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Interdisciplinary Land Use and Natural Resource Management
SLUSE February – April 2020

Livelihood and Environmental Impacts of Gendered Forest Access and Use

A case study of the Karima forest

Field Research on the Gendered Access and Use and the impact of these on the local livelihood and the environment of the Karima Forest as part of the *Thematic Course Interdisciplinary Land Use and Natural Resource Management* at the *University of Copenhagen* in Collaboration with the *University of Nairobi*

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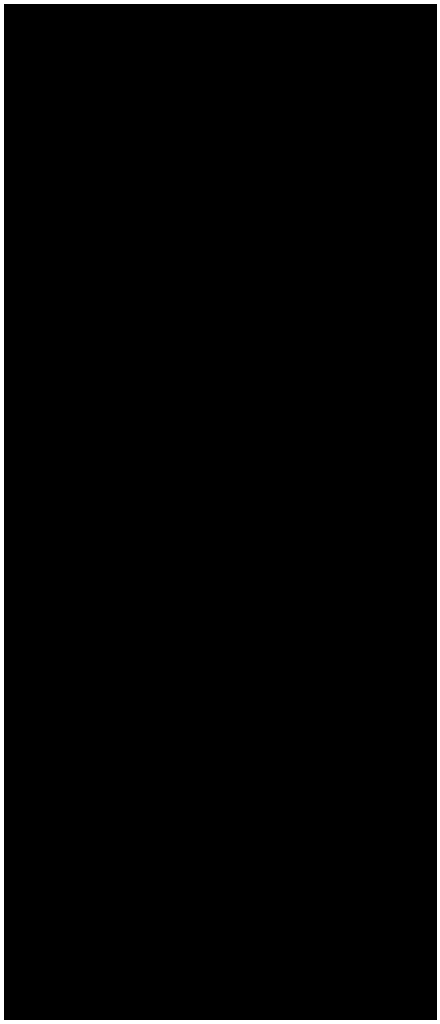
Declaration of Academic Integrity

By signing this document, we certify that all members have reviewed and agreed that this is the final version of the study report. Moreover, we declare that the research is our own and all sources of information have been acknowledged and the work in the same or similar form has not yet been submitted to any other examining authority. We also confirm that all authors contributed equally to production of this report.

Copenhagen, 3rd April 2020



Abstract

This research examines the different gendered ability to access and use the Karima forest in Nyeri, Kenya and the livelihood and environmental outcomes thereof. The data was collected through questionnaires, semi-structured interviews, focus groups, transect walks and forest resource assessments. A framework inspired by Ribot's and Peluso's (2003) *Theory of Access* and Ellis' (2000) *Sustainable Livelihoods Framework*, analyses the livelihood capitals and external influences impacting the access and use of the forest. The main findings depict that there is no significant gender difference regarding access, which could be influenced by the general reduction in entering the forest. Uses of forest products differ between genders. The general use of the resources is predominantly influenced by a lack of transparency amongst institutions regarding the restrictions and rules of the forest resulting in legal pluralism. Participatory Forest Management systems encourage the establishment of Community Forest Associations to allow local communities to negotiate their forest user rights, however such associations have not operationalized in Karima forest due to lack of funding. A national timber ban and employment of a forest guard has reduced the access and use of the forest, resulting in an increase in forest cover and an overall improvement in conservation status. The study aims to raise awareness of the gendered differences in the use of forest resources as well as acknowledge traditional conservation practices to include in management plans of future community associations. Furthermore, the importance of transparent communication of forest regulations is emphasized.

Keywords: *access, use, conservation, participatory forest management, forest products, livelihoods, gender, community forest association, Karima forest*

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Work Distribution

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Acknowledgement	ALL	ALL
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Introduction

Forests are an essential source of food, fiber, fuel, income and they are of cultural value for millions (Bishop & Landell-Mills, 2002; Ojea et al., 2016; Angelsen et al., 2014). Many rural households rely on forests for their basic needs and their livelihoods (Agarwal, 2001; Ming'ate et al., 2014). This is especially true for marginalized groups such women, who own little private land and thus rely on firewood collected from forests as their main source of energy (Agarwal, 2001). It has been researched that local land control over forest resources support sustainable livelihoods of rural households (Schmithüsen et al., 1999; Banerjee, 2000; Hajjar et al., 2012) and securing forest management rights can enable communities to manage forests in ways which contribute towards sustainable livelihood outcomes (Chhatre & Agrawal, 2009; Ming'ate et al., 2014). Involving communities has therefore been ever-more regarded as an effective natural resource management strategy (Lund & Treue, 2008; Brown et al., 2007). This is seen throughout the world, with at least 16 countries in Sub-Saharan Africa having implemented these strategies (Romano & Reeb, 2008). Although comparatively late to its bordering neighbors, Kenya encouraged participatory forest management (PFM) in order to conserve and manage forests with the introduction of the Forest Act of 2005 (Republic of Kenya, 2005). The Kenyan Forest Service (KFS) aims to enhance conservation, sustainable management and utilization of the forest by improving the livelihoods of local forest communities through PFM (KFS, 2020).

However, communities are not homogenous and should not be categorized as small spatial units with shared norms (Agrawal & Gibson, 1999). The access and uses of forest products and services amongst communities and between men and women differ, bearing in mind, women should not be essentialized (Nightingale, 2013). As Sunderland et al. (2014) show, women's access to forest products is restricted by, but not limited to, gender and social norms. Women are often busier with housework and raising children, hence spending more time at home. Men are involved in hunting and collecting construction material, while women foremost collect firewood and food (ibid.). Ingram et al. (2014) and Sunderland et al. (2014) found that men were more involved with cash generation while women are more prone to take care of household subsistence. However, Hopkins et. al. (1994) and Adedayo et al. (2010) argue that women, who have greater responsibility managing household finances, delegate more money to healthy food and necessary health care measures compared to men, which improves their households' livelihood. The differences in uses also affect the conservation of the forest differently. Adedayo

et al. (2010) state that women exploit the forest less than men as they have less time and resources to do so. Agarwal (2000, 2001) acknowledges the impact of the gendered nature of forest ecology knowledge. Women are more acquainted with sustainable harvesting and collecting of firewood and non-timber forest products (ibid.). Evidence demonstrates the link between women's involvement in forest management and improved conservation (Agarwal, 2010), where there is a 51% higher probability of an increase in forest cover amongst community forest managements managed by women (Agarwal, 2009). When women are involved, they are more likely to follow the rules, ensure other village women do as well, and transfer conservation ethics to their children (ibid.). However, as Harris-Fry and Grijalva-Eternod (2016) state, PFM programmes often fail to consider the costs and benefits of including women in decision making roles within participatory governance groups and thus leave these underrepresented (IUCN, 2015). Excluding women from decision-making leaves their traditional knowledge and experiences of natural resources neglected, despite their ability to conserve the forest (Aguilar, 2016).

With the relatively new adoption of PFM in Kenya, studies focus on the power and benefit distribution as well as governance aspects (Thygesen et al., 2016; Chomba et al., 2015; Mutune & Lund, 2016). Literature regarding PFM and forest management in Kenya, Mogoi, et al. (2012); Kimutai & Watanabe, (2016); Schreckenberg & Luttrell, (2009); Matiku et al. (2013); Muigua, (2017); Mbuvi et al. (2018), have limited focus on gendered aspects. Therefore, this paper attempts to investigate the gendered access and uses of forests and what livelihood and environmental impact these have, to include these in future participatory forest management plans, using Karima forest in Nyeri County, Central Kenya as an example.

Research Question

How does the access and use of the Karima forest differ between genders and what are the resulting livelihood and environmental outcomes?

Research Hypothesis

1) Urbanization shifted the forest value from being significant for rural livelihoods to being used recreationally.
2) A dormant CFA with no common forest user rights causes confusion and forest restrictions amongst community members, as governing bodies have various interpretations of these restrictions.
3) Although no gender is entirely restricted from accessing the forest, cultural and intra-household gender dynamics restrict the access to more forest resources for women than men.
4) Women rely more on forest resources for subsistence and place a higher value on the products and services derived compared to men.
5) Women use forests more sustainably through their traditional and indigenous knowledge compared to men.

Background

Participatory Forest Management in Kenya

Gazetted forest reserves and forest plantations were first introduced by the Forest Department of the colonial government (Standing & Gachanja, 2014; Ongugo & Njuguna, 2004). Local people were evicted, and their traditional uses and management strategies were discarded (ibid.). The centralized management system continued after Kenya's independence in 1963 (Ongugo & Njuguna, 2004; Ogada 2012; Coleman & Fleischman, 2012) with the established central government de-gazetting forests from early 1980s and distributing logging rights in state plantations (Standing & Gachanja, 2014). This, in addition to a growing population resulted in deforestation and degradation of forests. In response to civil society and donor's plea, an increasing people-oriented management approach with an interest in Participatory Forest Management (PFM) emerged (Chomba et al., 2015). This approach was introduced within the Forest Act, 2005 and operationalized two years later (Ongugo & Njuguna, 2004; Koech et al., 2009; Coleman & Fleischman, 2012). Following the 2010 Constitution land is classified as private, public and trust land (community land) (Standing & Gachanja 2014). The Kenya Forest Services (KFS) was established under the Forest Act to manage public forests and plantations (Standing & Gachanja, 2014). A guiding principle of the corporate body is to enable and facilitate public participation in forest conservation and management through Community Forest Associations (CFA). Communities adjacent to forests apply for permission to participate in PFM with the KFS in cases of public forests and with county assemblies in regard to trust land. A management plan specifying proposed use and conservation measures must be approved. The forest user rights are agreed on in a forest management agreement (Republic of Kenya, 2005). A nation-wide timber ban was introduced in 2011 to further minimize deforestation and is monitored by the KFS (KFS, 2020).

Research Site: Karima Forest

The research site of this paper is in and adjacent to the Karima forest (approx. 2000m) in Nyeri County, Central Kenya. In comparison to gazetted forests, which are managed by the KFS, the Karima forest is managed as trust land by the Nyeri County Assembly (NCA). In the 17th Century, the forest was governed by four clans related by kin and the customary uses of the forest remained with the community during colonial rule (CFA MP, 2009). During the *Mau Mau* uprising, the forest was believed to be used as a hiding place and thus was burned down by the colonists (ibid). Commercial exotic species were subsequently established (ibid). With a size of

108.5 hectares, 27.4 hectares are covered with indigenous species, while the remaining 81.1 hectares are commercial softwood plantations, such as *Eucalyptus sp., Cupressus sp.* and *Pinus sp.* (ibid). 32.3 hectares of the Eucalyptus plantation was leased for 30 years in 1999 to the tea company Iriaini Tea Factory (ibid). Karima initiated a PFM process in 2009. A management plan was drafted by the KFS and approved by the NCA in 2011. It however failed to determine how tasks, responsibilities and revenues derived from timber should be divided between the stakeholders. Therefore, the forest management agreement, an essential part of the decentralization process, was not signed, leaving the Karima CFA dormant (ibid.).

The infrastructure of the area surrounding the forest is well developed (Owour et al., 2009). Markets and the closest town, Othaya (4 kilometers), are reachable by tarmac roads. Most households have access to power grids and tapped water (ibid.). Land tenure in Karima is categorized predominantly as freehold land with owners residing on their land (CFA MP, 2009). Land near the forest is rarely leased (ibid.). The Kikuyu are the main ethnic group in the area, who are mainly small-scale subsistence farmers (ibid.). Fertile volcanic soils and favorable climate allow agricultural cash crops such as coffee and macadamia to be produced on their land, which is often less than one hectare large (ibid.). Households distribute a part of their land to growing fodder for their livestock, which are further important assets for many households (ibid.). The remaining land is used to grow subsistence crops including, maize and beans, and dairy (ibid.).

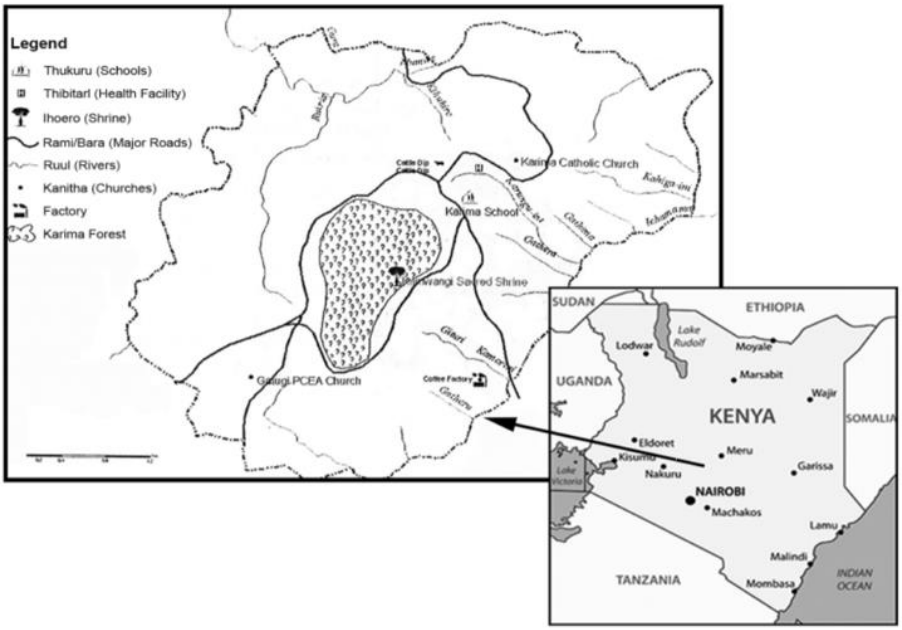

Figure 1 Map of Karima Forest (Source: CFA MP, 2009)

Analytical Framework

An analytical framework (figure 2) was designed to analyze the results of the research on the Karima forest. The foundation was established using Ellis' (2000) sustainable livelihood framework and Ribot and Peluso's (2003) Theory of Access. The main aspects of both of the frameworks were combined, emphasizing characteristics most important for this research.

Access to and use of the forest products are differentiated in the framework. Access, as defined in the Theory of Access, is *"the ability to derive benefits from things"* (Ribot & Peluso, 2003: 153). In this research it refers to the community's ability to enter the forest and benefit from forest resources. Access includes the community's own perception of restrictions to enter the forest. Use refers to the purpose for entering the forest, such as collecting different forest products and visiting sacred sites.

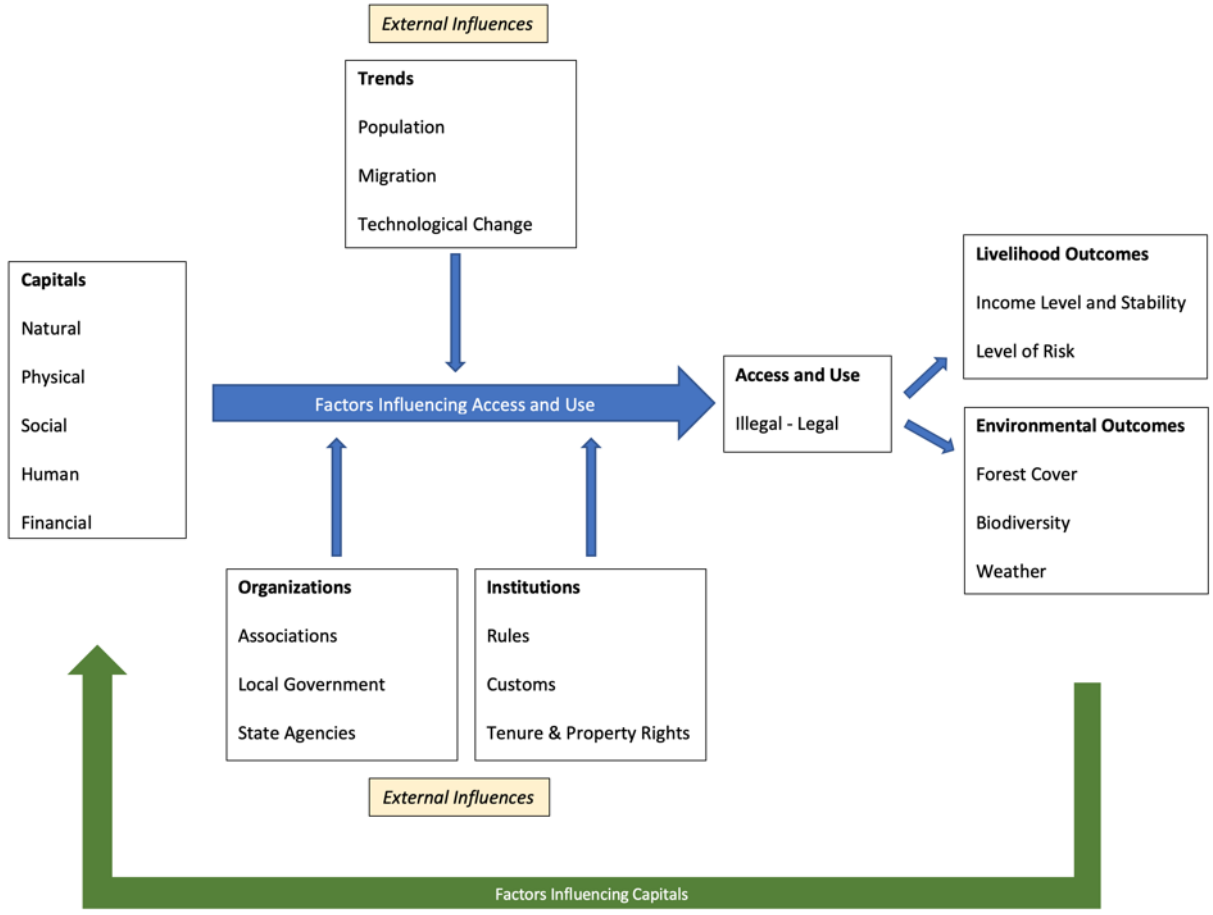

Figure 2 Analytical framework combining the sustainable livelihood framework (Ellis, 2000) and the Theory of Access (Ribot & Peluso, 2003) (Source: Author's Own)

The analytical framework (figure 2) identifies different livelihood capitals and external influences (organizations, institutions and trends) that impact the access to and use of the forest, and the resulting livelihood and environmental outcomes. According to Ellis' (2000) physical, natural, financial, human and social capitals make up a household's livelihood. Mediating processes such as institutions and organizations inhibit or facilitate individuals to access and use the forest products or services. These refer to the local and national stakeholders and rules, including customary rules and national laws. Both fortuitous and adverse trends can influence the ability for individuals to gain benefits from the forest. These external influences are dynamic and constantly changing, causing individuals to adapt new livelihood strategies accordingly (Ellis, 2000). Livelihood outcomes consider how the forest access and use impacts the individuals' livelihoods, for instance the financial security. The environmental outcomes examine how the uses affect the forest from a conservation standpoint. The framework argues that the outcomes continuously (positively or negatively) influence the individual capitals, for instance by providing economic stability or favorable climatic conditions.

Methodology

This research utilized various qualitative and quantitative methods in order to gain an interdisciplinary approach.

Questionnaire Survey

Questionnaires were used to gain a broad understanding of the community's access, uses and conservation of the forest as well as factors influencing these. 30 questionnaires (19 women and 11 men) were carried out along 11 roads (figure 3), including the main road surrounding the forest. Selection of respondents was done through the stratified sampling method with the aim to capture three respondents on each road. The strata were formed by dividing the roads. The households were randomly selected along the 11 roads, where a maximum distance of one kilometer from the main road was held with the assumption that forest users live closer to the forest. Prior to the execution of the questionnaires, the translators were briefed and trained regarding wording specific terminologies to Kikuyu. The questionnaire was tested using two respondents sampled randomly, which resulted in improvements being made.

Figure 3 The map of roads adjacent to the Karima forest where questionnaires were performed on households (Source: Author's Own)

Predominantly close-ended questions were asked, while open-ended questions were added to receive explanation of reasons for the choices in the most important questions. The

questionnaire used verbatim questions throughout, where an answer to a question leads to exclusion or inclusion of more questions around the same topic (Casley & Kumar, 1988). The purpose is to shorten the respondents time and go in dept with the respondents who understood the concepts. The questions covered six themes:

1) *Background Information:* e.g. age, education level, occupation

2) *Household Characteristics:* e.g. land size, number of livestock, type of energy source

3) *Community Forest Association:* e.g. awareness, membership, benefits

4) *Forest Use*: e.g. uses of forest, importance of forest, gendered differences in use

5) *Forest Access*: e.g. access restriction to the forest, actors who governing restrictions

6) *Forest Conservation and Management:* e.g. perception of who manage the forest, conservation of the forest, gendered knowledge regarding conservation

Questionnaire answers entered into excel according to each theme and analyzed according to each response share value. Through the share values to each question, an overview of results was constructed using descriptive statistical graphs and charts. These numbers were analyzed through chi-tests between variables, such as gender, age and education against uses and access, to show the different forest users dynamics. The test depicted (in)significant differences between variables.

Semi-Structured Interviews

30 semi-structured interviews (22 women and eight men) with selected individuals living adjacent to the Karima forest were conducted, with the core aim to find individuals' access, value and use of the forest. In contrast to the questionnaires, the semi-structured interviews were carried out through open-ended questions only without any options to answers, to have as little influence over the respondent’s answers as possible. The semi-structured interview was divided into two parts, use and access to the Karima forest: questions were formulated in a descriptive and structural manner to gain in-depth insight to the concepts. Respondents were randomly along the main round that runs around the forest and in the village centers Thuti and Gatugi to find people who were physically close to the forest, in order to increase the likelihood of them using the forest. Respondents were anonymous on purpose with no association with any house to increase participation, as sensitive information was shared. The snowball method for finding other forest users’ part of the target group was also used, with recommendations

from people along the road of recognizing users of the forests. Past users were also relevant for our target group, as they were assumed to have knowledge of the forest and its uses as well. Other semi-structured interviews were held with key informants involved individuals from the KFS, CFA, the village chief of Othaya sublocation, the forest guard of Karima forest and the elder of the village also took place. These key informants were of particular interest to this study as they brought forward important insight on the Karima forest management plan, governance structure and perceptions from the county assembly.

During the interviews, important quotes captured from the interviews were noted down by the authors. Answers to the semi-structured interviews were coded into categorical variables before added into excel. These values were statistically analyzed similarly to those of the questionnaire using chi-tests between different variables. Some overlapping semi-structured answers were merged with the questionnaire answers to run a larger sample size data in the chi-tests. Due to larger samples, more precise (in)significance could be found between variables, such as age and gender compared against uses and values of the forest. Descriptive statistical graphs and charts were developed in excel.

Focus Groups Discussions

Focus groups discussions with community members were used to understand different perceptions living adjacent to the Karima forest. The purpose was to find out whether a division of men and women generates different answers and to compare these against one another. Participants from the questionnaire were invited and two focus group discussions were held; one with men and one with women. The questions were developed to deepen the questionnaire results with additional information that had not been captured. In order to stimulate a discussion with active participants, only open-ended questions formed to promote the most important themes and concepts, and to help guide the conversation in the right direction. Five open-ended questions were asked: the first question revolved around the CFA, the second and third questions asked about uses of the forests, the fourth touched upon cultural norms in relation to gender activities, and the last question asked about future hopes for the forest. Translators translated and presented the questions to Kikuyu during the discussion, and the responses were thereafter translated to English. Notes were taken by authors.

Community Mapping

Community mapping (figure 4) provided an overview of the research area using local knowledge and perceptions. The maps identified specific sites within the forest such as sacred trees and viewpoints. The assistant town chief and the forest guard shared their understanding of the forest during an unstructured interview. Information about the forest as well as the community's perception of the forest were collected.

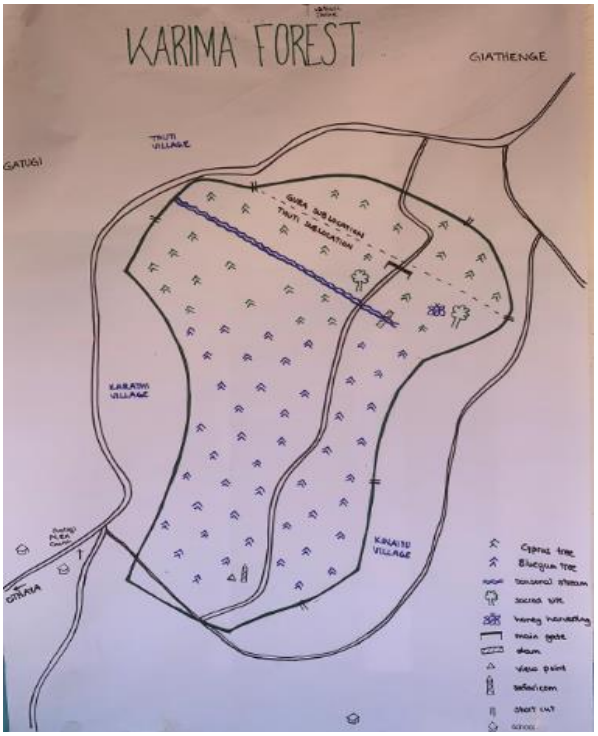

Figure 4 Community Mapping of Karima Forest (Source: Author's Own)

Satellite Imaging

Google Earth images were used to verify the community map as well as to pinpoint GPS marks in the transect walk maps below. Images of 2012 and 2019 were used to analyze the effects of the national timber ban and conservation efforts over the years on the forest cover.

Transect Walk

Two transect walks with local community members from Karima forest were conducted. A retired teacher and self-proclaimed private forester shared his knowledge of the various uses of the forest as a regular forest user (figure 5). A conservation activist who was involved in the

development of the CFA in Karima, shared his view of the association as well as the various tree species found in the forest, medicinal herbs and religious sacred places (figure 6).

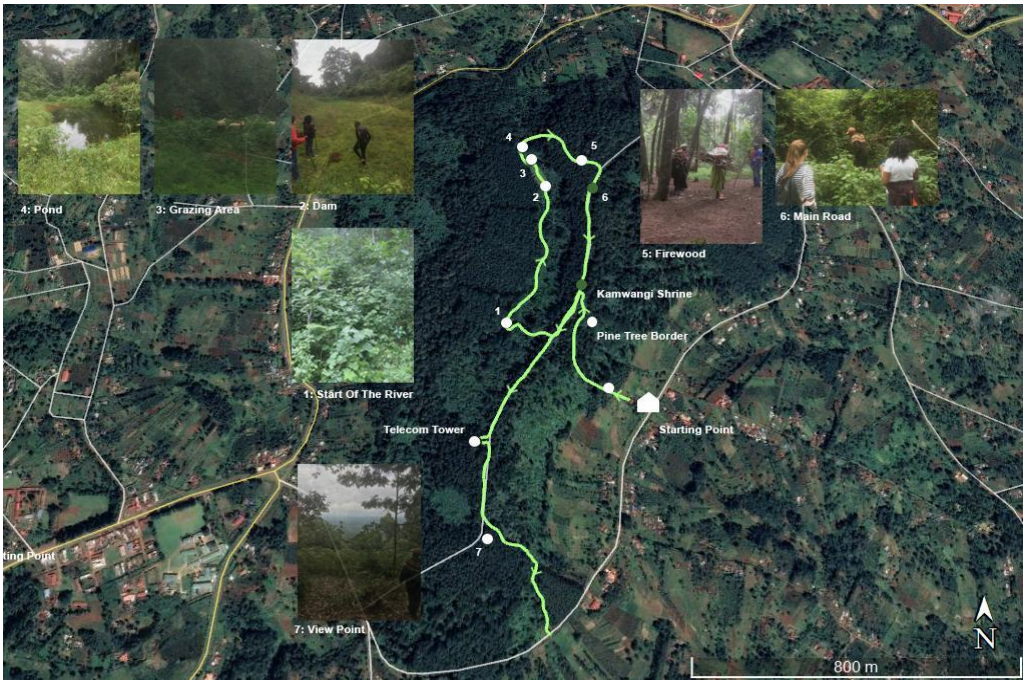

Figure 5 Transect Walk 1 (Source: Author's Own)

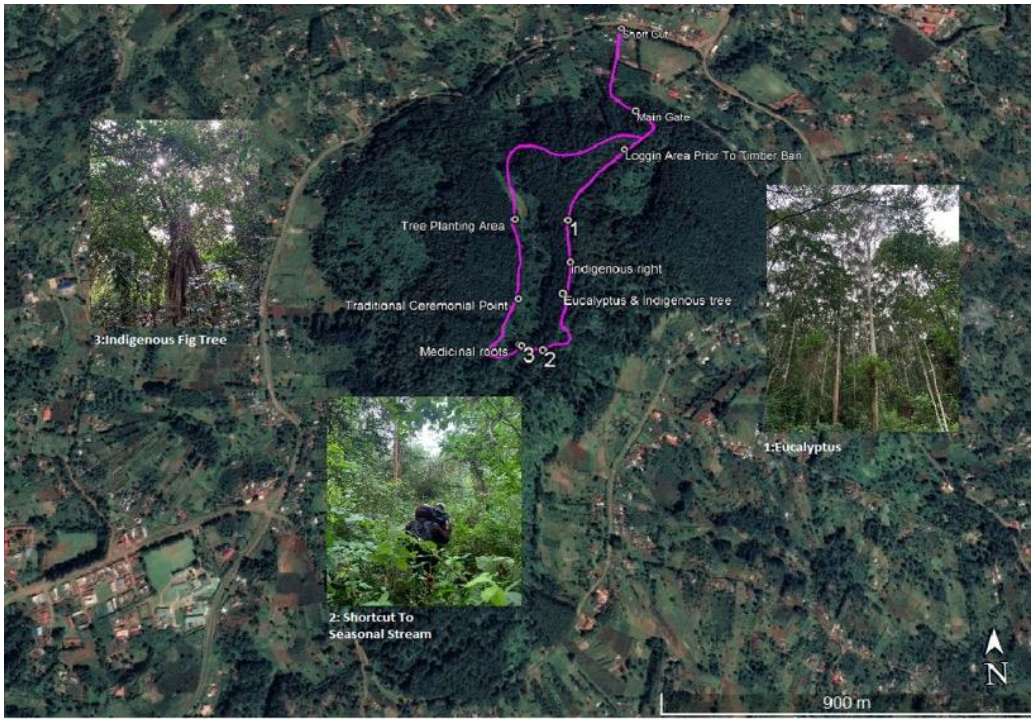

Figure 6 Transect Walk 2 (Source: Author's Own)

Forest Resource Assessment

Three plots within the forest were selected and a forest resource assessment was carried out in order to assess whether logging or firewood collection of fresh branches was taking place. The square plots measured 35x35 meters and were set up in different parts of the Karima forest along the main access road to monitor potential logging of trees and fresh branch cuttings used for household firewood. These plots were purposely chosen where most logging and firewood collection was observed during the transect walks. The first plot consisted of cypress trees, the second plot a mix of eucalyptus and indigenous trees, and the last plot with a mix of eucalyptus and pine trees. All living trees were counted and categorized as large (>approx. 15cm diameter) or small (<approx. 15cm diameter); all stumps were counted and categorized as old (approx. pre 2011, national logging ban, determined by state/age of the stump) and new (since national logging ban), large (>approx. 15cm diameter) or small (<approx. 15cm diameter); all cut branches were counted. The total numbers were added to calculate a percentage of logging or branch cutting collection taking place, to draw conclusions on the frequency of (illegal) felling of timber and firewood in Karima forest.

Figure 7 Example of a new cut (left) and an old cut (right). (Source: Author's Own)

Observations

Observations were carried out and noted by the authors throughout the fieldwork. Activities and assets were observed that had not been mentioned during other data collection methods. The overall aim was to capture living conditions of the community members, behavior and body language of the interviewees.

Results

The adapted livelihood framework was used for assessing access and use of the forest. First, the access and use of the forest are presented followed by livelihood capitals and external (organizations, institutions, trends) influences. The impact of the access and use of the forest on individual livelihoods and the environment are presented thereafter.

1. Access and Use

1.1 Access

Community members do not enter the forest frequently. Therefore, the main findings on the access to the forest were drawn from the perceptions of the community. It was the community's own perception on access which restricted them in entering the forest. The results showed that the community is conflicted in terms of the forest restrictions; 43% of the interviewees believed everyone is allowed to enter while 33% were of the opinion no one is allowed to enter the forest (SSI-U). Some interviewees (13%) stated that entry is only allowed with a permit (SSI-U).

There is little difference between men and women's ability to enter the forest. 83% stated that the access to the forest is the same for men and women. The other 17% who stated that there was a difference in gendered access to the forest, named gender roles (75%), cultural reasons (50%) and forest regulations (50%) as the main reasons for the difference (SSI-U).

Forest regulations were the factor that the community perceived as most limiting regarding the ability to benefit from the forest (100%, Q). Other factors include social status (10%) and lack of infrastructure (7%, Q). According to 62% of the respondents, the county assembly restricts the access to the forest, while 31% named the forest guard and 10% believed the national government does (Q).

1.2 Use

Similarly, to the perception of restricted access, forest uses restrictions also showed conflicting results, varying from complete ban for entering the forest to solely timber logging due to the national timber ban. As shown in figure 8, 73% stated hunting, 57% stated gathering firewood, 50% stated gathering fodder and grass for livestock, and 43% stated gathering food are restricted activities. The only restricted forest activity that all respondents (100%) agreed on was timber logging (Q).

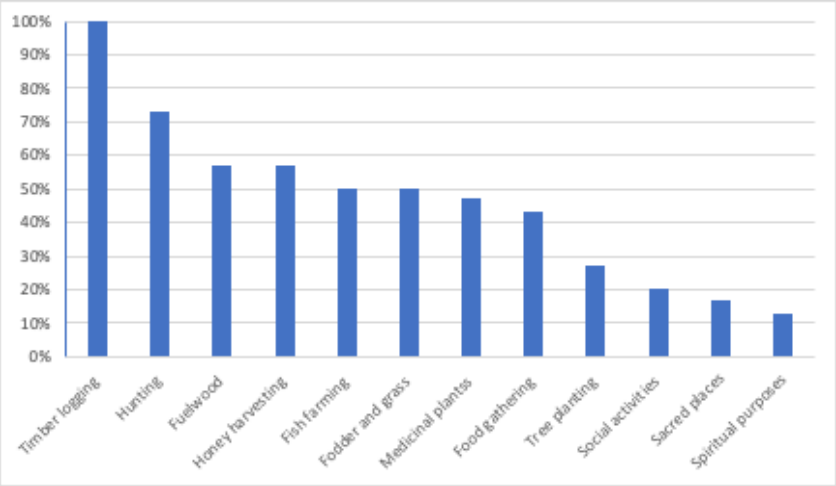

Figure 8 The community's perception of banned activities (Q) (Source: Author's Own)

Opposingly to the access of the forest, purposes for entering the forest and using resources differed between genders. Figure 9 shows how respondents use the forest differentiated by gender. Although the majority of the community (68%) believed both genders use the forest for the same purposes, answers to specific questions indicated the differences in gendered use. As an example, all respondents stated only women collect firewood. The collection of firewood was observed frequently during the fieldwork, with women collecting dead firewood from the ground or carrying firewood in the forest (O). Common male uses included gathering of construction materials (60% SSI-U), fodder for livestock (60%, SSI-U) and collecting herbal plants, such as *Croton m.* (20%, Q). Despite the physical presence of guards, some activities, which the community perceive as illegal, took place. 47% of respondents stated they have personally witnessed activities that they perceive as illegal (SSI-U). Respondents stated if one is caught doing illegal activities within the forest by the forest guard, "*you can negotiate or pay [him] off*" (SSI-U, 1) and "*if you pay 500 KSH to the forest guard you're able to log timber*" (SSI-U, 4). Men are more likely to participate in activities that were perceived as illegal by the community; 74%

believed that men are mostly the ones practicing, for instance, illegal logging in the forest (SSI-U). According to the results, the forest is currently not used for generating economic income; 100% of the respondents said they did not sell products from the forest (Q). However, 23% of the interviewees believed that men benefit more from the forest, due to the illegal logging and selling timber have seemingly become a black market for men since demand for timber remains high (SSI-U).

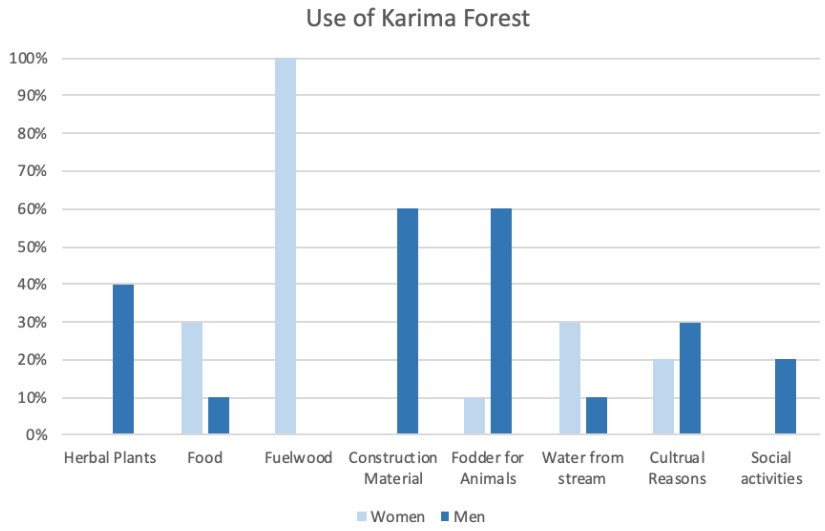

Figure 9 Community and Gendered Use of the Forest (Q) (Source: Author's Own)

The overall value of the Karima forest remains high, with the majority (73%) indicating the forest has highly important and 17% important (Q, figure 10). 85% stated that the forest's primary value for both men and women is weather, as it serves as a rain catchment and helps irrigate their crops naturally (Q, table 1). One respondent stated that her *"maize, coffee, bean and banana crops were doing extremely well because they were so close to the forest"* (SSI-U, 9). The second most valued forest service was the provision of firewood (33%, Q, table 1).

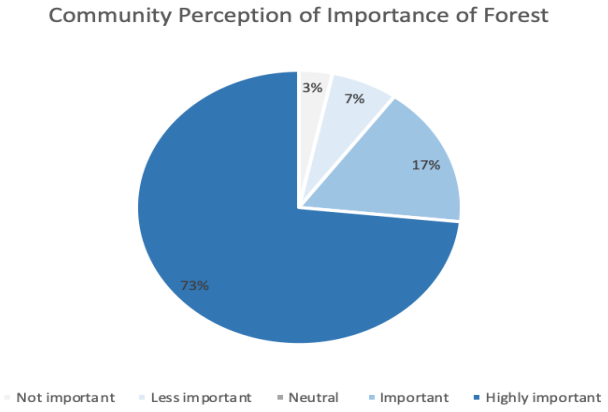

Figure 10 Community Perception of Importance of Forest (Q) (Source:

Table 1 Community Reason of Forest Importance

Importance of Forest	Respondent
Weather	85%
Firewood	33%
Aesthetic value	32%
Source of water	19%
Spiritual reasons	7%
Employment	4%
Tourism	4%
Grazing	4%
Trees	4%

Author's Own).

2. Livelihood Capitals

The natural, physical, social, human and financial capitals serve as a basis for analysing the respondents' assets, and how these affect the access and use of the forest.

Natural Capital

85% of respondents own land, with 44% of these owning more than 0.5 hectares. All households grow trees on their farms. As the majority stated that they are restricted from collecting firewood from the forest (Q), growing trees for subsistence was used to complement firewood collection in the forest. Despite 73% of respondents growing Napier grass on their farm as fodder for their livestock, no impact was seen in relation to forest use (Q). No significance was found between households that grew fodder and those that did not in relation to entering the forest for their livestock to graze, with a p-value of 0.195.

Physical Capital

Households featured in the questionnaires did not live further than one kilometer from the forest. Differences in age, physicality and perception determined the indicated distance to the Karima forest and the local market in Othaya, with an average of 25 and 31 minutes respectively (Q). However, the distance to the forest did not influence any forest activity, with a p-value of 0.89. Thus, households living closer or further away from the forest were neither less prone nor less likely to use the forest.

All households use firewood as a dominant source of cooking. Alternative energy sources for cooking were gas (50%), charcoal (23%) and biogas (3%) (figure 11, Q). Despite households having gas as an alternative for cooking, they collect more firewood in the forest, with a chi-value of 0.06. Households who purely rely on firewood as a source for cooking are likely to reduce their dependence on the forest and grow trees on their farm for their own convenience. Therefore, households who have alternative sources of cooking available in their houses may place less emphasis on growing their own firewood and collect these resources more in the forest.

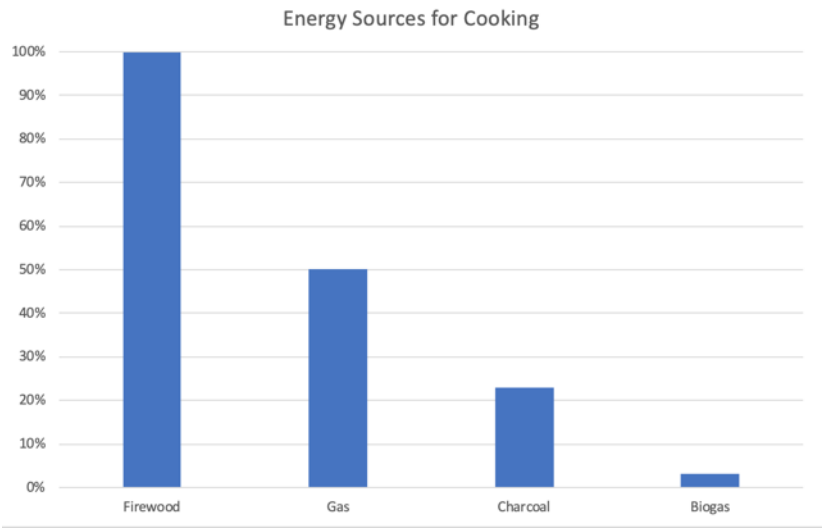

Figure 11 Energy Sources for Cooking (Q) (Source: Author's Own)

Social Capital

Trust and solidarity are especially important within the community (Ellis, 2000). It allows individuals to rely on each other and could impact the use and access to the forest. Trust enables a found security within the community that banned ongoing activities, such as timber logging, will not be brought to the forest guard as well. Respondents in the questionnaire were asked how much they trust their community, where 78% stated that the trust within the community was very strong (Q). However, forest uses of those respondents who trusted their community more were indifferent to those who trusted the community less, with p-values of fodder and grass of 0.07 and firewood collection of 0.66. The p-value for fodder and grass is close to having significance, which could indicate that the trust slightly affects the community's tendency of bringing livestock to graze in the forest.

Human Capital

Education levels between the household head and other family members differed: while 10% of household heads had a diploma degree, none of other family members did. 27% of all household heads had completed secondary school and 40% had completed primary school, while this was only true for 20% and 30% of non-household heads (Q). The chi-test between household heads with higher education and general forest uses is almost significant with a value of 0.066. The value indicates that individuals who graduated secondary school or with a diploma were more likely to enter the forest less than those with lower education.

Average number of children per household was 4.3. More children in each household strengthens labor capacity, increasing human capital by helping family members with farming, which 83% of all respondents stated as their main occupation (Q). Having more children in a household could indicate less need to use and enter the forest, as more human labor on-farm can help support subsistence needs. However, having children to assist with farming activities did not affect the general use of the forest. With a p-value of 0.52; the dependency on forest resources remains the same regardless of the number of children in a household.

Financial Capital

73% of all respondents owned livestock, and the ones that did had an average of 1.1 cows, 3.9 chickens and 1.6 goats per household. Having livestock could indicate a household being better off, as livestock is a fungible asset that can be transferred into monetary value.

Moreover, 50% of respondents stated that they use gas as a complementary energy source for cooking to firewood (Q). Cooking with gas is more expensive than using firewood, as firewood can be collected for free from the forest. This could indicate that households who cook with gas are wealthier. However, regardless of economic income, the chi-tests showed no significance between all households that use firewood for cooking and financial income: *"even though we have a gas stove, we use firewood every day to cook our meals [...] my parents taught me how to cook with firewood"* (SSI-U, 15).

Livelihood Capitals Key Findings

No household's livelihood capital had a significant impact on the access or use of the Karima forest. Chi-tests showed that having Napier grass or growing trees as part of natural capital does not suggest that households enter the forest less for fodder and grass or firewood collection. Human capital had a small influence on forest use, as household heads with higher education tend to use the forest more. Households who cook with gas, part of households' physical capital, also indicated higher firewood collection activity in the forest. Opposingly to the Theory of Access and the sustainable livelihood framework, social and financial capital did not show any impact. As Angelsen et al. (2014) state, less wealthy households rely more on natural resources than wealthy ones. However, trust, as a social asset, amongst the community and owning livestock or gas stoves, as financial assets, did not have any influence on the use of the Karima forest.

3. External Influences

Various external factors influence the access and use of the Karima forest, where the most prominent ones are described in the following section, as shown in figure 12.

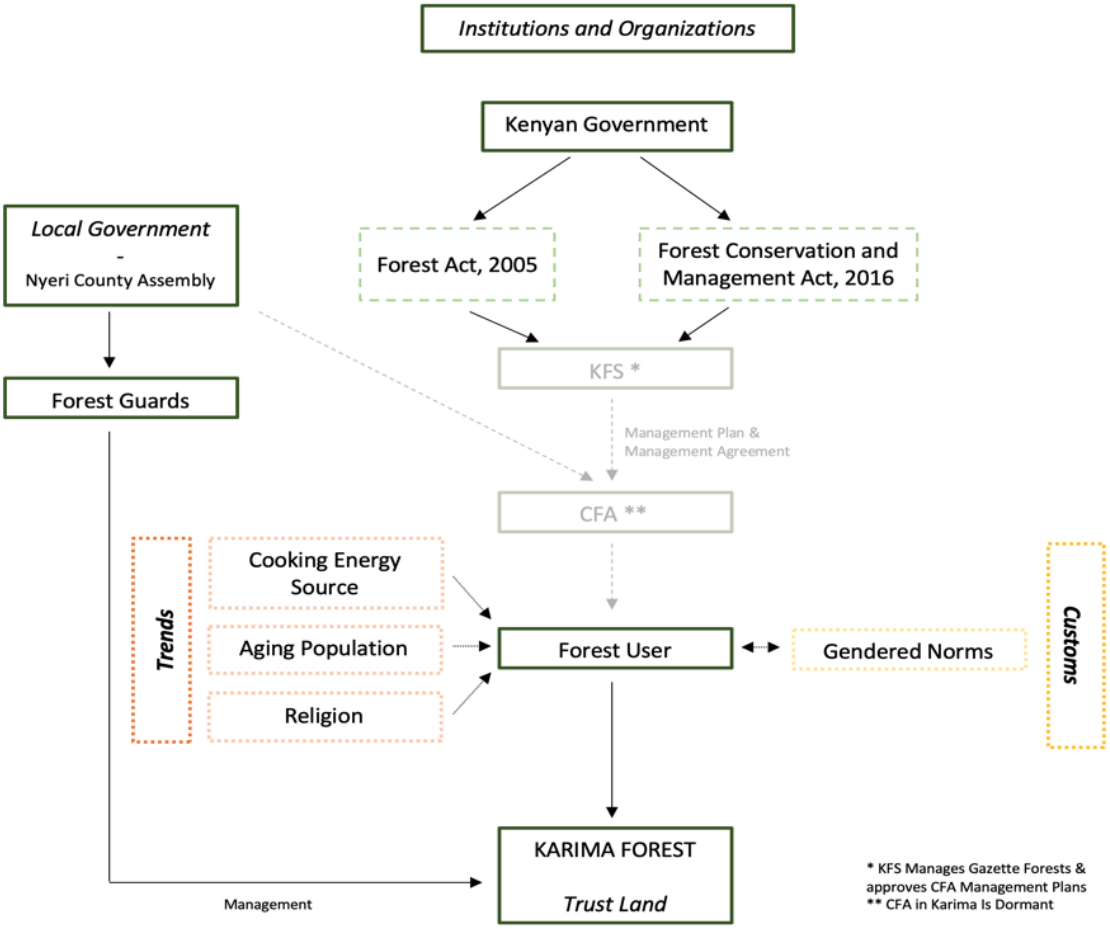

Figure 12 External Influences of Forest Users in Karima Forest

3.1 Institutions and Organizations

The Karima forest is categorized as trust land and managed by the Nyeri County Assembly (NCA) under the local Government Act, Cap 265, section 155 since 2011 (SSI-KI, 3). They implement national policies and offer extension services to communities, to facilitate them in sustainably using and conserving the forest. The Othaya District Commissioner appointed a forest guard who was trained as a paramilitary before being employed by the NCA since 2013. The guard controls all ten trust land forests in Nyeri County, whereby Tumutumu and Karima forest are prioritized respectively due to size and importance of the forest resources for the

community (SSI-KI, 6). These two trust land forests lie approximately 30 kilometers apart. The forest guard patrols the Karima forest two to three times a week, in order to protect the natural resources to ensure the Forest Act and KFS regulations are followed (SSI-KI, 3). He is empowered to distribute fines and imprison users who do not obey his understanding of forest rules, presented subsequently in this section. According to the NCA forester, "*Karima Hill is not given high priority. Nyeri has a high forest cover of 36%, which is above the national average. [...] The community is given the responsibility of managing and conserving the forest. The community informs the County Government in the case of illegal activities. [...] They are recorded in the incident reports*" (SSI-KI, 3). The forester relies on the community and the forest guard to conserve the forest. He notes any illegal activities conducted in the forest reported by the community in the County Assembly log book. However, most often the community reports incidents such as grazing and collecting firewood from the ground, which are not illegal and therefore the forester does not intervene in the conservation of the forest. Currently, the forester is mapping the Karima forest to value all resources and services to apply for funding to better conserve the forest and enable future CFAs to be successful (SSI-KI, 3).

On a national level, the most prominent forest related rules are stated in the Forest Act, 2005 and Forest Conservation and Management Act, 2016. The Kenyan Government introduced a national timber ban monitored by the KFS and punishable by law in 2011. According to interviewees, the forest guard occasionally approves logging through a permit in case of death within the family (SSI-U), assumptions that were dismissed by the forest guard personally during an interview: *"...no permits are issued today [for logging] due to the timber ban"* (SSI-KI, 6). Within the Forest Act and Forest Conservation and Management Act, the Government also recognizes the importance of deepening community participation in forest conservation and their customary user rights, which are to be conveyed by the KFS.

The KFS focus on national forests and therefore has limited impact on access and user rights of the Karima forest, unless a CFA were to be operationalized. An active CFA would enable the forest users within a five-kilometer radius to influence the access and use of the forest by negotiating their rights with the NCA written in a mandatory management plan and agreement (Forest Conservation and Management Act, 2016). Two main functions of the KFS include preparing management plans for forests on trust land in consultation with the County Assembly upon request and assisting County Assemblies with building capacity for forestry development on trust lands (KFS, 2020). As the NCAs forester stated that they have not yet established their

own county forest regulations for their trust lands and therefore, rely on the KFS for technical assistance and knowledge for conservation (SSI-KI, 3). The KFS would play an important role in assisting the NCA to establish future CFAs with the local community around Karima forest. This was demonstrated in 2009 when the KFS drafted a management plan for the Karima CFA (SSI-KI, 5). The KFS, having greater access to knowledge and information, is in the position to control the access of the forest and unfairly benefit from the forest. This was reported by a key informant, who stated that the interest of the community in the CFA management plan "*was being changed [...] by the KFS officer [...] to allow logging [by the KFS], contrary to the interest of the community*" (SSI-KI, 4). The dispute between the logging rights of the forest and the benefit sharing thereof resulted in the management agreement never being signed, hence leaving the CFA in Karima dormant. Rules for the uses of the forests were never established, nor were forest user groups with the corresponding permit scheme to regulate the natural resource extraction and conserve the forest (SSI-KI, 5). Only 33% of the respondents are currently aware of the CFA (Q) and 5% were going to be members of the association in 2009 (Q). Despite not having clear forest user rights to manage the harvesting of forest resources, the majority of respondents (84%) are satisfied with the management of the forest, with 53% believing there is no gender difference regarding the management of the forest (Q).

The Karima forest has a strong cultural value to the households living adjacent and is known as the sacred forest, due to its sacred *Ficus s.* trees being the second largest Kikuyu shrine (SSI-KI, 4). The importance of the forest was shown by the community, when they collectively protested against large logging harvest and with positive response, conserved the forest (SSI-KI, 4). Elders of the community wrote the book *The Footprints of the Sacred Hill* for younger generations to learn about the forest. An example of feelings expressed regarding the importance of the forest "*I really understand that I had caring ancestors when I see beautiful rivers flowing; standing forests growing ever more dense [...] a gift of inheritance periodically handed down to a new generation [...] when we destroy sacred forests we destroy the houses of grandparents of uncountable species*" (Wa Thuku, n.d.: 4, 6). The community is aware of the history of the forest and believe it is their right and belongs to their traditions to use the forest, despite the official management rights being in control of the NCA (SSI-U). As stated in the management plan, the forest is held in high esteem due to its traditional, environmental and socio-economic importance (CFA MP, 2009). Karima is an important source of livelihood resources, especially firewood as their main source of energy for cooking and therefore the communities continue to use the forest for subsistence. The community claimed user rights

towards water, timber for construction material, fodder, honey, medicinal herbs and wildlings, as they felt entitled to these in 2009 (ibid). Within households, gendered norms also exist. Women are in charge of house chores such as cooking and collecting subsistence household products (Q). According to a respondent *"collecting firewood is the duty of the women [...] and hunting and grazing are duties of the men"* (FG-F). Men predominantly extract products for economic purposes, including logging to construct houses and fences. Entry to the shrines is strictly prohibited for women due to cultural beliefs (FG-M).

In conclusion, as the CFA is currently dormant and the NCA has not established a list of user rights (SSI-KI, 3), it is not possible to state legal and illegal access and uses of the forest. They differ amongst the institutions the stakeholders refer to, causing legal pluralism (table 2). For example, the previous CFA chairman states "*all activities within the forest require the approval of the CFA and the Town Council*" (SSI-KI, 5). The retired KFS head in Karima mentioned only logging and firewood collection as prohibited (SSI-KI, 2) compared to his successor who stated in addition to these, grazing is illegal (SSI-KI 1). The forest guard ensures forest access only to communities residing in the four adjacent villages, as others are restricted access (SSI-KI, 6). Besides trespassing, the forest guard categorizes timber logging, honey harvesting, hunting or grazing as illegal activities (ibid.). This results in forest user rules not being harmonized. In addition, community members receive information from various sources. The forest guard stated that there is an informal knowledge transfer system within the community, where most information is passed on from generation to generation or between community members (SSI-KI, 6). The most mentioned source of information was the forest guard (44%), the chief (20%), the county assembly (8%) and the church (8%). 12% of the interviewees said they had never been informed about the restrictions (SSI-U).

Table 2 Allowed and banned forest uses according to key informants (SSI-KI)

Forest Uses	**Forest Guard**	**Nyeri County Assembly Forester**	**Retired KFS Head**	**Current KFS Head**	**CFA 2009 Chairman**
Timber Logging	Banned	Banned	Banned	Banned	*Entering Forest (incl. All Uses) Without Permit Is Banned*
Firewood Collection (Fresh Cut)		Banned	Banned	Banned	
Firewood Collection (Dead Branches)					
Honey Harvesting	Banned	Banned			
Hunting	Banned				
Livestock Grazing	Banned			Banned	
Fishing					
Harvesting Medicinal Herbs					
Collecting Fodder and Grass					
Harvesting Food					
Planting Trees					
Spiritual/Cultural Purposes (Shrines for Men Only)					
Social Activities (e.g. hiking, picnic, educational purposes)					

3.2 Trends

A prominent demographic trend in Othaya is the ageing population, which could affect the community's physical ability to access the forest. Significant part of the population surrounding the forest consists of individuals over 50 years of age (Q, SSI-U). One reason for the ageing population is the migration of younger individuals to larger cities that offer better career opportunities (SSI-KI, 8). The forest lies approximately 2000 meters above sea level with a steep incline in order to access (CFA MP, 2009). Only one main road runs through the forest that is physically blocked with a gate. The parts of the forest with a lacking infrastructure are especially challenging for older people, often with less physical capacity to access the forest resources (SSI-KI, 7).

Health risks of cooking exclusively with firewood are widely known and frequently addressed in the development sector (Silwal & McKay 2015). The global trend of moving towards alternative energy sources might have an effect on the uses of the forest. Other global trends include the shift from traditional medicinal plants towards western medicine. The use of traditional medicine has decreased and has been replaced by modern methods and pharmacies (O).

As of today, 83% of Kenyans are Christians (CIA World Factbook, 2019). The majority of community members in Othaya visited churches weekly and Christianity was present in the everyday lives (O). The forest's function as a spiritual place has decreased over the last years, with no respondent entering the forest for spiritual reasons compared to 18% the past (Q). The decline in spiritual uses of the forest can be explained by the shift from indigenous traditions to Christianity, starting during the colonial times (Maupeu, 2008). The rising popularity of Christianty has caused the traditional sacred places to become less significant for the community over the past decades (SSI-KI, 8). As an elder in Karima stated, "*We were taught and brainwashed that our ancestral ways of worship were archaic and savage. Christianity erected thick walls between the unborn, the living and the living dead ancestors [...] I can now see the dangers of disconnecting myself from my ancestors. In my prayers and spirituality, I was distanced from them.*" (Wa Thuku, n.d.: 9). A local environmental activist expects an increase in the use of spiritual sites, due their history and embedded traditions. He stated during the interview that *"The forest is still being used for spiritual and cultural reasons"* (SSI-KI, 4).

4. Outcomes

4.1 Livelihood Outcomes

As a result of the restrictions to the forest, households are foremost suffering from negative financial and natural livelihood consequences. 21% of the respondents expressed a growing need to purchase more firewood from neighbors and shops in the village due to the timber ban (SSI-U). As the restrictions to the forest are perceived as evermore prominent with 28% stating that they use the forest less due to the restrictions, the forest is no longer a source of firewood for many women (SSI-U). A p-value of 0.02 was found between age and decreasing collection of firewood due to restrictions, which shows that older respondents were less prone to use the forest. Finding alternatives to sources of firewood and other services that the forest brings were therefore the case for more than half of the respondents. In order to cater to the scarcity of free firewood without facing penalties, all households grow their own trees as mentioned previously: these are not only grown for firewood purposes to complement forest use, but among other reasons were timber for construction (60%), ornamentals (53%), fruits/nuts (87%) and weather purposes (47%, Q). The timber ban has caused high numbers of respondents to grow their own trees (90%) to replace the construction material and freshly cut firewood they previously collected from the forest (Q). Trees grown on private land aim to replace or contribute to the firewood collected from forests for cooking purposes. However, this occupies land which could be alternatively used to grow crops for their household subsistence. Therefore, if households felt less restricted to collecting firewood from the forest, households would grow less trees and instead produce more food.

The forest serves the households with many different products and ecosystem services. Prior to the establishment of the CFA, the forest uses were many more, especially in terms of spiritual purposes (18%), hunting (18%) and honey harvesting (14%), all of whom were found close to non-existent today (Q). These uses that once were part of the management plan have dissolved since with the employment of the forest guard in 2011, who gained high respect in the community (SSI-U, Q) and prompted the community to follow his established rules. Hence, the legal pluralism followed by the community's confusion of allowed uses of the forest could have had negative impacts on livelihood diversification of assets, in terms of limited grazing, limited collection of medicinal plants and food, and limited opportunities to have beehives in the forest. As a result of the forest restrictions, income or subsistence use of these products could have forced villagers to find these products elsewhere, putting strains to their livelihoods. Moreover,

respondents reported that forest animals eat much of their crops on their land, causing trouble for some households. These were reportedly one of the few negative factors the forest brought to the community.

4.2 Environmental Outcomes

Access and use restriction measures have overall positively improved the forest cover since 2011. As mentioned, the general community is aware of the timber ban and cutting of fresh branches for the use of firewood. The high respect for the forest guard and his efforts to patrol the forest could have limited the harvesting and removal of forest products. Thus, 63% of respondents perceived an increase in the number of trees, 10% noticed no change and 10% were not able to give a perception (Q). In relation to an increase in wildlife in the forest since the timber ban, 40% noticed an increase, 27% did not know and 17% stating no change (Q).

Figures 13 and 14 confirm the increase in forest cover from 2012 to 2019. Many areas within the forest in 2012 were clear cut, leaving the soil bare. Majority of trees felled were exotic trees, which were planted alongside the main road and in areas with little incline to enable easy extraction of timber. The areas that maintained forest cover in 2012 belong to the four sacred and indigenous sites in the forest with large fig trees. Areas on the perimeter of the forest and adjacent to houses had little grass and shrubs, presumably due to the grazing, and grass and fodder collection for their livestock. Figure 15 shows the areas, where tree cover has increased (blue), and grass and undergrowth accumulated (yellow) in 2019.

Figure 13 Karima Forest in 2012 (Source: Google Earth)

Figure 14 Karima Forest in 2019 (Source: Google Earth)

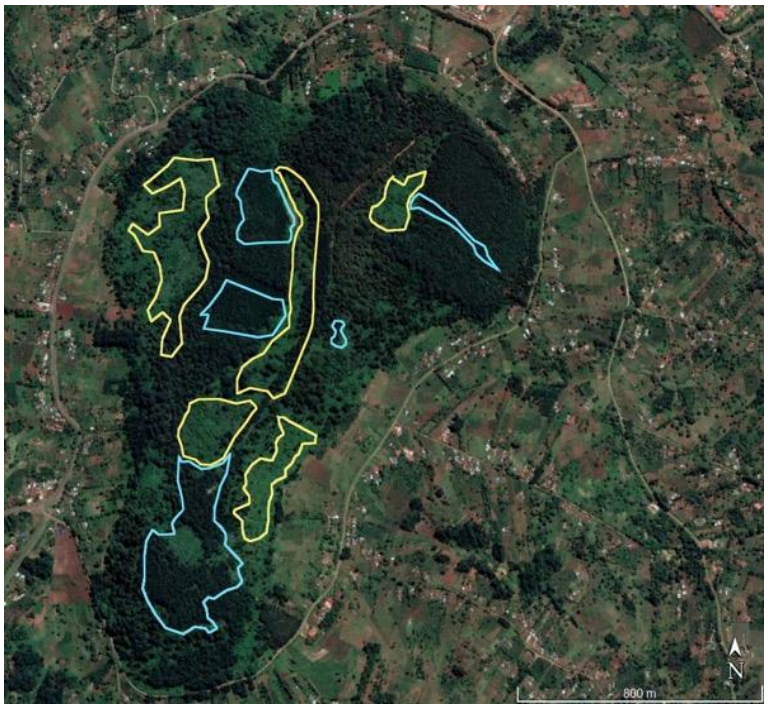

Figure 15 Karima Forest Cover Status (Yellow: grass and undergrowth; Blue: tree regrowth) (Source: Adapted from Google Earth)

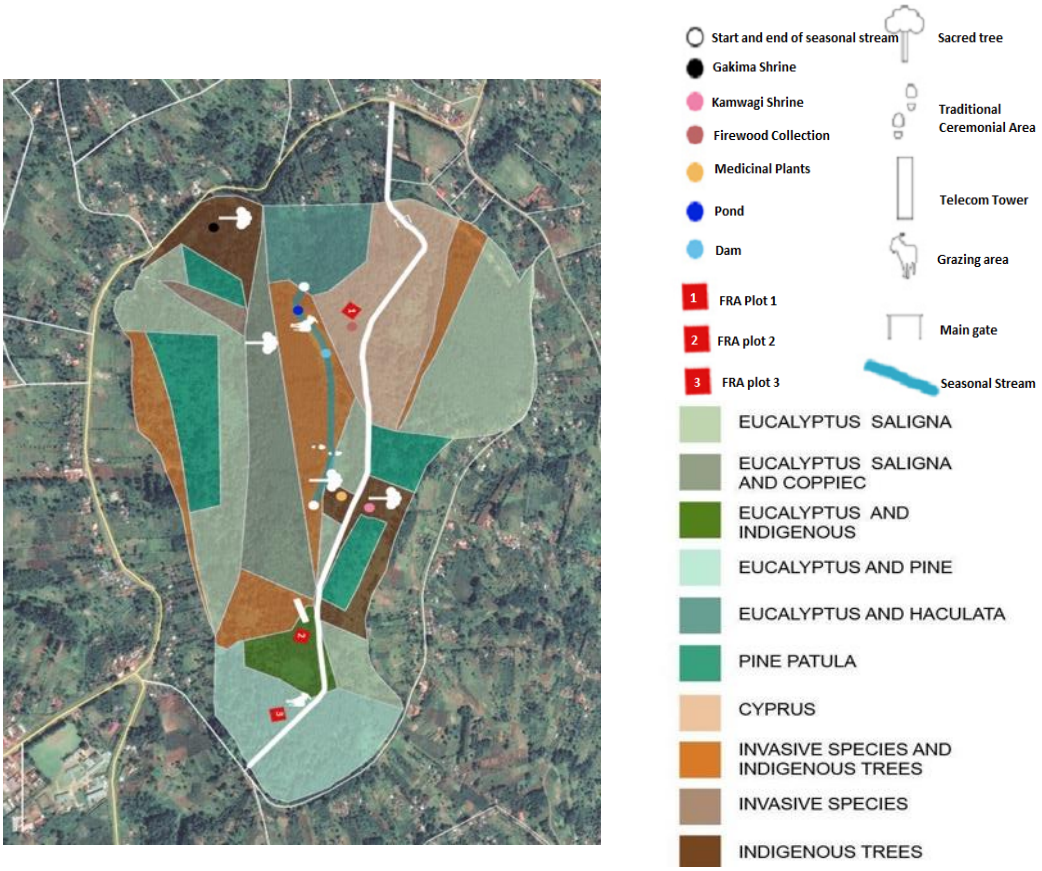

Figure 16 Map of Karima Forest including tree species, landmarks and main forest user sites recorded with GPS during Transect Walks (Source: Authors Adaptation of Atchadé et. al., 2004: 36)

The findings from the satellite images were confirmed by an on-site forest resource assessment using three plots. These plots were chosen in areas of the forest where noticeable logging continued to take place as well as harvesting of fresh cut branches (figure 16). As seen in figure 15, the plots were located in highly logged or clear-cut areas in 2012.

The forest resource assessment results (table 3) demonstrated a high forest density. The total number of standing trees are, to date, noticeably more than the number of stumps remaining. Plot 1 with cypress trees had the highest number of logged trees, with 73% of trees being logged, however only 11% of these were classified as newly logged trees. No branches were cut in this plot. Plot 2 and Plot 3 had 31% and 33% of total logged trees, and 21% and 24% newly logged trees, respectively. Plot 2 had 110 cut branches, and 50 cut branches on Plot 3. The number of newly logged trees in each plot, however, still indicate that illegal activities continue to occur despite the timber ban and forest guard in place.

Table 3 Forest Research Assessment Plots (FRA) (Source: Author's Own)

	Plot 1	Plot 2	Plot 3
Total Trees	339	306	184
Total Logged Trees	249	101	65
Logged Trees (%)	73%	33%	35%
Total Newly Logged Trees	38	67	45
Newly Logged Trees (%)	11%	22%	24%
Total Cut Branches	0	110	50

Discussion

1. Main Findings

Various factors, including urbanization, an aging population in Othaya and the current forest regulations, have arguably resulted in a general reduction in access and use of the Karima forest. The forest is still mainly used to support the rural livelihoods in day-to-day activities, such as collection of firewood, fodder and construction material. Recreational use was one of the less common purposes for entering the forest, rejecting the hypothesis (1), which suggested a shift from livelihood activities to recreationally use took place.

The dormant CFA resulted in no forest user rights being established. Conflicting rules and norms about access and use restrictions caused by legal pluralism by various institutions (e.g. KFS, NCA, Forest Guard) have resulted in general confusion amongst community members. As a result, the hypothesis (2) is supported by these findings. The Karima forest is less used compared to before the employment of the forest guard, who enforces his forest user rules during his weekly forest patrols.

When looking at the access and entering of the forest, there is no significant difference between genders, with the exception of the sacred site only being approachable by men. The cultural and intra household dynamics restricting more access for women than men are confirmed in hypothesis (3).

Women are more involved in taking care of household activities and raising their children. These activities are reflected in the forest resources they use, which include collecting food and firewood to cook for their household. Hypothesis (4) stating that women rely more on forest resources for subsistence is thus applicable to the findings. Men, on the other hand, are involved with assets having higher economical values such as livestock and construction materials. They use the forest accordingly to gather fodder and grass, and timber. Despite the difference in use, both genders place equally high value on the forest for rain catchment and firewood collection, rejecting the assumption (4) that women place greater value on products and services.

The forest cover in Karima has increased since the introduction of the national timber ban and the enforcement of a forest guard, who are appointed by the NCA. With the currently dormant

CFA, the management of the Karima forest resides with the County. Therefore, limited traditional knowledge is currently used to conserve the forest and no gender difference amongst the community members can be seen regarding forest conservation activities, rejecting the hypothesis (5), which assumes women use the forest more sustainably through their traditional and indigenous knowledge compared to men. The forest resource assessment showed evidence of freshly cut trees, an activity which has been associated with men. Comparing the forest uses between genders, it can be stated that women use the forest more sustainably, as they only collect firewood and food for subsistence use, which have less impact on the environment.

2. Literature Comparison

Legal pluralism is often formed through fixed perceptions of customary law, which disregards community's adaptation to changing external environments and their constantly changing needs and values as a result (Albano et al., 2015). The change of forest uses in the Karima forest over time have been poorly captured by the current legislations of forest use. Efforts in recognizing pluralism of forest values is important to help empower forest communities' livelihoods and prevent deforestation (ibid). Marginalized people, such as women, old and the poor, could suffer more from negative livelihood impacts due to these restrictions, as they categorize as the group that depends the most on forest resources (Agarwal, 2001). Urbanization and an aging population have contributed to a reduced reliance on the forest and thus the access of the Karima forest was only weakly influenced by gender, compared to other studies. Sunderland et al. (2014), for example, identifies women's role in intra-households as the core factor that prevent women from accessing specific forest resources and different forest technologies.

In terms of forest resource use, the results show a gender difference caused by intra household dynamics. Male activities in the Karima forest are similar to those found by Sunderland et al. (2014), where men generally take part in economic generating activities such as hunting, collecting fodder for livestock and (currently less) collecting timber and construction materials. Some respondents reported that men continue to generate some economic benefit from timber harvesting and sales in various black markets. In contrast, women mainly collect forest products for subsistence use; including firewood, food and medicinal plants (Ingram et al., 2014), which is in agreement to what this research found out. Studies by Adedayo et al. (2010) and Ingram et al. (2014) show that men are more involved with cash generation from the forest products than

women. Hopkins et al. (1994) argue that women delegate more resources to food and healthcare when having greater responsibility in household finances. Consequently, women's primary use of the forest in collection of firewood could decline, if they invest in healthier alternatives of cooking sources as an energy source substitute (Hopkins et al., 1994). The shift towards alternative energy sources for cooking around Othaya is already visible, which could indicate that women have gained more power in household decision-making.

Gender roles in conservation management and inclusion of women in the Karima CFA are not able to be assessed due to the inactive association. However, some scholars argue that involvement of women in governance leads to improved conservation outcomes (Agarwal, 2010) and therefore is suggested to take the gendered roles into consideration when establishing future CFAs and management plans. Agarwal (2001) states it is important to acknowledge women's traditional forest conservation knowledge for improved sustainable forest use (e.g. tree planting) and harvesting forest products they collect daily (e.g. firewood), when negotiating forest user rights within a CFA. Harris-Fry and Grijalva-Eternod (2016) also state that PFM's often fail to consider the gendered costs and benefits of participatory governance groups, as found to be the case in Karima forest due to the CFA management plan in 2009 not specifying gender roles and benefits. These measures of gender inclusivity in management plans would enable forest users to practice more sustainable practices in the Karima forest as women are more knowledgeable about the regeneration rate of the resources they harvest. Including women into PFMs would also allow gender inequities in benefit sharing to be addressed (Agarwal, 2001), which can improve household livelihood, as mentioned above. However, social customs such as men's dominance in decision-making roles are to be taken into consideration when establishing such groups to ensure women feel confident and willing to join (ibid). Additionally, women's role in the household with childcare, housework and gardening should be acknowledged when planning meetings, as their active participation could be restricted through these duties (ibid.). If women are involved in the executive committee of such PFMs, they are seen to be more likely to follow the rules and use the forest more sustainably as well as ensure other village women do the same (Agarwal, 2009). Conservation ethics are passed down from women to their children (ibid.), similarly to the forest user rights and practices being shared amongst the community in the Karima forest.

3. Reflection on Methods

The authors have similar social science backgrounds, which is reflected in the choice of data collection methods. More diversity in academic background could have strengthened the interdisciplinary approach to this study. The questionnaires were the main method for getting statistically comparable data about the community. However, it falls short in capturing in-depth responses due to the majority of close-ended questions where multiple-choice answers were provided. Hence, semi-structured interviews were used to obtain a better understanding of the access and use of the forest. More in-depth questions about the topics from the questionnaire were utilized to complement the results, which had not been captured through the questionnaires.

Additionally, the authors are from European countries with little research experience in Sub-Saharan Africa, causing cultural bias to a certain degree. Westernized approaches to gender roles could have affected the formation of interview questions and portraying of results. The hypothesis of gender differences demonstrated the eagerness towards finding distinct gender roles, where the majority were rejected. Another issue related to the students' role as visitors in the area could have been some of the sensitive topics of the research. When asked about, for instance, the illegal use of the forest, it must be taken into account that the respondents might have not told the complete truth about their own uses of the forest. Cultural differences, which could have additionally created a barrier between the authors and local community were minimized through the collaboration with two Kenyan students from the University of Nairobi. As the Kenyan students are acquainted with the local customs and spoke the local language, they were often able to relate to the interviewees and therefore gather more information. Since the Kenyan students had different cultural and academic backgrounds compared to the students from the University of Copenhagen, the time spent together resulted in fruitful discussions and positive learning experiences. The students work full time, attending evening classes in Nairobi. They therefore have gathered a significant amount of experience in regard to governance and the environmental sector, enriching the research experiences. Lots of insights regarding the forest law and the formations and success stories of CFAs in Kenya provided a solid foundation for this research to successfully reach the intended objectives. It showed the potential of these participatory management groups sparking an interest in understanding the cause of failure in the Karima and gathering relevant gender information, which could be integrated into future CFAs.

The language barrier was a dominant challenge in the data collection. As the community and the majority of key informants speak Kikuyu, the questions were translated from English by local guides. Certain terminologies in English could have been translated differently, thus affecting the understanding of the question and responses of the interviewees. These issues were noted once analyzing the results, as the answers occasionally did not match answers to other questions. In some questions, for instance, the respondents answered “yes” to a question whether men and women use the forest in the same ways. However, when leading through specific uses of the forest, gender differences were mentioned.

With gender differences limited to sacred sites discovered in the access to the forest due to the general lack of current use of the forest, one could argue that the study could have shifted from the gender focus. The research could instead discourse the lack of access and use of the forest and how this affects the community and its livelihoods. The low statistical significance using chi-tests are likely to have been predominantly caused by the limited sample size. Several chi-tests had p-values close to significance, where the low data sample most likely gave somewhat skewed results. The sample size of 30 for questionnaire and 30 for semi-structured interviews were chosen due to the ability of them being able to represent the community given the limited data collection period. Additionally, the respondents living adjacent to the forest were predominantly older women, who were physically unable to access the forest. A higher sample of respondents would provide a more accurate and more representative data of the households’ relationship to the access and use of the forest. Nevertheless, the knowledge gap in the gendered differences in use and conservation in the Karima forest was filled to a certain extent. More extensive research on a larger data sample in the area that represents gender and age in all categories is required to fully fill the knowledge gap. The analytical framework developed in this study that combines the Livelihood framework (Ellis, 2000) and the Theory of Access (Ribot and Peluso, 2003) is meant to benefit other scholars who wish to apply both frameworks to its research.

Conclusion

Access to the forest was perceived as restricted for some, indifferent to gender. Legal pluralism was found throughout different stakeholders' interpretations of forest user rights. Discrepancy of rules concerning legal and illegal uses of the forest among organizations reflected the response by the community, who were seemingly as much in disagreement. Legal pluralism causes uncertainty in the community as well as long-term instability and unsustainable uses resulting from lacking effective management. Transparent communication of legal and illegal uses is required to clear uncertainties of user rights.

Results showing differing gendered uses of forest products confirm the varying gender responsibilities in Othaya. Awareness of gender differences in forest uses can be linked to intra-household gender roles. Gendered perspectives of forest uses have lacked acknowledgement in policymaking and in the management plan. Inclusion of the different gender forest activities into the future re-establishment of the CFA are of particular importance to improve the livelihoods and promote increasing sustainable uses of the forest. Further research is needed to fill the gap of potential management systems tailored to forest user rights in the Karima forest.

Employment of a forest guard and enforcement of the national timber ban have improved the overall conservation of the forest. The prominent conservation roles are male dominated. Larger representatives of women in decision-making roles in i.e. the CFA could allow for more recognition of their efforts in forest conservation. Passing of traditional practices and knowledge of indigenous trees are important for Karima's forest conservation, as well as to serve and strengthen the important Kikuyu cultural legacy and future.

Introducing a permit scheme system into a future CFA management plan could clarify the existing legal pluralism by clearly communicating the legal and illegal forest user rights. Permit schemes could regulate forest use and reduce those of illegal nature that harm the conservation. However, the permit scheme could exclude marginalized groups, including women and the poor, who however rely on forest products the most to meet daily needs, e.g. firewood for cooking. Lower income households do not own sufficient natural capital to support themselves, where permit schemes could negatively impact their livelihoods. In order to avoid this, these marginalized groups are to be appropriately included in any participatory management system.

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Appendixes

1. Applied Methods

Methods	**Quantity**
Questionnaire	30
Semi-Structured Interviews with Forest Users	30
Semi-Structured Interviews with Key Informants	1. KFS Head Nyeri County 2. Retired KFS Head Nyeri County 3. Nyeri County Government Forester 4. Forest Activist 5. CFA Chairman 2009 6. Forest Guard 7. Village Elder and Member of Green Belt Movement 8. Group interview with Assistant Chief of Thuti Sublocation, Forest Guard and Village Elder
Focus Groups	2
Transect Walks	2
Community Mapping	3
Forest Resource Assessment	3 Plots

2. Questionnaire Template

Introduction
The purpose of this study is to investigate the (in)formal access and use of the Karima forest over the past 10 years and understand the effects on the conservation of the area. Our target group for this study is limited to households living adjacent (within one kilometers) to the Karima forest. Each interviewee has been randomly elected as part of these criteria.

Questions will start with asking for background personal information to have a better idea of the respondent. The questions will then move on to understand the accessibility, (in)formal uses of the forest, and how these products are being used for each participant.

This questionnaire will allow the voices of the community forest users to be heard and understood. It will allow others to understand the use and importance of the forest. Additionally, it will give the interviewee the ability to reflect on their uses in relations to conservation efforts. The interviewee has the right to interrupt if he/she does not feel comfortable answering the questions and can stop the interview at any time. The interviewees will be recorded anonymously and thus will not be exposed when the data is collected and presented.

Time required for answering the questions should be maximal **30 minutes**, where a student reporter will capture the data mentioned. An unofficial group presentation on Tuesday, 10th March will be held for any interested parties of the research study. Here, feedback and questions can be addressed to the student group.

> This questionnaire is part of our *Interdisciplinary Land Use and Natural Resource Management* fieldwork

in Kenya as part of a collaboration between *University of Copenhagen* and *University of Nairobi*. We are a group of six students: Helen, Julia, Oscar, Sisko, Beatrice and David that study at the University of Copenhagen and the University of Nairobi, in the master programmes *Environmental and Development*, *Human Geography and Environmental Governance*.

1 Background Information	**Please Mark X or write the answer here**
1. Name	
2. Phone number	
3. Gender	Male ___ Female___
4. Age	a) Under 20 ___ b) 20-30 ___ c) 31-40 ___ d) 41-50 ___ e) 50 and above ___
5. Name of village	

6. Head of the household	Yes ___ No ___
7. Marital status	a) Single ___ b) Married ___ c) In a relationship ___ d) Widowed ___ e) Divorced ___
8. Number of children in the household	
9. Average age of other persons in the household	Under 20 | 20 – 30 | 31 - 40 | 41 - 50 | 50 and above |
10. Education level of the interviewee (when not the household head)	a) Graduate___ b) Diploma/Certificate ___ c) Secondary school ___ d) Primary school ___ e) Not completed primary ___ f) Never gone to school ___ g) Other ___
11. Education level of the household head	a) Graduate___ b) Diploma/Certificate___ c) Secondary school___ d) Primary school___ e) Not completed primary___ f) Never gone to school___ g) Other___
12. Main Occupation	a) Student___ b) Farm___ c) Self Employed___ d) Employed e) Retired___ f) Other___

2 Household characteristics	**Please Mark X or write the answer here**
1. How long have you lived in the village around Karima Hill?	a) More than 13 years ___ b) Less than 13 years ___

2. How long is the walking distance to the forest (in min)?	
3. How long is the walking distance to the market (in min)?	
4. Do you own any land in Othaya Sub-county?	Yes ___ No____
4b. If yes, please indicate how much in hectares.	
5. Do you own any livestock?	Yes ___ No ___
5b. If yes, please indicate how much of each	a) Cows___ b) Chicken___ c) Goat___ d) Other___
6. Do you grow trees?	Yes ___ No ___
6b. If yes, what are the trees used for?	a) Firewood ___ b) Timber___ c) Ornamental ___ d) Fruit / Nuts ___ e) Weather ___ f) Other ___
7. Do you grow fodder?	Yes ___ No ___
7b. Are they adequate for your livestock all year around?	Yes ___ No ___
8. What energy source do you use for cooking?	a) Firewood ___ b) Gas ___ c) Biogas ___ d) Charcoal ___ e) Electricity ___ f) Other ___
8b. If you use firewood, where do you get your firewood from?	a) Forest ___ b) Own farm ___ c) Purchased ___ d) Other ___

3 Community Forest Association (CFA)	**Please Mark X or write the answer here**
1. Do you know what the Community Forest Association is?	Yes ___ No ___
1b. Are you familiar with the CFA introduced in 2007?	Yes ___ No ___

2. Are you a member of the CFA?	Yes ___ No ___
2b. If you are not a member, please indicate why? *(skip 2c – 2i)*	a) Never heard of ___ b) Was not of age ___ c) Do not see benefit ___ d) Too busy e) Not close with my community ___ f) Do not use the forest ___ g) I live too far from the forest ___ h) Other ___
2c. If you are a member, when did you join the CFA?	
2d. If you are a member, what is your role in the CFA?	
2e. What are the benefits of being in the CFA?	a) Use of the forest ___ b) Training on forest use___ c) Participation in conservation ___ d) To be able to make decisions on conservation of the forest ___ e) Other ____
2f. Do you attend CFA meetings?	Yes ___ No ___
2g. If yes, how frequently do you attend CFA meetings?	a) Monthly ___ b) Quarterly ___ c) Yearly ___
2h. When was the last time you attended a meeting?	
2i. When did you last carry out elections for the CFA leadership?	a) 2015 ___ b) 2016 ___ c) 2017 ___ d) 2018 ___ e) 2019 ___
2j. How frequently did you receive progress reports on the implementation of the forest management plan?	a) Monthly ___ b) Quarterly ___ c) Yearly ___ d) Never received one____
3. What funding does the CFA receive?	a) External funding ___ b) Member contribution ___ c) Membership fees ___ d) Government ___

	e) Other ___ f) Do not know ___
4. What are the activities of the CFA?	a) Tree planting ___ b) Forest protection ___ c) Control access ___ d) Conservation awareness ___ e) Training of forest users ___ f) Others ___ g) Do not know ___
5. Do you think the CFA is successful?	1. Not successful ___ 2. A bit successful ___ 3. Neutral ___ 4. Successful ___ 5. Very successful ___
5b. Could you briefly explain why?	
6. On a scale from 1 to 5, please estimate how well the CFA is connected with the community?	1. Not connected ___ 2. Little connection ___ 3. Neutral ___ 4. Connected ___ 5. Very connected ___
7. Do you know the Karima Hill forest guards?	Yes ___ No ___
7b. Do you trust the Karima Hill forest guards?	Yes ___ No ___
7c. If no, please briefly explain why.	
8. Are you part of other government groups or governmental organizations?	Yes ___ No ___
8b. Please state which one(s).	

4 Karima Forest Use	**Please Mark X or write the answer here**
1. In the last week, how many times did you enter the	

forest?	
1b. Is this a common pattern?	Yes ___ No ___
1c. How often did you visit the forest in the past before the CFA?	a) Daily ___ b) Weekly ___ c) Monthly ___ d) Yearly ___ e) Never ___
2. What is your purpose for entering the forest?	For individual/household use: a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber logging ___ f) Honey Harvesting ___ g) Fish farming ___ h) Hunting ___ i) Tree planting ___ j) Spiritual purposes ___ k) Social activities (Hiking, picnics, gatherings etc.) ___ l) Cultural reasons ___ m) Other___
2b. What was your purpose for entering the forest before the establishment of the CFA?	For individual/household use: a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber logging ___ f) Honey Harvesting ___ g) Fish farming ___ h) Hunting ___ i) Tree planting ___ j) Spiritual purposes ___ k) Social activities (Hiking, picnics, gatherings etc.) ___ l) Cultural reasons ___ m) Other___
3. Do you sell products you collect from the forest?	Yes ___ No ___

3b. If yes, what kind of forest products did you sell?	a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber ___ f) Honey ___ g) Fish ___ h) Other___
3c. If yes, where do you sell the forest products?	a) Thuti market ___ b) Gatugi market ___ c) Kanayu market ___ d) Karima market ___ e) Othaya market ___ f) Other ___
3d. If yes, how much gross income did you earn from forest products per month in KSH?	a) 0-2000 ___ b) 2000-5000 ___ c) 5000 or above ____
3e. Did you derive economic income from the forest products before the establishment of the CFA?	Yes ___ No ___
3f. If yes, what kind of forest products did you sell?	a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber ___ f) Honey ___ g) Fish ___ h) Other___
3g. If yes, how much gross income did you earn from the forest products before the establishment of the CFA 13 years ago per month in KSH?	a) 0-2000 ___ b) 2000-5000 ___ c) 5000 or above ___
4. How important is the forest to you?	1. Not important ___ 2. Less important ___ 3. Neutral ___ 4. Important ___ 5. Highly important ___
4b. Please briefly explain the choice above.	
4c. How important was the forest to you before the	1. Not important ___

CFA?	2. Less important ___ 3. Neutral ___ 4. Important ___ 5. Highly important ___
4d. Please briefly explain the choice above.	
5. Do women and men use the forest for the same purposes?	Yes ___ No ___
5b. If no, please explain which activities are different for men and women:	a) Herbal Plants (women/men) b) Food (women/men) c) Fuelwood (women/men) d) Construction material (women/men) e) Fodder for animals (women/men) f) Water from stream (women/men) g) Spiritual purposes (women/men) h) Social activities (Hiking, picnics, gatherings etc.) (women/men) i) Cultural reasons (women/men) j) Other, what? ___ (women/men)

5 Karima Forest Access	**Please Mark X or write the answer here**
1. Are you restricted from using any of the following forest resources?	a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food gathering ___ d) Fuelwood ___ e) Timber logging ___ f) Honey Harvesting ___ g) Fish farming ___ h) Hunting ___ i) Tree planting ___ j) Spiritual purposes ___ k) Sacred Places ___ l) Social activities (Hiking, picnics, gatherings etc.) ___
1b. If yes, please indicate the reason(s)	a) Forest regulations (e.g. timber ban) ___ b) Social status ___ c) Gender ___ d) Lack of infrastructure ___ e) Other___

1c. If yes, please indicate who.	
1d. Was it easier to enter the forest before the establishment of the CFA in 2007?	Yes ___ No ___
1e. Why?	
2. On a scale from 1 to 5, please estimate how much you trust your community?	1. Not connected ___ 2. Little connection ___ 3. Neutral ___ 4. Connected ___ 5. Very connected ___
3. Is the access to the forest the same for men and women?	Yes ___ No ___
3b. If no, what causes the difference:	a) Forest regulations ___ b) Economic restrictions ___ c) Social status ___ d) Gender role ___ e) Cultural reasons ___ f) Other___

6 Forest Conservation	**Please Mark X or write the answer here**
1. Who is responsible for the management of the forest?	a) CFA ___ b) County Government ___ c) KFS ___ d) Police ___ e) Other ___
2. Are you satisfied with the management of the forest at the moment?	1. Not satisfied ___ 2. A bit satisfied ___ 3. Neutral ___ 4. Satisfied ___ 5. Very satisfied ___
2b. If you are not satisfied (option 1 or 2) could you briefly	

explain why?	
2c. Do you know who to contact in a case of illegal activities in the forest?	a) CFA ___ b) County Government ___ c) KFS ___ d) Police ___ e) Other ___
2d. If you do know, how do you contact them?	
3. Has the number of trees in the forest changed over the last 13 years?	a) Increased ___ b) Decreased ___ c) No change ___ d) Do not know ___
4. Has the number of wild animals in the forest changed over the last 13 years?	a) Increased ___ b) Decreased ___ c) No change ___ d) Do not know ___
5. Do you know any indigenous knowledge that is used in the conservation of forest?	Yes ___ No ___
5b. If yes, please briefly explain which knowledge.	
6. Who in the community is more involved in taking care of the forest?	a) No difference ___ b) Men ___ c) Women ___ d) Do not know ___

3.SSI-U Template

3.1 Use of the Karima Forest

1. How do you use the forest?
2. How does your community use the forest?
3. Do you think women and men use the forest in the same ways?
4. Do you think women and men benefit equally from the forest?
5. How have your uses of the forest changed compared to the past? How have the changes affected your daily life?
6. What are illegal uses of the forest? What are legal uses of the forest?
7. Have you seen any illegal activities occur within the forest? If yes, what are the consequences?
8. Who controls the uses of the forest?
9. What value does the forest have to you?
10. What value does the forest have to the community?
11. How is the forest being conserved?

3.2 Access to the Karima Forest

1. Who does the forest belong to?
2. Who is allowed to enter the forest? Is there a difference between men and women?
3. Who restricts the access to the forest? How do they restrict access? How are you informed about these restrictions?
4. What role does the forest guard play in allowing or restricting the access to the forest? Do you respect the forest guard?
5. Who manages the forest conservation? Is the forest being well conserved?
6. Do men or women conserve the forest more? If so, how?

4. SSI-KI Template

4.1 SSI-KI, 1 KFS Head Nyeri County

1. Who owns the Karima forest?
2. What is the role of the KFS regarding the management of Karima forest?
3. What is your view of the FCMA 2016?
4. What are the challenges in the implementation of PFM?
5. What is your role in the Karima forest?

6. What activities are legal and what activities are illegal?
7. Do you monitor and evaluate the conservation of the Karima Forest?
8. What is the role of the forest guard?
9. Do you believe women or men have been more or less affected by the forest regulations and why?
10. Why has the TIP not been signed?

4.2 SSI-KI, 2 Retired KFS Head of Nyeri County

1. What is the role of KFS in regards to the management of Karima Forest?
2. Who has access to karima forest?
3. Do you monitor and evaluate the conservation of the Karima Forest?
4. What uses are legal and what are illegal?
5. How has the forest changed in the past 15 years?
6. Do you know the forest guards? What are their roles in the forest?
7. How does KFS support the conservation of the Karima forest?
8. Do you advocate the conservation of the Karima forest in the community?
9. Do you believe women or men have been more or less affected by the forest regulations and why?
10. Are you aware of the uses of forest?
11. What challenges do you foresee in the implementation of PFM?
12. Has the TIP been signed?
13. When was the CFA established?

4.3 SSI-KI, 3 Nyeri County Government Forester

1. How do you manage the forest?
2. Do you get reports of incidents?
3. How important is the Karima forest?
4. Who owns the forest?
5. You are a forester?
6. How are community forests supposed to be managed?
7. Has the County Assembly assisted the community in setting up a CFA?
8. Has the TIP been signed?
9. What is the county's view of the forest?

10. Does the Karima forest have a CFA?
11. Are there currently any forest users?
12. Does KTDA harvest trees in the forest?
13. Do you have a lease agreement with KTDA?
14. What role would the county offer to set up a CFA in the Karima forest?
15. Would you offer any training?
16. For how long have you lived in the county?
17. Is the tree cover of 36% a cause for lack of interest to manage community forests? What have you done in Tumutumu?

4.4 SSI-KI, 4 Forest Activist

1. What is the forest being used for?
2. What was your involvement in conservation of Karima hill forest?
3. What is the importance of the forest?
4. Were you involved in the formation of the CFA?
5. Did the CFA succeed in the management and conservation of the forest?
6. How is the forest being conserved now?
7. Do you trust the forest guards? Why?
8. Are there restrictions in access and use in the forest?
9. Does the community respect you? If yes, why?
10. Do you think the community trusts you?
11. What is your opinion about the future of the Karima hill forest?

4.5 SSI-KI, 5 CFA Chairman

1. What is the name of the CFA?
2. What was your role in the CFA?
3. What is the current status of the CFA?
4. How did the CFA help in conservation of the Karima forest?
5. What is the role of Kenya Forest Service?
6. Did KFS support the management plan?
7. Who can be a member of the CFA /who were the members of the CFA?
8. Was the CFA registered?
9. How were you appointed?

10. What benefit did the members have?
11. Are there CFA rules in the management plan?
12. Do you know what is legal and what was illegal in the forest?
13. How is the indigenous knowledge systems (IKS) taken into account in the CFA?
14. Do you think the CFA is important for conservation?
15. What is the future of CFA?
16. When did the CFA last hold elections?
17. When did the CFA last hold a meeting?
18. What is the relationship between the county assembly and the CFA?
19. Can the KTDA harvest their trees if the logging ban is lifted?

4.6 SSI-KI, 6 Forest Guard

1. What are your day-to-day activities?
2. What kind of forest is Karima hill?
3. What activities are illegal in the forest?
4. Are there any illegal activities taking place in the forest?
5. Who do you report to?
6. Do you issue any permits to people to access and use the forest?
7. What is the name of the other forest guard and how is the work divided between the two of you?
8. In a case of death in a household, do you allow fuelwood and timber to be logged from the forest?
9. Who has constituted the regulations? How are these regulations communicated to the community?
10. Do you think the community respects you?
11. Do you think the community trusts you?
12. How were you appointed?
13. What kind of training did you receive for this job?
14. What do you know about the forest act?
15. Does the CFA still exist in the community? Are there any active members?

4.7 SSI-KI, 7 Village Elder and Member of Green Belt Movement

1. What is the value of the forest to you?
2. How was the forest valued by the community before the CFA and has it changed?
3. Is the forest changing? if yes, in what ways and why?
4. Can you please explain your involvement in the CFA and what your role meant for the Karima forest?
5. What were the main issues that caused the collapse of the CFA?
6. To what extent is the CFA present at the moment in Karima Hill Community?
7. Are there any written rules about access and use of the forest? If yes, which rules and regulations exist?
8. Are you aware of the forest management plan?
9. Have the restrictions to the forest changed after the CFA collapsed?
10. Who is more involved in taking care of the forest, men or women?
11. Do you think the forest was better conserved when the CFA was functioning (2007-2013), compared to today?
12. If you would want to plant trees in the forest now, how would you proceed?

4.8 SSI-KI, 8 Forest guard, assistant chief of Tuti Sublocation and Village Elder

1. Where is the forest being used?
2. Who is using the forest?
3. How is the forest being used?
4. Has the health of the forest changed?
5. Are there forest guards in the forest?
6. Are there any illegal activities taking place in the forest?
7. Is there any funding available for the forest?
8. If there was any funding, how well was it accounted for?
9. Does the county assembly have a person responsible for the forest resources?
10. Do the local people have traditional knowledge for the use and conservation of the forest?

5.Focus Group Questions

1. Do you know of the CFA?
2. How are you using the forest at the moment?

3. How are other community members using the forest?
4. Are there any cultural reasons why men and women use the forest differently?
5. How would you like to benefit from the forest in the future?

6. Observation

1. How many houses are on the farm?
2. How many children?
3. Livestock - what? And how many?
4. Vehicles - how many?
5. Trees on the farm? Which trees?
6. Fodder on the farm? Which fodder?
7. Energy source? Which?
8. Is there firewood around? How much?
9. How many children?
10. Livestock - what? And how many?
11. Vehicles - how many?
12. Trees on the farm? Which trees?
13. Fodder on the farm? Which fodder?
14. Energy source? Which?
15. Is there firewood around? How much?

7. Synopsis

Karima Forest Community:
The Changing Role of the Forest for Men and Women

Karima Forest Community: *The Changing Role of the Forest for Men and Women*

Field Research on the Informal and Formal Gendered Access and Use of the Karima Forest as part of the *Thematic Course Interdisciplinary Land Use and Natural Resource Management* at the *University of Copenhagen* in Collaboration with the *University of Nairobi*

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Introduction

Forests are an essential source of food, fiber, fuel, income and are of cultural value for millions (Bishop and Landell-Mills, 2002; Ojea et al., 2016). The average share of household income from forests in Africa is 21.4% (Angelsen et al., 2014). Despite the awareness of the crucial role forests play in the well-being of humans, annual deforestation continues globally. Forests are especially being reduced in tropical countries, thus requiring sustainable forest management (FAO, 2010; FAO, 2015). As an example, decentralization of natural resources has gained momentum over the past decades (Lund & Treue, 2008), where management rights are transferred to the local communities (Thygesen et al., 2016). Kenya is currently in the process of decentralizing the forest management rights to the local communities (ibid.), in order to empower the local communities and increase conservation efforts (Republic of Kenya, 2016). Karima Forest, located in the highlands of central Kenya, has introduced a Participatory Forest Management system in 2009, which is the study site of this research.

The International Union for Conservation of Nature Environment and Gender Index states that women relying on forests are underrepresented in forest governance at all levels. Gender considerations are not included in the majority of national-level policies and programmes (IUCN, 2015). Thus, they are excluded from decision-making leaving their knowledge and experiences of natural resources neglected (Aguilar, 2016). It has been identified that the uses and values of forest products differ amongst men and women. In Africa, women collect more unprocessed subsistence forest products compared to men (Sunderland et al., 2014). Women's rights are affected by economic, social, cultural, political and legal spheres, leaving men generally in the position of ownership and control of the forest resources and land. However, it has been seen that women play an unique role in managing forests and thus the gender blindness should be minimized (Aguilar, 2016).

Therefore, the gendered access, knowledge and use of the Karima forest and the resulting effects on the environment will be analysed since 2011, when local community efforts resulted in restricted access of timber harvesting to protect the forest. The objective is to highlight any gender differentiation for potential future inclusion in local management plans.

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Background

The institutional change regarding the participatory forest management (PFM) in the Karima forest started in the early 2000s with the 2005 Forest Act, which provided legal background for the transformation (Republic of Kenya, 2005). One of the most important factors in the Forest Act was the definition of Community Forest Associations (CFA). Any local community with an interest in joining the participatory forest management may register as a CFA to promote the conservation of the forest alongside the government. However, there are a few factors that affect the process of establishing a CFA. Furthermore, a forest management plan must be agreed on by both the local authority and the CFA before becoming effective (ibid.).

With 108,5 ha in size, most of Karima forest's vegetation consists of exotic species, for instance eucalyptus and pine trees (PFMP, 2010). One part of the area is utilized by a local tea company, which uses the trees as firewood in the process of drying tea. The rest of the area is natural forest (ibid.). Currently, the households around the forest mainly rely on livelihood strategies outside of the forest, such as production of tea, coffee or dairy-products (Thygesen et al., 2016). However, collection of firewood, fruits and medical plants for personal use and other social and cultural activities are still undertaken (ibid.)

The current political situation of the Karima forest has been unsolved since 2011. The CFA for the Karima forest was established in 2009 together with the management plan and the forest has been under the jurisdiction of the Nyeri County government due to the forest decentralization transformation in 2010 (Thygesen et al., 2016). However, the management plan failed to determine how the tasks, responsibilities and revenues from the timber should be divided between the stakeholders. Additionally, during the negotiation process many timber firms started logging without an official management agreement, which caused the disapproving community to organize a physical blockage to the forest (ibid.). Since the Karima forest falls under the definition of trust land and is owned and managed by natives who follow the laws of the local councils, organizing and maintaining the blockage was possible without further consequences (FAO, 2020, Thygesen et al., 2016). Therefore, until today the official forest management agreement (FMA), an essential part of the decentralization process, has not been signed and all logging has been banned in the forest (ibid.). The Karima forest has been officially untouched for a decade at the time of conducting this research but according to the local community members, some illegal logging still takes place (Thygesen et al., 2016). Since

2011, a nation-wide timber ban was enforced to control the degradation of the Kenyan forest ecosystems.

This research aims to look into the gendered use of the forest. The current legal situation involves various different understandings of who is allowed to access and use the forest and for what purpose. Previous studies conducted of the Karima forest lied its focus on the local politics and on the aspect of decentralization in Kenya, with little emphasis on gender division (Thygesen et al., 2016). Thus, the goal of this research is to determine whether there is a significant difference between men and women regarding the access, knowledge, use and the conservation of the forest.

Research Objectives and Questions

This research intends to identify the gendered (in)formal uses and access of the Karima forest and the effects they could have on the conservation, to identify potential management gaps for sustainable forestry use.

Therefore, four main research objectives (RO) of this research are:

RO1: To understand the gendered ability to (in)formally **access** the forest and **utilize** the forest.
RO2: To understand the gendered **knowledge** and **use** of the Karima forest.
RO3: To understand how the access and use affects the **conservation** of the forest.
RO4: To raise awareness for appropriate **gender inclusion** in future management plans if differences are identified in forest access, use, knowledge and conservation efforts.

All RO's aim is to analyse the situation before the timber ban was introduced in Karima forest in 2011 to the current situation in order to capture the dynamics of the forest.

In order to reach these objectives, the following **main research question** will be answered:

How do the gendered (in)formal access and uses of the Karima Forest of the local forest community impact the conservation of the forest?

The following sub-research-questions (SRQ) are intended to support the main research question:

SRQ1: How does the community living adjacent to the Karima forest formally or informally **access** the forest?
SRQ2: What are the gendered formal and informal **uses** and **knowledge** of the Karima forest?
SRQ3: How does the access and uses of the Karima forest affect the **conservation** of the forest?

Framework and Methodology

Theoretical Frameworks

The Livelihood and Theory of Access frameworks provide a foundation for data collection of this research. They are defined and elaborated below for how they will be utilized in this research conducted in Karima forest. A detailed overview of both frameworks can be found in the appendices.

Livelihoods framework

Ellis (2000), DFID (2001) and Scoones (1998) were all groundbreaking in the creation of the livelihood framework. This paper will take point of departure in Ellis (2000) livelihood framework, who defines the five assets physical, natural, financial, human and social capitals that make up a household's livelihood.

Theory of Access

The Theory of Access will be used as an analytical framework to help determine how actors benefit from the forest resource. The framework defines access as *"the ability to derive benefits from things"* (Ribot and Peluso, 2003: 153).

Formal and Informal Access

Access created by the state through law, political positions, and legal documents can be seen as formal access. However, laws are not always static so law, positions and rules can overlap and create ambiguity of which laws are applied. This can create informal access where local communities make decisions on how the access should be managed instead (Ribot and Peluso, 2003).

Applying Theoretical Frameworks

In order to find the formal and informal access to the Karima forest and its products, the Theory of Access will be analysed through the livelihood capitals. The purpose of taking point of departure from the livelihood framework is to find how these allow or hinder individuals and households' access to different assets. Depending on the abundance or lack of the five livelihood capitals, formal and informal access to the Karima forest may be given to certain households.

The following access mechanisms will be used to help understand through what means the users of the forest have gained or maintain their access; access through knowledge, authority, social identity and negotiation of other social relations. With the use of this framework the goals is to gain a deeper understanding of how, for instance, belonging to a certain social group or having relations to the authorities or possessing relevant knowledge about the management of the forest affects the access to the resource.

In order to avoid acknowledging women as a homogenous group with similar interests and backgrounds, the ideology of Feminist Political Ecology will be applied (Nightingale, 2003). The aim is to conduct the research without categorizing men and women as such but understand the individuals in their own, unique context. The Theory of Access will be used to recognize gender as one of the possible factors impacting the individual's access and use of the forest, but other indicators, such as social relations, relations to authorities and belonging to different social groups, including socio-economic background, ethnicity and religion, will be considered (Ribot and Peluso, 2003).

Methodology

Several different data collection methods will be used, in order to gain a holistic understanding of the research topic. A combination of qualitative and quantitative methods is required as part of the interdisciplinary research; the differentiating role of Karima forest as a source of conservation and biodiversity, and as a source of livelihood for households. The sample size for each qualitative method will contain a minimum of 30 respondents, where the aim is to focus on households living adjacent to the Karima forest.

Qualitative Data Collection

Semi-structured Interviews

As part of our qualitative methods, semi-structured interviews with selected individuals living in households adjacent to the Karima forest will be utilized. These interviews are aimed to find individuals' interest, value and use of the forest, formal and informal. The questions will be formulated in a descriptive and structural manner to gain in-depth insight of the topic. Selection of participants for the semi-structured interviews will be done through clustering groups of

participants with similar profiles. The purpose is to easier code large amounts of data, as cluster analysis can serve as a key component of mixed methods research.

Questionnaires

Questionnaires will be used to gain background information of household characteristics and assets, to further explore perceptions, opinions and thoughts of the use and misuse of the forest. These answers will then be grouped into variables, coded and translated into quantitative statistics data. The answers will be grouped and presented in frequency and contingency tables to provide quick overviews of the household background information. The method to select respondents for questionnaires will be done through a systematic method. After a group of relevant respondents have been established (living adjacent to the Karima forest), the respondents will randomly be picked from this group.

Focus Groups

Focus groups from the village will be applicable for our study to understand different perceptions in the area. Discussions held with carefully selected participants will be useful for the different variables we aim to investigate, such as perception differences, informal and formal access and usages of the forest amongst genders. Selection of participants for focus groups will be done through the stratified method of relatively homogenous groups. This method will be utilized to divide our sample based on gender, with the purpose to find if a division of men and women generates different answers.

Observations

Observations made in the forest and of participants will be made throughout the study in the forest, in the village adjacent to the forest and during the interactions with households and individuals. The aim is to gain a holistic understanding of the forest and village environment and relationship, and to possibly include unforeseen evidence of usage of the forest not covered in interviews or questionnaires.

Quantitative Data Collection

Biomass Measurement

Biomass measurement will be used as an indication of the current conservation of the forest and of the trees. This will be done through the Forest Resource Assessment by measuring tree

height to density. The aim is to analyse if increase or decrease in forest biomass.

Biodiversity Index

Biodiversity index will be used to investigate a possible change in biodiversity and evaluate conservation efforts in the area, and how (un)successful these have been since 2010, right before the implementation of the forest decentralization. As there is no data from the past, time will be replaced by space. Through community mapping, semi-structured interviews and observations locations which are more and less utilised will be captured. The baseline will be the area where the forest is utilized the least. In these locations, biodiversity indexes will be measured and compared against another.

Community Mapping and Geographic Information System

Community mapping and Geographic Information System (GIS) will be utilized to capture the coordinates of the different areas in the forest where different uses occur. Mapping on paper will be done through the community itself, and GIS will be used to pinpoint the exact place or uses in the forest. A combination of both methods will allow for a more precise description of the location of uses in the forest.

Google Earth Satellite Images

Google Earth satellite images from 10 years ago (2010) to those of now will compare whether the forest cover in Karima has increased or decreased.

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8. Synopsis

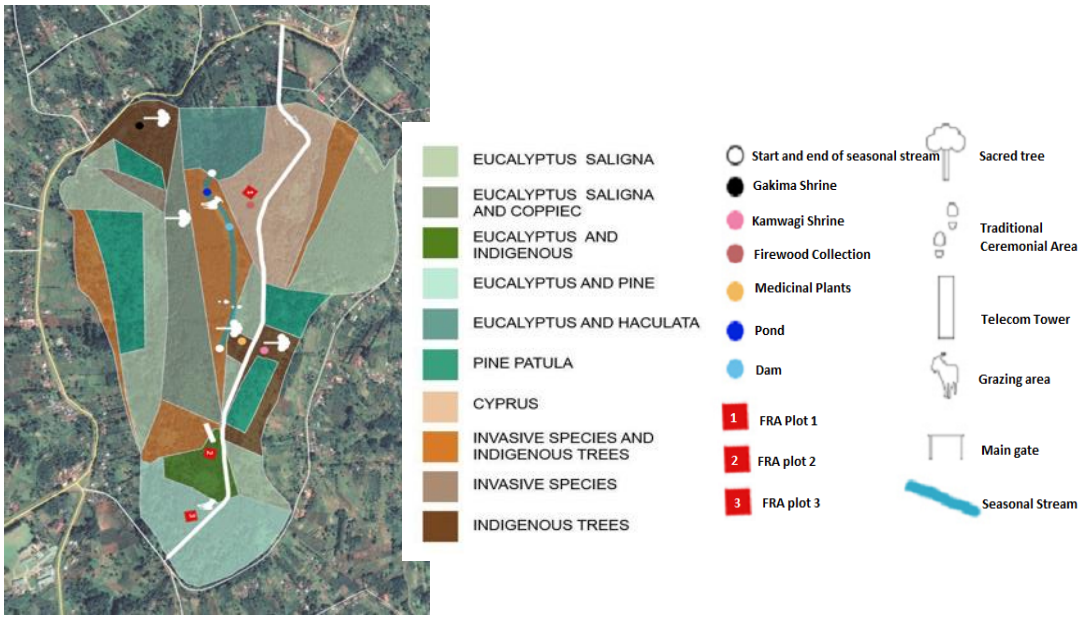

Figure XX: Map of Karima Forest including tree species, landmarks and main forest user sites recorded with GPS during Transect Walks (Source: Authors Adaptation of Atchadé et. al., 2004: 36)

The findings from the satellite images were confirmed by an on-site forest resource assessment using three plots. These plots were chosen in areas of the forest where noticeable logging continued to take place as well as harvesting of fresh cut branches (figure xx). As seen in figure XX, the plots were located in highly logged or clear cut areas in 2012.

The forest resource assessment results (table XX) demonstrated a high forest density. The total number of standing trees are, to date, noticeably more than the number of stumps remaining. Plot 1 with cypress trees had the highest number of logged trees, with 73% of trees being

logged, however only 11% of these were classified as newly logged trees. No branches were cut in this plot. Plot 2 and Plot 3 had 31% and 33% of total logged trees, and 21% and 24% newly logged trees, respectively. Plot 2 had 110 cut branches, and 50 cut branches on Plot 3. The number of newly logged trees in each plot, however, still indicate that illegal activities continue to occur despite the timber ban and forest guard in place.

	Plot 1	Plot 2	Plot 3
Total Trees	339	306	184
Total Logged Trees	249	101	65
Logged Trees (%)	73%	33%	35%
Total Newly Logged Trees	38	67	45
Newly Logged Trees (%)	11%	22%	24%
Total Cut Branches	0	110	50

Table XX. Forest Research Assessment Plots (FRA).

Discussion

1. Main Findings

Various factors, including urbanization, an aging population in Othaya and the current forest regulations, have arguably resulted in a general reduction in access and use of the Karima forest. The forest is still mainly used to support the rural livelihoods in day-to-day activities, such as collection of firewood, fodder and construction material. Recreational use was one of the less common purposes for entering the forest, rejecting the hypothesis (1), which suggested a shift from livelihood activities to recreationally use took place.

The dormant CFA resulted in no forest user rights being established. Conflicting rules and norms about access and use restrictions caused by legal pluralism by various institutions (e.g. KFS, NCA, Forest Guard) have resulted in general confusion amongst community members. As a result, the hypothesis (2) is supported by these findings. The Karima forest is less used compared to before the employment of the forest guard, who enforces his forest user rules during his weekly forest patrols.

When looking at the access and entering of the forest, there is no significant difference between genders, with the exception of the sacred site only being approachable by men. The cultural and intra household dynamics restricting more access for women than men is confirmed in hypothesis (3).

Women are more involved in taking care of household activities and raising their children. These activities are reflected in the forest resources they use, ,which include collecting food and firewood to cook for their household. Hypothesis (4) stating that women rely more on forest resources for subsistence is thus applicable to the findings. Men, on the other hand, are involved with assets having higher economical values such as livestock and construction materials. They use the forest accordingly to gather fodder and grass, and timber. Despite the difference in use, both genders place equally high value on the forest for rain catchment and firewood collection, rejecting the assumption (4) that women place greater value on products and services.

The forest cover in Karima has increased since the introduction of the national timber ban and the enforcement of a forest guard, who are appointed by the NCA. With the currently dormant

CFA, the management of the Karima forest resides with the County. Therefore, limited traditional knowledge is currently used to conserve the forest and no gender difference amongst the community members can be seen regarding forest conservation activities, rejecting the hypothesis (5), which assumes women use the forest more sustainably through their traditional and indigenous knowledge compared to men. The forest resource assessment showed evidence of freshly cut trees, an activity which has been associated with men. Comparing the forest uses between genders, it can be stated that women use the forest more sustainably, as they only collect firewood and food for subsistence use, which have less impact on the environment.

2. Literature Comparison

Legal pluralism is often formed through fixed perceptions of customary law, which disregards community's adaptation to changing external environments and their constantly changing needs and values as a result (Albano et al., 2015). The change of forest uses in the Karima forest over time have been poorly captured by the current legislations of forest use. Efforts in recognizing pluralism of forest values is important to help empower forest communities' livelihoods and prevent deforestation (ibid). Marginalized people, such as women, old and the poor, could suffer more from negative livelihood impacts due to these restrictions, as they categorize as the group that depends the most on forest resources (Agarwal, 2001). Urbanization and an aging population has contributed to a reduced reliance on the forest and thus the access of the Karima forest was only weakly influenced by gender, compared to other studies. Sunderland et al. (2014), for example, identifies women's role in intra-households as the core factor that prevent women from accessing specific forest resources and different forest technologies.

In terms of forest resource use, the results show a gender difference caused by intra household dynamics. Male activities in the Karima forest are similar to those found by Sunderland et al. (2014), where men generally take part in economic generating activities such as hunting, collecting fodder for livestock and (currently less) collecting timber and construction materials. Some respondents reported that men continue to generate some economic benefit from timber harvesting and sales in various black markets. In contrast, women mainly collect forest products for subsistence use; including firewood, food and medicinal plants (Ingram et al., 2014), which is in agreement to what this research found out. Studies by Adedayo et al. (2010) and Ingram et al. (2014) show that men are more involved with cash generation from the forest products than

women. Hopkins et al. (1994) argue that women delegate more resources to food and healthcare when having greater responsibility in household finances. Consequently, women's primary use of the forest in collection of firewood could decline, if they invest in healthier alternatives of cooking sources as an energy source substitute (Hopkins et al., 1994). The shift towards alternative energy sources for cooking around Othaya is already visible, which could indicate that women have gained more power in household decision-making.

Gender roles in conservation management and inclusion of women in the Karima CFA are not able to be assessed due to the inactive association. However, some scholars argue that involvement of women in governance leads to improved conservation outcomes (Agarwal, 2010) and therefore is suggested to take the gendered roles into consideration when establishing future CFAs and management plans. Agarwal (2001) states it is important to acknowledge women's traditional forest conservation knowledge for improved sustainable forest use (e.g. tree planting) and harvesting forest products they collect daily (e.g. firewood), when negotiating forest user rights within a CFA. Harris-Fry and Grijalva-Eternod (2016) also state that PFM's often fail to consider the gendered costs and benefits of participatory governance groups, as found to be the case in Karima forest due to the CFA management plan in 2009 not specifying gender roles and benefits. These measures of gender inclusivity in management plans would enable forest users to practice more sustainable practices in the Karima forest as women are more knowledgeable about the regeneration rate of the resources they harvest. Including women into PFMs would also allow gender inequities in benefit sharing to be addressed (Agarwal, 2001), which can improve household livelihood, as mentioned above. However, social customs such as men's dominance in decision-making roles are to be taken into consideration when establishing such groups to ensure women feel confident and willing to join (ibid). Additionally, women's role in the household with childcare, housework and gardening should be acknowledged when planning meetings, as their active participation could be restricted through these duties (ibid.). If women are involved in the executive committee of such PFMs, they are seen to be more likely to follow the rules and use the forest more sustainably as well as ensure other village women do the same (Agarwal, 2009). Conservation ethics are passed down from women to their children (ibid.), similarly to the forest user rights and practices being shared amongst the community in the Karima forest.

3. Reflection on Methods

The authors have similar social science backgrounds, which is reflected in the choice of data collection methods. More diversity in academic background could have strengthened the interdisciplinary approach to this study. The questionnaires were the main method for getting statistically comparable data about the community. However, it falls short in capturing in-depth responses due to the majority of close-ended questions where multiple-choice answers were provided. Hence, semi-structured interviews were used to obtain a better understanding of the access and use of the forest. More in-depth questions about the topics from the questionnaire were utilized to complement the results, which had not been captured through the questionnaires.

Additionally, the authors are from European countries with little research experience in Sub-saharan Africa, causing cultural bias to a certain degree. Westernized approaches to gender roles could have affected the formation of interview questions and portraying of results. The hypothesis of gender differences demonstrated the eagerness towards finding distinct gender roles, where the majority were rejected. Another issue related to the students' role as visitors in the area could have been some of the sensitive topics of the research. When asked about, for instance, the illegal use of the forest, it must be taken into account that the respondents might have not told the complete truth about their own uses of the forest. Cultural differences, which could have additionally created a barrier between the authors and local community were minimized through the collaboration with two Kenyan students from the University of Nairobi. As the Kenyan students are acquainted with the local customs and spoke the local language, they were often able to relate to the interviewees and therefore gather more information. Since the Kenyan students had different cultural and academic backgrounds compared to the students from the University of Copenhagen, the time spent together resulted in fruitful discussions and positive learning experiences. The students work full time, attending evening classes in Nairobi. They therefore have gathered a significant amount of experience in regard to governance and the environmental sector, enriching the research experiences. Lots of insights regarding the forest law and the formations and success stories of CFAs in Kenya provided a solid foundation for this research to successfully reach the intended objectives. It showed the potential of these participatory management groups sparking an interest in understanding the cause of failure in the Karima and gathering relevant gender information, which could be integrated into future CFAs.

The language barrier was a dominant challenge in the data collection. As the community and the majority of key informants speak Kikuyu, the questions were translated from English by local guides. Certain terminologies in English could have been translated differently, thus affecting the understanding of the question and responses of the interviewees. These issues were noted once analysing the results, as the answers occasionally did not match answers to other questions. In some questions, for instance, the respondents answered “yes” to a question whether men and women use the forest in the same ways. However, when leading through specific uses of the forest, gender differences were mentioned.

With gender differences limited to sacred sites discovered in the access to the forest due to the general lack of current use of the forest, one could argue that the study could have shifted from the gender focus. The research could instead discourse the lack of access and use of the forest and how this affects the community and its livelihoods. The low statistical significance using chi-tests are likely to have been predominantly caused by the limited sample size. Several chi-tests had p-values close to significance, where the low data sample most likely gave somewhat skewed results. The sample size of 30 for questionnaire and 30 for semi-structured interviews were chosen due to the ability of them being able to represent the community given the limited data collection period. Additionally, the respondents living adjacent to the forest were predominantly older women, who were physically unable to access the forest. A higher sample of respondents would provide a more accurate and more representative data of the households’ relationship to the access and use of the forest. Nevertheless, the knowledge gap in the gendered differences in use and conservation in the Karima forest was filled to a certain extent. More extensive research on a larger data sample in the area that represents gender and age in all categories is required to fully fill the knowledge gap. The analytical framework developed in this study that combines the Livelihood framework (Ellis, 2000) and the Theory of Access (Ribot and Peluso, 2003) is meant to benefit other scholars who wish to apply both frameworks to its research.

Regarding the results collected from the conservation aspect, only three 35x35 meter plots were assessed in the forest resource assessment, which represents 0.3% of the total forest area. Due to limited resources and time, the plots were specifically chosen for tree species, prominence of logging and/or firewood collection areas. Conduction of more plots scattered

around the sites covering larger areas with more tree species in the forest is required for an accurate conservation status of the forest.

Conclusion

Access to the forest was perceived as restricted for some, indifferent to gender. Legal pluralism was found throughout different stakeholders' interpretations of forest user rights. Discrepancy of rules concerning legal and illegal uses of the forest among organizations reflected the response by the community, who were seemingly as much in disagreement. Legal pluralism causes uncertainty in the community as well as long-term instability and unsustainable uses resulting from lacking effective management. Transparent communication of legal and illegal uses is required to clear uncertainties of user rights.

Results showing differing gendered uses of forest products confirm the varying gender responsibilities in Othaya. Awareness of gender differences in forest uses can be linked to intra-household gender roles. Gendered perspectives of forest uses have lacked acknowledgement in policymaking and in the management plan. Inclusion of the different gender forest activities into the future re-establishment of the CFA are of particular importance to improve the livelihoods and promote increasing sustainable uses of the forest. Further research is needed to fill the gap of potential management systems tailored to forest user rights in the Karima forest.

Employment of a forest guard and enforcement of the national timber ban have improved the overall conservation of the forest. The prominent conservation roles are male dominated. Larger representatives of women in decision-making roles in i.e. the CFA could allow for more recognition of their efforts in forest conservation. Passing of traditional practices and knowledge of indigenous trees are important for Karima's forest conservation, as well as to serve and strengthen the important Kikuyu cultural legacy and future.

Introducing a permit scheme system into a future CFA management plan could clarify the existing legal pluralism by clearly communicating the legal and illegal forest user rights. Permit schemes could regulate forest use and reduce those of illegal nature that harm the conservation. However, the permit scheme could exclude marginalized groups, including women and the poor, who however rely on forest products the most to meet daily needs, e.g. firewood for cooking. Lower income households do not own sufficient natural capital to support themselves, where permit schemes could negatively impact their livelihoods. In order to avoid this, these groups need to be appropriately included in any participatory management system.

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Appendixes

1. Table of applied methods

Methods	Quantity
Questionnaire	30
Semi-Structured Interviews with Forest Users	30
Semi-Structured Interviews with Key Informants	1. KFS Head Nyeri County 2. Retired KFS Head Nyeri County 3. Nyeri County Government Forester 4. Forest Activist 5. CFA Chairman 2009 6. Forest Guard 7. Village Elder and Member of Green Belt Movement 8. Group interview with Assistant Chief of Thuti Sublocation, Forest Guard and Village Elder
Focus Groups	2
Transect Walks	2
Community Mapping	3
Forest Resource Assessment	3 Plots

2. Questionnaire

Introduction
The purpose of this study is to investigate the (in)formal access and use of the Karima forest over the past 10 years and understand the effects on the conservation of the area. Our target group for this study is limited to households living adjacent (within 1 kilometres) to the Karima forest. Each interviewee has been randomly elected as part of these criterias.

Questions will start with asking for background personal information to have a better idea of the respondent. The questions will then move on to understand the accessibility, (in)formal uses of the forest, and how these products are being used for each participant.

This questionnaire will allow the voices of the community forest users to be heard and understood. It will allow others to understand the use and importance of the forest. Additionally, it will give the interviewee the ability to reflect on their uses in relations to conservation efforts. The interviewee has the right to interrupt if he/she does not feel comfortable answering the questions and can stop the interview at any time. The interviewees will be recorded anonymously and thus will not be exposed when the data is collected and presented.

Time required for answering the questions should be maximal **30 minutes**, where a student reporter will capture the data mentioned. An unofficial group presentation on Tuesday, 10th March will be held for any interested parties of the research study. Here, feedback and questions can be addressed to the student group.

This questionnaire is part of our *Interdisciplinary Land Use and Natural Resource Management* fieldwork
in Kenya as part of a collaboration between *University of Copenhagen* and *University of Nairobi*. We are a group of six students: Helen, Julia, Oscar, Sisko, Beatrice and David that study at the University of Copenhagen and the University of Nairobi, in the master programmes *Environmental and Development*, *Human Geography and Environmental Governance*.

1 Background Information	**Please Mark X or write the answer here**
1. Name	
2. Phone number	
3. Gender	Male ___ Female___
4. Age	a) Under 20 ___ b) 20-30 ___ c) 31-40 ___ d) 41-50 ___ e) 50 and above ___
5. Name of village	
6. Head of the household	Yes ___ No ___
7. Marital status	a) Single ___ b) Married ___ c) In a relationship ___ d) Widowed ___ e) Divorced ___
8. Number of children in the household	
9. Average age of other persons in the household	Under 20 |

	20 – 30 | 31 - 40 | 41 - 50 | 50 and above |
10. Education level of the interviewee (when not the household head)	a) Graduate___ b) Diploma/Certificate ___ c) Secondary school ___ d) Primary school ___ e) Not completed primary ___ f) Never gone to school ___ g) Other ___
11. Education level of the household head	a) Graduate___ b) Diploma/Certificate___ c) Secondary school___ d) Primary school___ e) Not completed primary___ f) Never gone to school___ g) Other___
12. Main Occupation	a) Student___ b) Farm___ c) Self Employed___ d) Employed e) Retired___ f) Other___

2 Household characteristics	**Please Mark X or write the answer here**
1. How long have you lived in the village around Karima Hill?	a) More than 13 years ___ b) Less than 13 years ___
2. How long is the walking distance to the forest (in min)?	
3. How long is the walking distance to the market (in min)?	
4. Do you own any land in Othaya Sub-county?	Yes ___ No____
4b. If yes, please indicate how much in hectares.	
5. Do you own any livestock?	Yes ___ No ___
5b. If yes, please indicate how much of each	a) Cows___ b) Chicken___

	c) Goat___ d) Other___
6. Do you grow trees?	Yes ___ No ___
6b. If yes, what are the trees used for?	a) Firewood ___ b) Timber___ c) Ornamental ___ d) Fruit / Nuts ___ e) Weather ___ f) Other ___
7. Do you grow fodder?	Yes ___ No ___
7b. Are they adequate for your livestock all year around?	Yes ___ No ___
8. What energy source do you use for cooking?	a) Firewood ___ b) Gas ___ c) Biogas ___ d) Charcoal ___ e) Electricity ___ f) Other ___
8b. If you use firewood, where do you get your firewood from?	a) Forest ___ b) Own farm ___ c) Purchased ___ d) Other ___

3 Community Forest Association (CFA)	**Please Mark X or write the answer here**
1. Do you know what the Community Forest Association is?	Yes ___ No ___
1b. Are you familiar with the CFA introduced in 2007?	Yes ___ No ___
2. Are you a member of the CFA?	Yes ___ No ___
2b. If you are not a member, please indicate why? *(skip 2c – 2i)*	a) Never heard of ___ b) Was not of age ___ c) Do not see benefit ___ d) Too busy e) Not close with my community ___ f) Do not use the forest ___ g) I live too far from the forest ___ h) Other ___

2c. If you are a member, when did you join the CFA?	
2d. If you are a member, what is your role in the CFA?	
2e. What are the benefits of being in the CFA?	a) Use of the forest ___ b) Training on forest use___ c) Participation in conservation ___ d) To be able to make decisions on conservation of the forest ___ e) Other ____
2f. Do you attend CFA meetings?	Yes ___ No ___
2g. If yes, how frequently do you attend CFA meetings?	a) Monthly ___ b) Quarterly ___ c) Yearly ___
2h. When was the last time you attended a meeting?	
2i. When did you last carry out elections for the CFA leadership?	a) 2015 ___ b) 2016 ___ c) 2017 ___ d) 2018 ___ e) 2019 ___
2j. How frequently did you receive progress reports on the implementation of the forest management plan?	a) Monthly ___ b) Quarterly ___ c) Yearly ___ d) Never received one____
3. What funding does the CFA receive?	a) External funding ___ b) Member contribution ___ c) Membership fees ___ d) Government ___ e) Other ___ f) Do not know ___
4. What are the activities of the CFA?	a) Tree planting ___ b) Forest protection ___ c) Control access ___ d) Conservation awareness ___ e) Training of forest users ___ f) Others ___ g) Do not know ___

5. Do you think the CFA is successful?	1. Not successful ___ 2. A bit successful ___ 3. Neutral ___ 4. Successful ___ 5. Very successful ___
5b. Could you briefly explain why?	
6. On a scale from 1 to 5, please estimate how well the CFA is connected with the community?	1. Not connected ___ 2. Little connection ___ 3. Neutral ___ 4. Connected ___ 5. Very connected ___
7. Do you know the Karima Hill forest guards?	Yes ___ No ___
7b. Do you trust the Karima Hill forest guards?	Yes ___ No ___
7c. If no, please briefly explain why.	
8. Are you part of other government groups or governmental organizations?	Yes ___ No ___
8b. Please state which one(s).	

4 Karima Forest Use	**Please Mark X or write the answer here**
1. In the last week, how many times did you enter the forest?	
1b. Is this a common pattern?	Yes ___ No ___
1c. How often did you visit the forest in the past before the CFA?	a) Daily ___ b) Weekly ___ c) Monthly ___ d) Yearly ___

	e) Never ___
2. What is your purpose for entering the forest?	For individual/household use: a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber logging ___ f) Honey Harvesting ___ g) Fish farming ___ h) Hunting ___ i) Tree planting ___ j) Spiritual purposes ___ k) Social activities (Hiking, picnics, gatherings etc.) ___ l) Cultural reasons ___ m) Other___
2b. What was your purpose for entering the forest before the establishment of the CFA?	For individual/household use: a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber logging ___ f) Honey Harvesting ___ g) Fish farming ___ h) Hunting ___ i) Tree planting ___ j) Spiritual purposes ___ k) Social activities (Hiking, picnics, gatherings etc.) ___ l) Cultural reasons ___ m) Other___
3. Do you sell products you collect from the forest?	Yes ___ No ___

3b. If yes, what kind of forest products did you sell?	a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber ___ f) Honey ___ g) Fish ___ h) Other___
3c. If yes, where do you sell the forest products?	a) Thuti market ___ b) Gatugi market ___ c) Kanayu market ___ d) Karima market ___ e) Othaya market ___ f) Other ___
3d. If yes, how much gross income did you earn from forest products per month in KSH?	a) 0-2000 ___ b) 2000-5000 ___ c) 5000 or above ____
3e. Did you derive economic income from the forest products before the establishment of the CFA?	Yes ___ No ___
3f. If yes, what kind of forest products did you sell?	a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food ___ d) Fuelwood ___ e) Timber ___ f) Honey ___ g) Fish ___ h) Other___
3g. If yes, how much gross income did you earn from the forest products before the establishment of the CFA 13 years ago per month in KSH?	a) 0-2000 ___ b) 2000-5000 ___ c) 5000 or above ___
4. How important is the forest to you?	1. Not important ___ 2. Less important ___ 3. Neutral ___ 4. Important ___ 5. Highly important ___
4b. Please briefly explain the choice above.	
4c. How important was the forest to you before the	1. Not important ___

CFA?	2. Less important ___ 3. Neutral ___ 4. Important ___ 5. Highly important ___
4d. Please briefly explain the choice above.	
5. Do women and men use the forest for the same purposes?	Yes ___ No ___
5b. If no, please explain which activities are different for men and women:	a) Herbal Plants (women/men) b) Food (women/men) c) Fuelwood (women/men) d) Construction material (women/men) e) Fodder for animals (women/men) f) Water from stream (women/men) g) Spiritual purposes (women/men) h) Social activities (Hiking, picnics, gatherings etc.) (women/men) i) Cultural reasons (women/men) j) Other, what? ___ (women/men)

5 Karima Forest Access	**Please Mark X or write the answer here**
1. Are you restricted from using any of the following forest resources?	a) Medicinal Plants ___ b) Fodder and Grass ___ c) Food gathering ___ d) Fuelwood ___ e) Timber logging ___ f) Honey Harvesting ___ g) Fish farming ___ h) Hunting ___ i) Tree planting ___ j) Spiritual purposes ___ k) Sacred Places ___ l) Social activities (Hiking, picnics, gatherings etc.) ___
1b. If yes, please indicate the reason(s)	a) Forest regulations (e.g. timber ban) ___ b) Social status ___ c) Gender ___ d) Lack of infrastructure ___ e) Other___

1c. If yes, please indicate who.	
1d. Was it easier to enter the forest before the establishment of the CFA in 2007?	Yes ___ No ___
1e. Why?	
2. On a scale from 1 to 5, please estimate how much you trust your community?	1. Not connected ___ 2. Little connection ___ 3. Neutral ___ 4. Connected ___ 5. Very connected ___
3. Is the access to the forest the same for men and women?	Yes ___ No ___
3b. If no, what causes the difference:	a) Forest regulations ___ b) Economic restrictions ___ c) Social status ___ d) Gender role ___ e) Cultural reasons ___ f) Other___

6 Forest Conservation	**Please Mark X or write the answer here**
1. Who is responsible for the management of the forest?	a) CFA ___ b) County Government ___ c) KFS ___ d) Police ___ e) Other ___
2. Are you satisfied with the management of the forest at the moment?	1. Not satisfied ___ 2. A bit satisfied ___ 3. Neutral ___ 4. Satisfied ___ 5. Very satisfied ___
2b. If you are not satisfied (option 1 or 2) could you briefly	

explain why?	
2c. Do you know who to contact in a case of illegal activities in the forest?	a) CFA ___ b) County Government ___ c) KFS ___ d) Police ___ e) Other ___
2d. If you do know, how do you contact them?	
3. Has the number of trees in the forest changed over the last 13 years?	a) Increased ___ b) Decreased ___ c) No change ___ d) Do not know ___
4. Has the number of wild animals in the forest changed over the last 13 years?	a) Increased ___ b) Decreased ___ c) No change ___ d) Do not know ___
5. Do you know any indigenous knowledge that is used in the conservation of forest?	Yes ___ No ___
5b. If yes, please briefly explain which knowledge.	
6. Who in the community is more involved in taking care of the forest?	a) No difference ___ b) Men ___ c) Women ___ d) Do not know ___

3.SSI-U Questions

3.1 Use of the Karima Forest

1. How do you use the forest?
2. How does your community use the forest?
3. Do you think women and men use the forest in the same ways?
4. Do you think women and men benefit equally from the forest?
5. How have your uses of the forest changed compared to the past? How have the changes affected your daily life?
6. What are illegal uses of the forest? What are legal uses of the forest?
7. Have you seen any illegal activities occur within the forest? If yes, what are the consequences?
8. Who controls the uses of the forest?
9. What value does the forest have to you?
10. What value does the forest have to the community?
11. How is the forest being conserved?

3.2 Access to the Karima Forest

1. Who does the forest belong to?
2. Who is allowed to enter the forest? Is there a difference between men and women?
3. Who restricts the access to the forest? How do they restrict access? How are you informed about these restrictions?
4. What role does the forest guard play in allowing or restricting the access to the forest? Do you respect the forest guard?
5. Who manages the forest conservation? Is the forest being well conserved?
6. Do men or women conserve the forest more? If so, how?

4. SSI-KI, 1 KFS Head Nyeri County

1. Who owns the Karima forest?
2. What is the role of the KFS regarding the management of Karima forest?
3. What is your view of the FCMA 2016?
4. What are the challenges in the implementation of PFM?
5. What is your role in the Karima forest?
6. What activities are legal and what activities are illegal?
7. Do you monitor and evaluate the conservation of the Karima Forest?
8. What is the role of the forest guard?
9. Do you believe women or men have been more or less affected by the forest regulations and why?
10. Why has the TIP not been signed?

5. SSI-KI, 2 Retired KFS Head of Nyeri County

1. What is the role of KFS in regards to the management of Karima Forest?
2. Who has access to karima forest?
3. Do you monitor and evaluate the conservation of the Karima Forest?
4. What uses are legal and what are illegal?
5. How has the forest changed in the past 15 years?
6. Do you know the forest guards? What are their roles in the forest?
7. How does KFS support the conservation of the Karima forest?
8. Do you advocate the conservation of the Karima forest in the community?
9. Do you believe women or men have been more or less affected by the forest regulations and why?
10. Are you aware of the uses of forest?

11. What challenges do you foresee in the implementation of PFM?
12. Has the TIP been signed?
13. When was the CFA established?

6. SSI-KI, 3 Nyeri County Government Forester

1. How do you manage the forest?
2. Do you get reports of incidents?
3. How important is the Karima forest?
4. Who owns the forest?
5. You are a forester?
6. How are community forests supposed to be managed?
7. Has the County Assembly assisted the community in setting up a CFA?
8. Has the TIP been signed?
9. What is the county's view of the forest?
10. Does the Karima forest have a CFA?
11. Are there currently any forest users?
12. Does KTDA harvest trees in the forest?
13. Do you have a lease agreement with KTDA?
14. What role would the county offer to set up a CFA in the Karima forest?
15. Would you offer any training?
16. For how long have you lived in the county?
17. Is the tree cover of 36% a cause for lack of interest to manage community forests? What have you done in Tumutumu?

7. SSI-KI, 4 Forest Activist

1. What is the forest being used for?
2. What was your involvement in conservation of Karima hill forest?
3. What is the importance of the forest?
4. Were you involved in the formation of the CFA?
5. Did the CFA succeed in the management and conservation of the forest?
6. How is the forest being conserved now?
7. Do you trust the forest guards? Why?
8. Are there restrictions in access and use in the forest?
9. Does the community respect you? If yes, why?
10. Do you think the community trusts you?
11. What is your opinion about the future of the Karima hill forest?

8. SSI-KI, 5 CFA Chairman

1. What is the name of the CFA?
2. What was your role in the CFA?
3. What is the current status of the CFA?
4. How did the CFA help in conservation of the Karima forest?
5. What is the role of Kenya Forest Service?
6. Did KFS support the management plan?
7. Who can be a member of the CFA /who were the members of the CFA?
8. Was the CFA registered?
9. How were you appointed?
10. What benefit did the members have?
11. Are there CFA rules in the management plan?

12. Do you know what is legal and what was illegal in the forest?
13. How is the indigenous knowledge systems (IKS) taken into account in the CFA?
14. Do you think the CFA is important for conservation?
15. What is the future of CFA?
16. When did the CFA last hold elections?
17. When did the CFA last hold a meeting?
18. What is the relationship between the county assembly and the CFA?
19. Can the KTDA harvest their trees if the logging ban is lifted?

9. SSI-KI, 6 Forest Guard

1. What are your day-to-day activities?
2. What kind of forest is Karima hill?
3. What activities are illegal in the forest?
4. Are there any illegal activities taking place in the forest?
5. Who do you report to?
6. Do you issue any permits to people to access and use the forest?
7. What is the name of the other forest guard and how is the work divided between the two of you?
8. In a case of death in a household, do you allow fuelwood and timber to be logged from the forest?
9. Who has constituted the regulations? How are these regulations communicated to the community?
10. Do you think the community respects you?
11. Do you think the community trusts you?

12. How were you appointed?
13. What kind of training did you receive for this job?
14. What do you know about the forest act?
15. Does the CFA still exist in the community? Are there any active members?

10. SSI-KI, 7 Village Elder and Member of Green Belt Movement

1. What is the value of the forest to you?
2. How was the forest valued by the community before the CFA and has it changed?
3. Is the forest changing? if yes, in what ways and why?
4. Can you please explain your involvement in the CFA and what your role meant for the Karima forest?
5. What were the main issues that caused the collapse of the CFA?
6. To what extent is the CFA present at the moment in Karima Hill Community?
7. Are there any written rules about access and use of the forest? If yes, which rules and regulations exist?
8. Are you aware of the forest management plan?
9. Have the restrictions to the forest changed after the CFA collapsed?
10. Who is more involved in taking care of the forest, men or women?
11. Do you think the forest was better conserved when the CFA was functioning (2007-2013), compared to today?
12. If you would want to plant trees in the forest now, how would you proceed?

11. SSI-KI, 8 Forest guard, assistant chief of Tuti Sublocation and Village Elder

1. Where is the forest being used?
2. Who is using the forest?
3. How is the forest being used?
4. Has the health of the forest changed?
5. Are there forest guards in the forest?
6. Are there any illegal activities taking place in the forest?
7. Is there any funding available for the forest?
8. If there was any funding, how well was it accounted for?
9. Does the county assembly have a person responsible for the forest resources?
10. Do the local people have traditional knowledge for the use and conservation of the forest?

12. Focus Group Questions

1. Do you know of the CFA?
2. How are you using the forest at the moment?
3. How are other community members using the forest?
4. Are there any cultural reasons why men and women use the forest differently?
5. How would you like to benefit from the forest in the future?

13. Observation

1. How many houses are on the farm?

2. How many children?
3. Livestock - what? And how many?
4. Vehicles - how many?
5. Trees on the farm? Which trees?
6. Fodder on the farm? Which fodder?
7. Energy source? Which?
8. Is there firewood around? How much?

14. Synopsis