m): 234m

Key to disturbance categories

P	Pitsaw	S	Settlement
F	Fire damage	B	Bark or root

T	Timber, planks, poles
K	Charcoal kiln

R	Path or road
G	Gunfire

C Cultivation

M Mining

N Traps or snares

O Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	2	-	13	1	-	-	-	-	F	F
50-100	2	-	9	-	-	-	1	-	F	F
100-150	4	-	16	-	-	-	-	-	F	F
150-200	4	-	14	-	-	-	1	-	F	F
200-250	2	-	3	1	-	-	1	1	F	F
250-300	1	-	10	-	-	-	1	-	F	F
300-350	-	-	8	-	-	-	-	-	F	F
350-400	2	-	6	-	-	-	2	-	F	F
400-450	4	-	15	-	-	-	6	-	F	F
450-500	6	-	2	-	-	-	-	-	F	F
500-550	3	1	3	-	-	-	1	-	F	F
550-600	4	4	-	-	-	-	-	-	F	F
600-650	-	1	6	-	-	-	2	-	F	F
650-700	1	-	9	-	-	-	2	-	F	F
700-750	-	-	26	-	-	-	3	-	F & K(1)	F
750-800	-	-	20	-	-	-	4	-	F	F
800-850	-	-	7	-	-	-	-	-	F & K(1)	F
850-900	-	-	5	-	-	-	2	-	F & K(2)	F
900-950	-	-	10	-	-	-	-	-	F	F
950-1000	-	-	12	-	-	-	3	-	F, K(1) & R	F
Total	35	6	194	2	0	0	29	1	F(20), K(5) & R(1)	F(20)

Key to topography

GLS	Gentle lower slope
SLS	Steep lower slope

GMS	Gentle mid-slope
SMS	Steep mid-slope

GUS	Gentle upper slope
SUS	Steep upper slope

CL	Cliffs
VF	Valley floor

Key to vegetation cover

1	< 10 % cover
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2	10 – 50 % cover
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3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	1	2	3	-	-	-
50-100		1	2	3	-	-	-

100-150	GUS	1	2	3	-	-	Nest and pits
150-200	GUS	1	2	3	-	-	-
200-250	GUS	1	2	2	LC	-	-
250-300	GUS	1	1	3	LC	-	-
300-350	GUS	2	2	2	LC	-	-
350-400	GUS	2	2	2	LC	-	-
400-450	GUS	2	2	2	-	-	-
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	LC	-	-
600-650	GUS	2	1	2	-	-	Rodent pits
650-700	GUS	2	1	2	LC	-	-
700-750	GUS	2	1	2	-	-	Rodent pit
750-800	GUS	2	1	2	-	-	Pit(unidentified)
800-850	GUS	2	2	2	-	-	Pit(unidentified)
850-900	GUS	2	2	2	-	-	-
900-950	GUS	2	2	2	-	-	-
950-1000	GUS	2	2	2	-	-	-

Notes: Invasive species *Lantana camara* (LC)

Appendix 8. Disturbance transect no. 7

Names of recorders: Justine Gwegime

Date of survey: 15/6/2011

District: Kisarawe

Village: Machimbo ya Miembeni

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₇K

Dominant vegetation: Grassland-Shrub

Bearing:

Start point Longitude: 0506962

Latitude: 9224849

Altitude (m): 128m

End point Longitude: 0506351

Latitude: 9225650

Altitude (m): 136m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	-	-	18	-	1	-	-	-	C	C
50-100	1	-	21	2	-	-	1	1	R & C	C
100-150	-	-	12	1	-	-	-	-	K(1) & C	C
150-200	1	-	17	3	-	-	-	-	C	C
200-250	-	-	10	3	-	-	-	-	M & C	-
250-300	5	-	1	-	-	-	-	-	R & C	C
300-350	1	-	1	1	1	-	-	-	C	C
350-400	4	-	2	-	-	-	-	-	C	C
400-450	3	-	1	-	-	-	-	-	C	C
450-500	1	-	-	-	-	-	-	-	C	C
500-550	-	-	3	-	-	-	-	-	C	C
550-600	-	-	-	-	-	-	-	-	C	C
600-650	-	-	13	2	-	-	-	-	C	C
650-700	6	-	19	-	-	-	-	-	C	C
700-750	8	-	10	1	1	-	-	-	C	C
750-800	10	-	4	2	-	-	-	-	C	C
800-850	-	-	10	1	-	-	3	-	C	C
850-900	-	-	12	-	-	-	-	-	C & M	C
900-950	-	-	6	-	-	-	-	-	C	C
950-1000	-	-	6	-	-	-	-	-	C	C
Total	40	0	166	16	3	0	4	1	C(20), M(2) R(2), K(1)	C(19)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	1	1	3	-	-	-
50-100		1	1	3	-	-	-
100-150	GLS	1	2	3	-	-	-
150-200	GLS	1	2	3	-	-	-
200-250	GLS	1	1	3	-	-	Nest
250-300	GLS	1	2	3	-	-	-
300-350	GLS	1	2	2	LC	-	-
350-400	GLS	1	2	2	-	-	-
400-450	GLS	1	2	3	LC	-	-
450-500	GLS	1	2	3	LC	-	-
500-550	GLS	1	2	3	LC	-	-
550-600	GLS	1	2	2	-	-	-
600-650	GUS	1	1	2	-	-	-
650-700	GLS	1	2	2	-	-	-
700-750	GUS	1	2	2	-	-	-
750-800	GLS	1	2	2	-	-	-
800-850	GLS	1	2	2	-	-	-
850-900	GLS	1	2	2	-	-	Nest
900-950	GLS	2	2	2	LC	-	-
950-1000	GUS	2	2	2	LC	-	-

Notes: Invasive species *Lantana camara* (LC).

Appendix 9. Disturbance transect no. 8

Names of recorders: Justine Gwegime

Date of survey: 15/6/2011

District: Kisarawe

Village: Vibura-Bicon 127

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₈K

Dominant vegetation: Shrub-Grassland

Bearing: SW

Start point Longitude: 0502118

Latitude: 9228864

Altitude (m): 177m

End point Longitude: 0502824

Latitude: 9229240

Altitude (m): 161m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	1	2	12	-	1	-	-	-	F	F
50-100	-	1	6	-	1	-	-	-	F & K(1)	F
100-150	1	-	9	-	-	-	-	-	F	F
150-200	-	-	1	-	-	-	-	-	F	F
200-250	-	-	3	-	-	-	-	-	F	F
250-300	-	-	6	-	-	-	-	-	F	F
300-350	-	-	7	-	-	-	2	-	F & K(2)	F
350-400	1	1	7	-	1	-	2	-	F	F
400-450	8	1	6	-	-	-	-	-	K(1) & F	F
450-500	-	-	8	-	-	-	-	-	F & R	F
500-550	-	-	2	-	-	-	-	-	F	F
550-600	5	-	8	-	-	-	3	-	F & K(1)	F
600-650	6	2	4	1	3	-	1	-	F & K(1)	F
650-700	8	6	9	-	-	-	-	-	F	F
700-750	1	1	7	-	-	-	-	-	F	F
750-800	3	2	13	-	1	1	-	-	F	F
800-850	4	2	1	-	1	2	-	-	F	F
850-900	2	1	2	2	1	-	3	-	F & K(1)	F
900-950	4	1	-	3	2	-	2	-	F & K(1)	F
950-1000	-	-	2	-	1	-	3	-	F	F
Total	44	20	113	6	12	3	16	0	F(20), K(8) & R(1)	F(20)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	1	2	3	-	-	-
50-100	GLS	1	2	3	-	-	-
100-150	GUS	1	1	3	-	-	-
150-200	GUS	1	1	3	-	-	Millipede
200-250	GUS	1	1	3	-	-	-
250-300	GUS	1	1	3	-LC	-	-
300-350	GUS	1	2	3	LC	-	-
350-400	GUS	1	2	3	LC	-	Nest, rodent pit
400-450	GUS	1	1	3	-	-	-
450-500	GUS	1	1	3	-	-	-
500-550	GUS	1	1	3	-	-	Nest
550-600	GUS	1	1	2	-	-	Nest(3)
600-650	GUS	1	2	3	-	-	Nest and camp(perhaps for charcoal makers)
650-700	GUS	2	2	2	-	-	Millipede
700-750	GLS	1	1	3	LC	-	Snake(Python)
750-800	GUS	1	2	3	LC	-	-
800-850	GUS	1	1	3	-	-	-
850-900	GUS	1	1	3	-	-	-
900-950	GUS	1	1	3	-	-	-
950-1000	GUS	1	1	3	-	-	-

Notes: Invasive species *Lantana camara* (LC)

Appendix 10. Disturbance transect no. 9

Names of recorders: Justine Gwegime

Date of survey: 16/6/2011

District: Kisarawe

Village: Kazimzumbwi

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₉K

Dominant vegetation: Forest

Bearing: N

Start point Longitude: 0502716

Latitude: 9231413

Altitude (m): 238m

End point Longitude: 0503518

Latitude: 9231983

Altitude (m): 196m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	1	-	11	5	-	-	3	-	K(1)	-
50-100	3	1	11	2	3	-	4	1	K(2)	-
100-150	5	4	14	-	-	-	3	-	K(2)	-
150-200	15	4	14	-	15	-	14	-	-	-
200-250	3	1	10	-	-	-	8	1	-	K(1)
250-300	7	-	13	-	-	-	3	1	K(1)	-
300-350	-	-	11	-	-	-	11	8	K(1)	-
350-400	-	-	8	2	-	-	10	3	K(1)	-
400-450	-	-	10	3	-	-	15	1	-	-
450-500	-	-	12	-	-	-	9	-	K(3)	-
500-550	-	-	1	-	-	-	21	-	K(3)	-
550-600	-	-	9	1	-	-	9	1	K(1) & F	-
600-650	-	-	11	1	-	-	7	-	K(1) & F	-
650-700	-	-	15	-	-	-	5	2	K(5) & F	-
700-750	-	-	7	2	-	-	9	8	K(1) & F	-
750-800	-	1	7	-	-	-	2	-	K(1) & F	-
800-850	3	-	7	-	-	-	2	-	K(1) & F	-
850-900	-	-	6	-	-	-	-	-	-	-
900-950	-	1	7	-	-	-	3	-	-	-
950-1000	6	-	7	5	-	-	1	1	-	-
Total	43	12	191	21	18		139	27	K(24) & F(6)	K(1)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	1	2	-	-	-
50-100	GUS	2			-	-	-
100-150	GUS	1	1	2	-	-	-
150-200	GUS	1	1	2	-	-	Millepedes
200-250	GUS	1	1	2	LC	-	-
250-300	GUS	2	1	2	-	-	-
300-350	GUS	1	1	1	-	-	-
350-400	GUS	1	1	2	-	-	-
400-450	GUS	3	1	3	-	--	-
450-500	GUS	2	1	3	-	-	-
500-550	GUS	1	1	2	LC	-	-
550-600	GUS	2	1	2	LC	-	-
600-650	GUS	2	1	2	LC	-	-
650-700	GUS	1	1	2	-	-	-
700-750	GUS	2	1	3	-	-	-
750-800	GUS	2	1	2	-	-	-
800-850	GUS	1	1	3	-	-	-
850-900	GUS	1	1	2	-	-	-
900-950	GUS		1	2	LC	-	-
950-1000	GUS	2	1	2	LC	-	-

Appendix 11. Disturbance transect no. 10

Names of recorders: Justine Gwegime

Date of survey: 17/6/2011

District: Kisarawe

Village: Chanika

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₁₀K

Dominant vegetation: Shrub-Grassland

Bearing: SW

Start point Longitude: 0506599

Latitude: 9225619

Altitude (m): 129m

End point Longitude: 0505859

Latitude: 9226287

Altitude (m): 144m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	-	-	24	2	-	-	1	-	K(1)	-
50-100	1	-	6	-	-	-	-	-	R	-
100-150	6	-	10	-	-	-	-	-	C	-
150-200	-	-	1	-	-	-	-	-	C	-
200-250	1	-	4	-	-	-	-	-	C	-
250-300	2	-	-	-	-	-	-	-	C	-
300-350	7	-	4	-	-	-	-	-	C	-
350-400	-	-	1	1	-	-	-	-	C	-
400-450	2	-	5	3	-	-	-	-	C & M	-
450-500	1	-	21	2	-	-	3	1	C & M	-
500-550	-	-	2	-	-	-	-	-	M	-
550-600	-	-	-	-	-	-	-	-	M	-
600-650	-	-	-	-	-	-	-	-	M	-
650-700	-	-	-	-	-	-	-	-	M	-
700-750	2	-	5	-	-	-	-	-	M	-
750-800	3	-	9	-	-	-	-	-	R & C	-
800-850	-	-	4	-	-	-	1	-	C	-
850-900	-	-	1	-	-	-	2	-	C	-
900-950	-	-	6	-	-	-	1	-	C	-
950-1000	2	-	7	-	-	-	-	-	C & R	-
Total	27	0	110	8	0	0	8	1	C(13),K(1),R(3) &M(7)	0

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	1	2	2	-	-	Bird nest
50-100	GLS	1	2	2	-	-	-
100-150	GUS	1	2	2	-	-	-
150-200	GUS	1	2	2	-	-	-
200-250	GUS	1	2	2	-	-	-
250-300	GUS	1	2	2	-	-	-
300-350	GUS	2	2	2	-	-	-
350-400	GUS	2	2	2	-	-	Nest
400-450	GUS	2	1	2	-	-	Nest
450-500	GUS	2	2	2	-	-	Dam/water catchment
500-550	GUS	2	2	2	-	-	Nest(2)
550-600	GUS	2	2	2	-	-	-
600-650	GUS	1	2	2	-	-	-
650-700	GUS	1	2	2	-	-	-
700-750	GUS	1	2	2	-	-	-
750-800	GUS	1	1	1	-	-	-
800-850	GUS	2	1	1	-	-	-
850-900	GUS	2	1	1	-	-	-
900-950	GUS	2	1	1	-	-	-
950-1000	GUS	2	1	2	-	-	-

Appendix 12. Disturbance transect no. 11

Names of recorders: Justine Gwegime

Date of survey: 9/7/2011

District: Kisarawe

Village: Buyuni

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₁₁K

Dominant vegetation: *Trema orientalis*

Bearing:

Start point Longitude: 0508980

Latitude: 9232226

Altitude (m): 133m

End point Longitude: 0508061

Latitude: 9232650

Altitude (m): 250m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	-	-	-	10	-	-	-	-	F	F
50-100	-	-	3	-	-	-	2	-	F	F
100-150	-	1	9	1	-	-	5	-	F	F
150-200	1	-	5	-	-	-	3	-	F	F
200-250	2	-	3	1	-	-	3	-	F	F
250-300	6	1	8	-	-	-	10	-	F & K(1)	F
300-350	-	-	4	6	-	-	8	3	K(3) & F	F
350-400	1	-	5	-	-	-	1	-	F	F
400-450	1	-	2	8	-	-	1	-	F & K(1)	F
450-500	2	3	11	1	-	-	5	-	F	F
500-550	-	-	19	-	-	-	2	-	F & K(1)	F
550-600	5	1	5	-	-	-	3	-	F	F
600-650	11	-	8	-	-	-	3	-	F	F
650-700	1	1	5	-	-	-	5	-	K(1) & F	F
700-750	-	-	5	-	-	-	3	-	K(1) & F	F
750-800	2	1	6	-	-	-	6	-	F	F
800-850	3	-	-	-	-	-	5	-	F & K(3)	F
850-900	1	-	-	-	-	-	3	-	F&T(1)&K(3)	F
900-950	3	-	2	-	-	-	5	-	K(2) & F	F
950-1000	7	-	4	-	-	-	2	-	F & K(1)	F
Total	46	8	104	27	0	0	75	3	F(20), K(17) & T(1)	F(20)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	2	1	1	LC	-	Bird nests(2)
50-100	GLS	2	1	1	LC	-	Nest
100-150	GUS	2	1	1	LC	-	-
150-200	GUS	2	1	1	LC	-	-
200-250	GUS	2	1	1	LC	-	-
250-300	GUS	2	1	1	LC	E	-
300-350	GUS	2	2	1	LC	-	-
350-400	GUS	2	2	1	LC	-	-
400-450	GUS	2	2	1	LC	E	Piper(seed dispersal)
450-500	GUS	2	2	2	LC	-	-
500-550	GUS	2	2	2	LC	-	-
550-600	GUS	2	2	2	LC	-	-
600-650	GUS	2	2	2	LC	E	-
650-700	GUS	2	2	2	LC	-	-
700-750	GUS	2	2	2	LC	-	-
750-800	GUS	2	2	2	LC	-	-
800-850	GUS	2	2	2	LC	E	-
850-900	GUS	2	2	2	LC	-	-
900-950	GUS	2	2	2	LC	-	-
950-1000	GUS	2	2	2	LC	-	Bird nest, animal pit

Notes: Invasive alien species *Lantana camara* (LC);

Coastal forest endemic spp. *Baphia puguensis*, *Xylopia arenaria*, *Monanthes trichocarpa* and *Manilkara sansibarensis*

Were photos taken along the transect: YES

Appendix 13. Disturbance transect no. 12

Names of recorders: Justine Gwegime

Date of survey: 10/7/2011

District: Kisarawe

Village: Buyuni

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₁₂K

Dominant vegetation: *Trema orientalis*

Bearing: SE

Start point Longitude: 0509016

Latitude: 9232309

Altitude (m): 137m

End point Longitude: 0508369

Latitude: 9232942

Altitude (m): 268m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	2	1	8	-	-	-	-	-	-	-
50-100	5	-	6	1	-	-	1	-	K(2) & F	F
100-150	1	-	12	1	-	-	4	-	F & K(2)	F
150-200	-	-	8	2	-	-	3	-	K(3),N(3)&R	-
200-250	-	1	6	-	-	-	5	-	K(2)	-
250-300	1	1	10	-	-	-	4	-	K(3)	-
300-350	1	-	5	-	-	-	7	-	F & K(5)	F
350-400	-	-	10	-	-	-	3	-	K(6)	-
400-450	3	-	3	-	-	-	4	-	F	F
450-500	4	-	3	1	-	-	2	-	K(1)	-
500-550	-	-	4	-	-	-	1	-	F	F
*550-	2	-	10	2	-	-	6	-	-	-
600-650	-	-	4	-	-	-	6	-	K(3)	-
650-700	-	-	2	-	-	-	-	-	F	F
700-750	-	-	1	-	-	-	-	-	F	F
750-800	-	-	7	-	-	-	5	-	F&K(2)	F
800-850	-	-	3	-	-	-	5	-	F	F
850-900	-	-	3	-	-	-	5	-	F	F
900-950	-	-	1	-	-	-	-	-	K(1)&F	F
950-1000	1	-	6	-	-	-	1	-	F&K(1)	F
Total	20	3	112	7	0	0	62	0	K(31),F(12),N(3)&R(1)	F(12)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	1	1	2	-	-	-
50-100	GUS	1	1	2	-	-	-
100-150	GUS	1	1	2	-	E	-
150-200	GUS	1	1	2	-	-	-
200-250	GUS	1	2	2	-	-	-
250-300	GUS	1	1	2	LC	-	Aardvark pit, animal signs
300-350	GUS	1	1	2	-	E	-
350-400	GUS	1	2	2	-	-	-
400-450	GUS	1	2	2	LC	-	-
450-500	GUS	1	2	2	-	-	-
500-550	GUS	1	1	2	LC	-	Aardvark pit
550-600	GUS	1	1	2	-	E	-
600-650	GUS	1	1	2	-	-	Animal signs
650-700	GUS	1	1	2	LC	-	-
700-750	GUS	1	1	2	LC	-	-
750-800	GUS	1	1	2	LC	E	-
800-850	GUS	1	1	2	LC	-	-
850-900	GUS	1	2	2	LC	E	-
900-950	GUS	1	2	2	LC	-	-
950-1000	GUS	1	2	2	LC	E	-

Notes: Invasive species *Lantana camara* (LC);

Coastal forest endemic spp.: *Manilkara sansibarensis*, *Baphia puguensis*, *Xylopia arenaria*, and *Pristimera graciflora*

Appendix 14. Disturbance transect no. 13

Names of recorders: Justine Gwegime

Date of survey: 11/7/2011

District: Kisarawe

Village: Chanika

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₁₃K

Dominant vegetation: Wooded grassland

Bearing: SW

Start point Longitude: 0505486

Latitude: 9225452

Altitude (m): 174m

End point Longitude: 0505610

Latitude: 9226445

Altitude (m): 166m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			Old	fresh			old	fresh		
0-50	1	-	5	-	-	-	-	-	F	F
50-100	-	-	-	-	-	-	-	2	F & C	F
100-150	3	-	1	3	-	-	1	1	F & C	F & C
150-200	5	-	1	-	-	-	-	-	F & C	F & C
200-250	4	-	4	-	-	-	-	-	F & C	F & C
250-300	11	-	2	-	-	-	2	-	F & C	F & C
300-350	1	-	1	-	-	-	-	-	F & C	F & C
350-400	10	-	4	-	-	-	1	-	F	F
400-450	3	-	5	-	-	-	-	-	F & C	F & C
450-500	1	-	10	-	-	-	-	-	K(2) & C	C
500-550	2	-	10	1	-	-	-	-	C	C
550-600	5	-	8	-	-	-	1	-	C & T	C
600-650	4	-	3	-	-	-	-	-	C	C
650-700	3	-	8	-	-	-	-	-	C	C
700-750	3	-	11	3	-	-	1	-	K & C	C
750-800	8	-	3	-	-	-	2	-	K & C	C
800-850	1	-	2	-	-	-	-	-	C	C
850-900	2	-	4	-	-	-	-	-	K & C	C
900-950	-	-	11	-	2*	-	-	-	C	C
950-1000	-	-	8	-	-	-	-	-	C	C
Total	67	0	101	7	2*	0	8	3	F(9),K(5) C(18), T(1)	F(9), C(17)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	1	2	2	-	-	-
50-100	GUS	1	2	2	-	-	-
100-150	GUS	1	2	2	-	-	-
150-200	GUS	1	2	2	-	-	-
200-250	GUS	1	2	2	-	-	-
250-300	GUS	1	2	2	-	-	-
300-350	VF	1	2	2	LC	-	Bird nest
350-400	GLS	1	2	2	LC	-	-
400-450	VF	1	2	2	LC	-	-
450-500	GLS	1	2	2	-	-	-
500-550	GLS	1	2	2	-	-	-
550-600	GLS	1	2	2	-	-	-
600-650	GLS	1	2	2	-	-	-
650-700	GLS	1	2	2	LC	-	-
700-750	GLS	1	2	2	-	-	Bird nest(2)
750-800	GLS	1	2	2	-	-	-
800-850	VF	1	2	2	-	-	-
850-900	GLS	1	2	2	-	-	-
900-950	GUS	1	2	2	-	-	-
950-1000	GLS	1	2	2	-	-	-

Notes: Invasive species *Lantana camara* (LC)

Appendix 15. Disturbance transect no. 14

Names of recorders: Justine Gwegime

Date of survey: 11/7/2011

District: Kisarawe

Village: Vibura

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₁₄K

Dominant vegetation:

Bearing:

Start point Longitude: 0502515

Latitude: 9227607

Altitude (m): 168m

End point Longitude: 0503457

Latitude: 9227947

Altitude (m): 214m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	-	-	6	-	-	-	4	-	F, K(2) & C	C & F
50-100	-	-	11	-	1	-	4	-	K(1) & C	C
100-150	-	-	6	-	3	-	2	-	C	C
150-200	4	-	6	-	-	-	-	-	F & C	F & C
200-250	10	-	11	-	1	-	2	-	K(1) & F	F
250-300	4	-	7	-	-	-	4	-	K(1)	-
300-350	4	-	1	-	-	-	3	-	K(1) & C	C
350-400	-	-	10	1*	-	-	3	-	C & F	C & F
400-450	-	-	2	-	-	-	-	-	F	F
450-500	-	-	6	-	-	-	2	-	F	F
500-550	-	-	4	-	-	-	3	-	C	C
550-600	-	-	4	-	-	-	2	-	C	C
600-650	5	-	1	-	-	-	1	-	C	C
650-700	-	-	-	-	-	-	2	-	C	C
700-750	1	-	1	-	-	-	1	-	C	C
750-800	-	-	-	-	-	-	-	-	C	C
800-850	3	3	4	-	-	-	1	-	C & F	C & F
850-900	-	-	2	-	-	-	2	-	F & C	F & C
900-950	-	-	1	-	-	-	-	-	C	C
950-1000	-	-	3	-	-	-	-	-	F & C	F & C
Total	31	3	86	1*	5	0	36	0	F(9), C(16) & K(6)	C(16), F(9)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	1	2	2	-	-	-
50-100	GLS	1	2	2	-	-	-
100-150	GLS	1	2	2	-	-	-
150-200	GUS	1	2	2	-	-	-
200-250	GUS	1	2	2	-	E	Rodent routes
250-300	GLS	1	2	2	-	-	-
300-350	GUS	1	2	2	LC	-	-
350-400	GLS	1	2	2	LC	E	-
400-450	GUS	1	2	2	LC	-	-
450-500	GUS	1	2	2	LC	E	-
500-550	GUS	1	2	2	-	-	-
550-600	GLS	1	2	2	-	E	-
600-650	GLS	1	2	2	-	-	-
650-700	GLS	1	2	2	-	-	-
700-750	GUS	1	2	2	LC	-	-
750-800	GUS	1	2	2	-	-	-
800-850	GUS	1	2	2	-	-	-
850-900	GUS	1	2	2	-	-	-
900-950	GUS	1	2	2	-	-	-
950-1000	GUS	1	2	2	-	-	-

Notes: Invasive alien species *Lantana camara* (LC)
Azelia quanzensis and *Hymenaea verrucosa* (disappeared valuable timber species)
Trema orientalis (dominant species suppressing other species)
Pristimera graciflora (Coastal forest endemic)

Were photos taken along the transect: YES

Appendix 16. Disturbance transect no. 15

Names of recorders: Justine Gwegime

Date of survey: 12/7/2011

District: Kisarawe

Village: Mambisi

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve

Transect Number: T₁₅P

Dominant vegetation: *Trema orientalis*

Bearing: N

Start point Longitude: 0508047

Latitude: 9238983

Altitude (m): 127m

End point Longitude: 0508828

Latitude: 9238468

Altitude (m): 237m

Key to disturbance categories

P Pitsaw

S Settlement

T Timber, planks, poles

R Path or road

F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	6	-	7	-	1	-	5	-	F	F
50-100	3	-	7	-	-	-	7	-		F
100-150	10	-	8	3	2	-	10	-	K(1)	-
150-200	2	-	11	2	-	-	12	-	K(1)	-
200-250	12	-	10	-	4	-	10	-	K(2)	-
250-300	11	1	4	-	3	-	-	-	-	-
300-350	3	-	2	12	-	-	11	-	K(2)	-
350-400	7	1	3	-	3	-	3	-	K(1)	-
400-450	5	-	2	-	-	-	1	-	-	-
450-500	5	-	5	-	-	-	6	-	K(1)	-
500-550	1	-	4	-	-	-	4	-	-	-
550-600	7	-	4	-	-	-	1	-	K(1)	-
600-650	1	-	5	-	-	-	2	-	K(1) & F	F
650-700	-	-	11	-	-	-	4	-	K(1)	-
700-750	-	-	3	-	-	-	2	-	-	-
750-800	3	-	9	-	1	-	1	-	F & K(1)	F
800-850	3	1	6	-	-	-	5	-	K(1) & F	F
850-900	-	-	3	-	-	-	2	-	F & K(1)	F
900-950	-	-	1	-	-	-	1	-	F	F
950-1000	-	2	6	-	-	-	1	-	F	F
Total	79	5	111	17	14	0	88	0	F(7)&K(14)	F(8)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	1	2	-	-	Dikdik pellets
50-100	GUS	2	1	2	-	-	-

100-150	GUS	2	1	2	-	E	Rodent routes
150-200	GUS	2	1	2	-	-	-
200-250	GUS	2	1	2	-	-	Dikdik pellets
250-300	GUS	2	1	2	-	-	-
300-350	GUS	2	1	2	-	E	-
350-400	GUS	2	1	2	LC	E	Rodents routes
400-450	GUS	2	1	2	-	E	Dikdik pellets
450-500	GUS	2	1	2	-	E	-
500-550	GUS	2	2	2	-	E	Animal pit
550-600	GUS	2	2	2	-	E	-
600-650	GUS	2	2	2	-	E	-
650-700	GUS	2	2	2	LC	E	-
700-750	GUS	2	2	2	-	E	-
750-800	GUS	2	2	2	-	E	-
800-850	GUS	2	2	2	-	E	-
850-900	GUS	2	2	2	-	E	-
900-950	GLS	2	2	2	-	E	-
950-1000	GUS	2	2	2	-	E	-

Notes: Invasive alien species *Lantana camara* and *Stachytarpheta jamaicensis*

Coastal forest endemic species: *Cissus quinquangularis*, *Pristimera graciflora*, *Nesogordonia holtzii*, *Monanthes trichocarpa*

Endemic to Pugu and Kazimzumbwi forests; *Millettia puguensis*

Trema orientalis (dominant in fire damaged areas with worry it will suppress other plant species)

Milicia excelsa (disappeared valuable timber plant species)

Were photos taken along the transect: YES

Appendix 17. Disturbance transect no. 16

Names of recorders: Justine Gwegime

Date of survey: 13/7/2011

District: Kisarawe

Village: Mambisi

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve **Transect Number:** T_{16P}

Dominant vegetation: Disturbed forest /
Trema orientalis

Bearing: NE

Start point Longitude: 0508601

Latitude: 9239193

Altitude (m): 119m

End point Longitude: 0509499

Latitude: 9239255

Altitude (m): 212m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	5	-	2	6	3	-	-	-	-	-
50-100	19	-	10	-	9	1	-	-	-	-
100-150	10	-	3	1	3	-	1	-	N(1) & K(1)	-
150-200	7	-	6	5	3	-	1	-	K(1)	-
200-250	7	2	4	5	1	1	5	-	-	-
250-300	10	-	12	-	5	-	4	-	K(1)	-
300-350	10	-	7	-	3	-	3	1	K(3)	-
350-400	7	-	3	-	1	1	-	-	K(1)	-
400-450	7	-	16	1	1	-	10	-	K(1) & F	F
450-500	-	1	9	-	-	-	3	-	K(1) & F	F
500-550	-	-	20	-	-	-	10	-	F	F
550-600	-	-	12	-	-	-	3	-	F & K(1)	F
600-650	1	1	7	-	-	-	3	-	F	F
650-700	1	-	10	-	-	-	1	-	F & K(1)	F
700-750	5	-	5	-	-	-	6	-	F & K(1)	F
750-800	4	-	5	-	-	-	3	-	K(1) & F	F
800-850	2	-	6	-	3	-	2	-	K(1) & F	F
850-900	1	1	8	-	1	-	2	-	F & K(1)	F
900-950	1	-	14	-	-	-	-	-	F & K(1)	F
950-1000	-	-	9	-	-	-	3	-	F & K(1)	F
Total	97	5	168	18	33	3	60	1	F(12), N(1) & K(17)	F(12)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	2	1	2	-	-	-
50-100	GLS	2	1	2	-	-	Rodent routes
100-150	GLS	2	1	2	-	-	Rodent routes
150-200	GLS	2	1	2	-	-	Rodent routes
200-250	GUS	2	1	2	-	-	-
250-300	GUS	2	1	2	-	-	Bird feather and rodent routes
300-350	GUS	2	1	2	-	E	Rodents routes
350-400	GUS	2	1	2	-	-	-
400-450	GUS	2	1	2	-	E	-
450-500	GUS	2	1	2	LC	-	-
500-550	GUS	2	1	2	-	E	-
550-600	GUS	2	1	2	-	-	Aardvark footprints
600-650	GUS	2	1	2	-	-	-
650-700	GUS	2	1	2	-	-	-
700-750	GLS	2	1	2	-	E	-
750-800	GLS	2	2	2	-	-	Footprints
800-850	GLS	2	2	2	-	-	-
850-900	GUS	2	2	2	-	E	-
900-950	GUS	2	2	2	-	-	-
950-1000	GUS	2	2	2	-	-	-

Notes: Coastal forest endemic species *Nesogordonia holtzii* and *Pristimera graciflora*

Were photos taken along the transect: YES

Appendix 18. Disturbance transect no. 17

Names of recorders: Justine Gwegime

Date of survey: 14/7/2011

District: Kisarawe

Village: Pugu relini

Nearest sub-village:

Village Forest Reserve: Pugu Forest Reserve

Transect Number: T₁₇P

Dominant vegetation: Disturbed forest

Bearing: SW

Start point Longitude: 0512998

Latitude: 9239337

Altitude (m): 109m

End point Longitude: 0512290

Latitude: 9238668

Altitude (m): 149m

Key to disturbance categories

P
F

Pitsaw
Fire damage

S
B

Settlement
Bark or root harvesting

T
K

Timber, planks, poles
Charcoal kiln

R
G

Path or road
Gunfire

C Cultivation**M** Mining**N** Traps or snares**O** Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	-	-	13	-	-	-	16	-	R(1)	-
50-100	-	-	21	-	-	-	5	-	K(3)	-
100-150	-	-	22	-	-	-	20	-	K(2)	-
150-200	-	-	23	2	1	-	16	-	-	-
200-250	-	-	25	2	-	-	9	-	K(1)	-
250-300	-	-	20	-	-	-	10	-	K(1)	-
300-350	1	-	20	-	-	-	13	-	K(1)	-
350-400	2	-	20	1	-	-	6	-	R(2) & K(1)	R(1)
400-450	-	-	26	1	-	-	16	-	R(2) & K(1)	-
450-500	5	-	8	-	-	-	12	-	R(2) & K(1)	R(1)
500-550	3	-	17	-	-	-	12	-	K(2) & R(1)	-
550-600	-	-	22	-	-	-	12	-	R(2) & K(2)	-
600-650	6	-	24	-	-	-	22	-	K(2)	-
650-700	1	-	17	-	-	-	9	-	K(1) & R(1)	-
700-750	-	-	27	3	-	-	22	-	R(1)	-
750-800	1	-	11	-	-	-	15	-	R(2) & K(2)	-
800-850	-	-	8	-	-	-	4	-	K(2) & R(1)	R(1)
850-900	4	-	11	5	-	-	11	-	K(2)	-
900-950	2	-	16	2	-	-	5	2	K(1)	-
950-1000	2	-	35	-	-	-	20	-	K(2) & R(1)	-
Total	27	-	386	16	1	-	255	2	K(27) & R(16)	R(3)

Key to topography

GLS	Gentle lower slope
SLS	Steep lower slope

GMS	Gentle mid-slope
SMS	Steep mid-slope

GUS	Gentle upper slope
SUS	Steep upper slope

CL	Cliffs
VF	Valley floor

Key to vegetation cover**1** < 10 % cover**2** 10 – 50 % cover**3** > 50 % cover**Invasive alien species**

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	1	2	-	-	-
50-100	GLS	2	1	2	-	-	-

100-150	GUS	2	1	2	-	-	-
150-200	GLS	2	1	2	-	-	-
200-250	GLS	2	1	2	-	E	-
250-300	GLS	2	1	2	-	-	-
300-350	GLS	2	1	2	-	-	-
350-400	GLS	2	1	2	-	-	-
400-450	GLS	2	1	2	-	E	-
450-500	GLS	2	1	2	-	-	-
500-550	GUS	2	1	2	-	-	Bird nest
550-600	GLS	2	1	2	-	-	-
600-650	GUS	2	1	2	-	E	Rodent routes
650-700	GLS	2	1	2	-	-	-
700-750	GLS	2	1	2	-	-	-
750-800	GLS	2	1	2	-	-	-
800-850	GLS	2	1	2	-	-	-
850-900	GLS	2	1	2	-	-	-
900-950	GLS	2	1	2	-	-	-
950-1000	GUS	2	1	2	-	-	-

Notes: Coastal forest endemic species *Xylopia arenaria*

Were photos taken along the transect: YES

Appendix 19. Disturbance transect no. 18

Names of recorders: Justine Gwegime

Date of survey: 15/7/2011

District: Kisarawe

Village: Kazimzumbwi Jeshini

Nearest sub-village:

Village Forest Reserve: Kazimzumbwi FR

Transect Number: T₁₈K

Dominant vegetation: Disturbed forest

Bearing: SW

Start point Longitude: 0503092

Latitude: 9231433

Altitude (m): 280m

End point Longitude: 0503576

Latitude: 9232175

Altitude (m): 190m

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5–15cm)				Qty of timber (>15cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		On transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	5	-	1	10	2	-	3	1	K(1)	-
50-100	3	-	3	2	1	-	3	-	K(2)	-
100-150	12	-	10	-	-	-	4	-	K(2)	-
150-200	5	1	6	-	1	-	-	-	-	-
200-250	5	-	1	-	1	-	1	-	C	-
250-300	5	-	2	-	-	-	2	-	K(1)	-
300-350	6	1	5	-	1	2	2	-	K(1)	-
350-400	6	-	6	-	4	-	2	-	K(1)	-
400-450	1	1	4	-	-	-	1	-	K(1)	-
450-500	1	1	9	-	-	-	8	-	K(1)	F
500-550	4	3	11	-	2	-	5	-	F & K(2)	F
550-600	-	1	2	2	-	-	5	-	K(1)	F
600-650	1	1	7	-	-	-	10	-	K(2)	-
650-700	1	-	1	-	-	-	7	-	F & K(2)	F
700-750	-	-	8	-	-	-	3	-	F & K(1)	F
750-800	-	-	6	-	-	-	7	-	F	F
800-850	-	-	2	-	-	-	2	-	F	F
850-900	-	-	8	-	-	1	3	-	F	F
900-950	-	-	3	-	3	-	5	-	F & K(2)	F
950-1000	15	1	5	-	1	-	11	-	F & K(1)	F
Total	70	10	100	14	16	3	84	1	K(21), F(8) & C(1)	F(10)

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	1	1	-	-	-
50-100	GUS	2	1	1	-	-	-
100-150	GUS	2	1	1	-	-	-
150-200	GUS	2	1	1	-	-	Rodent routes
200-250	GUS	2	1	1	-	-	-
250-300	GUS	2	1	1	-	E	-
300-350	GUS	2	1	1	-	-	-
350-400	GUS	2	1	1	-	-	-
400-450	GUS	2	1	1	-	E	-
450-500	GUS	2	1	1	-	-	Aardvark pit
500-550	GUS	2	1	1	-	-	Dikdik pellets
550-600	GUS	2	1	1	-	-	Bush pig
600-650	GUS	2	1	2	-	-	-
650-700	GUS	2	2	2	-	-	-
700-750	GUS	2	2	2	-	-	-
750-800	SUS	1	2	2	-	-	-
800-850	GUS	1	2	2	-	-	-
850-900	GUS	1	2	2	-	-	-
900-950	GLS	1	2	2	-	-	-
950-1000	GLS	1	2	2	-	-	-

Notes: Coastal forest endemic species *Pristimera graciflora* and *Nesogordonia holtzii*

Were photos taken along the transect: YES

Appendix 20. Disturbance Transect Details, 2012 Surveys

Transect name (number)	Transect length (m)	Start point (Lat/Long UTM)	End point (Lat/Long UTM)	Survey date	Transect direction	Habitat type
PUGU FOREST RESERVE						
Mpakani (1)		0511902/9237618	0511571/9238408	26/05/2012	NE	
Dunda-Kigogo (2)		511910/9236054	511024/9236020	27/05/2012	NE	
Minaki Bwawani (3)		510736/9236601	511549/9236908	28/05/2012	NE	
Pugu Kimani (4)		509011/9235220	509161/9235718	29/05/2012	SW	
Pugu Relini 1 (5)		512998/9239337	512345/9238680	30/05/2012	SW	

Pugu Relini 2 (6)		512770/9239914	512243/9239232	31/05/2012	NE	
Mambisi Bustanini (7)		510646/9239934	511121/9239152	1/06/2012	SE	
Mambisi 1 (8)		508047/9238983	508534/9238541	2/06/2012	SE	
Mambisi 2 (9)		508601/9239193	502847/9231118	3/06/2012	NE	
KAZIMZUMBWI FOREST RESERVE						
Jeshini 1 (10)		502847/9231118	505317/9231730	4/06/2012	NE	
Jeshini 2 (11)		503092/9231433	503576/9232175	8/06/2012	NE	
Vibura 1 (12)		502824/9229240	502145/9228719	5/06/2012	NEE	
Vibura 2 (13)		502515/9227607	503454/9227888	5/06/2012	/	
Chanika-Shamba 1 (14)		506956/9224654	506326/9125419	6/06/2012	SW	
Chanika-Shamba 2 (15)		506667/9225355	506054/9226099	6/06/2012	NE	
Chanika (16)		505436/9225452	505563/9226408	6/06/2012	NE	
Buyuni 1 (17)		508980/9232226	508048/9232392	7/06/2012	NWW	
Buyuni 2 (18)		508369/9232942	509121/9232676	7/06/2012	SE	

Appendix 21. Disturbance Transect no. 1 (2012)

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 26/5/2012

District: Kisarawe

Village: Kisarawe

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve

Transect Number: 1, Mpakani

Dominant vegetation:

Bearing: NE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5-15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	7	0	0	0	0	0	0	0	R(1)	-
50-100	16	0	6	0	5	0	1	0	O	-
100-150	10	0	7	0	0	0	0	0	O	-
150-200	11	0	4	0	0	0	0	0	O	-
200-250	10	0	3	0	1	0	2	0	R(1)	-
250-300	8	0	0	0	0	3	0	0	K(1)	-
300-350	3	3	0	0	0	0	4	0	K(1)	-
350-400	1	0	5	0	0	0	0	0	P(2)	-
400-450	4	0	1	2	0	0	1	0	R(2)	-
450-500	0	0	0	0	0	0	0	0	K(1)	-
500-550	10	0	5	0	0	0	6	0	K(1) R (3)	-
550-600	10	0	9	0	0	0	3	0	R(3), K(1)	-
600-650	7	0	0	0	0	0	0	0	F&P	-
650-700	5	0	4	0	0	0	0	0	F,R (1)	-
700-750	7	0	5	0	0	0	4	0	K(1)	-
750-800	0	0	4	0	0	0	4	0	F	-
800-850	3	0	1	0	0	0	2	0	F	-
850-900	1	0	1	0	0	0	1	0	F	-
900-950	1	0	0	0	0	0	2	0	K(1)	-
950-1000	6	0	0	0	0	0	0	0	F	-
Total	120	3	55	2	6	3	30	0	F(6),K(7), R(11), P(3), O(3)	

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	1	1	2	-	-	-
50-100	GLS	1	2	2	-	-	-
100-150	GLS	1	1	2	-	-	Duiker footprints
150-200	GUS	1	1	2	-	-	Dikdik pellets
200-250	GUS	1	1	2	-	-	<i>Baphia puguensis</i>
250-300	GUS	1	1	2	-	-	Animal signs
300-350	GUS	1	1	2	-	-	Duikers prints, trails; dikdik dung
350-400	GUS	1	1	2	-	-	Duikers foot prints
400-450	GUS	1	1	2	-	-	Mushrooms and duikers footprints
450-500	GUS	1	1	2	-	-	Antelope area
500-550	GUS	1	2	2	-	-	Antelope area
550-600	GUS	1	2	2	-	-	Dikdik pellets
600-650	GUS	1	1	2	-	-	<i>Trema orientalis</i>
650-700	GUS	1	1	2	-	-	<i>Trema orientalis</i>
700-750	GUS	1	1	2	-	-	Antelope area
750-800	GUS	1	1	2	-	-	Duiker trail and <i>Trema orientalis</i>
800-850	GUS	1	1	2	-	-	<i>Trema orientalis</i> dikdik pellets
850-900	GUS	1	1	2	-	-	Very old stumps
900-950	GUS	1	1	2	-	-	-
950-1000	GUS	1	1	2	-	-	-

Notes: The area is characterised by thicketed vegetation as a result of excessive harvesting of trees for charcoal production. Additionally, there were human paths/ trails observed but the majority seem to no longer be used which suggests that conservation efforts may now be working.

Appendix 22. Disturbance Transect no. 2

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 27/5/2012

District: Kisarawe

Village: Dunda kigogo

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve

Transect Number: 2

Dominant vegetation:

Bearing: NE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	5	0	0	0	3	1	0	0	R	-
50-100	0	0	0	0	0	0	1	0	0	-
100-150	1	0	0	0	2	0	3	0	R	-
150-200	2	0	7	0	6	0	6	0	R	-
200-250	11	0	7	0	3	0	4	0	R	-
250-300	10	0	3	0	0	0	3	0	0	-
300-350	10	0	6	0	1	0	17	0	0	-
350-400	6	0	5	0	2	0	4	0	0	-
400-450	15	0	9	0	0	0	0	0	0	-
450-500	7	0	3	2	0	0	2	0	F	-
500-550	20	0	1	0	0	0	5	0	F	-
550-600	7	0	3	0	6	0	3	0	F	-
600-650	3	0	0	0	0	1	0	0	F	-
650-700	2	2	1	0	0	0	2	0	F	-
700-750	7	0	15	0	0	0	13	0	F	-
750-800	6	0	0	0	0	0	4	0	F	-
800-850	13	0	0	0	0	0	1	0	F	-
850-900	9	0	1	0	1	0	2	0	F	-
900-950	8	0	2	0	0	0	0	0	F	-
950-1000	2	0	4	0	0	0	3	0	F	-
Total	144	2	67	2	24	2	73	0	F(11)&R(4)	

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	1	2	1	-	-	<i>Senna cimena</i>
50-100	GUS	1	1	2	-	-	<i>Senna cimena</i>
100-150	GLS	1	1	2	-	-	<i>Senna cimena</i>
150-200	GLS	1	1	2	-	-	<i>Senna cimena</i>
200-250	GUS	1	2	1	-	-	<i>Senna cimena</i>
250-300	GUS	1	2	1	-	-	Duiker trail and fallowland
300-350	GUS	1	2	1	-	-	Dikdik foot print/ trail, <i>Senna cimena</i>
350-400	GUS	1	1	2	-	-	
400-450	GUS	1	1	2	-	-	<i>Senna cimena</i> and duiker sign
450-500	GUS	1	2	1	-	-	Sykes monkey heard 50m away
500-550	VF	1	1	2	-	-	<i>Senna cimena</i>
550-600	GUS	1	1	2	-	-	<i>Senna cimena</i>
600-650	VF	1	1	2	-	-	Grassy area with few shrubs
650-700	GUS	1	1	2	-	-	<i>Trema orientalis</i>
700-750	GUS	1	2	1	-	-	Fire damage
750-800	GUS	1	1	2	-	-	
800-850	GUS	1	1	2	-	-	Wildpig prints, <i>Trema orientalis</i>
850-900	GUS	1	1	2	-	-	Nests, wildpig sign
900-950	GUS	1	1	2	-	-	<i>Trema orientalis</i> , Grewis sp.
950-1000	GUS	1	1	2	-	-	<i>Trema orientalis</i> , Grewis sp.

Appendix 23. Disturbance Transect no. 3

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 28/5/2012

District: Kisarawe

Village: Minaki Bwawani

Nearest sub-village: Pugu

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	23	0	0	0	0	0	0	0	0	-
50-100	28	1	6	0	0	0	2	0	0	-
100-150	25	0	5	0	0	0	2	0	K(1)	-
150-200	26	0	3	0	2	0	0	0	0	-
200-250	16	0	10	0	1	0	0	0	K(2)	-
250-300	10	0	6	0	1	0	0	0	0	-
300-350	5	1	10	0	0	0	2	0	K (1)	-
350-400	20	1	16	0	0	0	0	0	0	-
400-450	15	0	11	0	0	0	6	0	K(1)	-
450-500	11	0	12	0	0	0	5	0	K(2), P, R	-
500-550	13	0	11	0	0	0	15	0	K(3), R(2)	-
550-600	11	0	17	0	0	0	9	0	K(2)	-
600-650	11	0	13	0	0	0	7	0	K(2)	-
650-700	14	0	7	0	4	0	6	0	0	-
700-750	6	0	10	0	1	0	14	0	K(1)	-
750-800	16	0	2	0	0	1	12	0	K(2)	-
800-850	11	0	2	0	0	0	9	0	K(2), R(2)	-
850-900	7	0	10	0	1	0	5	0	0	-
900-950	10	0	11	0	0	0	3	0	0	-
950-1000	20	0	7	0	0	0	8	0	K(1)	-
Total	298	3	169	0	10	1	105	0	K(20),R(5) &P(1)	

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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spring							
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	LC	E	Duiker trail (2)
50-100	GUS	2	2	3	-	E	Duiker trail (3)
100-150	GUS	2	2	3	-	E	Duiker trail (3) and Footprints
150-200	GUS	2	2	3	-	E	Duiker trail (2)
200-250	GUS	2	2	3	-	E	Dikdik pellets
250-300	GUS	2	2	3	-	E	Dikdik trail (2)
300-350	GUS	2	2	3	-	E	Mushroom
350-400	GUS	2	2	3	-	E	Antelope trail (3) and Dikdik pellets
400-450	GUS	2	2	3	-	E	Suni/Dikdik trail (2)
450-500	GUS	2	2	3	-	E	Dikdik pellets(3) and Footprints
500-550	GUS	2	2	3	-	E	Dikdik footprints
550-600	GUS	2	2	3	-	E	Duiker footprints
600-650	GUS	2	2	3	-	E	Duiker footprints
650-700	GUS	2	2	3	-	E	Antelope trail
700-750	GUS	2	2	3	-	E	
750-800	GUS	2	2	3	-	E	Dikdik trail
800-850	GUS	2	2	3	-	E	Dikdik trail
850-900	GUS	2	2	3	-	E	Dikdik (Seen)
900-950	GUS	2	2	3	-	E	Dikdik trail
950-1000	GUS	2	2	3	-	E	Dikdik foot prints

Notes: The area is highly affected by charcoal production as a lot of charcoal kilns were recorded. Nevertheless, regeneration potential is also high.

Appendix 24. Disturbance Transect no. 4

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 29/5/2012

District: Kisarawe

Village: Kisarawe

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve

Transect Number: 4, Pugu Kimani

Dominant vegetation: Thicket

Bearing: SW

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	10	0	0	0	0	0	0	0		-
50-100	13	0	0	0	1	0	0	0		-
100-150	11	0	0	0	3	0	0	0		-
150-200	16	1	0	0	6	1	0	0	P	-
200-250	12	0	0	0	6	0	0	1		-
250-300	26	0	0	0	7	0	0	0		-
300-350	26	1	0	0	6	0	0	0		-
350-400	28	1	0	0	5	0	0	0	R	-
400-450	33	0	0	0	4	0	0	0		-
450-500	16	0	0	0	1	0	0	0		-
500-550	31	0	0	0	3	0	0	0		-
550-600	24	0	0	0	2	0	0	0		-
600-650	9	1	0	0	2	0	0	0		-
650-700										
700-750										
750-800										
800-850										
850-900										
900-950										
950-1000										
Total	255	4	0	0	46	1	0	1	P(1)&R(1)	

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	LC	-	
50-100	GUS	2	2	3	LC	-	Duiker trail (1)
100-150	GUS	2	2	3	LC	-	
150-200	GUS	2	2	3	LC	-	
200-250	GUS	2	2	3	LC	-	E.shrew trail
250-300	GUS	2	2	3	LC	-	Dikdik trail(3)
300-350	GUS	2	2	3	LC	-	Dikdik trail
350-400	GUS	2	2	3	LC	-	Dikdik trail
400-450	GUS	2	2	3	LC	-	E.shrew trail
450-500	GUS	2	2	3	LC	-	Dikdik trail
500-550	GUS	2	2	3	LC	-	Duiker trail (1)
550-600	GUS	2	2	3	LC	-	Duiker trail
600-650	GUS	2	2	3	LC	-	-
650-700							
700-750							
750-800							
800-850							
850-900							
900-950							
950-1000							

Notes: The area is characterised by high regeneration. Transect ended as reached the edge of the reserve.

Appendix 25. Disturbance Transect no. 5

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 30/5/2012

District: Kisarawe

Village: Kisarawe

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve

Transect Number: 5, Pugu Relini 1

Dominant vegetation: Thicket

Bearing: SW

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	4	0	16	0	1	0	2	0	O	-
50-100	9	0	25	0	0	0	3	0	O	-
100-150	20	0	18	0	0	0	0	0	K(1)	-
150-200	7	0	12	0	0	0	5	0	K(2)	-
200-250	5	0	25	0	0	0	6	0	K(1), R	-
250-300	6	0	16	0	0	0	5	0	O	-
300-350	15	0	21	5	0	0	8	0	K(1)	-
350-400	10	0	4	0	0	0	5	0	K(1)	-
400-450	6	0	8	0	0	0	1	0	O	-
450-500	1	0	6	0	0	0	9	0	R(1)	-
500-550	18	0	11	6	0	0	4	0	O	-
550-600	7	0	2	0	0	0	11	0	K(1)	-
600-650	9	0	14	0	0	0	15	0	K(1)	-
650-700	8	0	11	3	0	0	5	0	K(1), R(2)	-
700-750	4	0	10	0	0	0	10	0	K(1), R(1)	-
750-800	8	0	13	0	0	0	17	0	R(1)	-
800-850	6	0	9	0	0	0	12	0	K(3)	-
850-900	0	0	2	0	0	0	7	0	K(2)	-
900-950	3	0	16	0	0	0	5	0	R	-
950-1000	8	0	11	0	0	0	6	0	K(1)	-
Total	154	0	250	14	1	0	136	0	K(16) & R(7)	-

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	-
50-100	GUS	2	2	3	-	-	-
100-150	GUS	2	2	3	-	-	-
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	-
300-350	GUS	2	2	3	-	-	-
350-400	GUS	2	2	3	-	-	-
400-450	GUS	2	2	3	-	-	-
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	-	-	Duiker trail
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	E.shrew trail
750-800	GUS	2	2	3	-	-	Dikdik trail
800-850	GUS	2	2	3	-	-	Antelope trail
850-900	GUS	2	2	3	-	-	-
900-950	GUS	2	2	3	-	-	-
950-1000	GUS	2	2	3	-	-	-

Notes: The area is highly affected by charcoal production as many charcoal kilns were recorded. Timber- sized trees were also very rare yet regeneration potential was very high.

Appendix 26. Disturbance Transect no. 6

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 31/5/2012

District: Kisarawe

Village: Pugu

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve

Transect Number: 6, Pugu relini 2

Dominant vegetation: Thicket

Bearing: NE

Key to disturbance categories

P Pitsaw	S Settlement	T Timber, planks, poles	R Path or road
F Fire damage	B Bark or root harvesting	K Charcoal kiln	G Gunfire

C Cultivation**M** Mining**N** Traps or snares**O** Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	0	0	5	0	0	0	8	0	0	-
50-100	2	0	0	0	0	0	7	0	R(1)	-
100-150	10	0	5	3	0	0	3	0	0	-
150-200	3	0	15	0	0	0	18	0	0	-
200-250	6	0	14	0	0	0	10	0	0	-
250-300	5	0	7	0	0	0	6	0	0	-
300-350	12	0	28	0	1	0	11	0	0	-
350-400	5	0	10	0	0	0	3	0	K(1) & M(1)	-
400-450	7	0	20	0	0	0	8	0	K(1)	-
450-500	0	0	10	0	0	0	11	0	K(1) & R(1)	-
500-550	5	0	12	0	0	0	12	0	0	-
550-600	4	0	3	0	0	0	3	0	R(1)	-
600-650	2	0	10	0	0	0	6	0	0	-
650-700	6	0	7	0	0	0	5	0	0	-
700-750	6	0	5	0	0	0	1	0	0	-
750-800	1	0	6	0	0	0	2	0	K(1)	-
800-850	13	0	5	0	0	0	1	0	0	-
850-900	7	0	3	0	0	0	1	0	F	-
900-950	6	0	1	0	0	0	0	0	F	-
950-1000	12	0	0	0	0	0	0	0	F	-
Total	112	0	166	3	1	0	116	0	F(3), K(4), R(3), M(1)	-

Key to topography

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	-
50-100	GUS	2	2	3	-	-	-
100-150	GUS	2	2	3	-	-	-
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	Snail
300-350	GUS	2	2	3	LC	-	-
350-400	GUS	2	2	3	LC	-	-
400-450	GUS	2	2	3	LC	-	Dikdik pellets
450-500	GUS	2	2	3	LC	-	Dikdik trail
500-550	GUS	2	2	3	LC	-	Dikdik trail
550-600	GUS	2	2	3	-	-	-
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	-
750-800	GUS	2	2	3	LC	-	-
800-850	GUS	2	2	3	LC	-	Duiker pellets
850-900	GUS	2	2	3	-	-	-
900-950	GUS	2	2	3	LC	-	-
950-1000	GUS	2	2	3	LC	-	Dikdik pellets

Notes: There is regeneration potential in the area. Part of the forest was discovered to be outside the reserve boundary.

Appendix 27. Disturbance Transect no. 7

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 1/6/2012

District: Kisarawe

Village: Kisarawe

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve

Transect Number: 7, Mambisi bustanini

Dominant vegetation: Thicket

Bearing: SE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	0	0	3	0	0	0	1	0	F	-
50-100	4	0	3	0	0	0	3	0	F	-
100-150	2	0	4	0	0	0	3	0	F	-
150-200	0	0	0	0	0	0	3	0	F	-
200-250	6	0	1	0	0	0	3	0	F	-
250-300	15	0	2	0	0	0	0	0	O	-
300-350	3	0	5	0	0	0	4	0	F	-
350-400	12	0	11	0	0	0	0	0	F	-
400-450	0	0	7	0	0	0	1	0	F	-
450-500	11	0	6	0	0	0	0	0	F	-
500-550	3	0	1	0	0	0	1	0	F	-
550-600	9	0	5	0	2	0	3	0	F	-
600-650	2	0	6	0	0	0	1	0	F	-
650-700	12	0	8	0	0	0	5	0	F	-
700-750	27	0	26	0	0	0	1	0	F & K	-
750-800	17	0	10	0	0	0	0	0	K	-
800-850	7	0	7	0	0	0	4	0	F	-
850-900	9	0	5	0	0	0	2	0	K	-
900-950	10	0	25	0	0	0	11	0	F & K(1)	-
950-1000	5	0	3	0	0	0	2	0	F	-
Total	154	0	138	0	2	0	48	0	F(17)&K(4)	-

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana</i>	CO	<i>Cedrela</i>	RU	<i>Rubus</i>	SJ	<i>Stachytarpheta</i>	O	Other
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	<i>camara</i>		<i>odorata</i>		sp.		<i>jamaicensis</i>		(specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50		2	2	3	-	-	-
50-100		2	2	3	-	-	-
100-150		2	2	3	LC	-	-
150-200		2	2	3	LC	-	Rodent pit
200-250		2	2	3	-	-	-
250-300		2	2	3	-	-	Nest
300-350		2	2	3	LC	-	Nest
350-400		2	2	3	-	-	-
400-450		2	2	3	-	-	-
450-500		2	2	3	-	-	-
500-550		2	2	3	LC	-	-
550-600		2	2	3	-	-	-
600-650		2	2	3	LC	-	-
650-700		2	2	3	LC	-	-
700-750		2	2	3	LC	-	Guinea fowl
750-800		2	2	3	-	-	-
800-850		2	2	3	LC	-	-
850-900		2	2	3	-	-	-
900-950		2	2	3	-	-	-
950-1000		2	2	3	-	-	-

Notes: The area is highly damaged by fire but with high regeneration potential.

Appendix 28. Disturbance Transect no. 8

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 2/6/2012

District: Kisarawe

Village: Mambisi

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve **Transect Number:** 8

Dominant vegetation: Thicket

Bearing: SE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other Within transect (qty)*
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		
			old	fresh			old	fresh	
0-50	22	0	1	0	0	0	2	0	F
50-100	3	0	5	0	0	0	1	0	F & K(2)
100-150	5	0	10	0	1	0	2	0	K(1)
150-200	8	0	5	0	1	0	5	0	K(2)
200-250	5	0	4	0	1	0	5	2	K(2)
250-300	10	0	5	0	2	0	2	0	0
300-350	8	0	9	0	0	0	2	0	0
350-400	14	0	7	0	0	0	2	0	K(1)
400-450	3	0	1	0	0	0	1	0	K(1)
450-500	5	0	3	0	0	0	0	0	K (1) & R
500-550	4	0	2	0	0	0	0	0	F
550-600	1	0	4	0	1	0	2	0	0
600-650	3	0	0	2	0	0	0	0	0
650-700	5	0	0	9	2	0	2	1	K(1)
700-750	12	0	0	0	1	0	0	0	0
750-800	10	0	0	1	3	0	1	0	0
800-850	5	0	0	0	0	0	0	0	0
850-900	13	0	4	0	1	0	1	0	0
900-950	0	0	0	0	0	0	0	0	0
950-1000	0	0	0	0	0	0	0	0	0
Total	136	0	60	12	13	0	28	3	K(11),R(1)&F(3)

* No disturbances observed outside transect

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover
1 < 10 % cover

2 10 – 50 % cover

3 > 50 % cover

Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	-
50-100	GUS	2	2	3	-	-	-
100-150	GUS	2	2	3	-	-	-
150-200	GUS	2	2	3	-	-	E-shrew trail, dikdik trail
200-250	GUS	2	2	3	-	-	Nest
250-300	GUS	2	2	3	-	-	Duiker trail
300-350	GUS	2	2	3	-	-	E-shrew trail
350-400	GUS	2	2	3	-	-	E-shrew trail
400-450	GUS	2	2	3	-	-	E-shrew footprints
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	-	-	-
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	Dikdik trail
750-800	GUS	2	2	3	-	E	Duiker trail
800-850	GUS	2	2	3	-	-	-
850-900	GUS	2	2	3	-	E	Duiker trail
900-950	GUS	2	2	3	-	E	-
950-1000	GUS	2	2	3	-	E	-

Notes: The area is characterised by thicket and some places highly affected by fire.

Appendix 29. Disturbance Transect no. 9

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 3/6/2012

District: Kisarawe

Village: Mambisi

Nearest sub-village: Pugu

Village Forest Reserve: Pugu Forest Reserve

Transect Number: 9

Dominant vegetation: Thicket

Bearing: NE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	16	0	15	0	1	0	0	0	0	-
50-100	13	0	4	0	3	1	3	0	K(2) & R(2)	-
100-150	25	0	5	0	0	0	0	0	R(1)	-
150-200	17	0	0	0	0	0	0	0	R	-
200-250	15	0	0	0	6	0	1	0	K(1) & R	-
250-300	2	0	4	0	2	0	0	0	R(1)	-
300-350	17	0	1	0	0	0	1	0	K(1) & F	-
350-400	7	0	5	0	0	0	0	0	F & R(1)	-
400-450	4	0	4	1	0	0	4	0	F & K(1)	-
450-500	25	0	4	0	0	0	5	0	K(2)	-
500-550	11	0	13	0	0	0	11	0	F	-
550-600	5	0	11	5	0	0	5	0	F	-
600-650	0	0	4	15	0	0	2	0	F	-
650-700	3	0	1	7	0	0	0	0	F, K(2) & R	-
700-750	2	0	2	0	1	0	3	0	F	-
750-800	6	0	3	0	0	0	5	0	F	-
800-850	10	0	3	0	1	0	6	0	F & K(1)	-
850-900	14	0	2	0	0	0	2	0	F	-
900-950	3	0	5	0	0	0	1	0	F	-
950-1000	5	0	1	0	0	0	1	0	F	-
Total	200	0	87	28	14	1	50	0	F(13),K(10) & R(8)	-

GLS	Gentle lower slope
SLS	Steep lower slope

GMS	Gentle mid-slope
SMS	Steep mid-slope

GUS	Gentle upper slope
SUS	Steep upper slope

CL	Cliffs
VF	Valley floor

Key to vegetation cover

1 < 10 % cover

2 10 – 50 % cover

3 > 50 % cover

Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	-
50-100	GUS	2	2	3	-	-	Dikdik trail
100-150	GUS	2	2	3	-	-	Dikdik trail
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	Trail
300-350	GUS	2	2	3	-	-	-
350-400	GUS	2	2	3	-	-	-
400-450	GUS	2	2	3	-	-	-
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	-	-	Snail
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	-
750-800	GUS	2	2	3	-	-	-
800-850	GUS	2	2	3	-	-	-
850-900	GUS	2	2	3	-	-	-
900-950	GUS	2	2	3	-	-	Elephant shrew
950-1000	GUS	2	2	3	-	-	-

Notes: Some cutting of regenerating vegetation was observed at this site.

Appendix 30. Disturbance Transect no. 10

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 4/6/2012

District: Kisarawe

Village: Kazimzumbwi

Nearest sub-village: Pugu

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 10, Kazimzumbwi jeshini

Dominant vegetation: Thicket

Bearing: NE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	1	0	0	0	0	0	0	0	K(2) & R	-
50-100	2	0	1	0	0	0	2	0	K (1)	-
100-150	11	0	2	0	0	0	6	0	K(1)	-
150-200	8	1	6	0	0	0	7	0	K(1)	-
200-250	4	0	5	0	1	0	10	0	K(1) & F	-
250-300	7	0	4	0	0	0	3	0	O	-
300-350	8	1	6	0	1	0	2	0	K(1) & F	-
350-400	7	0	3	0	1	0	12	0	K(2) & F	-
400-450	1	0	5	0	0	0	12	0	F	-
450-500	0	0	8	0	0	0	6	0	K & F	-
500-550	1	2	2	0	0	0	20	0	K(2) & F	-
550-600	0	0	6	0	0	0	10	0	K(1) & F	-
600-650	3	0	8	0	0	0	2	0	F	-
650-700	1	0	4	0	0	0	8	0	K(2) & F	-
700-750	0	0	5	0	0	0	6	0	F	-
750-800	6	0	3	0	0	0	3	0	K(1) & F	-
800-850	0	0	8	0	0	0	6	0	F	-
850-900	3	0	15	0	0	0	8	0	K(1)	-
900-950	0	0	10	0	0	0	10	0	F	-
950-1000	2	0	15	0	0	0	10	0	K(1) & F	-
Total	65	4	116	0	3	0	143	0	K(18),F(14) & R(1)	

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	-
50-100	GUS	2	2	3	-	1	-
100-150	GUS	2	2	3	-	-	-
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	Wildpig footprints
300-350	GUS	2	2	3	-	-	-
350-400	GUS	2	2	3	-	-	-
400-450	GUS	2	2	3	-	-	-
450-500	GUS	2	2	3	E	-	-
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	E	-	-
600-650	GUS	2	2	3	E	-	-
650-700	GUS	2	2	3	E	-	-
700-750	GUS	2	2	3	E	-	-
750-800	GUS	2	2	3	-	-	-
800-850	GUS	2	2	3	-	-	-
850-900	GUS	2	2	3	-	-	Wildpig footprints
900-950	GUS	2	2	3	-	-	-
950-1000	GUS	2	2	3	-	-	-

Appendix 31. Disturbance Transect no. 11

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 8/6/2012

District: Kisarawe

Village: Chanika

Nearest sub-village: Buyuni

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 11, Kazimzumbwi jeshini 2

Dominant vegetation: Open grassland

Bearing: NE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within the transect (qty)
			old	fresh			old	fresh	
0-50	5	1	2	0	0	0	1	0	K(1)
50-100	1	0	5	0	2	0	3	0	K(1)&N
100-150	7	1	10	0	0	0	3	0	O
150-200	12	0	5	0	0	0	1	0	K(3)
200-250	8	0	7	0	0	0	4	0	K(1)
250-300	2	0	9	0	1	0	3	0	K(1)
300-350	5	1	5	0	0	0	6	0	K(1)
350-400	0	0	0	0	1	0	1	0	K(1)
400-450	1	2	3	0	0	0	0	0	F
450-500	6	1	0	0	0	0	0	0	F&K
500-550	14	0	1	0	1	0	2	0	O
550-600	0	0	0	0	0	0	1	0	K(1)
600-650	3	0	0	0	4	0	0	0	F
650-700	6	0	0	0	0	0	1	0	F
700-750	2	0	0	0	0	0	1	0	O
750-800	6	2	0	0	0	1	3	0	F
800-850	1	0	0	0	0	0	1	0	F
850-900	4	0	0	0	0	0	0	0	F
900-950	0	0	0	0	1	0	2	0	F
950-1000	5	0	0	0	0	0	0	0	F
Total	88	8	47	0	10	1	33	0	F(9),K(11)&N(1)

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	E	Duiker trail
50-100	GUS	2	2	3	-	E	-
100-150	GUS	2	2	3	-	E	E. shrew trail (1)
150-200	GUS	2	2	3	-	E	E. shrew trail (3)
200-250	GUS	2	2	3	-	E	E. shrew and Duiker
250-300	GUS	2	2	3	-	E	-
300-350	GUS	2	2	3	-	E	-
350-400	GUS	2	2	3	-	E	Footprint (3)
400-450	GUS	2	2	3	-	E	-
450-500	GUS	2	2	3	-	E	Duiker trail
500-550	GUS	2	2	3	-	E	-
550-600	GUS	2	2	3	-	E	-
600-650	GLS	2	2	3	-	E	Duiker pellets
650-700	GLS	2	2	3	-	E	Wildpig footprints, <i>Bonamia mosambisensis</i>
700-750	SUS	2	2	3	-	E	-
750-800	SUS	2	2	3	-	E	<i>Trema orientalis</i>
800-850	SUS	2	2	3	-	E	-
850-900	GLS	2	2	3	-	E	-
900-950	GLS	2	2	3	-	E	-
950-1000	GLS	2	2	3	-	E	<i>Trema orientalis</i>

Appendix 32. Disturbance Transect no. 12

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 5/6/2012

District: Kisarawe

Village: Vibura/Maguruwe

Nearest sub-village: Buyuni

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 12

Dominant vegetation: Thicket

Bearing: NE/E

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	1	0	4	0	0	0	2	0	K(1)	-
50-100	5	0	3	0	0	0	1	0	F	-
100-150	7	0	7	0	2	0	0	0	F	-
150-200	4	0	2	0	1	0	2	0	F	-
200-250	4	0	0	0	0	0	0	0	K(1) & F	-
250-300	8	0	0	0	2	0	2	0	R	-
300-350	18	1	0	0	1	0	1	0	F	-
350-400	7	0	4	0	1	0	0	0	F & K(1)	-
400-450	5	0	1	0	0	2	0	0	F	-
450-500	4	1	0	0	0	0	0	0	F	-
500-550	3	0	5	0	1	0	2	0	F	-
550-600	7	0	3	0	0	0	3	0	F & K(2)	-
600-650	7	0	0	0	0	0	0	0	F	-
650-700	4	0	5	0	0	0	0	0	O	-
700-750	8	0	3	0	0	1	0	0	F	-
750-800	6	2	0	0	0	0	3	0	F	-
800-850	2	0	0	0	0	0	1	0	F	-
850-900	5	0	0	0	0	0	1	0	K(1)	-
900-950	4	0	1	0	0	0	0	0	R(1)	-
950-1000	0	0	0	0	0	0	0	0	O	-
Total	109	4	38	0	8	3	18	0	F(14),K(6) &R(2)	-

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	-
50-100	GUS	2	2	3	-	-	-
100-150	GUS	2	2	3	-	-	-
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	-
300-350	GUS	2	2	3	-	-	-
350-400	GUS	2	2	3	-	-	Wildpig footprints
400-450	GUS	2	2	3	-	-	Guinea fowl feather(2), Wildpig signs; bird nest
450-500	GUS	2	2	3	-	-	Snail
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	-	-	-
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	-
750-800	GUS	2	2	3	-	-	-
800-850	GUS	2	2	3	-	-	-
850-900	GUS	2	2	3	-	-	-
900-950	GUS	2	2	3	-	-	-
950-1000	GUS	2	2	3	-	-	-

Appendix 33. Disturbance Transect no. 13

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 5/6/2012

District: Kisarawe

Village: Kisarawe

Nearest sub-village: Buyuni

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 13, Vibura 2

Dominant vegetation: Thicket

Bearing:

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	0	0	1	0	2	0	1	0	F	-
50-100	1	0	0	0	0	0	1	0	K(1) & F	-
100-150	0	0	2	0	0	0	1	0	O	-
150-200	0	0	2	0	0	0	0	0	K(1)	-
200-250	1	0	7	0	0	0	2	0	K(1) & F	-
250-300	1	0	5	0	0	0	4	0	K(1) & F	-
300-350	0	0	1	0	2	0	3	0	K(1) & F	-
350-400	2	0	2	0	0	0	0	0	K(1)	-
400-450	11	0	3	0	0	0	1	0	F	-
450-500	0	0	3	0	0	0	1	0	F & R	-
500-550	2	0	6	0	0	0	3	0	O	-
550-600	1	0	0	0	1	0	0	0	O	-
600-650	3	0	2	0	1	0	0	0	C	-
650-700	1	0	1	0	0	0	0	0	O	-
700-750	4	0	0	0	0	0	0	0	O	-
750-800	5	0	0	0	0	0	0	0	C	-
800-850	0	0	0	0	0	0	0	0	C	-
850-900	3	0	1	0	0	0	0	0	C & F	-
900-950	2	0	2	0	0	0	1	0	C & F	-
950-1000	0	0	3	0	0	0	0	0	C	-
Total	37	0	41	0	6	0	18	0	C(6),F(9),K(6)&R(1)	-

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	Nest, Wildpig footprints
50-100	GUS	2	2	3	-	-	Guinea fowl feathers
100-150	GUS	2	2	3	-	-	-
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	-
300-350	GUS	2	2	3	-	-	-
350-400	GUS	2	2	3	-	-	-
400-450	GUS	2	2	3	-	-	-
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	2	3	-	-	Wildpig footprints
550-600	GUS	2	2	3	-	-	<i>Solanum capscum</i>
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	-
750-800	GUS	2	2	3	-	-	-
800-850	GUS	2	2	3	-	-	-
850-900	GUS	2	2	3	-	-	-
900-950	GUS	2	2	3	-	-	-
950-1000	GUS	2	2	3	-	-	-

Appendix 34. Disturbance Transect no. 14

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 6/6/2012

District: Kisarawe

Village: Chanika Shamba

Nearest sub-village: Buyuni

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 14

Dominant vegetation: Thicket

Bearing: SW

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	0	0	10	3	0	0	2	0	F	-
50-100	0	0	3	5	0	0	0	0	F & P(2)	-
100-150	0	0	5	3	0	0	0	0	C	-
150-200	0	0	7	1	0	0	2	0	C & P(2)	-
200-250	0	0	0	0	0	0	0	0	C	-
250-300	1	0	6	1	0	0	0	0	O	-
300-350	3	0	3	0	0	0	0	0	C & P(1)	-
350-400	2	0	1	0	0	0	1	0	O	-
400-450	1	0	0	0	0	0	4	0	C	-
450-500	3	0	2	0	0	0	1	0	C	-
500-550	3	0	14	0	0	0	1	0	O	-
550-600	11	0	6	0	1	0	2	0	C	-
600-650	11	0	1	0	0	0	2	0	C	-
650-700	2	0	1	0	0	0	0	0	C, M & S	-
700-750	0	0	7	0	0	0	3	0	O	-
750-800	3	0	1	0	0	0	1	0	M	-
800-850	3	0	4	0	0	0	0	0	O	-
850-900	7	0	5	0	0	0	0	0	O	-
900-950	7	0	5	0	0	0	0	0	O	-
950-1000	4	0	5	0	0	0	1	0	M	-
Total	61	0	86	13	1	0	20	0	C(9),F(2), M(2),P(5) &S(1)	-

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	Animal grazing
50-100	GUS	2	2	3	-	-	-
100-150	GUS	2	2	3	-	-	Animal grazing
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	Animal grazing
300-350	GUS	2	2	3	-	-	-
350-400	GUS	2	2	3	-	-	-
400-450	GUS	2	2	3	-	-	-
450-500	GUS	2	2	3	-	-	-
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	-	-	Nest
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	-
750-800	GUS	2	2	3	-	-	-
800-850	GUS	2	2	3	-	-	-
850-900	GUS	2	2	3	-	-	-
900-950	GUS	2	2	3	-	-	-
950-1000	GUS	2	2	3	-	-	-

Appendix 35. Disturbance Transect no. 15

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 6/6/2012

District: Kisarawe

Village: Chanika Shamba 2

Nearest sub-village: Buyuni

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 15

Dominant vegetation: Thicket

Bearing: NE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	1	0	3	0	0	0	0	0	C & P(1)	-
50-100	3	0	8	0	0	0	3	0	K(1)	-
100-150	1	0	0	0	0	0	0	0	C	-
150-200	2	0	2	0	0	0	3	0	R(2)	-
200-250	0	0	0	0	0	0	1	0	C	-
250-300	0	0	1	0	0	0	0	0	C	-
300-350	5	0	5	0	0	0	2	0	C	-
350-400	2	0	2	0	0	0	3	0	C	-
400-450	5	0	3	0	1	0	2	0	O	-
450-500	0	0	6	0	0	0	0	0	C, M & R	-
500-550	2	0	2	0	0	0	1	0	O	-
550-600	5	0	8	2	0	0	0	0	C	-
600-650	2	0	3	0	1	0	2	0	C & N	-
650-700	3	0	3	0	1	0	0	0	C	-
700-750	0	0	0	0	0	0	0	0	C & F	-
750-800	5	0	3	0	0	0	0	0	F	-
800-850	0	0	5	0	0	0	1	0	F	-
850-900	3	0	4	0	0	0	0	0	F	-
900-950	2	0	4	0	0	0	2	0	O	-
950-1000	4	0	2	0	3	0	1	0	O	-
Total	45	0	64	2	6	0	21	0	C(11)	-
GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL		Cliffs		
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF		Valley floor		

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	-	-
50-100	GUS	2	2	3	-	-	-
100-150	GUS	2	2	3	-	-	-
150-200	GUS	2	2	3	-	-	-
200-250	GUS	2	2	3	-	-	-
250-300	GUS	2	2	3	-	-	-
300-350	GUS	2	2	3	-	-	-
350-400	GUS	2	2	3	-	-	-
400-450	GUS	2	2	3	-	-	-
450-500	GUS	2	2	3	-	-	Bird footprints
500-550	GUS	2	2	3	-	-	-
550-600	GUS	2	2	3	-	-	-
600-650	GUS	2	2	3	-	-	-
650-700	GUS	2	2	3	-	-	-
700-750	GUS	2	2	3	-	-	-
750-800	VALLEY	2	2	3	-	-	-
800-850	GUS	2	2	3	-	-	-
850-900	GUS	2	2	3	-	-	-
900-950	GUS	2	2	3	-	-	-
950-1000	GUS	2	2	3	-	-	-

Appendix 36. Disturbance Transect no. 16

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 6/6/2012

District: Kisarawe

Village: Chanika

Nearest sub-village: Buyuni

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 16

Dominant vegetation: Thicket

Bearing: NE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	4	0	0	0	0	0	0	0	O	-
50-100	0	0	0	0	0	0	0	0	O	-
100-150	5	0	0	0	2	0	0	0	O	-
150-200	5	0	0	0	0	0	0	0	O	-
200-250	8	0	0	0	0	0	0	0	O	-
250-300	9	0	0	0	2	0	0	0	O	-
300-350	3	0	0	0	0	0	0	0	F	-
350-400	3	0	0	0	0	0	0	0	O	-
400-450	1	0	0	0	0	0	0	0	O	-
450-500	5	0	0	0	0	0	0	0	O	-
500-550	0	0	0	0	0	0	0	0	O	-
550-600	3	0	0	0	0	0	0	0	O	-
600-650	0	0	0	0	0	0	0	0	F	-
650-700	1	0	0	0	0	0	0	0	F	-
700-750	5	0	0	0	1	0	0	0	C & R	-
750-800	4	0	0	0	0	0	0	0	F	-
800-850	0	0	0	0	0	0	0	0	C & F	-
850-900	2	0	0	0	0	0	0	0	O	-
900-950	8	0	0	0	0	0	0	0	O	-
950-1000	9	0	0	0	0	0	0	0	O	-
Total	75	0	0	0	5	0	0	0	F(5), C(2), R(1)	-

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GLS	2	2	3	-	E	Wildpig footprints & termite mound
50-100	GLS	2	2	3	-	E	-
100-150	GLS	2	2	3	-	E	Wildpig footprints
150-200	GLS	2	2	3	-	E	-
200-250	GLS	2	2	3	-	E	-
250-300	GLS	2	2	3	-	E	-
300-350	GLS	2	2	3	-	E	-
350-400	GLS	2	2	3	-	E	Wildpig footprints
400-450	GLS	2	2	3	-	E	Rodent & pig footprints
450-500	GLS	2	2	3	-	E	-
500-550	GLS	2	2	3	-	E	-
550-600	GLS	2	2	3	LC	E	-
600-650	GLS	2	2	3	LC	E	Pig footprints & <i>Trema orientalis</i>
650-700	GLS	2	2	3	LC	E	-
700-750	GMS	2	2	3	-	E	Trails/paths
750-800	GMS	2	2	3	LC	E	-
800-850	GLS	2	2	3	-	E	Rodent & pig footprints
850-900	GUS	2	2	3	-	E	-
900-950	GUS	2	2	3	-	E	-
950-1000	GUS	2	2	3	-	E	Pig footprints & termite mound seen

Appendix 37. Disturbance Transect no. 17

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 7/6/2012

District: Kisarawe

Village: Buyuni

Nearest sub-village: Buyuni/Chania

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 17

Dominant vegetation: Thicket

Bearing: NWW

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

Section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	1	0	3	0	0	0	2	0	F & K(2)	-
50-100	3	0	3	0	0	0	0	0	F	-
100-150	3	0	3	0	0	0	3	0	O	-
150-200	1	0	6	0	0	0	0	0	F	-
200-250	8	0	8	0	0	0	2	0	F	-
250-300	5	0	7	0	0	0	6	0	F & K(1)	-
300-350	2	0	5	0	0	0	1	0	F	-
350-400	1	0	2	0	0	0	2	0	F	-
400-450	5	0	1	0	0	0	5	0	F	-
450-500	2	0	10	0	0	0	2	0	F	-
500-550	6	0	5	0	0	0	0	0	F	-
550-600	0	0	0	0	0	0	0	0	F	-
600-650	3	0	7	0	0	0	2	0	F	-
650-700	2	0	7	0	0	0	5	0	F	-
700-750	6	0	2	0	0	0	2	0	F	-
750-800	5	0	3	0	0	0	2	0	F & K(1)	-
800-850	3	0	2	0	0	0	9	0	O	-
850-900	10	0	10	0	0	0	5	0	K(2)	-
900-950	5	0	10	0	0	0	5	0	K(1)	-
950-1000	3	0	2	0	0	0	0	0	F	-
Total	74	0	96	0	0	0	53	0	F(16)&K(7)	-

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana camara</i>	CO	<i>Cedrela odorata</i>	RU	<i>Rubus</i> sp.	SJ	<i>Stachytarpheta jamaicensis</i>	O	Other (specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GUS	2	2	3	-	E	-
50-100	GUS	2	2	3	-	E	-
100-150	GUS	2	2	3	-	E	-
150-200	GUS	2	2	3	-	E	-
200-250	GUS	2	2	3	-	E	-
250-300	GUS	2	2	3	-	E	-
300-350	GUS	2	2	3	-	E	-
350-400	GUS	2	2	3	-	E	-
400-450	GUS	2	2	3	-	E	-
450-500	GUS	2	2	3	-	E	-
500-550	GUS	2	2	3	-	E	-
550-600	GUS	2	2	3	-	E	-
600-650	GUS	2	2	3	-	E	-
650-700	GUS	2	2	3	-	E	-
700-750	VALLEY	2	2	3	-	E	-
750-800	GUS	2	2	3	-	E	-
800-850	GUS	2	2	3	-	E	-
850-900	GUS	2	2	3	-	E	-
900-950	GUS	2	2	3	-	E	-
950-1000	GUS	2	2	3	-	E	-

Appendix 38. Disturbance Transect no. 18

Names of recorders: Justine Gwegime & Habibu Said

Date of survey: 7/6/2012

District: Kisarawe

Village: Buyuni

Nearest sub-village: Buyuni

Village Forest Reserve: Kazimzumbwi FR

Transect Number: 18

Dominant vegetation: Open grassland

Bearing: SE

Key to disturbance categories

P	Pitsaw	S	Settlement	T	Timber, planks, poles	R	Path or road
F	Fire damage	B	Bark or root harvesting	K	Charcoal kiln	G	Gunfire
C	Cultivation	M	Mining	N	Traps or snares	O	Other

section (m)	Qty of poles (5 – 15 cm)				Qty of timber (> 15 cm dbh)				Other disturbances	
	Live	Naturally dead	Cut		Live	Naturally dead	Cut		Within transect (qty)	Outside transect (qty)
			old	fresh			old	fresh		
0-50	3	0	0	0	0	0	0	0	0	-
50-100	0	0	0	0	0	0	0	0	0	-
100-150	0	0	0	0	0	0	0	0	0	-
150-200	3	0	0	0	0	0	0	0	F	-
200-250	2	0	2	0	0	0	0	0	F	-
250-300	6	0	0	0	0	0	0	0	F	-
300-350	14	0	0	0	0	0	0	0	F	-
350-400	13	0	0	0	0	0	0	0	F	-
400-450	11	0	0	0	0	0	0	0	F	-
450-500	5	0	0	0	0	0	1	0	F	-
500-550	6	6	6	6	6	6	6	6	0	-
550-600	4	0	0	0	0	0	0	0	F	-
600-650	3	0	0	0	0	0	0	0	F	-
650-700	0	0	0	0	0	0	0	0	F	-
700-750	0	0	0	0	0	0	0	0	F	-
750-800	0	0	0	0	0	0	0	0	F	-
800-850	3	0	0	0	0	0	0	0	F	-
850-900	0	0	0	0	0	0	0	0	F	-
900-950	0	0	0	0	0	0	0	0	F	-
950-1000	0	0	0	0	0	0	0	0	F	-
Total	73	6	8	6	6	6	7	6	F(16)	-

GLS	Gentle lower slope	GMS	Gentle mid-slope	GUS	Gentle upper slope	CL	Cliffs
SLS	Steep lower slope	SMS	Steep mid-slope	SUS	Steep upper slope	VF	Valley floor

Key to vegetation cover

1	< 10 % cover	2	10 – 50 % cover	3	> 50 % cover
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Invasive alien species

LC	<i>Lantana</i>	CO	<i>Cedrela</i>	RU	<i>Rubus</i>	SJ	<i>Stachytarpheta</i>	O	Other
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	camara		odorata		sp.		jamaicensis		(specify)
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High conservation values

S	Stream or spring	M	Ming'oko	T	Threatened plant species	E	Coastal forest or E. Arc endemic species	O	Other e.g. edible mushrooms
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Section (m)	Topography	Canopy cover	Shrub layer	Ground layer	Invasive alien species	High conservation values	Other observations
0-50	GMS	2	2	3	-	E	-
50-100	GMS	2	2	3	-	E	-
100-150	GUS	2	2	3	-	E	-
150-200		2	2	3	-	E	<i>Trema orientalis</i>
200-250	GLS	2	2	3	-	E	<i>Trema orientalis</i>
250-300	GLS	2	2	3	-	E	<i>Trema orientalis</i>
300-350	GLS	2	2	3	-	E	<i>Trema orientalis</i> & wildpig footprints
350-400	GMS	2	2	3	-	E	<i>Trema orientalis</i> & wildpig footprints
400-450	GMS	2	2	3	-	E	<i>Trema orientalis</i> & elephant shrew trail
450-500	GMS	2	2	3	-	E	-
500-550	GUS	2	2	3	-	E	-
550-600	GUS	2	2	3	-	E	Guinea fowl feathers, <i>Trema orientalis</i>
600-650	GLS	2	2	3	-	E	<i>Trema orientalis</i>
650-700	GLS	2	2	3	-	E	-
700-750	GLS	2	2	3	-	E	<i>Trema orientalis</i>
750-800	GLS	2	2	3	-	E	-
800-850	GLS	2	2	3	-	E	-
850-900	GUS	2	2	3	-	E	-
900-950	GUS	2	2	3	-	E	-
950-1000	GUS	2	2	3	-	E	-

Notes: The area is dominated by grasses and affected by fire.

Appendix 39. Botanical survey site descriptions.

Site Number	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Site Name	Mambisi and Pugu Relini	Dunda and Kimani	Pugu Mpakani and Minaki Bwawani	Kazimzumbwi Jeshini and Buyuni	Vibura	Chanika
Longitude	512998	509011	510736	503092	502824	
Latitude	9239337	9235220	9236601	9231433	9229240	
Vegetation category	Mambisi = Historically degraded and Pugu Relini = recently degraded	Dunda = Recently degraded and Kimani = being cleared	Pugu Mpakani and Minaki Bwawani = Less disturbed forest	Kazimzumwi Jeshini = Less disturbed forest and Buyuni = recently deforested	Vibura = Degraded thicket and farmland	
Forest Reserve	Pugu	Pugu	Pugu	Kazimzumbwi	Kazimzumbwi	Kazimzumbwi
Altitude (m)	93 - 224	65 - 217	124 - 239	172 - 189	110 - 134	
Vegetation type	Forest/Woodland	Forest	Forest	Forest	Forest/Scrub/Wooded grassland	
Dominant canopy species	Angylocalyx braunii, Baphia punctulata, Ricinodendron heudelottii and Diospyros verrucosa.	Senna siamea, Albizia petersiana, Erythrophloeum suaveolens, Cola clavata, Millettia usaramensis and Trema orientalis	Pouteria alnifolia, Albizia glaberrima, Senna siamea, Syzygium cuminii, Albizia petersiana, Diospyros verrucosa and Scorodophloeus fischeri.	Hymenocardia ulmoides, Trema orientalis, Grewia conocarpa, Diospyros verrucosum, Mimosops acutifolia and Albizia petersiana.	Annona senegalensis, Maprounea africana, Vitex donniana, Crossopeterax febrifugum, Millettia usaramensis and Brachystegia spiciformis	
Dominant understorey species	Woodland: Commiphora edulis, Thespesia danis, Dalbergia melanoxylon, Albizia pertesiana, Millettia impressa and Baphia nitida.	Carissa tetramera, Ehretia garckeana, Clerodendrum	Rinorea ferruginea, Whitfieldia elongata, Maytenus	Rinorea ferruginea, Mildbraedia carpinifolia, Alchornea	Aspilia mossambicensis, Catunaregan spinosa,	

Site Number	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
	Desmodium velutinum, Clerodendrum glabrum, Allophyllus rubifolius and Senna abbreviata.	hidebrandtii, Caesalpinia volkensii and Chamaecrista mimosoides.	mossambicensis, Bridelia cathartica, Whitfieldia orientalis and Chytranthus obliquinervis.	laxiflora ,Antidesma venosum, Heinsia crinita, Xylothea tettensis, Deinbolia borbonica and Maerua angolensis.	Rauvolfia mombasiana, Tinnea aethiopica, Carissa tetramera? Arundinaria alpina, Schizozygia coffaoides and Dichrostachyus cinerea.	
Dominant ground layer species	Waltheria indica, Cythula cyridrica, Astripomoea hyoscyamoides, Hibiscus physaloides, Pentas bussei, Indigofera hirsutaand & Cyperus glaucophyllus.	Pentas lanceolata, Tephrosia interrupta, Rhynchosia sublobata, Crotalaria goodiiformis and Stylosanthes fruticosa.	Justicia flava, Justicia matamensis, Oxalis barrelieri, Dorstenia tayloriana, Scleria foliosa(Sedge) and Psilotrichum scleranthus.	Setaria macrophylla, Agathisanthe mum bojeri, Abutilon mauritianum, Triumfetta rhomboidea, Physalis angulata and Crassocephallum vetellinum.	Agathisanthemum bojeri, Barleria sp, Spermacoce dibrachiata, Smilax anceps, Physalis peruviana Panicum trichocladumand Setaria macrophylla.	
Canopy height	7-10m	10-12m	10-15m	5-10m	3-7m	
Density of Canopy	<30%	<50%	>50%	<30%	>50%	
Density of understorey	>50%	>50%	>50%	>50%	>50%	
Density of ground layer species	>50%	>50%	<40%	>50%	>50%	
Slope angle	>10 degrees	<30 degrees	<30 degrees			
Topography	Gentle slope	Valley/Gentle slope	Gentle slope			
Signs of disturbance	Pole cutting / Fire / Charcoal burning	Charcoal burning /Fire / Pole cutting	Charcoal burning / Pole cutting	Charcoal making / Pole cutting / Fire	Charcoal making / Pole cutting / Fire	

Appendix 40. List of plant species recorded in Pugu and Kazimzumbwi in 2011 and 2012.

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Acanthaceae	<i>Barleria sp</i>		F	H						1					No coll
Acanthaceae	<i>Blepharis involuocrata</i>		W	H	WS			1	1		1				MM7998
Acanthaceae	<i>Blepharis monocotyle</i>		F	H	WS			1	1		1				MM7985
Acanthaceae	<i>Crossandra sp.</i>		F	H				1			1				MM7973
Acanthaceae	<i>Justicia flava</i>		F	H	WS			1			1				MM7833
Acanthaceae	<i>Justicia matamensis</i>		F	H	WS			1			1				MM7859
Acanthaceae	<i>Justicia sp.</i>		W	H				1		1	1				MM7900
Acanthaceae	<i>Thunbergia alata</i>		F	H	WS			1		1	1				MM7951
Acanthaceae	<i>Thunbergia heterochondros</i>		F	L	WS			1	1		1				No coll
Acanthaceae	<i>Whitfieldia elongata</i>		F	S	WS			1		1	1				MM7834
Acanthaceae	<i>Whitfieldia orientalis Vollesen</i>		F	S	Coastal Forest and Eastern Arc Mountain endemic			1			1				MM7858
Agavaceae	<i>Sansivieria sp</i>		W	H										1	No coll
Amaranthaceae	<i>Achyranthes aspera</i>		F	H	WS			1	1		1	1			No coll
Amaranthaceae	<i>Celosia hastata</i> Lopr.		F	H	Coastal forest endemic					1					
Amaranthaceae	<i>Celosia schweinfurthiana</i>		F	H	WS			1			1				MM7936
Amaranthaceae	<i>Cyathula cylindrica</i>		F	H	WS			1			1				MM7877
Amaranthaceae	<i>Ptilotrichum scleranthus</i>		F	H	WS			1			1				MM7872
Anacardiaceae	<i>Anacardium occidentale</i> (Exotic)		W	T	WS									1	No coll
Anacardiaceae	<i>Lannea schimperi</i>		W	T	WS									1	No coll
Anacardiaceae	<i>Lannea stuhlmannii</i>		F	T	WS	1			1	1	1	1			No coll
Anacardiaceae	<i>Ozoroa obovata</i>		F&W	T	WS		1		1	1	1	1			MM7879
Anacardiaceae	<i>Rhus glaucescens</i>		F	T	WS					1					No coll
Anacardiaceae	<i>Rhus natalensis</i>		W	T	WS			1	1		1			1	No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Anacardiaceae	<i>Salacia madagascariensis</i>		F	L	WS					1					No coll
Anacardiaceae	<i>Sclerocarya birrea</i>		W	T	WS				1		1			1	No coll
Anacardiaceae	<i>Sorindeia madagascariensis</i>		F	T	WS	1			1	1	1				No coll
Annonaceae	<i>Annona senegalensis</i>		W	T	WS				1		1			1	No coll
Annonaceae	<i>Monanthes buchananii</i>		F	L	WS			1	1	1	1				No coll
Annonaceae	<i>Monanthes ferruginea</i> Engl.		F	L	WS			1	1		1				MM7839
Annonaceae	<i>Monanthes trichocarpa</i> (Engl. & Diels) Verdc.	LC	F	L	Coastal Forest Endemic		1					1			No coll
Annonaceae	<i>Uvaria acuminata</i> Oliv.	LC	F	L	Coastal Forest Endemic	1	1	1	1	1	1	1			No coll
Annonaceae	<i>Uvaria kirkii</i> Hook. F.	NT	F	T	Coastal Forest Endemic		1					1	1		No coll
Annonaceae	<i>Uvaria puguensis</i> D.M. Johnson	CR	F	T	Pugu and Pande Endemic	1	1			1					No coll
Annonaceae	<i>Xylopiya aethiopica</i>		F	T	WS	1	1			1	1	1	1		No coll
Annonaceae	<i>Xylopiya arenaria</i> Engl.	VU	F	L	Coastal Forest Endemic	1				1		1			No coll
Annonaceae	<i>Xylopiya collina</i> Diels	EN	F	T	Coastal Forest Endemic			1	1		1				MM7883
Annonaceae	<i>Xylopiya parviflora</i> (A.Rich) Benth		F	T	WS			1	1		1				MM7815 and MM7959
Apocynaceae	<i>Carissa spinarum</i>		F	T	WS	1				1		1	1		No coll
Apocynaceae	<i>Carissa tetramera</i>		F	T/S	WS			1	1		1				MM7889
Apocynaceae	<i>Dictyophleba acida</i>		F		WS	1	1			1		1	1	1	No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Apocynaceae	<i>Dictyophleba lucida</i>		F	L	WS			1	1		1				MM7828
Apocynaceae	<i>Holarrhena pubescens</i>	LC	F	L	WS			1	1		1		1		No coll
Apocynaceae	<i>Landolphia buchananii</i>		F	L	WS			1	1	1	1	1	1		No coll
Apocynaceae	<i>Landolphia kirkii</i>		F	L	WS	1	1		1	1	1	1		1	No coll
Apocynaceae	<i>Landolphia parvifolia</i>		F	L	WS			1			1				MM7961
Apocynaceae	<i>Rauvolfia mombasiana</i>		F	T	WS			1		1	1				MM7832
Apocynaceae	<i>Saba comorensis</i>		F	L	WS			1	1	1	1	1			No coll
Apocynaceae	<i>Secamone parvifolia</i>		F	L	WS			1	1		1				MM7905
Apocynaceae	<i>Strophanthus petersianus</i>		F	T	WS			1			1				MM7888
Apocynaceae	<i>Tabernaemontana elegans</i>		F	T	WS	1				1					No coll
Apocynaceae	<i>Thevetia peruviana</i>		F	T	WS					1	1				MM7855
Aquifoliaceae	<i>Apodytes dimidiata</i>		F	T	WS					1			1		No coll
Araceae	<i>Gonotopus sp.</i>		F	H	WS						1				MM7986
Araliaceae	<i>Cussonia zimmermanii</i>		F	T	WS					1			1	1	No coll
Asclepiadaceae	<i>Calotropis procera</i>		W	T	Exotic			1	1		1				No coll
Asclepiadaceae	<i>Pergularia daemia</i>		F	L	WS		1	1	1		1				MM7925
Asclepiadaceae	<i>Secomone parvifolia</i>		F	L	WS			1	1		1				MM7814 and MM 8006
Asparagaceae	<i>Asparagus falcatus</i>		F	L	WS	1		1	1		1			1	No coll
Asparagaceae	<i>Asparagus setaceus</i>		F	L	WS			1	1		1				No coll
Asteraceae	<i>Achyrothalamus marginatus</i>		W	H	WS			1			1				MM7979
Asteraceae	<i>Aspilia mossambiscensis</i>		F	H	WS								1		No coll
Asteraceae	<i>Bidens pilosa</i>		F	H	WS							1			No coll
Asteraceae	<i>Blepharispermum zanguebaricum</i>		F	L	WS			1	1		1				MM7822
Asteraceae	<i>Brachylaena hutchinsii</i>		F	T	WS					1					No coll
Asteraceae	<i>Crassocephalum vetellinum</i>		F	H	WS					1					No coll
Asteraceae	<i>Emilia coccinea</i>		F	H	WS								1	1	No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Asteraceae	<i>Emilia javanica</i>		W	H	WS			1	1		1				MM7988
Asteraceae	<i>Grewia galamensis</i>		F	H	WS					1					No coll
Asteraceae	<i>Mikania cordata</i>		F	H	WS			1			1				MM8010
Asteraceae	<i>Pluchea sp.</i>		F&W	S	WS			1	1		1	1	1		MM7892
Asteraceae	<i>Vernonia galamensis</i>		F	S	WS							1	1		No coll
Asteraceae	<i>Vernonia sp.</i>		F	S	WS			1	1						MM7960
Barringtoniaceae	<i>Barringtonia racemosa</i>		F	T	WS				1	1					No coll
Bignoniaceae	<i>Fernandoa magnifica</i> Seem.		F	T	WS			1	1						No coll
Bignoniaceae	<i>Fernandoa sp.</i>		F		WS		1			1		1			No coll
Bignoniaceae	<i>Markhamia</i> <i>hidebrandtii</i>		F		WS							1	1		No coll
Bignoniaceae	<i>Markhamia obtusifolia</i>		F&W	T	WS	1		1		1	1	1		1	No coll
Bombacaceae	<i>Bombax</i> <i>rhodognophalon</i> Engl.		F	T	Coastal Forest Endemic	1	1	1		1	1				No coll
Boraginaceae	<i>Ehretia amoena</i>		W	T	WS	1		1		1	1		1	1	No coll
Boraginaceae	<i>Ehretia garckeana</i>		W	T	WS			1			1				MM7910
Bursaraceae	<i>Commiphora africana</i>		W	T	WS			1						1	No coll
Bursaraceae	<i>Commiphora edulis</i>		W	T	WS			1	1						MM7898
Bursaraceae	<i>Commiphora eminii</i>		F	T	WS		1			1			1		No coll
Bursaraceae	<i>Commiphora</i> <i>fulvotomentosa</i>		F	T	WS		1						1		No coll
Capparidaceae	<i>Capparis</i> <i>erythrocarpus</i>		W	L	WS			1	1		1				MM7964
Capparidaceae	<i>Capparis fascicularis</i>		F	L	WS		1			1			1		No coll
Capparidaceae	<i>Maerua angolensis</i>		W	T	WS		0	1	1		1		1		MM7880
Capparidaceae	<i>Maerua triphylla</i>		F	T	WS		1							0	No coll
Celastraceae	<i>Maytenus heterophylla</i> <i>heterophyllus</i>		F	T	WS			1			1				MM7843
Celastraceae	<i>Maytenus</i> <i>mossambicensis</i>		F	T	WS	1			1	1	1	1		1	MM7851
Celastraceae	<i>Maytenus</i> <i>senegambiensis</i>		W	T	WS			1	1		1				No coll
Celastraceae	<i>Maytenus undata</i>		F	T	WS		1	1		1	1				MM7840

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Celastraceae	<i>Pristimera graciliflora</i>		F		WS	1	1			1		1			No coll
Celastraceae	<i>Reissantia parviflora</i>		F	L	WS			1	1		1				MM7906
Celastraceae	<i>Salacia erecta</i>		F	L	WS		1	1	1	1	1		1		MM7842 and MM 7836
Celastraceae	<i>Salacia madagascariensis</i>		F	L	WS	1	1					1			No coll
Combretaceae	<i>Combretum apiculatum</i>		F	L	WS			1	1		1				MM7922 and MM 7874
Combretaceae	<i>Combretum pentagonum</i>		F	L	WS		1	1	1	1	1		1		No coll
Combretaceae	<i>Combretum schumannii</i>		F	T	WS			1	1						No coll
Combretaceae	<i>Combretum sp.</i>		F	L	WS		1					1			No coll
Combretaceae	<i>Combretum zanthothesum</i>		F	L	WS			1			1				MM7921
Combretaceae	<i>Pteleopsis myrtifolia</i>		F	T	WS			1	1	1	1	1	1	1	No coll
Combretaceae	<i>Terminalia catapa (Exotic)</i>		F	T	WS					1					No coll
Commelinaceae	<i>Aneilema sp.</i>		F	H				1			1				MM7935
Connaraceae	<i>Byrsocarpus orientalis</i>		F	T	WS			1	1	1	1	1			No coll
Connaraceae	<i>Bysocarpus sp</i>		W	L	WS									1	No coll
Connaraceae	<i>Cnestis comfertiflora</i>		F	T	WS	1		1			1				MM7891
Connaraceae	<i>Rourea orientalis</i>		F	T	WS	1	1	1	1		1	1	1		No coll
Convolvulaceae	<i>Astripomoea hyoscyamoides (Vatke) Verdc.</i>		W	S	WS			1	1		1				MM7901
Convolvulaceae	<i>Bonamia mossambicensis</i>		F	L	WS	1	1	1	1	1	1	1	1	1	MM7819 and MM 7820
Convolvulaceae	<i>Ipomoea filicifolia</i>		F	L	WS			1			1				MM7924
Convolvulaceae	<i>Ipomoea involcratus</i>		F	CL	WS		0			1					No coll
Convolvulaceae	<i>Ipomoea wightii</i>		F	CL	WS		1						1		No coll
Convolvulaceae	<i>Jacquemontia paniculata</i>		W	L	WS				1						MM7896

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Convolvulaceae	<i>Metaporana densiflora</i>		F	L	WS			1	1		1				MM7829
Crysobalanaceae	<i>Parinari curatelifolia</i>		F&W	T	WS						1	1		1	No coll
Cucurbitaceae	<i>Coccinia grandis</i>		W	L	WS			1			1				MM7878
Cucurbitaceae	<i>Coccinia urugurensis</i>		F	CL	WS					1					No coll
Cucurbitaceae	<i>Cucumis dipsaceus</i>		W	L	WS			1			1				MM7902
Cucurbitaceae	<i>Laggenaria sp</i>		F	CL	WS					1					No coll
Cucurbitaceae	<i>Momordica trifoliolata</i>		W	L	WS			1			1				MM7895
Cucurbitaceae	<i>Peponium vogelii</i>		T	L	WS			1			1				MM7919
Cucurbitaceae	<i>Zehneria thwaitesii</i>		T	L	WS			1			1				MM7927
Cyperaceae	<i>Cyperus glaucophyllus</i>	LC	F	Sedge	WS			1	1		1				MM7876 and MM 7949
Cyperaceae	<i>Cyperus hemisphaeriis</i>		F	Sedge	WS			1			1				MM7993
Cyperaceae	<i>Cyperus involucratus</i>		F	Sedge	WS						1	1			No coll
Cyperaceae	<i>Cyperus rotundus</i> L.	LC	F	Sedge	WS			1			1				MM7991
Cyperaceae	<i>Fuirena sp.</i>		F								1				No coll
Cyperaceae	<i>Scleria foliosa</i>	LC	F	Sedge	WS			1			1				MM7866 and MM 8008
Dichapetalaceae	<i>Dichapetalum brownii</i>		F	L	WS	1	1			1		1	1		No coll
Dichapetalaceae	<i>Dichapetalum mossambicensis</i>		F	L	WS	1		1	1		1				MM7850
Dichapetalaceae	<i>Dichapetalum sp.</i>		F	L							1				No coll
Dilleniaceae	<i>Tetracera boiviniana</i> Bailll.		F	S	WS	1		1	1		1	1	1	1	MM7987
Dilleniaceae	<i>Tetracera litoralis</i> Gilg.		F	L	WS	1				1					No coll
Dioscoraceae	<i>Dioscorea hastifolia</i>		W	L	WS			1	1		1				MM8002
Dioscoraceae	<i>Dioscorea sansibarensis</i>		F	L	WS			1			1				MM8005
Dioscoraceae	<i>Dioscorea sp</i>		F	CL		1									No coll
Dracaenaceae	<i>Dracaena mannii</i>		F	T	WS	1		1	1	1	1				No coll
Ebenaceae	<i>Diospyros sp</i>		F	T	WS					1					No coll
Ebenaceae	<i>Diospyros kabuyeana</i>		F	T	WS					1	1				No coll
Ebenaceae	<i>Diospyros mafiensis</i>		F	T	WS				1		1				MM7847

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Ebenaceae	<i>Diospyros mespiliformis</i>		F	T	WS	1	1						1	1	No coll
Ebenaceae	<i>Diospyros usambarensis</i>		F	T	WS							1			No coll
Ebenaceae	<i>Diospyros verrucosa</i>		F	T	WS		1	1	1	1					MM7848
Ebenaceae	<i>Euclea divinorum</i>		F	T	WS					1					No coll
Euphorbiaceae	<i>Acalypha neptunica</i>		F	S	WS	1	1			1		1	1		No coll
Euphorbiaceae	<i>Acalypha racemosa</i>		F	S	WS			1	1		1				MM7938
Euphorbiaceae	<i>Alchornea laxiflora</i>		F	T	WS			1	1	1	1				No coll
Euphorbiaceae	<i>Antidesma venosum</i>		W	T	WS			1	1		1			1	MM7971
Euphorbiaceae	<i>Bridelia cathartica</i>		F	T	WS	1	1	1	1	1	1	1		1	MM7854
Euphorbiaceae	<i>Bridelia micrantha</i>		F	T	WS			1		1					No coll
Euphorbiaceae	<i>Croton sylvaticus</i>		F	T	WS				1		1				No coll
Euphorbiaceae	<i>Dalechampia scandens</i>		F	L	WS		1	1	1	1	1	1	1		MM7826
Euphorbiaceae	<i>Erythrococca sp</i>		F	S	WS					1					No coll
Euphorbiaceae	<i>Flueggea virosa</i>		F	T/S	WS			1	1		1			1	No coll
Euphorbiaceae	<i>Gravea sp</i>		F	T	WS		1			1					No coll
Euphorbiaceae	<i>Mallotus oppositifolius</i>		F	T/S	WS						1				MM7968
Euphorbiaceae	<i>Maprounea africana</i>		W	T	WS			1							MM7995
Euphorbiaceae	<i>Margaritaria discoidea</i>		F	T	WS	1	1	1	1		1	1	1	1	No coll
Euphorbiaceae	<i>Mildbraedia carpinifolia</i> (Pax) Hutch.	VU	F	T/S	Coastal Forest Endemic	1	1	1	1	1	1	1			MM7956
Euphorbiaceae	<i>Phyllanthus delpyanus</i>		F	L	WS			1			1				MM7967
Euphorbiaceae	<i>Phyllanthus muellerianus</i>		F	T	WS		1								No coll
Euphorbiaceae	<i>Phyllanthus sp</i>		F	L				1			1				MM7934
Euphorbiaceae	<i>Pseudolachnostylis maproneifolia</i>		W	T	WS									1	No coll
Euphorbiaceae	<i>Ricinodendron heudelotii</i>		F	T	WS		1	1	1		1	1			No coll
Euphorbiaceae	<i>Ricinus communis</i>		F	H				1	1		1				No coll
Euphorbiaceae	<i>Shirakiopsis trilocularis</i>		F	T	WS	1		1	1	1	1	1	1		No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Euphorbiaceae	<i>Suregada zanzibariensis</i>		F	T	WS	1	1	1	1	1	1	1			MM7823
Euphorbiaceae	<i>Tragia petiolaris</i>		F	L	WS			1	1		1				MM7940
Euphorbiaceae	<i>Tragia sp</i>		F	CL	WS	1									No coll
Fabaceae subfamily Caesalpinioideae	<i>Afzelia quanzensis</i>		F	T	WS	1	1	1	1	1	1	1	1	1	No coll
Fabaceae subfamily Caesalpinioideae	<i>Baikiaea sp.</i>		F	T	WS				1		1				MM7937
Fabaceae subfamily Caesalpinioideae	<i>Bauhinia thonningii</i>		W	T	WS			1			1			1	No coll
Fabaceae subfamily Caesalpinioideae	<i>Brachystegia spiciformis</i>		F	T	WS								1		No coll
Fabaceae subfamily Caesalpinioideae	<i>Caesalpinia orientalis</i>		F		WS							1			No coll
Fabaceae subfamily Caesalpinioideae	<i>Caesalpinia volkensii</i>		F	L	WS		1	1	1	1	1	1	1	1	MM7929
Fabaceae subfamily Caesalpinioideae	<i>Chamaecrista mimosoides</i>		W	H	WS			1			1				MM7913
Fabaceae subfamily Caesalpinioideae	<i>Cordyla africana</i>		F	T	WS			1		1	1				No coll
Fabaceae subfamily Caesalpinioideae	<i>Dialium holtzii</i> Harms	VU	F	T	Coastal Forest Endemic		1		1	1	1	1	1		No coll
Fabaceae subfamily Caesalpinioideae	<i>Erythrophloem suaveolens</i>		F	T	WS					1	1				No coll
Fabaceae subfamily Caesalpinioideae	<i>Hymenaea verrucosa</i>		F	T	WS	1		1	1	1	1	1	1	1	No coll
Fabaceae subfamily Caesalpinioideae	<i>Paramacrolobium coeruleum</i>		W	T	WS			1							MM7982
Fabaceae subfamily Caesalpinioideae	<i>Parkia filicoides</i>		F	T	WS						1				No coll
Fabaceae subfamily Caesalpinioideae	<i>Pterolobium stellatum</i>		F	L	WS					1		1			No coll
Fabaceae subfamily Caesalpinioideae	<i>Scorodophloeus fischeri</i> Harms.		F	T	Coastal Forest Endemic		1	1		1	1	1			No coll
Fabaceae subfamily	<i>Senna abbreviata</i>		F	T	WS			1	1	1	1		1		MM7939

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Caesalpinioideae															and MM 7969
Fabaceae subfamily Caesalpinioideae	<i>Senna auriculata</i>		F	T	WS		1			1		1	1		No coll
Fabaceae subfamily Caesalpinioideae	<i>Senna siamea</i>		F	T	WS	1		1	1	1	1				No coll
Fabaceae subfamily Caesalpinioideae	<i>Senna singuena</i>		W	T	WS				1		1				No coll
Fabaceae subfamily Caesalpinioideae	<i>Tamarindus indica</i>		W	T	WS									1	No coll
Fabaceae subfamily Faboideae	<i>Abrus precatorius L.</i>		F	L	WS			1	1		1			1	MM7855
Fabaceae subfamily Faboideae	<i>Aeschynomene uniflora</i>		W	S				1			1				MM7980
Fabaceae subfamily Faboideae	<i>Angylocalyx braunii</i>	VU	F	T	Coastal Forest Endemic			1	1		1				MM7928
Fabaceae subfamily Faboideae	<i>Baphia nitida</i>		W	T				1			1				MM7909
Fabaceae subfamily Faboideae	<i>Baphia puguensis</i> Brummitt	EN	F	L	E to Pugu and Kazimzumbwi		1	1	1	1	1	1			No coll
Fabaceae subfamily Faboideae	<i>Baphia punctulata</i>		F	T				1	1						MM7918
Fabaceae subfamily Faboideae	<i>Crotalaria sp.</i>		W	S				1							MM7942
Fabaceae subfamily Faboideae	<i>Crotalaria sp.</i>		F	S	WS			1	1	1	1				MM7845
Fabaceae subfamily Faboideae	<i>Crotalaria cylindrostachys</i>		F	S				1			1				MM7916
Fabaceae subfamily Faboideae	<i>Crotalaria goodiformis</i> Vatke		W	S				1	1		1				MM7881
Fabaceae subfamily Faboideae	<i>Dalbergia lasiantha</i>		F	L				1	1		1				No coll
Fabaceae subfamily Faboideae	<i>Dalbergia melanoxyton</i>	NT	F&W	T				1	1	1	1	1	1	1	MM7899

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Fabaceae subfamily Faboideae	<i>Dalbergia vacciniifolia</i> Vatke	VU	W	L	Coastal Forest Endemic			1			1				MM7908
Fabaceae subfamily Faboideae	<i>Desmodium barbatum</i>		W	S				1							MM7984
Fabaceae subfamily Faboideae	<i>Desmodium velutinum</i>		F&W	S	WS			1			1	1			MM7912
Fabaceae subfamily Faboideae	<i>Eriosema foliosolum</i>		F	S	WS								1		
Fabaceae subfamily Faboideae	<i>Eriosema psoralioides</i>		W	S	WS			1							MM7990
Fabaceae subfamily Faboideae	<i>Indigofera</i> sp.		F	S	WS	1		1			1				MM7945
Fabaceae subfamily Faboideae	<i>Indigofera hirsuta</i> L.		F	S	WS			1			1				MM7975
Fabaceae subfamily Faboideae	<i>Indigofera ormocarpoides</i> Baker		F	S	WS			1	1		1				MM7813
Fabaceae subfamily Faboideae	<i>Indigofera vohemarensis</i>		W	S	WS			1			1				MM7989
Fabaceae subfamily Faboideae	<i>Millettia bussei</i> Harms	VU	F	T	WS			1			1				MM7870
Fabaceae subfamily Faboideae	<i>Millettia lasiantha</i>		F	L	WS		1	1		1	1	1			MM7952
Fabaceae subfamily Faboideae	<i>Millettia puguensis</i> Gillett		F	L	E to Pugu but found in Pugu and Kazimzumbwi		1	1			1				MM7917
Fabaceae subfamily Faboideae	<i>Millettia</i> sp.		W	T				1							MM7907
Fabaceae subfamily Faboideae	<i>Millettia usaramensis</i>		F	T	WS	1		1	1	1	1	1			MM8000
Fabaceae subfamily Faboideae	<i>Mucuna gigantea</i>		W	L	WS			1			1				No coll
Fabaceae subfamily Faboideae	<i>Pterocarpus angolensis</i>		W	T	WS								1		No coll
Fabaceae subfamily Faboideae	<i>Rhynchosia hirta</i>		W	L	WS		1			1	1				MM7882

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Faboideae															
Fabaceae subfamily Faboideae	<i>Rhynchosia sublobata</i>		W	L	WS			1	1		1				MM7875
Fabaceae subfamily Faboideae	<i>Stylosanthes fruticosa</i>		W	S	WS			1			1				MM7911
Fabaceae subfamily Faboideae	<i>Tephrosia interrupta</i>		W	S	WS	1	1	1			1		1		MM7871
Fabaceae subfamily Mimusoideae	<i>Acacia latistipulata</i>		F	L	WS			1	1		1				MM7976
Fabaceae subfamily Mimusoideae	<i>Acacia nilotica</i>		W	T	WS			1	1		1				No coll
Fabaceae subfamily Mimusoideae	<i>Acacia sp</i>		F	L	WS	1									No coll
Fabaceae subfamily Mimusoideae	<i>Albizia adianthifolia</i>		F	T					1		1				No coll
Fabaceae subfamily Mimusoideae	<i>Albizia glaberrima</i>		F	T	WS					1					No coll
Fabaceae subfamily Mimusoideae	<i>Albizia lebbeck</i>		W	T				1			1				No coll
Fabaceae subfamily Mimusoideae	<i>Albizia petersiana</i>		F&W	T	WS		1	1	1	1	1			1	MM7811 and 7903
Fabaceae subfamily Mimusoideae	<i>Albizia versicolor</i>		F&W	T	WS			1		1	1	1			No coll
Fabaceae subfamily Mimusoideae	<i>Dichrostachys cinerea</i>		F&W	T	WS		1	1	1		1	1		1	No coll
Fabaceae subfamily Mimusoideae	<i>Mimosa pigra</i>		F	S				1							No coll
Fabaceae subfamily Mimusoideae	<i>Parkia filicoidea</i>		F	T	WS					1					No coll
Flacourtiaceae	<i>Bivinia jalbertii</i>	LR/nt	F	T	WS				1		1				MM8009
Flacourtiaceae	<i>Casearia glandiformis</i>		F	T	WS	1		1		1	1				MM7972
Flacourtiaceae	<i>Flacourtia indica</i>		F	T	WS	1			1	1	1				No coll
Flacourtiaceae	<i>Rawsonia lucida</i>		F	T	WS			1	1		1				MM7828
Flacourtiaceae	<i>Xylothea tettensis</i>		F	T/S	WS			1	1	1	1		1	1	No coll
Flaggerariaceae	<i>Flagellaria guineensis</i>		F	L	WS			1	1		1				No coll
Guttiferae	<i>Psorospermum</i>		W	T	WS									1	No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
	<i>febrifugum</i>														
Guttiferae	<i>Vismia orientalis</i>		F	T	WS			1	1	1	1	1	1		No coll
Hugoniaceae	<i>Hugonia castaneifolia</i>		F	L/S	WS		1			1		1	1		No coll
Hymenocardiaceae	<i>Hymenocardia ulmoides</i>		F	T	WS	1	1	1	1	1	1	1	1		MM7846
Incacinaceae	<i>Apodytes dimidiata</i>		F	T	WS	1		1	1		1				MM7978
Incacinaceae	<i>Leptailurus holstii</i>		F		WS							1			No coll
Lamiaceae	<i>Clerodendrum capitatum</i>		F	S	WS	1									No coll
Lamiaceae	<i>Hoslundia opposita</i>		F&W	S	WS	1		1	1	1		1		1	No coll
Lamiaceae	<i>Hyptis suaveolens</i> (L.) Poit.		W	S	WS			1	1			1	1	1	No coll
Lamiaceae	<i>Ocimum americanum</i>		W	S	WS			1	1		1				MM7994
Lamiaceae	<i>Ocimum gratissimum</i>		W	S	WS			1	1		1				MM7941
Lamiaceae	<i>Tinea aethiopica</i>		F	S	WS	1		1	1	1	1	1			MM7818
Liliaceae	<i>Gloriosa superba</i>		F	L	WS			1	1		1				No coll
Linaceae	<i>Hugonia castaneifolia</i>		F	L	WS			1	1		1				MM7817
Loganiaceae	<i>Mostuea brunonis</i>		F	S	WS	1	1	1	1	1	1	1			MM7837
Loganiaceae	<i>Strychnos lucens</i>		W	T	WS					1			1		No coll
Loganiaceae	<i>Strychnos madagascariensis</i>		F	L	WS									1	No coll
Loganiaceae	<i>Strychnos panganensis</i> Gilg.		F	L	Coastal Forest Endemic	1	1	1	1	1	1	1	1		MM7887
Loranthaceae	<i>Englerina holstii</i>		F	P	WS			1			1				MM7853
Loranthaceae	<i>Englerina inaquilatera</i>		F	P	WS						1				MM7970
Malpighiaceae	<i>Acridocarpus chloropterus</i> Oliv.		F		Coastal Forest Endemic							1	1		No coll
Malpighiaceae	<i>Acridocarpus sp</i>		F	L			1								No coll
Malpighiaceae	<i>Acridocarpus zanzibaricus</i> A. Juss.		F	L	Coastal Forest Endemic			1	1		1				MM7862 and 8007
Malvaceae	<i>Abutilon mauritianum</i>		F	S	WS								1		No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Malvaceae	<i>Gossypoides kirkii</i> (Mast.) Skovst. ex J.B.Hutch.		F	S	Coastal Forest Endemic			1	1		1				MM7885
Malvaceae	<i>Gossypoides sp.</i>		F	L		1	1			1		1			No coll
Malvaceae	<i>Hibiscus physaloides</i>		F	S	WS			1	1		1				MM7920
Malvaceae	<i>Pavonia mollissima</i>		F	S	WS			1	1		1				MM7954
Malvaceae	<i>Thespesia danis</i>		W	T	WS			1	1						MM7897
Meliaceae	<i>Trichilia emetica</i>		F	T	WS			1		1	1				No coll
Meliaceae	<i>Turraea mombasa</i>		F	T/S	WS			1	1		1				MM7816 and MM 7958
Menispermaceae	<i>Cissampelos pareira</i>		W	L	WS			1			1				MM7965
Moraceae	<i>Antiaris toxicaria</i>		F	T	WS		1	1	1	1	1		1		No coll
Moraceae	<i>Artocarpus heterophyllus</i>		F	T	WS					1	1				No coll
Moraceae	<i>Cardiogene sp.</i>		F		WS							1			No coll
Moraceae	<i>Cardiogene/Maclura africana</i>		W	L	WS			1	1						MM8003
Moraceae	<i>Dorstenia tayloriana</i>		F	H	WS						1				MM7932
Moraceae	<i>Ficus exasperata</i>		F	T	WS			1			1				No coll
Moraceae	<i>Ficus sycomorus</i>		F	T	WS			1		1	1	1	1		No coll
Moraceae	<i>Milicia excelsa</i>	NT	F	T	WS		1			1		1	1		No coll
Moraceae	<i>Streblus usambarensis</i>		F	T	WS						1				MM7835
Moraceae	<i>Trilepisium madagascariensis</i>		F	T	WS				1	1	1				No coll
Myrtaceae	<i>Eucalyptus sp</i>		F	T	Exotic					1					No coll
Myrtaceae	<i>Syzygium cordatum</i>		F	T	WS					1					No coll
Myrtaceae	<i>Syzygium cumini</i>		F	T	WS					1		1			No coll
Ochnaceae	<i>Ochna afzелиi</i>		F	T	WS								1	1	No coll
Ochnaceae	<i>Ochna holstii</i>		F	T	WS			1	1						No coll
Ochnaceae	<i>Ochna sp</i>		F	T	WS	1									No coll
Ochnaceae	<i>Ochna thomasiiana</i>		F	T	WS	1	1	1	1	1	1	1			MM7844
Olacaceae	<i>Ximea caffra</i>		F	T	WS	1									No coll
Oleaceae	<i>Jasminum fluminense</i>		W	L	WS			1	1		1				MM7893

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Oleaceae	<i>Olea sp.</i>		F	T							1				MM7852
Oleaceae	<i>Schrebera trichocladium</i>		W	T	WS			1			1			1	No coll
Oxalidaceae	<i>Oxalis barrelieri</i> L.		F	H	WS						1				MM7857
Palmae	<i>Elaeis sp</i>		F	T	WS					1					No coll
Palmae	<i>Hyphaene coriceae</i>		W	T	WS									1	No coll
Palmae	<i>Phoenix reclinata</i>		F	T	WS					1		1		0	No coll
Passifloraceae	<i>Adenia gummifera</i>		F	L	WS				1	1	1	1			No coll
Passifloraceae	<i>Adenia lindiensis variliendiansis</i>		F	L				1			1				MM7884
Passifloraceae	<i>Passiflora edulis</i> Sims		F	L	WS			1	1	1	1	1			MM7977
Passifloraceae	<i>Passiflora foetida</i> L.		F	L	WS		1	1	1		1	1	1		MM7869
Passifloraceae	<i>Schlechterina mitommastoides</i>		W	L	WS	1		1	1						No coll
Poaceae	<i>Eragrostis chapelieri</i> (Kunth) Nees		W	G	WS			1	1		1				MM7963
Poaceae	<i>Megastachya mucronata</i> (Pair) Beauv		F	G	WS			1	1		1				MM7957
Poaceae	<i>Olyra latifolia</i> L.		F	G	WS		1			1	1	1			No coll
Poaceae	<i>Panicum trichocladum</i>		W	G	WS			1	1					1	No coll
Poaceae	<i>Pennisetum polystachion</i>		W	G	WS			1	1		1				MM7915
Poaceae	<i>Setaria macrophylla</i>		F	G	WS			1		1	1				No coll
Rhamnaceae	<i>Helinus mystacinus</i>		W	L	WS		1	1	1	1	1				MM7943
Rubiaceae	<i>Agathisanthemum bojeri</i>		F	H	WS			1	1	1	1	1		1	No coll
Rubiaceae	<i>Canthium bibracteum</i>		F	F	WS							1			No coll
Rubiaceae	<i>Canthium gueinzii</i>		F	L	WS			1	1		1				MM7868
Rubiaceae	<i>Canthium mombazense</i> Baill.		F	T	Coastal Forest Endemic			1	1		1				MM7824
Rubiaceae	<i>Canthium oligocarpum</i>		F	T				1	1		1				MM7864
Rubiaceae	<i>Canthium sp.</i>		F	T				1			1				MM7966
Rubiaceae	<i>Canthium zanzibaricum</i>		F	T				1			1				No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Rubiaceae	<i>Catunaregam spinosa</i>		W	T	WS					1	1			1	No coll
Rubiaceae	<i>Chassalia umbraticola</i>		F	S	WS			1	1	1	1	1		1	No coll
Rubiaceae	<i>Cremaspora triflora</i>		F	T	WS		1			1	1				MM7821
Rubiaceae	<i>Crossopteryx febrifuga</i>		W	T	WS			1						1	MM7999
Rubiaceae	<i>Gardenia transvenulosa</i> Verdc.	VU	F	T	Coastal Forest Endemic	1	1	1			1	1			MM7955
Rubiaceae	<i>Heinsia crinita</i>		F	S	WS	1	1		1		1	1	1		MM7812
Rubiaceae	<i>Heinsia densiflora</i>		F	H				1			1				MM7838
Rubiaceae	<i>Hymenodictyon parvifolium</i>		W	T				1	1						MM7981
Rubiaceae	<i>Keetia guanzi</i>		F	L	WS					1		1		1	No coll
Rubiaceae	<i>Kraussia kirkii</i>		F	T	WS					1		1			No coll
Rubiaceae	<i>Leptactina platyphylla</i>		F	T	WS		1	1	1	1	1	1	1		MM7926
Rubiaceae	<i>Multidentia crassa</i>		W	T	WS						1		1		No coll
Rubiaceae	<i>Mussaenda monticola</i>		F	T				1			1				MM7933
Rubiaceae	<i>Oxyanthus lepidus</i>		F	T	WS			1		1	1				No coll
Rubiaceae	<i>Pentas bussei</i>		F	H				1			1				MM7946
Rubiaceae	<i>Pentas lanceolata</i>		F	H				1			1				MM7867
Rubiaceae	<i>Pentodon pentandrus</i>		W	H				1							MM7997
Rubiaceae	<i>Polysphaeria parvifolia</i>		F	T	WS	1	1	1	1	1	1	1	1		No coll
Rubiaceae	<i>Psychotria mahonii</i>		F	T							1				MM7950
Rubiaceae	<i>Richardia scabra</i>		F	H				1	1		1				MM7974
Rubiaceae	<i>Rothmannia engleri</i>		F	T				1	1		1				No coll
Rubiaceae	<i>Rothmannia macrosiphon</i> (Engl.) Bridson	VU	F	T	Coastal Forest Endemic		1	1	1		1				MM7865
Rubiaceae	<i>Rothmannia sp</i>		W	T	WS									1	No coll
Rubiaceae	<i>Rytigynia monantha</i>		F	T	WS	1									No coll
Rubiaceae	<i>Rytigynia sp.</i>		F	T	WS							1			No coll
Rubiaceae	<i>Scoparia dulcis</i>		F	H				1			1				MM8012
Rubiaceae	<i>Spermacoce dibrachiata</i>		W	H	WS			1						1	MM7996
Rubiaceae	<i>Spermacoce princeae</i>		F	H				1			1				MM7948

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Rubiaceae	<i>Tricalysia pallens</i>		F	T	WS				1	1	1				MM7830
Rutaceae	<i>Vepris lanceolata</i>		F	T	WS	1				1					No coll
Rutaceae	<i>Vepris sp</i>		F	T	WS		1								No coll
Rutaceae	<i>Zanthoxylum chalybeum</i>		F&W	T	WS	1	1	1	1		1	1	1	1	No coll
Sapindaceae	<i>Allophylus parvillei</i>		W	T	WS	1	1	1	1	1	1			1	MM8011
Sapindaceae	<i>Allophylus rubifolius</i>		F	T				1	1						MM7931
Sapindaceae	<i>Blighia unijugata</i>		F	T	WS	1		1	1	1	1	1	1		No coll
Sapindaceae	<i>Chytranthus obliquinervis</i> Engl.	VU	F	T	Coastal Forest Endemic			1			1				MM7860
Sapindaceae	<i>Deinbollia borbonica</i>		F	T	WS	1		1	1	1	1	1	1		No coll
Sapindaceae	<i>Haplocoelopsis africana</i> F.G. Davies		F		Coastal Forest Endemic					1		1			No coll
Sapindaceae	<i>Pancovia holtzii</i>		F		WS							1			No coll
Sapotaceae	<i>Bequaertiodendron magalismontanum</i>		F	T				1			1				MM8004
Sapotaceae	<i>Manilkara sansibarensis</i> (Engl.) Dubard		F	T	Coastal Forest Endemic	1		1		1		1			No coll
Sapotaceae	<i>Manilkara sulcata</i>		F	T	WS	1	1	1	1	1	1	1			No coll
Sapotaceae	<i>Mimosopsis acutifolia</i>		F		WS							1			
Sapotaceae	<i>Mimosopsis fruticosa</i>		F	T				1			1				MM8001
Sapotaceae	<i>Mimosopsis obtusifolia</i>		F	T	WS								1		No coll
Sapotaceae	<i>Pouteria alnifolia</i>		F	T	WS					1					No coll
Sapotaceae	<i>Synsepalum cerasifera</i>		F		WS					1		1	1		No coll
Sapotaceae	<i>Synsepalum msolo</i>		F	T				1	1		1				No coll
Scrophurialiaceae	<i>Striga pubiflora</i>		W	H				1							MM7992
Simaroubaceae	<i>Harrisonia abyssinica</i>		F	T	WS		1	1	1	1	1	1	1		No coll
Smilacaceae	<i>Smilax anceps</i>		F	L	WS			1	1					1	No coll
Solanaceae	<i>Capsicum sp.</i>		F	S	WS							1			
Solanaceae	<i>Physalis angulata</i>		F	H	WS			1	1		1		1		No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Solanaceae	<i>Solanum anguivi</i>		F	S	WS					1					No coll
Solanaceae	<i>Solanum incanum</i>		F	S					1		1				No coll
Solanaceae	<i>Solanum sp.</i>		F		WS							1	1		No coll
Solanaceae	<i>Solanum zanzibarens</i>		F	S	WS			1	1	1	1				MM7825
Sterculiaceae	<i>Cola chlorantha F. White</i>		F	T							1				MM7863
Sterculiaceae	<i>Cola clavata</i>		F	T	WS		1								No coll
Sterculiaceae	<i>Cola greenwayi</i>		F	T	WS		1								No coll
Sterculiaceae	<i>Dombeya kirkii</i>		W	T				1							No coll
Sterculiaceae	<i>Dombeya mupangae</i>		F	T	WS	1				1		1	1		No coll
Sterculiaceae	<i>Nesogordonia holtzii (Engl.) Capuron</i>		F	T	Coastal Forest Endemic		1	1		1	1			1	No coll
Sterculiaceae	<i>Sterculia africana</i>		W	T	WS			1	1		1			1	No coll
Sterculiaceae	<i>Sterculia quinqueloba (Garcke) K. Schum</i>		W	T	WS									1	No coll
Sterculiaceae	<i>Waltheria indica</i>		W	H	WS			1	1		1				MM7914
Tiliaceae	<i>Grewia bicolor</i>		W	T	WS			1	1						No coll
Tiliaceae	<i>Grewia capitellata</i>		F	T	WS							1			No coll
Tiliaceae	<i>Grewia conocarpa K. Schum</i>		F	T	Coastal Forest Endemic	1	1	1	1	1	1	1	1		MM7886
Tiliaceae	<i>Grewia forbesii Harv. ex Mast.</i>		F	L	Coastal Forest Endemic	1	1	1	1	1	1	1	1		No coll
Tiliaceae	<i>Grewia goetzeana K. Schum</i>	DD	F	T	Coastal Forest Endemic			1	1						MM7947
Tiliaceae	<i>Grewia similis</i>		F	T	WS			1	1		1				MM7849
Tiliaceae	<i>Grewia sp</i>		F	T	WS					1			1		No coll
Tiliaceae	<i>Triumfetta rhomboidea</i>		W	H	WS		1	1	1		1			1	No coll
Ulmaceae	<i>Trema orientalis</i>		F	T	WS	1	1	1	1	1	1	1	1	1	No coll
Verbenaceae	<i>Clerodendrum capitatum</i>		F	S	WS							1	0		No coll

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Verbenaceae	<i>Clerodendrum glabrum</i>		W	S	WS			1			1				MM7894
Verbenaceae	<i>Clerodendrum hidebrandtii</i>		F	S	WS			1			1				MM7923
Verbenaceae	<i>Clerodendrum myricoides</i>		F	S	WS			1	1		1				No coll
Verbenaceae	<i>Clerodendrum sp.</i>		F	S	WS							1			No coll
Verbenaceae	<i>Lantana camara</i>		F&W	S	Invasive species	1	1	1	1	1	1	1	1		No coll
Verbenaceae	<i>Lippia ukambensis</i>		F&W	S	WS			1	1		1				MM7953
Verbenaceae	<i>Premna serratifolia</i>		F	L	WS					1					
Verbenaceae	<i>Stachytarpheta jamaicensis</i>		W	H	Invasive species		1	1	1		1				No coll
Verbenaceae	<i>Tectona grandis</i>		F	T	Exotic				1		1				No coll
Verbenaceae	<i>Vitex buchananii</i>		W	T	WS				1		1			1	MM7944
Verbenaceae	<i>Vitex donniana</i>		W	T	WS			1	1		1			1	No coll
Verbenaceae	<i>Vitex ferruginea</i>		F	L/S	WS	1				1			1		No coll
Verbenaceae	<i>Vitex payos</i> (Lour.)		W	T	WS									1	No coll
Verbenaceae	<i>Vitex strickeri</i> Vatke & Hildebr.		F	L	WS		1			1		1	1		No coll
Verbenaceae	<i>Vitex zanzibarensis</i> Vatke	VU	F	T	Coastal Forest endemic			1			1				No coll
Violaceae	<i>Rinorea angustifolia</i>		F	T	WS					1					No coll
Violaceae	<i>Rinorea ferruginea</i>		F	T	WS			1		1	1				MM7831
Violaceae	<i>Rinorea squamosa</i> ssp I (Engl.) Grey-Wilson		F	T	WS			1			1				MM7841
Violaceae	<i>Rinorea welwitschii</i> (Oliv.) Kuntze		F	T	WS							1			No coll
Vitaceae	<i>Cissus quinquangularis</i> Chiov.		F	T	Coastal Forest Endemic		1								No coll
Vitaceae	<i>Cyphostemma purpureozonatus</i>		F	L	WS			1	1		1				MM7873

Family	Scientific name	Red List	Habitat	Habit	Range	Pugu						Kazimzumbwi			Coll No
						1a	1b	1c	2	3a	3b	4	5	6	
Vitaceae	<i>Cyphostemma</i> sp		F	CL	WS								1		No coll
Vitaceae	<i>Roicissus tridentata</i>		W	CL	WS									1	No coll
Total						72	82	250	175	148	260	111	79	63	

Key to

Pugu Mpakani and Minaki Bwawani (less disturbed forest) was the most species rich site with 321 species, followed by Mambisi and Pugu Rellini (historically and recently degraded) with 305 species (Table 7). The least diverse site was Chanika with only 63 species.

Table 7

Site 1 a = Pugu Relini in 2011

Site 1 b = Pugu Mambisi in 2011

Site 1c = Pugu Relini and Pugu Mambisi in 2012

Site 2 = Pugu Dunda and Kimani

Site 3a = Pugu Mpakani and Minaki Bwawani in 2011

Site 3b = Pugu Mpakani and Minaki Bwawani in 2012

Site 4 = Buyuni in 2011

Site 5 = Vibura in 2011

Site 6 = Chanika in 2011

Red List

CR = Critically Endangered

EN = Endangered

VU = Vulnerable

NT = Near threatened

LC = Least Concern

DD = Data Deficient

Habitat

F = Forest

W = Woodland

Habit

CL = Climber H = Herb

L = Liana

S = Shrub

T = Tree

Geographical range

E CF = Endemic plants of the Swahilian Regional Centre of Endemism sensu lato (including coastal forests) based on Appendix 3. Of Burgess and Clarke 2000.

Collection

MM = Numbering in Moses Mwangoka's botanical collection series.

No coll = No collection made.