



UNIVERSITY OF NAIROBI

**IMPACTS OF LEGAL PLURALISM IN CONSERVING WATER TOWERS IN  
KENYA: A CASE STUDY OF MAASAI MAU WATER TOWER**

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**A60/31234/2019**

**A Thesis Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master  
of Science in Environmental Governance of the University of Nairobi**

**November, 2023**

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## ABSTRACT

Water towers offer ecosystem-based goods and services that support a number of sectors, which are crucial for the well-being of humans. Over the years, water towers have experienced severe degradation due to increase in human population and unsustainable human activities such as encroachment. Kenya is still grappling with sustainable forest conservation and management despite a supportive legislative framework. These threats to the forest conservation have been reported despite the existence of multiple policies, legislation, and institutions managing the same natural resource. Furthermore, there is little empirical data focusing on how legal pluralism impacts the sustainable management and conservation of Kenya's water towers. The broad aim of this research study was to assess the impacts of legal pluralism in relation to the Joint Enforcement Unit (JEU) in conserving water towers in Kenya highlighting the Maasai Mau Water Tower (MMWT). The main aims of the study were; to assess the status of MMWT before and after the JEU's establishment; assess how the existence of the JEU affected the access to forest products by the forest adjacent in MMWT; and to assess the sustainability and replicability of the JEU in other water towers in Kenya. The study adopted a mixed method approach where quantitative and qualitative data was collected from primary and secondary sources. Primary data was collected through household surveys, key informant interviews, focused group discussions, participant observations and satellite imagery. Secondary data was sourced from publications and reports. The key informants were purposefully selected while random sampling was applied in selecting ninety-nine (99) respondents for administering questionnaires. The study used thematic/content analysis to analyze the qualitative data and empirical analysis to analyze the quantitative data. Survey data revealed that MMWT faced a myriad of threats and challenges before the JEU was established in 2008. These challenges jeopardized the ecological potential of the water tower to provide ecosystem goods and services. Upon deployment of the JEU to protect the water tower, the study reported a decrease in the cases of illegal encroachment, charcoal production and illegal logging which was attributed to enhanced protection through regular patrols, seizures, arrests and prosecutions made by the JEU Rangers; heightened

sensitization forums; stakeholders' support through building of synergies and the electric fence project that helped in deterring forest offenders from easily accessing the forest. This access to the water tower was initially fueled by the high dependence on the forest for crop farming, livestock grazing, firewood/charcoal production and timber for construction. In order to sustainably manage the Water Tower, the study recommended for coordination of organizations working in the water tower to increase synergy; creation of community awareness on the importance of conserving water towers; enhanced protection through fencing of remaining section; and continued restoration activities.

## **DEDICATION**

I am pleased to dedicate this piece to my beloved wife (Nainyeyie); my lovely son and daughter (Saitabau and Naisula respectively); my dad (Ole Mebikie); my mum (Parakuo Mebikie); my siblings whom I support their University and High School education (Salaon and Naipiri respectively); and my friends (Kirui, Naikuni and Nelson) whom we enrolled for a Master's degree same time.

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## LIST OF ABBREVIATIONS

<b>AFRI</b>	African Forest Landscape Restoration Initiative
<b>CBD</b>	Convention of Biological Diversity
<b>CIDP</b>	County Integrated Development Plan
<b>CITES</b>	Convention on International Trade in Endangered Species of Wild Fauna and Flora
<b>CPF</b>	Collaborative Partnership on Forests
<b>EAC</b>	East African Community
<b>ENSDA</b>	Ewaso Ngíro South Development Authority
<b>FDGs</b>	Focused Group Discussions
<b>GDP</b>	Gross Domestic Product
<b>ITTA</b>	International tropical timber agreement 2006
<b>JEU</b>	Joint Enforcement Unit
<b>JFM</b>	Joint Forest Management
<b>KEFRI</b>	Kenya Forestry Research Institute
<b>KFS</b>	Kenya Forest Service
<b>KFWG</b>	Kenya Forest Working Group
<b>KWS</b>	Kenya Wildlife Service
<b>KWTA</b>	Kenya Water Towers Agency
<b>MEAs</b>	Multilateral Environmental Agreements
<b>MMWT</b>	Maasai Mau Water Tower
<b>MoEF</b>	Ministry of Environment and Forestry
<b>NCG</b>	Narok County Government
<b>NDC</b>	Nationally Determined Contribution
<b>NEMA</b>	National Environment Management Authority

<b>NETFUND</b>	National Environment Trust Fund
<b>RDU</b>	Rapid Deployment Unit
<b>SLF</b>	Sustainable Livelihood Framework
<b>UNCCD</b>	United Nations Convention to Combat Desertification
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>WHC</b>	World heritage convention
<b>WRA</b>	Water Resources Authority

# CHAPTER ONE

## INTRODUCTION

### 1.1 Overview

This introductory chapter will provide information on the study from background information, problem statement, research objectives, justification, significance, scope and limitations of the study.

### 1.2 Study Background

The struggle over the future of forests, water catchment areas and the claims regarding natural resources on many tropical borders have increasingly become an issue of public interest. Consequently, a significant body of research has emerged detailing the disordered activities of land reclamation, water conservation, and natural resource appropriation across the globe (Tegnan, 2018). Many of these research works have contested the paradigm of “legal centralism” due to the fact that it mainly reflects the law of state which in many cases is administered by a single state institution. Griffith (2016), for instance, shows that there is legislation governing land tenure in the Amazonian region and that state-based laws governing the use of natural resources in Central America contain shifting rules and a variety of internal contradictions, leading to inefficient resource use and conservation in the area.

Across the globe, countries have instituted different institutions, frameworks, and adopted various regulations while grappling with climate change and global warming issues. Consequently, the international community of lawyers and environmental activists rely on government-based laws and responsibilities while solving policy issues pertaining climate change and global warming. This implies that agreements on environmental conservation operate mainly on government-based negotiations as a practical way of solving disputes. As a result, national judicial systems have usually played critical roles in environmental degradation, climate change and global warming issues, though

they solve conservation matters based on the existing judicial systems (Arthur, 2013). The conservation resolutions made by domestic judicial systems are often perceived to be inadequate because the ensuing judgments ignore the wider scope of environmental harm. Additionally, national economic interests are frequently given priority by domestic courts (Maguire et al., 2013). In a nutshell, environmentalists, communities, and activists continue to be concerned about the implementation of both local and international environmental rights related to conservation (Taylor, 2018). This has necessitated the widespread adoption and implementation of multiple legislation and institutions as an alternate way to counter environmental degradation and conservation issues.

Pradan (2015) defined legal pluralism as the co-existence and interaction of multiple legal and institutional frameworks within a social setting. Multiple laws existing simultaneously does not imply that all of those laws are equal or equally strong. State law is frequently seen by state authorities as the highest law in various situations, such as those involving interactions between the state and local communities. When there are several laws in effect, people might utilize more than one law to justify and validate their choices or actions.

An effective adoption and implementation of legal pluralism require that states recognize that not all laws are state-owned to be administered by a government singly (Griffiths, 2016). An efficient legal pluralism reflects an implacable way of operation in which all standard arrangements co-exist mutually within a normative community. Tuebner (2017) recognizes that legal pluralism coexists in multiple settings and reflects systems that are not within the national legislative frameworks. These systems include NGOs, financial institutions, activists, and local/indigenous communities, which have formulated their own laws to protect, secure and conserve the environment. From water conservation perspective, legal pluralism is often considered an effective alternative for conserving water towers because it allows permeability (Techera, 2010).

Application of legal pluralism in water tower conservation has made significant headways in many

jurisdictions across the globe. For instance, the Atrato River was recognized as a legal entity by the Colombian Constitutional Court in partnership with the nearby towns. The Colombian government was concurrently ordered by that court to take part in judicial engagement among the communities (Sentencia, 2016). Additionally, the New Zealand government in 2012 recognized these legitimate rights to the Whanganui River after successful negotiations with the local community- the Maori people (Hsiao, 2012).

The Indian government changed its approach significantly in 1988 and adopted a Joint Forest Management System (JFM). JFM was a policy-based initiative that created management "partnerships" between the state and the local communities who use forest resources for their survival in order to sustainably manage and share the benefits of public forest land (Hathaway, 2012). By directly incorporating local people and institutions in forest management, JFM changed the focus from the current unequal allocation of management control (Campbell, 2016). In Tamilnadu- the Southern state of India, Village Forest Councils were formed under a pilot Project. The Japan Bank for International Cooperation provided funding for the Tamilnadu Forestry Project, a joint forest management (community forestry) initiative (Hathaway, 2012).

Similar advances have been undertaken in other jurisdictions such as Bolivia, UK, South Asia, and Ecuador (Rajagopal, 2015). In many African states, legal pluralism is a field of research and its application is still in the infancy stage (von Benda-Beckmann, 2012; Bermann, 2016). Legal pluralism is acknowledged as a significant diversity of non-governmental judicial systems run by organizations like activists, professional associations, and village councils in countries like Nigeria and South Africa (Beckmann, 2012). Notably, legal pluralism has demonstrated remarkable powers and impacts in influencing a myriad of economic and social activities in aforementioned countries.

In Kenya, legal pluralism has been applied besides legal systems in solving contentious economic and social disputes relating to land repossession, conservation of forest, and regulation on natural

resource use as well as natural resource allocation. However, the application of legal pluralism in Kenya is often anchored on the view that law requires institutions to enforce it despite the existence of constituted social structures (Berman, 2016). This is evident in the establishment of Joint Enforcement Unit (JEU) to protect and secure Maasai Mau Water Tower (MMWT).

ENSDA (2015) reported that of the twenty two (22) blocks of forest blocks that constitute the Mau Forest Complex (MFC). MMWT is the most threatened. Increased human settlement and illegal logging in MMWT has become a threat to biodiversity conservation and may in future negatively affect the communities' livelihoods (KWTA, 2018). Human populations keep increasing but resources like land and water remain constant. This reliance and/or over-reliance of communities on forest resources for settlement, farming, charcoal burning, fuel and timber leads to destruction of water catchment areas and consequently lead to reduction in river flows and eventually climate change.

In the context of the Mau Forest Complex, several issues arise from the interplay of legal pluralism, impacting governance, conservation efforts, and community engagement. The presence of multiple legal systems may lead to fragmentation, with different laws and regulations governing aspects of land use, resource management, and conservation within the Mau Forest Complex. The result is inconsistent and conflicting legal provisions than can create ambiguity, making it difficult to enforce and implement coherent conservation strategies. Additionally, Legal pluralism often results in uncertainty regarding land tenure and resource rights, especially when customary laws and formal legal systems intersect. This ambiguity can lead to disputes over land ownership, resource access, and usage rights, potentially hindering effective conservation efforts (Beckmann, 2012).

Prior research done in Kenya has focused on conservation of water towers as influenced by other factors and not legal pluralism. For instance, the study by Mwangi et al.,(2020) assessed the vulnerability of Kenya's water towers to future climate change, with a specific focus on informing

decision-making in watershed management. Schmitz (2020) focused on the role of investing in ecosystems as a strategy for ensuring water security, using the Kenya water towers as a case study. Research by Odawa and Seo (2019) explores the relationship between land cover change, population growth, and the condition of water tower ecosystems. Research by Russell, Ongugo, and Banana (2016) focused on key lessons learned from past experiences, aiming to inform the improvement of policies pertaining to forest conservation and climate change adaptation in communities associated with Kenya's water towers. This shows that research capturing legal frameworks particularly legal pluralism and conservation of water towers in Kenya remains scanty. It is against this background that this research sought to determine the impacts of legal pluralism in conserving water towers in Kenya, focusing on determining the sustainability and replicability of the JEU.

### **1.3 Problem Statement**

Water towers and riparian reserves have been significantly degraded over the past few decades as a result of illegal settlements, encroachment, excision, forest fires, and over-exploitation of the area's resources (KWTA, 2018). Conflicting policies, limited sectoral approaches to management, structural and systemic difficulties, insufficient enforcement of laws, poor leadership, and poor coordination are further enhancing water towers degradation which has negatively impacted on the environment, water resources, biodiversity, and socioeconomic growth. In many cases, the quantity and quality of ecosystem services have been significantly reduced as a result of water tower degradation, as shown by decreased river base flows, increased erosion rates, and decreased biodiversity, among other indicators. Conflicts over resources arise between diverse water tower users due to the diminishing water supplies against the increasing demand.

The Government of Kenya has instituted various policies, legislations and institutional frameworks governing different water towers in the country. Despite this government commitment, Maasai Mau Water Tower has continued to lose its ecological integrity overtime, largely due to overlapping and

conflicting mandates among institutions operating in that water tower which create interagency tensions that are counterproductive in protecting and conserving the water tower. MMWT is protected and secured by the JEU that was established in 2008 (Mau Task Force Report, 2009). The management of MMWT is fragmented, with numerous institutions concentrating on their assigned mandates with little consideration for the interconnectedness nature of the water tower. This essential resource's planning and administration so continue to be significantly biased toward sectoral policies and mandates rather than a holistic approach to landscape management, depriving the water tower of the deployment of effective and efficient management measures that are sorely required.

The local communities also feel that they have limited opportunities to guarantee their rights to engagement in the official channels such as JEU that has been put in place to protect and secure MMWT. Additionally, there is insufficient information that is backed by rigorous scientific research on the impact of legal pluralism in relation to JEU's efforts in conserving water towers in Kenya. Many water towers in the country are facing similar challenges but lack sufficient facts hence the need to assess how legal pluralism impacts the sustainable management of these water towers.

Despite the valuable contributions from previous research, significant research and knowledge gaps exist that warrant further investigation. While Mwangi, et al. (2020) assessed the vulnerability of Kenya's water towers to climate change, it did not extensively delve into the legal frameworks governing conservation efforts. The study focused more on climate-related impacts and adaptation strategies, leaving a gap in understanding the legal dynamics that influence effective conservation policies. Schmitz (2020) highlighted the importance of investing in ecosystems for water security, but the specific legal mechanisms or pluralistic frameworks that govern such investments were not thoroughly explored. Additionally, Odawa and Seo (2019) examined the influence of land cover change and population growth on water tower ecosystems, but the legal dimensions of land use changes and the role of JEUs were not explicitly addressed. Furthermore, Russell, Ongugo, and Banana (2016) focused on lessons learned for improving policies affecting forest conservation and



climate change adaptation. However, the specific role and effectiveness of legal pluralism, especially within JEUs, were not deeply scrutinized. This research aimed to address the above gaps by evaluating how legal pluralism in relation to JEU impacts the conservation of water towers in Kenya by focusing on MMWT. It is expected to benefit policy makers and the government on matters to do with joint or collaborative engagements between institutions in the same ecosystem.

## **1.4 Research Objectives**

### **1.4.1 Broad Objective**

The overall objective of this research study was to evaluate how legal pluralism in relation to JEU impacts the conservation of water towers in Kenya by focusing on MMWT.

### **1.4.2 Specific Objectives**

- i. To evaluate the status of MMWT before and after the JEU's establishment.
- ii. To examine how the existence of the JEU affected the access of forest products by the forest adjacent community in the MMWT.
- iii. To assess the sustainability and replicability of the JEU in other Kenya's water towers.

## **1.5 Research Questions**

The following questions guided the study:

- i. What was the status of MMWT before and after JEU's establishment?
- ii. How has the JEU affected access to forest products by the adjacent forest communities in the Maasai Mau forest?
- iii. How can JEU be sustained and replicated in other water towers in Kenya?

## **1.6 Justification of the Study**

Goldstein (2013) in a study focusing on urban squatters in Bolivia, suggests that legal pluralism can be very useful in understanding the challenges facing water towers since it offers a thorough

examination of how law and legality affect the lives of people especially those living on the buffer zone of the water tower. The explanation is important to the situation of MMWT, where there are conflicts between government agencies (JEU) whose aim is to implement laws and offer rational patterns of settlement to conserve the water tower and local communities who claim that the order established by JEU severely ignores their rights to resources. The inability to understand the current resources laws and rights lead to a neglect of the local people's methods of livelihood and further sabotage their dignity. The failure also delegitimizes existing government institutions such as JEU in the eyes of the locals and thus creates an impediment to the ongoing environmental conservation. It also hinders the ability of development programs to produce the self-motivated participation among the local communities and enforcement needed to ensure the success of such programs. It is therefore imperative to have a better comprehension of these challenges so that there is successful integration of nature conservancy programs, policies, and regulations since they take into consideration social justice, normative orders, and democracy. Most of environmental regulations and conservation institutions in Kenya are state-based, and this has led to constant conflicts among the government, enforcement institutions, and local communities. The case of MMWT presents an opportunity for widespread adoption and application of pluralism in various environmental conservation programs in Kenya. It is in this context that this research sought to assess the impacts of legal pluralism in the management of water towers.

### **1.7 Significance of the Study**

Understanding the multiple sets of laws through the framework of legal pluralism is of great significance to policy-makers in managing natural resources. The results of this research will assist the state, environmentalists, concerned institutions, and local communities along natural resource margins in understanding and improving efforts to promote the rule of law as well as good governance, and develop more broadly in all legally pluralist settings. The study will inform the Government whether the JEU has achieved its intended goal of containing water towers destruction,

encroachment and illegal extraction of water towers resources since its establishment in 2008. The finding of this study will provide recommendation to the government on sustainable mechanisms for managing water towers. From a broader perspective, the findings of ethnographic cases on pluralism around Maasai Mau will provide valuable insights into the daily struggles over resources and inform the environmental conservation and sustainability discussions according to the sustainable development goals (SDG -15), Paris agreements, Kyoto protocol, African development agenda 2063, Kenya's forest laws (Forest Conservation and Management Act (2016), and Kenya Vision 2030. Finally, this study will be useful to scholars, researchers and students who would want to explore legal pluralism in natural resources management as they will find valuable data/ information.

### **1.8 Scope of the Study**

The extent of this research was to generate pertinent information on the impacts of multiple institutional, policy, legal frameworks on the conservation of water towers in Kenya focusing on the MMWT which is the only water tower protected by the JEU. This study focused on Maasai Mau Water Tower since it is the most significant water tower in Kenya and supports millions of livelihoods on a local, regional, and global level. The research therefore assessed the status of the water tower before and after the JEU's establishment. Furthermore, the study determined how the existence of the JEU affected the access to forest products by the forest adjacent community in MMWT; and assessed the sustainability of the JEU in the water tower and the possibility of replicating the concept in other water towers in the country. This was achieved through the collection of primary and review of secondary data.

### **1.9 Limitations of the Study**

The Covid-19 epidemic, difficult terrain, terrible weather, scattered households, hostile community members, financial and time constraints were some of the difficulties the study faced. Out of the twelve locations around Maasai Mau Water Tower, the study was only done at the Sagamian

Location. My four research assistants, including the village elder, were knowledgeable about the local languages and their familiarity about the terrain, made it easier to collect data since they could reassure the locals that the research was discrete and was only being done for academic purposes.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

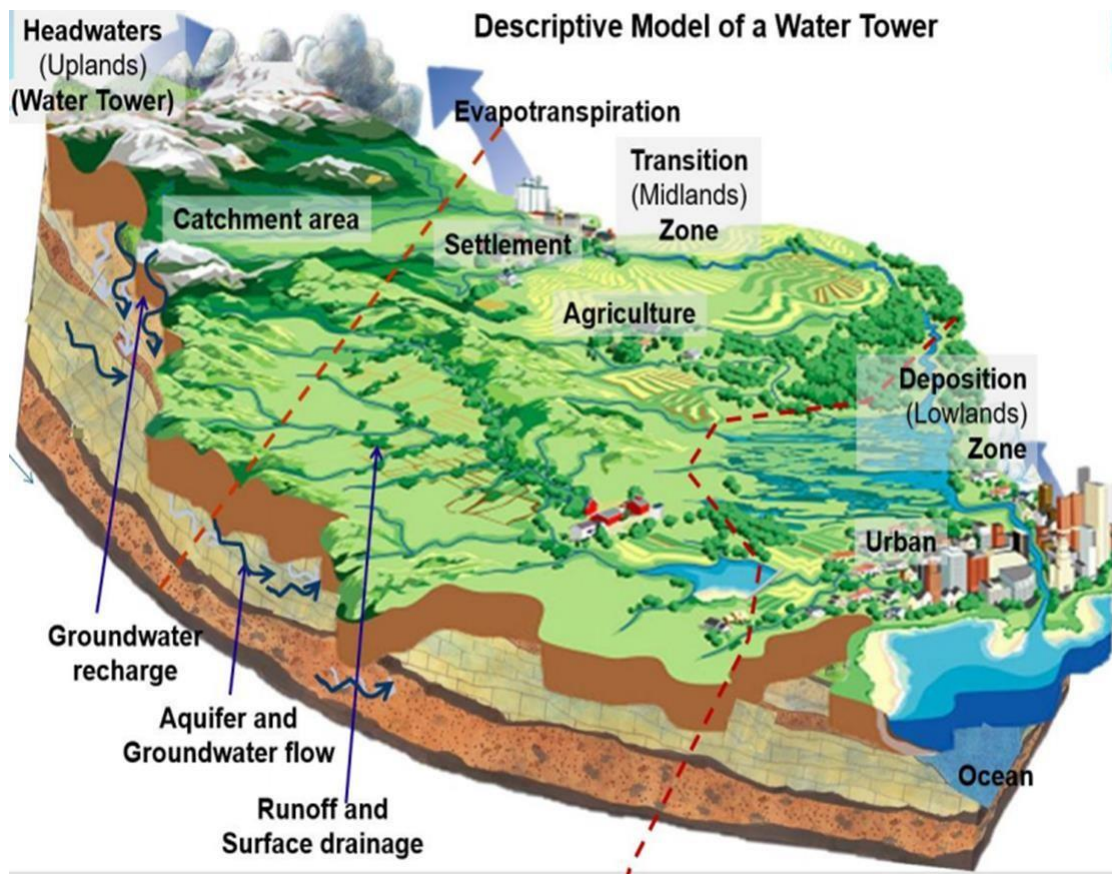
#### **2.1 Introduction**

The chapter contains all the literature that the researcher reviewed. It focuses on several themes which were organized according to the research objectives.

#### **2.2 Water Towers in Kenya**

According to Duckett (2005), the term “water tower” was originally coined to describe “a pillar holding a raised tank, whose height generates necessary pressure to distribute water in a piped system”. KWTA (2019) defines the term "water tower" as “an elevated geographical area made up of mountains, hills, and plateaus” from a hydrological perspective. The topography, soils, vegetation and geology of the geographical area supports the “reception, retention, infiltration, and percolation of precipitation and storage as groundwater” (KWTA, 2019). This water is ultimately released through various waterbodies such as rivers, streams, lakes, swamps, springs, and oceans to ensure that the connected biodiverse ecosystems are sustained.

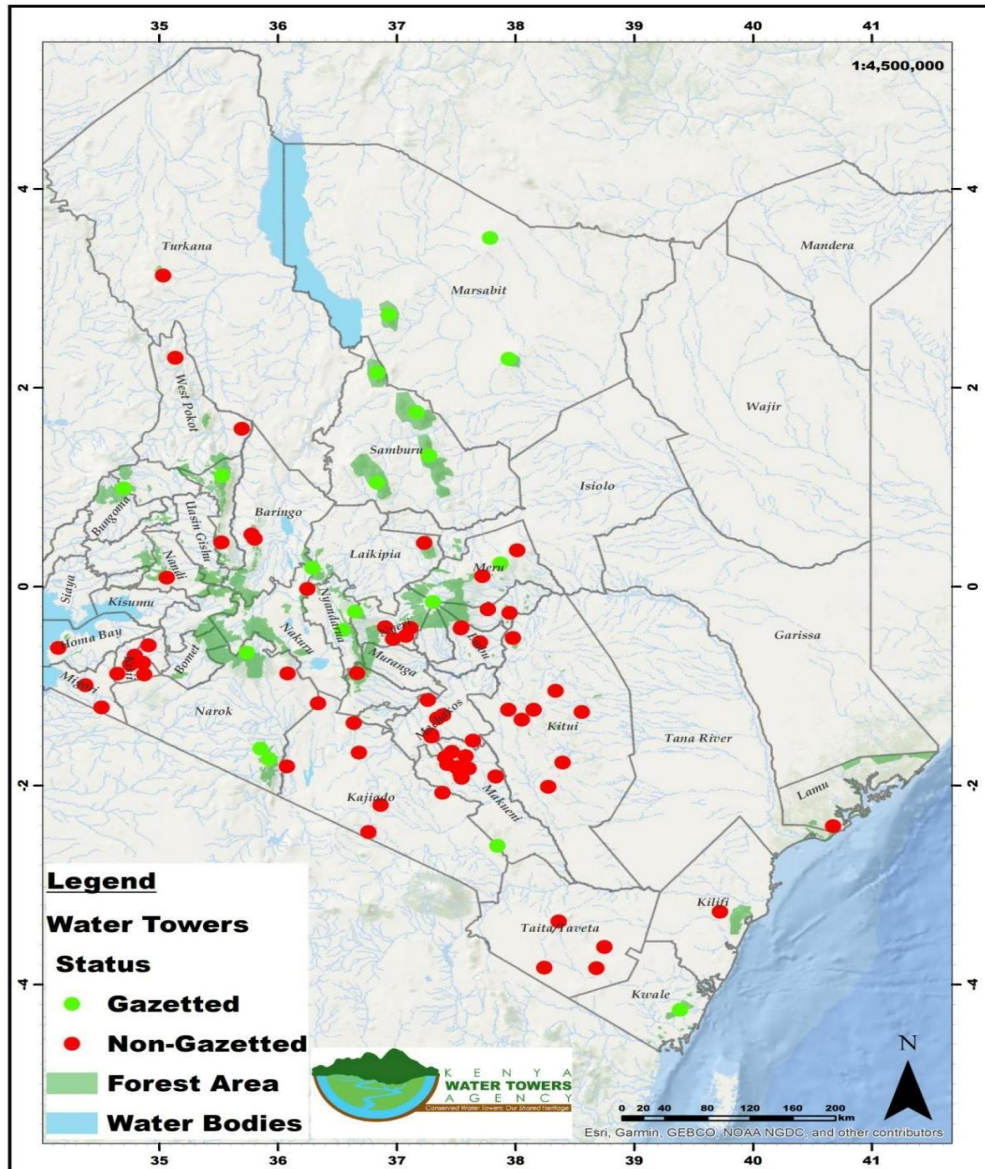
Water towers convey water, which performs several essential ecological and hydrological activities, over the terrain and into the ground. For example, they serve as vital habitat for several floral and faunal species and as pathways for the transportation of sediment, nutrients, minerals, and a wide range of chemicals. Additionally, water towers provide water to human communities for use in industries, hydroelectric power, recreation, cleaning, and drinking. A descriptive model of a water tower showing how the released water is harnessed for domestic, industrial, agricultural, environmental and other uses is depicted in Figure 1.



**Figure 1:** Descriptive model of a water tower

(Source: KWTA, 2018)

Water towers form a very important part of Kenya’s environment system, and restoring these resources is one of the critical projects under the Kenya Vision 2030. The upper catchment of all the major rivers in Kenya is formed by eighteen (18) gazetted water towers, including five (5) major ones: the Mt. Kenya, Cherangany, Mau Forest Complex, Aberdares, and Mt. Elgon, which together provide seventy-five percent (75%) of Kenya’s water resources. The other gazetted water towers which provide essential services to communities include Mt. Marsabit, Marmanet forest, Chyulu Hills, Nyambene Hills, Shimba Hills, Matthews Range, Mt. Kipipiri, Loita Hills, Mt. Nyiru, Mt. Kulal, Huri Hills, Kirisia Hills and the Ndotos Ranges. Moreover, there are other seventy (70) water towers that have been proposed for gazettement. Figure 2 shows the spatial distribution of water towers in Kenya including gazetted and non-gazetted water towers.



**Figure 2:** Spatial distribution of water towers in Kenya

(Source: KWTA, 2021)

### 2.3 Mau Forest Complex

The Mau Forest Complex (MFC) Water Tower lies between latitude  $37.90^{\circ}$  to  $38.04^{\circ}$  East and longitude  $2.21^{\circ}$  to  $2.33^{\circ}$  North at an elevation between 2,000m and 3,000m above the sea level on the western slope of the Mau Escarpment. It borders Kericho County to the West, Nakuru County to the East, and to the North is Uasin Gishu County.

The MFC is the most significant water tower in Kenya and supports millions of livelihoods on a local,

regional, and global level. The Water Tower has a total area of 455,000 hectares, which is equal to the combined size of the forests on Mount Kenya (203,150 Ha) and the Aberdare Mountains (104,078 Ha) (Mau Taskforce Report, 2009). The Water Tower comprises 22 forest blocks within seven regions namely Transmara, Southern Mau, Maasai Mau, Western Mau, Mau Narok, Eastern Mau, and South West Mau. Of the 22 blocks of forest, 21 are gazetted under the Forest Act, CAP 385 repealed in 2005 as forests and are managed by the Kenya Forest Service (KFS). Maasai Mau Forest is the only forest that is managed by the County Government of Narok as a trust land under the Trust Land Act (Cap 288).

The Amalo, Mara, Makalia, Ewaso-Ng'iro, Mumberes, Molo, Njoro, Naishi, Nzoia, Nderit, Sondu, Nyando and Yala rivers are among the 13 major rivers that flow through the MFC (KWTA, 2018). Five significant lakes namely; Lake Victoria, Lake Nakuru, Lake Natron, Lake Turkana, and Lake Baringo are fed by these rivers. Millions of people in the area depend on the water tower because it is also the source of the Nile, which flows through Egypt, South Sudan, Sudan, and Uganda before pouring into the Mediterranean Sea.

The Maasai Mara and Serengeti National Reserves receive life-giving energy from the MFC Water Tower (ENSDA, 2018). Water from the MFC Water Tower is crucial to the massive wildebeest migration across the Mara River, which has been termed the eighth wonder of the world. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) has designated the yearly picturesque event as one of the most stunning natural spectacles in the world. Through tourism, agriculture, pastoralism, biodiversity, and hydroelectric power production. The water tower and its ecosystem significantly contribute to the economic development of Kenya.

The remaining twenty-one (21) blocks in the Complex are gazetted as forests, with the exception of the Maasai Mau Water Tower, which is registered under the Trust Lands Act as a trust land (KWTA, 2018). According to a 2012 order from the Kenya Water Towers Agency, the entire MFC is classified



as a critical water tower.

## **2.4 Importance of the Conservation of Water Towers**

According to Jentoft (2019), water towers support various sectors of the economy like the energy sector, agriculture and irrigation, wildlife and health, which account for the largest share of Gross Domestic Product (GDP). The other significant ecological services offered by water towers include erosion control, water cycle management, water and air filtration, storage for spring, river, and reservoir recharge, as well as climate regulation and mitigation through carbon sinks. Additionally, biodiversity is crucial because it increases the capacity of the ecosystems to adjust to the consequences of climate change. As a result, populations living in these locations see changes in their economic performance and way of life, which makes it harder for them to adjust to climate change and variability. The many goods and services produced by the water towers promote sustainable development and advance the Sustainable Development Goals and Vision 2030.

Regionally, water towers serve as watershed and water catchment areas and are extremely important for preserving biodiversity, fostering economic growth, and promoting equitable development. They are essentially natural reservoirs that collect and store precipitation, ensuring a reliable supply of water for various purposes, including drinking water, irrigation, and industrial use. This function is especially significant in regions where water resources are limited or prone to seasonal fluctuations.

Moreover, water towers contribute significantly to the preservation of biodiversity. These elevated areas often support diverse ecosystems with unique flora and fauna. They provide habitats for numerous species, including endemic and endangered ones. The conservation of water towers helps protect these ecosystems, safeguarding the biodiversity within them and ensuring the long-term sustainability of the surrounding landscapes.

In addition to their ecological significance, water towers also foster economic growth and promote equitable development. They provide a dependable water supply for agricultural activities, enabling sustainable farming practices and enhancing food security. Furthermore, water towers support tourism and recreational activities, attracting visitors who appreciate the natural beauty and wildlife associated with these areas. The economic benefits derived from tourism and related industries contribute to local livelihoods and regional development. Keyes (2015) found that collaboration and participation from all stakeholders are necessary to realize the full potential of the water tower ecosystem. Given their different mandates, stakeholders in water towers might then develop synergies through a coordinated and integrated strategy. Disjointed elements that cause duplication, waste, and community problems will be eliminated as a result. Therefore, the significance of harnessing the synergies among all entities engaged in the planning and managing water towers cannot be overstated. In order to manage this vital resource sustainably. Kanui (2016) recommended the creation of urgent policy and legislative frameworks that will guarantee efficient and effective coordination of diverse parties within the water towers.

## **2.5 Threats and Challenges Facing Maasai Mau Water Tower**

### **2.5.1 Introduction**

Over the years, water towers have experienced severe degradation due to rising population of humans and associated demand for resources (ICS, 2011). As human populations grow, there is a greater need for land, water, and other natural resources, leading to increased pressure on water tower ecosystems. Deforestation, illegal logging, and land conversion for agriculture or settlements have taken a toll on these critical areas. The degradation of water towers has resulted in several adverse effects. Firstly, the loss of forest cover and vegetation reduces the water-holding capacity of these areas, leading to decreased water availability and altered hydrological cycles. This, in turn, affects downstream

communities, agriculture, and ecosystems that rely on a consistent water supply. Secondly, the destruction of habitat within water towers threatens biodiversity, leading to the loss of unique and endemic species. The disruption of ecological balance can have cascading effects on ecosystem services, such as pollination, nutrient cycling, and natural pest control. According to Musula 2011, these challenges are manifested through unsustainable human activities such as deforestation, human encroachment, land degradation and loss of biodiversity as people try to meet the growing demand. Other challenges include pollution, poaching, deterioration of the traditional systems of management, declining grazing lands and farmlands, insecurity, bio-piracy, and encroachment by alien and invasive species. Degradation of water towers deprive the poor of key resources thereby underpinning livelihoods and diminishing their capacity to escape poverty.

Degradation of Kenya's water towers directly impacts on climate change as is witnessed in drying of water resources, water scarcity, rising costs of water treatment, water conflicts, low land productivity and poor health (ENSDA, 2015). The effects of global warming are vast and varied ranging from increased droughts as being witnessed in Central, Eastern and Northern parts, flooding as is seen in most parts of Rift Valley Western and Nyanza, reductions in snow and ice on Mt. Kenya as is being observed by retreatment of glaciers especially Lewis. This compromises the country's development agenda, which is primarily depended on natural resources.

The MMWT ecosystem is now the MFC forest block that faces the greatest vulnerability, primarily as a result of pressures and damage brought on by humans. According to Githiru (2018), the greatest threat to Maasai Mau biodiversity is human interference. The ecosystem's ability to support and provide goods and services is threatened by the degradation of Maasai Mau Water Tower. There is proof that MMWT destruction had catastrophic effects and caused environmental disasters, frequent flooding, loss of livelihoods, water shortages, protracted droughts, reduced river flows, food shortages, poor productivity of land, and conflicts over natural resources like pasture and water,

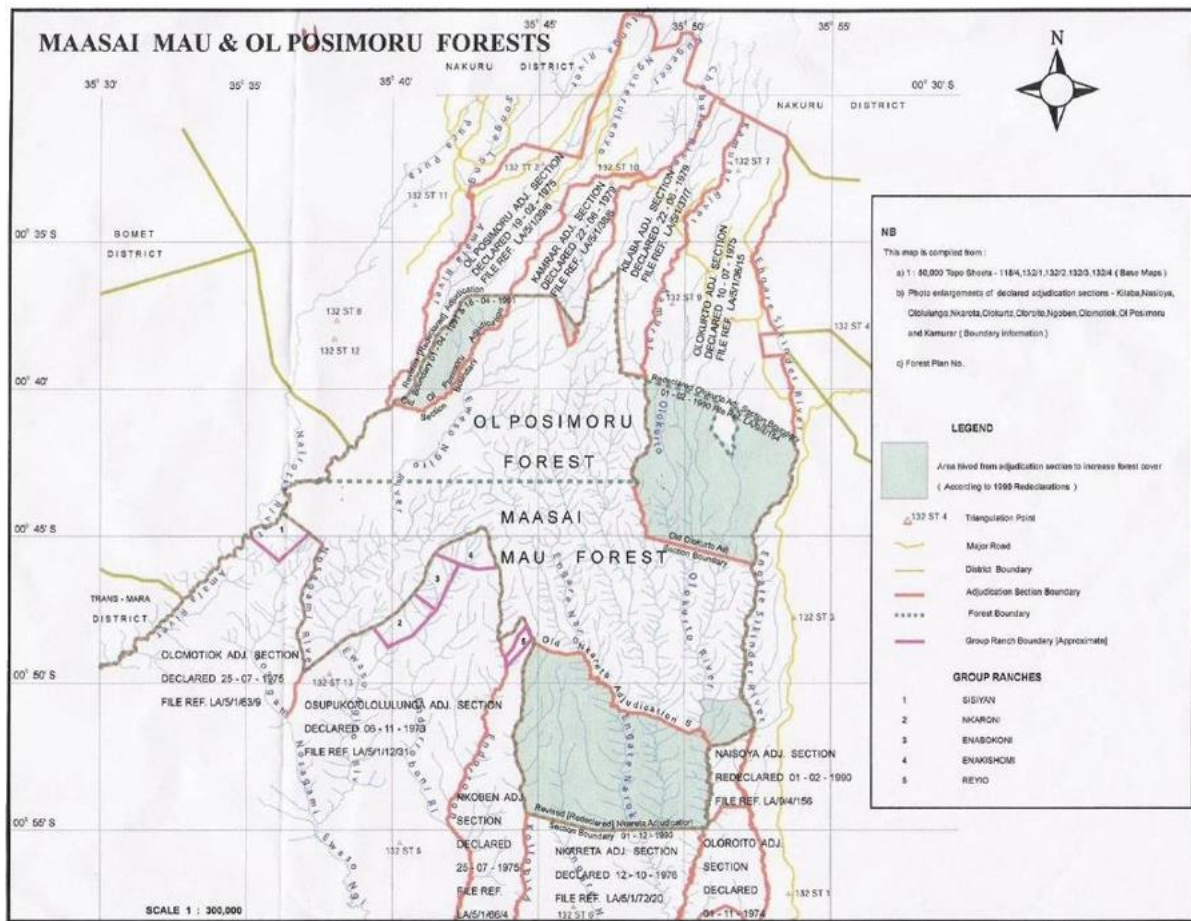
among others.

Some of these threats are discussed below:

### **2.5.2 Illegal human settlements/ encroachment**

This is the main threat that MMWT grapples with and it goes back to the 1970s. During this time, the Kenyan government created five adjudications in the north of Olpusimoru and MMF (Githiru, 2018). The sections as illustrated in Figure 3 included Kamurar, Kilapa, Olposimon A and B and Olkurro. The Government of Kenya later declared five other adjudication sections namely Nkareta, Ilmotiok, Nkobon, Ololulunga, and Naisuya to the south of the forest. However, this resulted to heightened pressure in the adjudication sections.

The Maasai Mau Forest came under new pressure in 1999 when five (5) Group Ranches that were next to the forest and had been arbitrated in the 1970s asked the local territory Control Board for permission to divide their territory among themselves (ICS, 2011). Reiyo (Nkobon Adjudication Section), Nkaroni, Enoosokon, and Enakishomi (Ololulunga Adjudication Section), and Sisiyan (Ilmotiok Adjudication Section) were affected ranches. These sections' boundaries were clearly determined during the land adjudication process, and were therefore adopted at First Registration.



**Figure 3:** Original and re-declared boundaries of the adjudication sections adjacent to Maasai Mau and Ol Posimoru

(Source: ICS, 2011)

Githiru (2018) points out that after the issuance of consents, politicians, officers of government, private surveyors and other influential people in society added the sizes of their Group Ranches irregularly beyond what was originally outlined in the adjudication sections. These people also illegally obtained title deeds such that by 2005 the illegal expansion into the Mau Forest had created 1,962 parcels of land, which amounted to 17,101 hectares of the forest. This is illustrated in Table 1 below.

**Table 1:** Illegally increased sizes of the group ranches

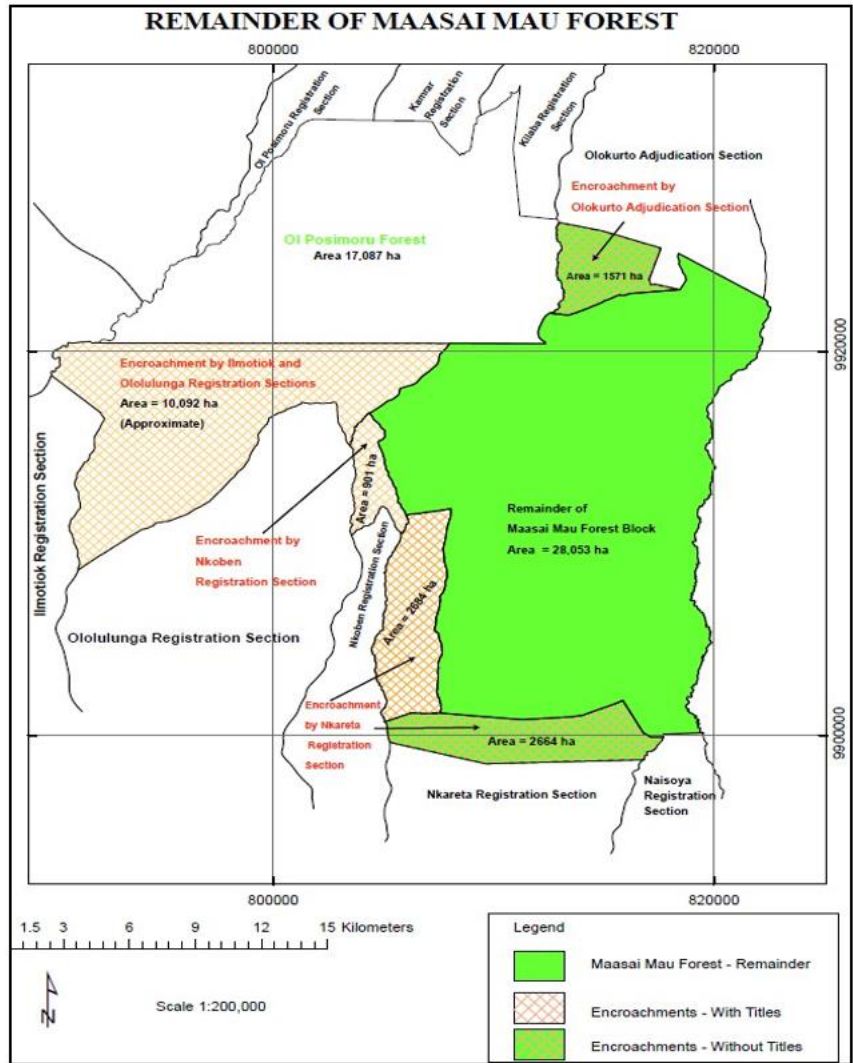
<b>Adjudication Section</b>	<b>Group Ranch</b>	<b>Original parcel number</b>	<b>Area at first registration (Ha)</b>	<b>Total titled area after sub-division (Ha)</b>	<b>Titled area in the forest (Ha)(*)</b>
Ilmotiok	Sisiyian	375	447.5	1,059.7	732.5
Ololulunga	Nkaroni	118	1,597.5	7,861.0	(Approx.) 7,127.3
Ololulunga	Enoosokon	110	155.0	1,723.4	(Approx.) 1,593.4
Ololulunga	Enakishomi	115	844.5	8,169.4	(At least) 7,324.9
Nkobon	Reyio	34	26.0	323.0	323.0
<b>Total</b>			<b>3,070.5</b>	<b>19,136.5</b>	<b>(At least)</b> <b>17,101.0</b>

(\*) “Approx.” values are provided based on an approximate delineation of the original Group Ranch boundaries on the Preliminary Index Diagrams. “At least” values derive from subtracting the original Group Ranch area from the total titled area.

(Source: ICS, 2011)

This "ballooning" of these lands beyond the stipulated area led to human encroachment and degradation, resulting in the land ownership dilemma witnessed today. Since then, increased population, land subdivisions, and speculative squatters have resulted in a steady stream of people and human settlement. This has resulted in even more encroachment into the forest (ENSDA, 2018). If the settlers are let to remain on the unlawfully obtained forest land totaling 21,336 Ha, just 24, 942 Ha of MMF will be left out of the total 46, 278 Ha as shown in Figure 4. This negatively impact on the ability of the ecosystem to offer the services it performs on a continual basis, decreasing its

ecological integrity.



**Figure 4:** A map of Maasai Mau Forest showing the encroached areas and the hectarage that will remain if settlers are allowed to continue living in the forest.

(Source: KWTA, 2020)

### 2.5.3 Incomplete Survey of MMWT Boundaries

The forest limits were thus set by default of the boundaries of the surrounding adjudication sections, which were re-declared in 1990 to adhere to the recommendations that the 1986 Ole Ntutu Commission made (Pradan, 2015). The re-declaration of one adjudication section, Nkareta, was not completed, allowing claims on vast areas still covered by indigenous forest beyond the presidential

Ole Ntutu Commission boundaries. Furthermore, during the subdivision of the five group ranches in the Ilmotiok, Nkobon, and Ololunga adjudication sections in the late 1990s, title documents were issued in excess of the group ranches' initially adjudicated areas. This resulted in major encroachment and the destruction of the Maasai Mau Water Tower.

#### **2.5.4 Population Growth**

Population growth has resulted in increased demand for goods and services and thus over-extraction of natural resources through unsustainable human activities (Arthur, 2013). The high demand for housing has led to illegal logging in search of timber, which is the most common material, used for building. Cutting of trees have led to reduced biodiversity, important in maintaining provision of ecosystem services. Selective cutting of medicine and wood products take place in most of the water towers. Furthermore, increased population raised the demand for food leading to high conversion of forestland to cropland.

#### **2.5.5 Political and security tensions:**

Some political leaders have been heightening up emotions among some communities bordering MFC, making conservation initiatives appear politically motivated. This escalates the prevailing situation beyond conservation and ultimately causes security/communal tensions. Arthur (2013) points out that the political and tribal tensions exacerbate the situation on the ground and make operations and coordination of the different Agencies very difficult. Additionally, in anticipation of evictions, settlers tend to utilize that opportunity to exploit the forest resources in anticipation of leaving the area.

#### **2.5.6 Uncoordinated Efforts in Conservation of Water Towers**

When the same region is gazetted as a national park, a wildlife conservancy, a public forest, and a water tower, the need for conservation is heightened. Due to this reality in Maasai Mau, three different public institutions namely; Kenya Forest Service (KFS), Kenya Wildlife Service (KWS) and Kenya Water Towers Agency (KWTA) operate in the same region, oftentimes with overlapping legislative



mandates. Jentoft (2019) opines that this may result in conflicts among the institutions and some important areas remaining unaccounted for especially in terms of responsibility thus making conservation difficult. This is further catalyzed by the fact that the three Institutions operate based on different conservation standards thus causing coordination challenges. When an area is gazetted by multiple public institutions, conflicts also emerge which confuses ecosystem users and may result in further unsustainable management (ICS, 2011).

## **2.6 The Mau Task Force of 2009**

After recognizing threats in the MFC and other water towers in Kenya, the Government formed a Task Force on the conservation of the MFC which included institutions such as KFS, KWS, Water Resources Authority (WRA) and key Ministries in 2008 (KWTA, 2018). The taskforce recommended immediate actions for restoring MFC. The findings of the taskforce revealed inefficiencies in the institutional arrangements that limited proper coordination for sustainable management. The cabinet adopted the Taskforce's main findings on 31st July 2009 and Parliament on 15th September 2009.

An Interim Coordinating Secretariat (ICS) was further established to oversee and implement the recommendations and to further develop measures that could ensure the restoration and sustainable management of the Mau Forests Complex and other water towers across the Country (ENSDA, 2018).

The ICS transitioned into Kenya Water Towers Agency (KWTA) through the Legal Notice No. 27 of 13th April, 2012 (Legislative Supplement No. 12) and mandated to carry out coordination and oversight roles of protecting, rehabilitating, conserving and sustainably managing all the critical water towers (Arthur, 2013). KWTA has since supported efforts to rehabilitate water towers including Maasai Mau Water Tower.

## **2.7 Establishment of a Joint Enforcement Unit**

According to the Interim Coordinating Secretariat (2011), the Joint Enforcement Unit (JEU) was set

up in 2008 following recommendations by the Government Task Force on the Conservation of the Mau Forest Complex. This special Multi-Agency Unit comprises officers from KWS, KFS, Narok County Government (NCG) and the National Police Service (NPS). The Unit was formed to prevent further destruction of the MFC. The Mau Taskforce Report (2009) highlights the unit's specific goals which include: halt further illegal logging and movement of forest products for commercial use, like charcoal, logged timber and other forest produce; stop further encroachment on forests through illegal settlements and farming; evaluate the level of forest damage and recognize the hotspots; and carry out forest management activities, such as preventing poaching and human-wildlife conflict and monitor flora and fauna for biodiversity protection.

## **2.8 Reclamation Efforts**

The Mau Forest Complex Water Tower was encroached and was in need of restoration until the Kenyan government came up with an ambitious plan which led to a recovery of 19,000 hectares in South-West Mau Water Tower in 2009 (Musula, 2011). It also resettled people who voluntarily left the water tower in Chemusian in Baringo County, while others received KES 400,000 to purchase land elsewhere. In 2018, the government reclaimed 4,500 hectares of forest land in Maasai Mau as part of Phase I of the reclamation exercise (ENSDA, 2018). It further recovered 17,101 hectares in 2019 as part of Phase II reclamation, which included Siera Leone, Kipchoge and Kamwengoi (KWTA, 2020). In total, 40,000 hectares have so far been recovered by the government since the Joint Enforcement Unit was stationed in Mau Forest Complex.

## **2.9 Policy, Legal and Institutional Frameworks Related to Water Towers**

### **2.9.1 International Protocols and Conventions on Natural Resources**

Kenya is a party to numerous Multilateral Environmental Agreements (MEAs) that address several issues of the environment and has since developed national strategies and made appropriate efforts aimed at conservation and sustainable management of these natural ecosystems (Keyes, 2015). These

include Convention of Biological Diversity (CBD), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC), Kenya is committed to achieve her Nationally Determined Contribution (NDC) through laid down strategies and action plans. Sustainable Development Goals 6, 7, 14, and 15 which focus on water, energy, climate change, sustainable use of resources, such as forests and oceans, combat desertification and halt loss of biodiversity are all dependent on effective protection and conservation of our water tower ecosystems (Mulleta, 2014). The additional agreements and conventions comprise the following: the Ramsar Convention on Wetlands, the United Nations Convention to Combat Desertification (UNCCD), the African Convention on the Conservation of Nature and Natural Resources, the Collaborative Partnership on Forests (CPF), the Protocol on Environment and Natural Resources Management to the Treaty for the Establishment of the East African Community, the International Tropical Timber Agreement 2006 (ITTA), the International Convention for the Protection of New Varieties of Plants, and the Convention of the protection and use of Transboundary Watercourses and International Lakes (WHC).

### **2.9.2 Regional Legal Frameworks**

Kenya is a member of regional blocks and therefore a signatory to several treaties that are relevant in managing and conserving water towers sustainably (Maguire, 2013). The first one is Agenda 2063 whose transformational outcomes are dependent on sustainable management of environmental resources in an integrated manner and commitments towards mitigating climate change and its associated impacts. Like other water towers in the region, MMWT plays a critical function in ameliorating the serious effects of climate change.

The second treaty is the Protocol for sustainable development of Lake Victoria basin and protocol on the environment and natural resources for the East African Community (EAC). Through these

protocols, MMWT contributes to waters that feed Lake Victoria and therefore an important catchment for the basin (KWS, 2009).

The Memorandum of Understanding for the cooperative management of water resources in the transboundary Mara River Basin between the governments of the United Republic of Tanzania and the Republic of Kenya is the third treaty. The source of Mara River, which serves the Mara-Serengeti ecosystem, is Enapuiyapui Wetland located within the Mau Forest Complex (KWTA, 2018).

Last but not least, a country-led initiative called AFR100 (the African Forest Landscape Restoration Initiative) aims to restore 100 million hectares of land in Africa by 2030. The MFC is the largest closed- forest canopy in East Africa (ENSDA 2018) and therefore provides significant socio-economic benefits.

### **2.9.3 National policies**

A number of national policies, plans and strategies relate to the conservation and sustainable management of water towers. These include:

#### **2.9.3.1 Kenya Vision 2030**

The aim of Vision 2030 is to transform Kenya into an industrializing country that ensures high quality of life for its citizens. To realize this, it emphasizes the concept of a clean environment that is anchored on the concept on sustainable development. Water towers support this pillar and socio-economic development which is also a critical pillar of Vision 2030 (Jackson, 2018). They support industrial development, electricity generation, agriculture, irrigation, health, wildlife, tourism as well as indigenous knowledge, conservation of biodiversity and research. MMWT is the source of Mara River which supports the downstream Mara-Serengeti ecosystem hence contributing to tourism revenue. The Kenya Vision 2030 recognizes the protection and rehabilitation of the five major water towers Kenya and other smaller crucial water towers and watersheds as one of the flagship projects towards realizing their sustainable management. The vision further calls for promotion of nature-

based enterprises and scaling up of market-based instruments as strategies to support the overall environmental management. The role of the JEU in protecting MMWT is therefore critical for both Kenya and the region.

### **2.9.3.2 Sessional Paper No. 3 of 2009 on National Land Policy**

The land policy addresses land issues such as rapid population expansion, a breakdown in the processes for managing and transferring land, and insufficient community participation in the governance of land and land-based natural resources. It also focuses on issues such as conflicts over land related resources, declining land productivity, poor environmental management, and these issues. The unclear circumstances of land ownership in the formative years contributed largely to encroachment of MMWT leading to its degradation.

### **2.9.3.3 Sessional Paper Number 1 of 2017 on National Land Use Policy**

The policy provides a framework for directing action in response to the issue of haphazard land use approaches and practices. In order to advance the public good and general interest, the policy seeks for maintaining land use systems that support resource allocation, management, and planning for sustainable development, including inside water towers.

### **2.9.3.4 National Environment Policy, 2013**

This policy outlines guidelines for the reclamation and rehabilitation of ecologically damaged sites, such as hilltops in water towers. The policy acknowledges the crucial contribution made by the nation's water towers to the preservation of biodiversity, since they serve as homes for distinctive varieties of flora and fauna, including species that are endemic. The strategy recognizes that, among other factors, illegal timber harvesting, wild plant and animal poaching, fires and mining, unchecked grazing, encroachment, and the consequences of climate change pose increasing threats to these resources. The policy mandates that the water towers to be managed through land use planning, integrated approaches, and techniques of managing watersheds, while also ensuring that all water

catchment areas are mapped and managed as protected areas, free from excision.

## **2.9.4 National Legislation and Institutional Frameworks**

### **2.9.4.1 The Constitution of Kenya 2010**

The Constitution of Kenya is the principal framework for governance of water towers and other environmental based resources in the country. Article 42, 60(1) (e) and 69(1) (a) of the Constitution explicitly provide for sound protection and conservation of ecologically sensitive areas and sustainable exploitation, utilization, management and conservation of these resources. So far, the Government has pronounced that protecting water towers is one of its major projects under natural resources management and this is emphasized by the Vision 2030. The Constitution 2010 also embraces sustainable development, enhances equitable sharing of benefits accrued from natural resources, and increases stakeholder involvement and participation. There is need for increased synergy and coordination amongst stakeholders operating within water towers, in National Government, County Governments, private sector, Non-Governmental Organizations, communities and development partners for efficiency in sustainable management of water towers. The JEU undertakes protection and conservation of water towers for purposes of fulfilling Articles 42, 43 (1) (c) and (d), 69 and 70 of the Constitution.

### **2.9.4.2 Environmental Management and Coordination Act 1999 (Amended 2015)**

The main legislative foundation for the coordination of environmental management is the Environmental Management and Coordination Act (EMCA). The Act outlines steps for preservation of biological diversity, access to genetic resources, and protection of various ecosystems including those found in lakes, rivers, and marshes, mountain ranges, hillsides and forests. According to Section 3 (1) of the Act, everyone has a constitutionally protected right to a clean environment. The National Environment Management Authority (NEMA), which has the authority to coordinate and exert general supervision over all environmental policy, is also established by the EMCA.

### **2.9.4.3 Forest Conservation and Management Act, 2016**

This is the main Act that governs the conservation and protection of all public forests in Kenya. It creates the Kenya Forest Service (KFS) to lead this initiative, giving it the authority to identify and gazette new public forests and give licenses relating to forest resources. KFS is a member of the JEU, which protects Maasai Mau Water Tower by containing the water tower's destruction. Understanding the criteria for identifying forest regions, high places, and water towers is a key goal of this study. The study also suggests that we comprehend how these natural resources are managed cooperatively.

### **2.9.4.4 Water Act, 2016**

This is the primary legal document that governs the country's water resources, including those for water storage and sewage services. In order to ensure efficient administration and utilization of water resources, such as water catchment areas and water towers, the Water Act was put into place. Among its other responsibilities, the Water Act of 2016 gave the Water Resources Authority (WRA) the power to set and enforce standards for the management and use of water resources.

### **2.9.4.5 Wildlife Conservation and Management Act (WCMA) 2013**

With regard to wildlife conservation areas, national parks and sanctuaries, this Act which is overseen by the Kenya Wildlife Service (KWS) establishes a framework for managing the diversity of wildlife in both maritime and terrestrial ecosystems. The WCMA, 2013 mandates KWS to conserve and manage wildlife conservation areas, national parks, reserves and sanctuaries within protected areas. KWS is part of the JEU that protects Maasai Mau Water Tower in containing its destruction.

### **2.9.4.6 Agriculture (Farm Forestry) Rules, 2009**

According to the Ministry of Agriculture's regulations, anyone who occupies or owns an agricultural land is required to maintain far forestry of at least 10% of the land owned. To realize this, people can engage in tree planting activities. They should however consider tree species that are not invasive or

have a negative impact on other crops, animals, fertility of soil or surrounding water sources.

#### **2.9.4.7 Land Act, 2012 (No. 6 of 2012)**

The Act gives effect to Article 68 of the Constitution, to “revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land-based resources, and for connected purposes.” The National Land Commission is required by Section 12 (2) of the Act to ensure that “any public land that has been identified for allocation does not fall into any of the following categories: public land that is adjacent to watersheds, river and stream catchments, public water reservoirs, lakes, beaches, fish ponds, mangroves, or wetlands, or that is within the buffer zones of such reserves.”

#### **2.9.4.8 Energy Act, 2019**

Section 4 of the Act the Renewable Energy Resource Advisory Committee as an advisory body to the Cabinet Secretary responsible for energy on a range of issues among them the management of water towers and catchment areas.

#### **2.9.4.9 Legal Notice No. 27 of 20th April 2012**

The Legal Notice no. 27 of 20th April, 2012 (Legislative Supplement No. 12) mandates the Kenya Water Towers Agency to “coordinate and oversee the protection, rehabilitation, conservation and sustainable management of all critical water towers in the Country.” The Agency coordinates and facilitates the JEU in the protection of Maasai Mau.

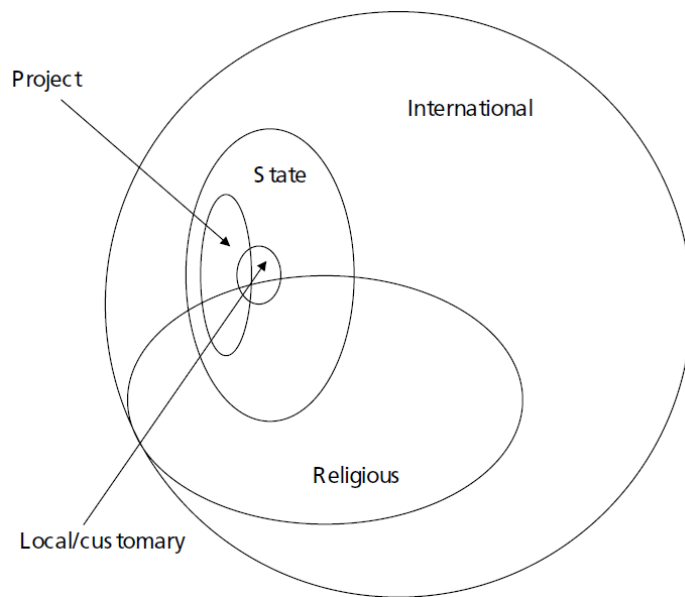
### **2.10 Definition of Legal Pluralism**

According to Beckmann (2012), legal pluralism is an analytical perspective of governance that examines multiple normative orders that are applied to a similar situation. It enquires how existing rules and norms can be connected to resolve a legal problem. Meinzen (2015) argues that in any country, there exists various kinds of laws as follows:



- i. State or statutory law formulated by legislatures and upheld by the government;
- ii. Religious law comprising both legislation based on established religious theory and law based on recognized religious practice;
- iii. Customary law, which can take the form of formal written custom or living interpretations of custom;
- iv. Organizational law, which includes rules made by user groups and associations, and
- v. Project or donor law, which includes regulations associated with specific projects or programs, such as a conservation project; and
- vi. A variety of local/community norms, which may incorporate elements of other laws.

Legal pluralism therefore refers to the co-existence and interaction of multiple legal and institutional frameworks within a social setting (Pradan, 2015) as illustrated in Figure 5 below.



**Figure 5:** Illustration of Legal Pluralism

(Source: Pradan, 2015)

### 2.11 Legal Pluralism Overview

According to Erlich (2016), the debate on legal pluralism started back in the 1930s and has brought

about different descriptions of legal pluralism- strong and weak legal pluralism. Griffiths (2016) defined a strong legal pluralism as a situation whereby, the state does not recognize all laws as state law that is handled by one government backed-authority. Moreover, a strong legal pluralism is an inevitable state of affairs in which all legislative arrangements co-exist within a legislative space irrespective of their mutual recognition and origin (Warman et al., 2018). On the other hand, weak legal pluralism is witnessed when the sovereign orders different law bodies that belong to different groups consider their own legislature into the central administration of law and courts. According to Griffiths (2016), weak legal pluralism is a type of governance where the normative existence of non-state norms relies on their approval and recognition by the central administration (Griffiths 2016).

Furthermore, Griffiths (2016) and Pospisil (2011) opined that a society cannot have a single consistent legal system. Therefore, a society can have many legal systems depending on the number of operational subgroups. Pospisil describes the manifestation of legal pluralism in the society as the legal level. Nevertheless, Pospisil does not explain which law should be used to govern in a situation whereby there is a conflict between different functioning groups in his examination of legal pluralism (Pospisil, 2011). Alternatively, Tamanaha (2017) maintains that the state law is not the main source of law despite being used to maintain social order. Tamanaha also believes that every society has a multiple legislative order that should be taken into consideration.

## **2.12 Legal Pluralism and Complex Water Conservation Rights**

The protection and conservation of water towers is one of the subjects that are increasingly relying on legal pluralism as a solution to water conservation. This is based on the fact that many social movements are increasingly participating in water conservation programs within the United Nations (UN) Framework Convention on Climate Change. In a recent study, Dilwyn (2015) established that there has been significant contributions that legal pluralism has made in settling disputes associated with environmental degradation and water conservation. In another study, Pomade (2012) established

that the application of legal pluralism allowed actors to incorporate different views of legal problems to facilitate environmental conservation negotiations.

According to Hidalgo et al. (2017), community water management systems are made up of a dynamic and complex system of hybrid rules, rights, and organizational norms that frequently blend state law and non-state law. Official water management rights are frequently outlined in statutory laws that, in many water conservation policies across Africa, ignore some local and customary water management rights in favor of "well-defined" property rights in the name of ensuring tenure security and effectiveness. Water protection rights should be identified, established, and protected by both state and non-state groups, according to Jackson (2018) and Boelens et al. (2017). It is clear from the literature that legal pluralism recognizes that water management rights are varied, flexible, and open to negotiation and reinterpretation that should not be subjected to state-centric regulations.

### **2.13 Effect of legal pluralism on access to forest products**

In the seminal work conducted by Sikor (2012), an in-depth exploration of legal pluralism in the Indonesian context unveils a complex interplay between customary and state legal systems, profoundly influencing access to forest products. Sikor's research underscores the intricate dynamics that emerge when local communities seek to uphold their customary access rights while concurrently navigating the landscape of state-driven conservation initiatives. The study illustrates that legal pluralism, in certain instances, has empowered local communities, allowing them to sustain their traditional practices and customary relationships with forest resources despite the encroachment of formal state regulations.

However, the coexistence of customary and state legal systems is far from uniform or harmonious. As highlighted by Brosius (2016), the potential for conflict arises when these legal frameworks diverge, creating a landscape of ambiguity that complicates the efficient access to forest products. This discord may manifest in instances where state-driven conservation efforts clash with local

customs, leading to disputes and challenges in reconciling divergent norms. The result is a nuanced socio-legal terrain where the preservation of customary access rights is contingent upon the delicate negotiation of tensions between these legal frameworks. The work of Sikor (2002) and the insights echoed by Brosius (2006) collectively contribute to a deeper understanding of the multifaceted nature of legal pluralism in forest resource governance.

In Nigeria, the integration of formal state laws and customary legal norms shapes the intricate dynamics of resource access (Dressler & Pulhin, 2010; Nwankwo, 2012). Customary laws, deeply rooted in local traditions and practices, often play a pivotal role in regulating access to forest resources, reflecting the historical relationships between communities and their ecosystems (Oyéjìdé, 2006). Simultaneously, state laws and regulations, influenced by global conservation discourses, introduce standardized frameworks aimed at sustainable management and biodiversity preservation (Oyéjìdé, 2016; Tsing, 2015). Research by Dressler and Pulhin (2010) emphasizes that the coexistence of these legal systems is not without tensions. While customary laws may encourage local autonomy and community-based resource management, conflicts arise when they collide with state laws, leading to legal uncertainties and impeding efficient access to forest products (Nwankwo, 2012).

Research by Ingelaere et al., delves into the intricate interactions between customary and state legal systems in Rwanda. The study uncovers that the coexistence of these legal frameworks significantly shapes local resource management practices. The findings reveal that while legal pluralism offers opportunities for adaptive resource management, tensions emerge when customary and state laws diverge, leading to uncertainties in resource access. Similarly, Uwizeye (2013) explored the integration of conservation with rural development and its consequences on access to forest products in Rwanda. The study found discernible effects of conservation efforts on the access of local communities to forest resources. It identified challenges and opportunities associated with aligning conservation goals with the needs of rural development. Uwizeye emphasized the necessity for

sustainable approaches that balance conservation priorities with the livelihoods of local communities, providing valuable insights for the nuanced governance of Rwanda's forest resources.

#### **2.14 Sustainability and replicability of legal frameworks in conservation of water towers**

Legal frameworks in the conservation of water towers serve as instrumental tools for promoting sustainability and establishing replicable models. The discourse on the sustainability of these legal structures encompasses their ability to endure and adapt to changing environmental conditions. As Oyéjìdé (2016) contends, sustainable legal frameworks should integrate adaptive strategies that respond dynamically to evolving ecological challenges. Emphasizing the importance of legal foundations, Oyéjìdé underscores that effective conservation necessitates laws that provide a stable and resilient framework for resource management, thereby contributing to the long-term preservation of water towers (Oyéjìdé, 2016).

Ensuring the replicability of successful legal frameworks is paramount for wider conservation efforts. Sikor's (2002) analysis of legal pluralism in the Indonesian context underscores the need for flexible legal structures that can be tailored to diverse socio-ecological settings. Replicability hinges on the capacity of legal frameworks to accommodate local nuances and community-specific needs, facilitating the successful implementation of conservation measures across varying regions (Sikor, 2002). This perspective underscores the importance of developing legal models that are adaptable and scalable across different contexts.

Furthermore, international collaboration plays a pivotal role in shaping the sustainability and replicability of legal frameworks in water tower conservation. Schmitz's (2020) research emphasizes the significance of transnational cooperation in fostering sustainable legal structures. The study advocates for legal frameworks that align with international standards and facilitate collaborative efforts, thereby ensuring the longevity and effectiveness of conservation initiatives for water towers on a global scale (Schmitz, 2020).

In addressing the challenges of sustainability, Borowy (2013) introduces the concept of

intergenerational equity within legal frameworks. The intergenerational equity framework considers the rights of future generations, urging the integration of sustainable practices to safeguard water towers for posterity (Borowy, 2013). This perspective aligns with the broader discourse on the ethical responsibilities embedded in legal frameworks to ensure the enduring vitality of water tower ecosystems.

Furthermore, integrating local knowledge and community engagement within legal frameworks is crucial for their sustainability. As emphasized by Middleton and Ojha (2013), community involvement fosters a sense of ownership and responsibility, ensuring that legal structures are rooted in the social fabric of the communities they seek to protect. Community participation not only enhances the effectiveness of legal frameworks but also contributes to their long-term viability and adaptability (Middleton & Ojha, 2013).

### **2.15 Theoretical Framework**

This research study aimed to address the objectives adequately by applying the Sustainable Livelihoods Framework (SLF) by Frank Ellis (2010). This theory conceptualizes livelihoods in a holistic way by capturing the many complexities of lives as well as the constraints and opportunities that they are subjected to. SLF encompasses the assets, skills and the approaches that are utilized by the society to survive. The sustainability element of the theory allows individuals and communities to manage natural resource use conflicts and keep or even better current and future assets and skills without exploiting the natural resource base.

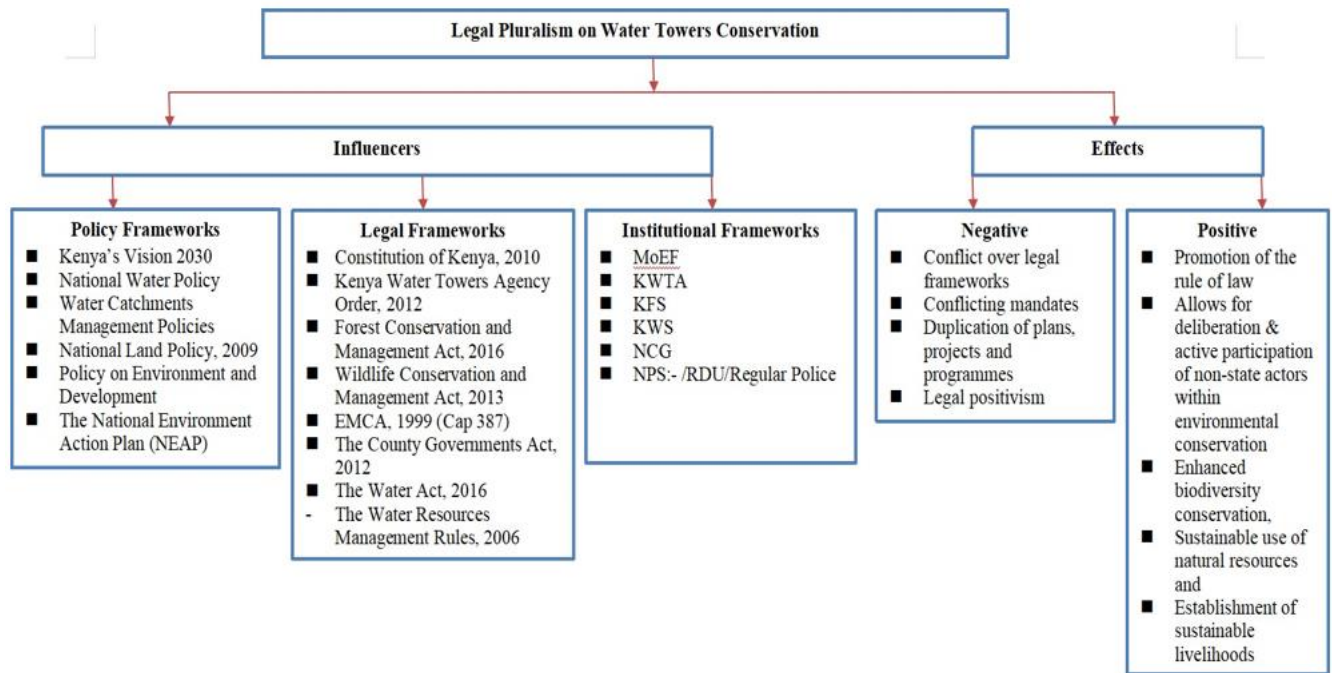
A pivotal aspect of the SLF employed in this study is its emphasis on environmental and livelihood sustainability. This dimension equips individuals and communities with the tools to effectively manage conflicts arising from the use of natural resources. The sustainability element is rooted in the responsible utilization of resources, ensuring that current assets and skills are preserved or enhanced without compromising the natural resource base. By adopting the SLF, the research not only

addresses immediate objectives but also promotes a balanced and sustainable approach to livelihoods, safeguarding the well-being of both present and future generations.

### **2.16 Conceptual Framework**

In the conceptualization of SLF, this study seeks to analyze and distinguish between the effects of multiple policy, legal and institutional frameworks on the conservation of MMWT. Furthermore, this study will determine the sustainability of the JEU in the water tower and the possibility of replicating the concept in other water towers facing the similar threats of illegal settlement like Kirisia Hills, Marmanet Water Tower, Chyulu Hills among others. Sustainable Livelihood Framework will help in explaining the driving forces/ influencers of legal pluralism in water towers conservation. The influencers will be inspired by SLF and are defined as policy, legal and institutional frameworks/ factors.

The conceptual framework is depicted in Figure 6 and it illustrates driving forces (influencers) of legal pluralism on water towers conservation. The existence of multiple institutions implementing plans, projects and programmes in the same water tower can produce both positive and negative effects on its conservation and the ability of the water tower adjacent community to access the 'commons'. It is therefore important to understand the interrelationships of these influencers in order to determine the achievements, sustainability and replicability of the JEU in other water towers.



**Figure 6:** Conceptual Framework

(Source: Researcher, 2023)



## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

This chapter provides a description of the study area baseline information and outlines the materials and methods used to collect, analyze and present data. The chapter explains how analysis of data was conducted to give results used in the study.

#### **3.2 Study Area**

##### **3.2.1 Introduction**

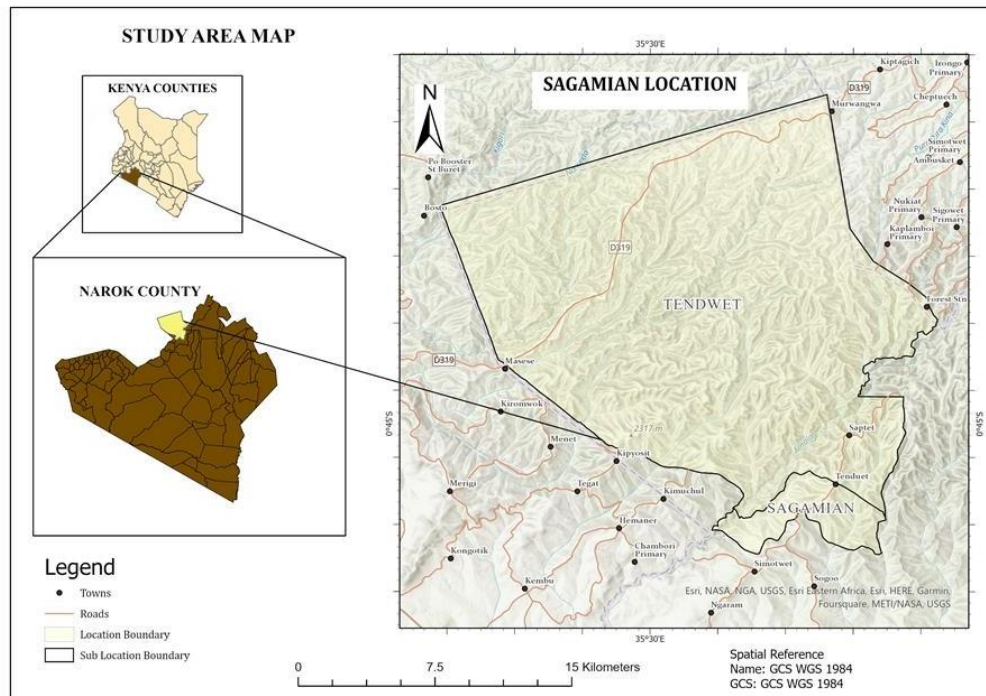
Kenya has five (5) major water towers namely Mt. Kenya, Aberdare Ranges, Cherangani Hills, Mau Forest Complex and Mt. Elgon. The Mau Forest Complex comprises 22 forest blocks (KFWG, 2010). Of these 22 forest blocks, this study focused on Maasai Mau forest block (Water Tower) since is the most significant water tower in Kenya and supports millions of livelihoods on a local, regional, and global level.

##### **3.2.2 Geographical Location**

The MMWT lies between Latitude 0°40' and 00°55' South and Longitudes 35°35' and 35°55' East, at an elevation of between 2,000m and 2,700m in Narok County. Maasai Mau covers an area of 96,998 Hectares (Ha) where the community forest is 46,223 Ha while the buffer zone covers 50,775 Ha. MMWT borders Olposimoru forest block to the North, Transmara forest block to the North West and South Mau to the North East. The Maasai Mau Ecosystem is surrounded by twelve (12) administrative Locations as follows; Naisoya, Enabelibel, Nkareta, OIPosimoru, Ololulunga, Olokurto, Naituyipaki, Ereteti, Oloshapani, Melelo, Sogoo and Sagamian (KFWG, 2010).

This study was undertaken in Sagamian Location which comprises of Tendwet and Sagamian Sub

Locations due to the high presence of JEU activities. Figure 7 shows the map of the study area.



**Figure 7:** Map for Sagamian Location covering Tendwet and Sagamian Sub Locations

(Source: Researcher, 2022)

### 3.2.3 Climate and Soil

The climate of the region is predominantly controlled by the North-South Movement of the Inter-tropical Convergence Zone (ITCZ) as modified by local orographic influences, with typical temperatures of 19°C and annual rainfall of approximately 2,000 millimeters (Climate-data, 2021).

Additionally, the rainfall distribution pattern is bimodal with peaks in April and August. The geology is mainly composed of quaternary and tertiary volcanic deposits (Sambroek et al., 1980).

The Maasai Mau Water Tower provides favorable micro-climatic conditions and soil characteristics for agricultural production.

### 3.2.4 Hydrology

The water tower is a major water catchment area with several rivers key among them Enkare Narok,

Sikkinder River, Ewaso Ng'iro and Amalo river. Amalo River is the largest tributary of the Mara River that serves as the lifeline of the Maasai Mara Game Reserve and Serengeti National Park which are both world-famous for wildebeest migration hence promoting tourism (ENSDA, 2018). While the westernmost part of the forest is a component of the upper watershed of the Mara River, Maasai Mau Forest also serves as the upper catchment for the Ewaso Ng'iro River. The Ewaso Ng'iro River empties its waters into Lake Natron, which is where Lesser Flamingos primarily breed. The Mara and Ewaso Ng'iro rivers supply the much-needed water to pastoralist communities, agricultural activities and to urban areas of Kajiado and Narok counties.

### **3.2.5 Biodiversity**

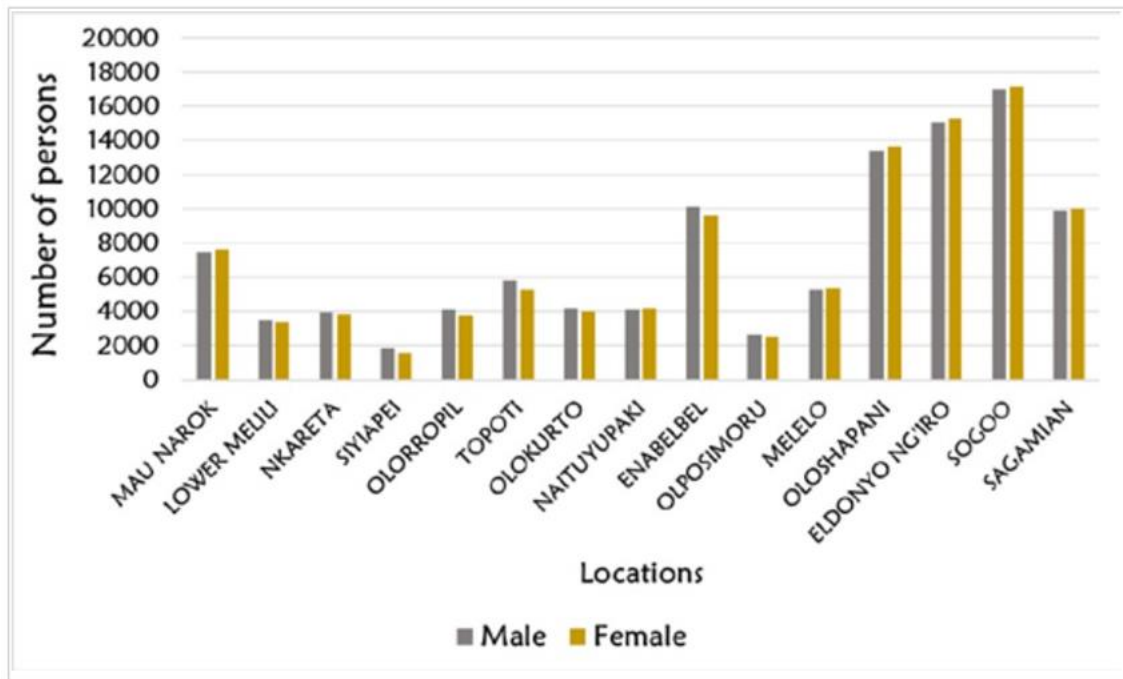
The southern part of Mau Forest Complex is incredibly diverse in terms of their flora and fauna. The magnificent and endangered Bongo, the yellow-backed Duiker, carnivores like the Golden Cat and the Leopard, and forest elephants can all be found in the Maasai Mau Forest. According to Githiru (2018), large stands of cedar and podocarpus forests, as well as sporadic natural glades, can also be found in the forest Maasai Mau.

### **3.2.6 Socio-economic profile**

#### **3.2.6.1 Population**

Maasai Mau Water Tower lies within two sub-counties namely Narok North and Narok South with a total population of 251,862 and 238,472 respectively (KNBS, 2019). This is an increase compared to the 2009 population which was 175,588 in Narok North and 176,764 in Narok South (KNBS, 2009). The 2019 population within Maasai Mau Water Tower is 372,534 (108, 347 males and 107,321 females) (KNBS, 2019). This is 99% increase of the 2009 population which was 187,665 persons (95,212 males and 92,453 females) as shown in Figure 8 below. Sogoo, Eldonyo Ng'iro, Oloshapani and Sagamian Locations had the highest population due to growth of town centers in the area, influx of illegal settlers evicted from the forest and Oloshapani being the headquarter for Ololulunga

division. On the other hand, Siyiapei Location had the lowest population due to large tracks of land in this area which is under wheat cultivation.



**Figure 8:** 2019 Population census per location in Maasai Mau Water Tower

(Source: KWTA, 2020)

### 3.2.6.2 Population Density

The 2019 overall population density within Maasai Mau Water Tower is 157 persons per Km<sup>2</sup>. Sogoo Sub-location in Sogoo Location and Sagamian Sub-location in Sagamian Location have the highest population density of 1,051 and 955 persons per Km<sup>2</sup> respectively.

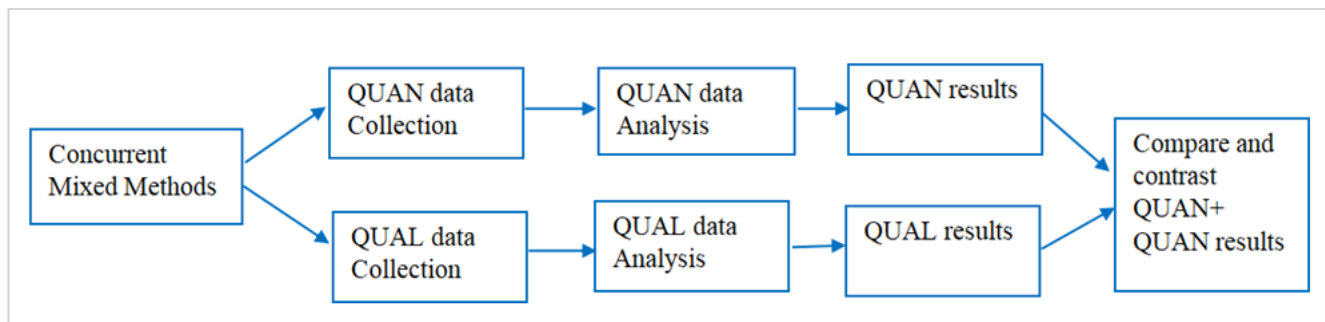
This is mainly attributed to favorable conditions for agriculture, good road network and proximity to urban centers. Olokurto Sub-location in Olokurto Location had the lowest density of 50 persons per km<sup>2</sup>. The low population density within Olokurto is attributed to the location extending to Olokurto forest which covers almost half of the location, unfavorable climatic conditions where temperature can be as low as 4°C as well as poor road networks.

### **3.2.6.3 Economic activities**

Narok County is known for the production of wheat and barley as well as livestock rearing which sustains the livelihood of the local community (CIDP, 2018-2022). Crop farming and livestock rearing are among the main economic activities carried out by the locals of Sagamian Location. The Maasai Mau Water Tower provides important ecological services, such as the ideal microclimate conditions surrounding the forest that are beneficial to agricultural production. The water tower also provides an essential location for spiritual and cultural purposes, as well as building materials, charcoal, wood fuel, grazing, herbs, fruits, and water for the local community (ENSDA, 2018). The area is largely inhabited by Kipsigis and a small mix of ethnic groups including the Kisii and Ogieks.

### **3.3 Research Design**

This study was a case study and applied a mixed-methods research design in the collection, analysis and interpretation of both qualitative and quantitative data as shown in Figure 9. Mixed method design seeks to collect data and use it to systematically describe a phenomenon. The design sought to make careful and detailed documentation of the problem under study. According to this study plan, the research will pay close attention to figuring out the nature of particular events so that the data would be summarized in a plain descriptive manner. The main goal of using the research design was to accurately report and assess particular study occurrences. This study aimed at assessing the impacts of legal pluralism in relation to the JEU in conserving water towers in Kenya with a focus on the MMWT. The research design, therefore, matched the objective of the study and enabled the researcher to answer the research questions.



**Figure 9:** Research Design

(Source: Researcher, 2023)

### 3.4 Research Population and Sample

This study only focused/ sampled Sagamian Location due to two main reasons; the high presence of JEU activities; as well as high encroachment and degradation threats (KWTA, 2015). The target population were residents residing within a 5 km buffer zone of the water tower where there is a population of 36,000 people. Random sampling was used as each household had an equal chance of being included in the sample. For this research, Yamane’s Formula – a simplified formula to calculate sample size for households was used. The Yamane formula is appropriate for determining sample sizes in studies with finite populations as it provides a systematic and straightforward method, taking into account the size of the population, desired level of confidence, and acceptable margin of error to ensure statistical reliability while optimizing resource efficiency (Israel, 1992). The risk of lack of representation of the total population is low because the study area is small. The confidence level was 90% with a margin error of 0.10

$$n = \frac{N}{1 + N(e)^2}$$

Where: n is the sample size;

N is the population under study

E is the margin error

$$n = 36,000 / (1 + 36,000 (0.10)^2)$$

$$n = 36,000 / (1 + 36,000 (0.01))$$

$$n = 36,000 / (1 + 360)$$

$$n = 36,000 / 361$$

$$n = 99$$

The sample size was therefore arrived at 99 households from a sample population of 36,000 households, at a confidence level of 90% and margin error of 0.10.

### **3.5 Data Collection**

The study depended on both primary and secondary data. Primary data was collected through household surveys and Focus Group Discussions (FDGs) while secondary data was collected from literature such as JEU monthly and quarterly reports, taskforce and scientific journals on MMWT, and KWTA reports. Specifically, the data was collected through the following methods/tools:

#### **3.5.1 Socio-economic Data**

Socio-economic data is important in understanding and determining the level of interaction between the local communities and the water tower resources. This data collection was gathered through the administration of household surveys. The respondents were water tower stakeholders from both state and non-state organizations. At the administrative location level, focused group discussions were also undertaken to collect information from the surrounding community. Based on 2019 demographic information, the population density map was created where actual densities were calculated and presented as chloropleth maps at the location level using ArcGIS.

#### **3.5.2 Land Cover and Land Use Assessment**

In order to examine the causes and socioeconomic effects throughout time and space, various analytical techniques were utilized to evaluate and interpret changes in Land Cover and Land Use

(LCLU).

The LCLU assessment was completed using remote sensing (RS) and geographic information system (GIS) methods. By calculating the area changes of the land cover classes and displaying patterns over time, the LCLU changes in the water tower were identified. The System for Land-based Emissions Estimation in Kenya (SLEEK) project, which is overseen by the Ministry of Environment and Forestry, provided the land cover data for 1990, 2000, 2010, and 2020.

### **3.5.3 Assessment of Degradation Status**

Using weighted overlay in ArcGIS, LCLU maps were overlaid with slope data to ascertain degradation levels. The weight of influence was specified to range from 1-3, with a probability of degradation of '3' having the highest probability and '1' having little or no influence. 60% for the land cover and 40% for the slope were chosen as the overall weights of effect for the two datasets. This indicates that a region with a low vegetation cover and a steep slope had a significant possibility of degradation, offering a chance for rehabilitation.

## **3.6 Analysis of Data**

Prior to analysis, all of the data utilized in this study were standardized to cut down on redundancy and make sure that only related data was maintained. Due to the different analysis employed to approach each target, this was thought to be appropriate. This study employed thematic analysis to analyze qualitative data and SPSS Statistical tools and excel to analyze quantitative data. Results have been presented in frequency tables, charts, graphs, LCLU and GIS datasets, and Satellite imagery.

### **3.7 Ethical Considerations**

Prior to the commencement of the study, the researcher obtained a letter from the school authority outlining the study's purpose. Additionally, an official research authorization was obtained from the National Commission for Science, Technology, and Innovation (NACOSTI). Throughout the



research process, the participants in this study were instructed to maintain anonymity, ensuring the utmost protection of their privacy. By using codes instead of actual names, the researcher took additional measures to ensure that no data could be linked back to specific individuals. This anonymity safeguarded the participants from any potential harm or embarrassment, reinforcing their privacy. The researcher conducted the study with professionalism and respect, adhering to proper etiquette and decorum. Moreover, the researcher provided assurance to all the research participants involved that the information they shared would be treated confidentially and their identities would remain anonymous. Additionally, the respondents were informed in advance about the purpose of the information collected, emphasizing its sole use for academic purposes.

## **CHAPTER FOUR**

### **RESEARCH FINDINGS, ANALYSIS AND DISCUSSIONS**

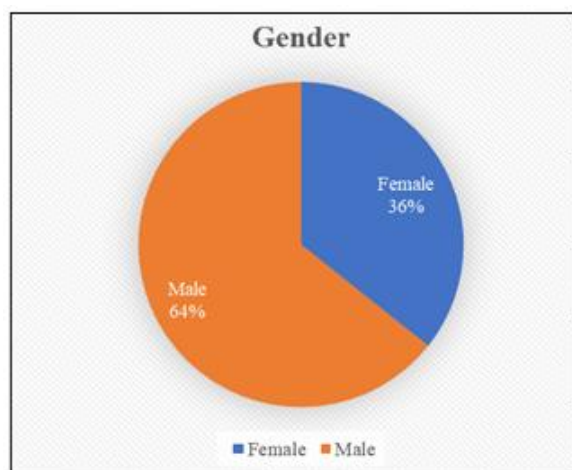
#### **4.1 Introduction**

The chapter presents findings of the study and offers a comprehensive analysis and discussion of the same. Visualizations are presented in maps, pie-charts, graphs and tabulated statistics on the status of MMWT before and after JEU's establishment.

#### **4.2 Household Characteristics**

The respondents comprised 64% male and 36% women as shown in Figure 10. The low participation of women can be attributed to their gender assigned chores such as fetching water and firewood, and the general house chores. The majority of homes were headed by males (87%) and by females (13%). This finding is consistent with local peoples' customs in the country, where males are regarded as the family leaders and females only assume this role upon the death or migration of their spouses. However, it's vital to remember that men lose this duty when they drink too much alcohol.

The average family is made up of eight (8) people at the household level, which is a little more than the five (5) people per household national average (KNBS, 2019). As also noticed by KWTA (2018), larger family numbers require more forest-based products. For example, more firewood must be fetched from the water tower to cook a meal than would be required to prepare a meal for fewer people.



**Figure 10:** Respondents by gender and age representation

(Source: Researcher, 2023)

According to the study's findings, the majority of respondents were between the ages of 18 and 35, followed by those between the ages of 36 and 60.

The findings on literacy levels showed that majority of the people (45%) who were interviewed in this research had completed primary school level of education as shown in Table 2.

**Table 2:** Education levels

Education levels	Frequency	Percentage
Primary	45	45
Secondary	20	20
Tertiary (College/University)	14	14
Never been to school	21	21

(Source: Researcher, 2023)

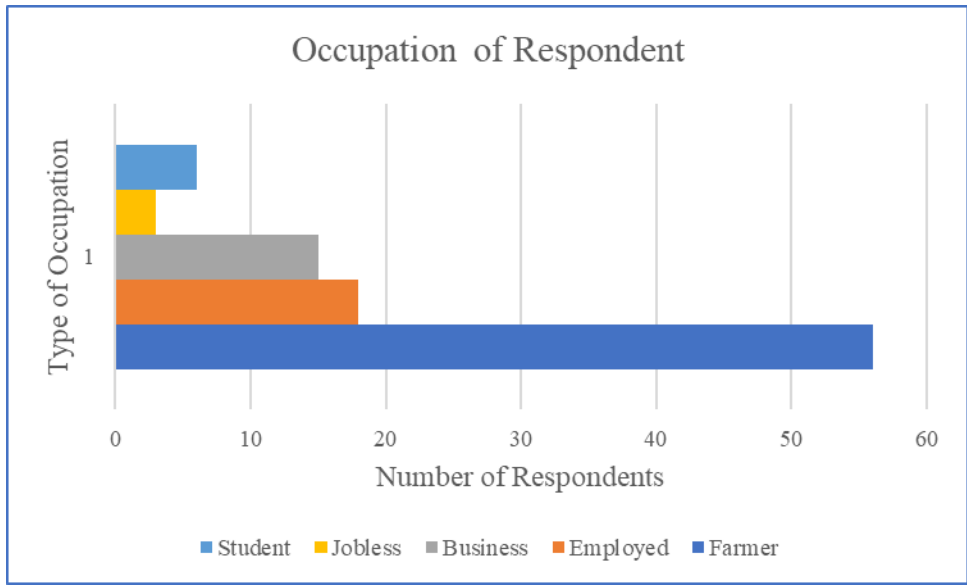
The study found out that 21% of the respondents had never attended school. The inadequate schools in the area and the greater travel distances to the adjacent schools are to blame for this. It is also commonly accepted that the country's rural regions' more educated residents frequently move to

metropolitan areas in pursuit of employment in to improve their living standards, hence reducing literacy rates (Thenya, 2014). Most educated and learned residents of this area have shifted to Narok town which is the county headquarter of Narok County. As a result, the communities, including those in the study region, have less capability and are therefore still dependent on the resources of the forest. However, the respondents with a primary education lay the groundwork for the development of capable and better-educated community members (Jackson, 2018), who are better able to understand the questions and rapidly answer to them. This is crucial for the success of the research. On the other side, the educated members of the community who obtain formal jobs play a crucial part in enhancing households' wellbeing through salary remittance, thereby lessening the over-reliance on forest-based products.

The Maasai Mau Water Tower is endowed with rich volcanic soils and good climatic conditions that are favorable for agriculture. Figure 11 highlights farming (crop and livestock) as the main economic activity for the residents with farming being practiced at 57%. The main crops grown are wheat, barley, maize, tomatoes, peas, potatoes, cabbage, onions, beans and carrots. Wheat and barley are grown at large scale, mainly on the Southern and Eastern section of the Water Tower.

Livestock kept by the locals included cattle, sheep, donkey and goats. Donkeys are mainly used for transportation of farm produce, river water, firewood and charcoal. Poultry, beekeeping and small-scale business are other socio-economic activities practiced in the area. The local community also practices minimal agroforestry. They mainly plant both exotic trees such as Cypress, Eucalyptus and *Gravellia Robusta*. The indigenous trees planted include *Prunus Africana*, *Olea Africana*, *Acacia*, *Juniperus Procera*, *Casuarina Equisetifolia*, *Olea Europaea*, and *Podocarpus Falcutus*.

The local communities in Maasai Mau also depend on the Water Tower for firewood, medicine & herbs, honey, timber, construction & building materials and charcoal. *Olea Africana*, *Olea Europaea*, *Juniperus Procera* and *Podocarpus Falcutus* are most exploited trees for different uses by the locals.



**Figure 11:** Occupation of Respondents

(Source: Researcher, 2023)

**4.3 Status of MMWT Before and After JEU’s Establishment**

**4.3.1 Status of MMWT before JEU’s Establishment**

The Maasai Mau Forest came under pressure in 1999 when the local Land Control Board granted permission to five forest-adjacent Group Ranches that had been decided upon in the 1970s to split their land among members (Interim Coordinating Secretariat, 2011). Reiyio (Nkobon Adjudication Section), Nkaroni, Enosokon, and Enakishomi (Ololulunga Adjudication Section), and Sisiyan (Ilmotiok Adjudication Section) were the impacted ranches. The study found out that these the boundaries of these sections were clearly established during land adjudication and consequently accepted at First Registration.

The "ballooning" of the Group's ranches beyond the adjudicated boundaries as a result of this adjudication resulted in an excess of 17,101 Ha as shown in Table 3. According to the Mau Task Force (2009), the period between 1999-2008 witnessed massive illegal human encroachment and settlement leading to forest degradation through illegal logging and charcoal production.

**Table 3:** Illegally increased sizes of the group ranches

Adjudication Section	Group Ranch	Original parcel number	Area at first registration [Ha]	Total titled area after sub-division [Ha]	Titled area in the forest [Ha] (*)
Ilmotiok	Sisiyan	375	447.5	1,059.7	732.5
Ololulunga	Nkaroni	118	1,597.5	7,861.0	(Approx.) 7,127.3
Ololulunga	Enoosokon	110	155.0	1,723.4	(Approx.) 1,593.4
Ololulunga	Enakishomi	115	844.5	8,169.4	(At least) 7,324.9
Nkobon	Reyio	34	26.0	323.0	323.0
<b>Total</b>			<b>3,070.5</b>	<b>19,136.5</b>	<b>(At least) 17,101.0</b>

(\*) "Approx." values are provided based on an approximate delineation of the original Group Ranch boundaries on the Preliminary Index Diagrams. "At least" values derive from subtracting the original Group Ranch area from the total titled area.

(Source: Interim Coordinating Secretariat, 2011)

From the survey findings, majority of the respondents agreed that there was rampant encroachment, charcoal production and illegal logging activities before JEU's establishment in 2008 as indicated in Table 4. Majority of the respondents (91.84%) agreed that Illegal human settlement/Illegal human settlement/ encroachment was high before JEU'S establishment. Similarly, 94.89 of the respondents indicated that Charcoal burning was rampant before JEU'S establishment. It was also shown that most of the respondents indicated that access to forest products had no restrictions (88.66%) and that Forest products were easily available (83.67%). However, majority of the respondents disagreed that there was plenty of water from the Water Tower before JEU'S establishment (57.14%). Notably, before the JEU'S establishment, the surrounding community had more conflicts over forest based products (like fodder, water, tree products) as indicated by 61.23% of the respondents. The

community attributed this to free access to the forest as protection was minimal and the sub- divisions and sale of the forest land that was experienced before 2008.

**Table 4 Status of MMWT Before and After JEU’s Establishment**

	<b>SD</b>	<b>D</b>	<b>N</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>
Illegal human settlement/Illegal human settlement/ encroachment was high	3.06%	4.08%	1.02%	53.06%	38.78%	4.2
Charcoal burning was rampant	0.00%	3.06%	2.04%	61.22%	33.67%	4.26
Illegal logging was rampant	0.00%	8.16%	5.10%	58.16%	28.57%	4.07
Access to forest products had no restrictions	1.03%	3.09%	7.22%	55.67%	32.99%	4.16
Forest products were easily available	3.06%	5.10%	8.16%	53.06%	30.61%	4.03
There was plenty of water from the Water Tower	30.61%	26.53%	7.14%	24.49%	11.22%	2.59
The surrounding community had more conflicts over forest based products (like fodder, water, tree products)	7.14%	16.33%	15.31%	35.71%	25.51%	3.56

(Source: Researcher, 2023)

### **4.3.2 Status of MMWT after JEU’s Establishment**

Most of the participants reported that there was a decline in the cases of illegal encroachment, charcoal production and illegal logging after the JEU Rangers were deployed to MMWT in 2008 as illustrated in Table 5. From the findings, most of the respondents (93.88%) indicated that after JEU’S establishment, Illegal human settlement/Illegal human settlement/ encroachment was reduced, 86.73% indicated that Charcoal burning had reduced, 90.81% indicated that Illegal logging was reduced and 94.9% indicated that access to forest products had more restrictions. Further, the respondents indicated that after JEU’S establishment, there was plenty of water from the Water Tower

(84.7%) and that the surrounding community had reduced conflicts over forest based (71.02%). Notably, most of the study participants (56.94%) disagreed that forest products were easily available after JEU' establishment. This was attributed to enhanced protection of the water tower through regular patrols, seizures, arrests and prosecutions made by the JEU Rangers.

**Table 5 Status of MMWT after JEU's Establishment**

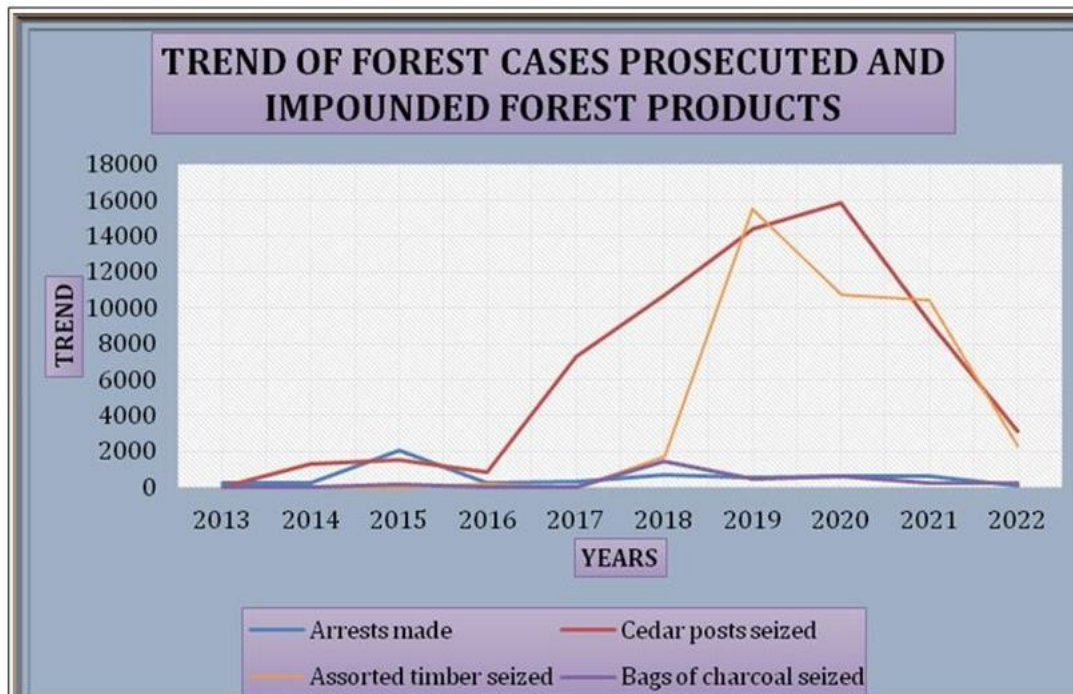
	SD	D	N	A	SA	Mean
Illegal human settlement/Illegal human settlement/ encroachment was reduced	0.00%	4.08%	2.04%	54.08%	39.80%	4.3
Charcoal burning had reduced	1.02%	6.12%	6.12%	53.06%	33.67%	4.12
Illegal logging was reduced	0.00%	3.06%	6.12%	62.24%	28.57%	4.16
Access to forest products had more restrictions	0.00%	2.04%	3.06%	66.33%	28.57%	4.21
Forest products were easily available	29.59%	27.35%	9.18%	24.69%	9.18%	2.77
There was plenty of water from the Water Tower	2.04%	6.12%	6.12%	43.88%	40.82%	4.12
The surrounding community had reduced conflicts over forest based products (like fodder, water, tree products)	3.47%	7.14%	17.35%	39.80%	31.22%	4.05

**(Source:** Researcher, 2023)

The comparative analysis and trend of forest cases prosecuted and recovered forest products by JEU across the sectors within MMWT drawn over a period of ten years shows that there was a declining



trend on the number of arrested persons and impounded forest produce as a result of increased patrols and surveillance by officers of the JEU as per Figure 12. A drastic decline of forest cases and recoveries have been realized between 2020 and 2022 as a result of heightened sensitization forums, sustenance/ dominance efforts by enforcement officers, stakeholder support and the inception of the 30km Amalo-Masaita electric fence project that has helped in deterring forest offenders from easily accessing the forest.

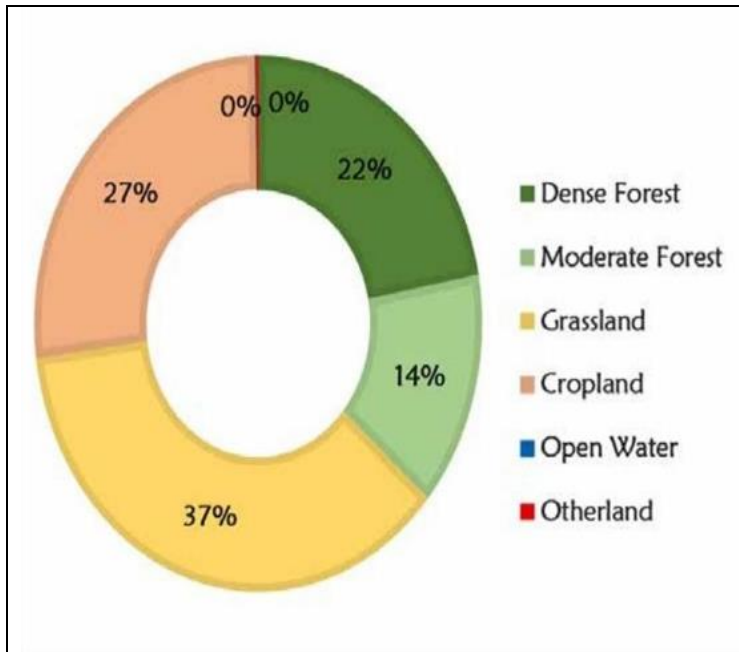


**Figure 12:** Comparative Analysis & Trend of Forest Cases Prosecuted & Recovered Forest Product

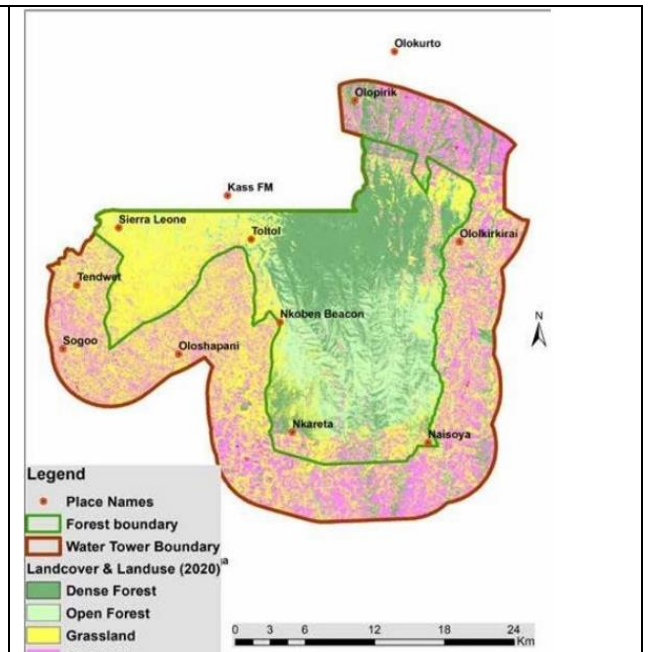
(Source: JEU Annual Progress Reports, 2022)

### 4.3.3 Land Cover and Land Use as at 2020

The dominant land cover in MMWT was forestland and grassland covering an area of 35,431 Ha and 35,583 Ha respectively as shown in Figure 13 and Figure 14. Cropland covered 25,725 Ha while other land types comprising built up areas and bare land covered 180 Ha. The built-up areas were mainly in town centers such as Sogoo, Olokurto, Tendwet and Kisiriri.

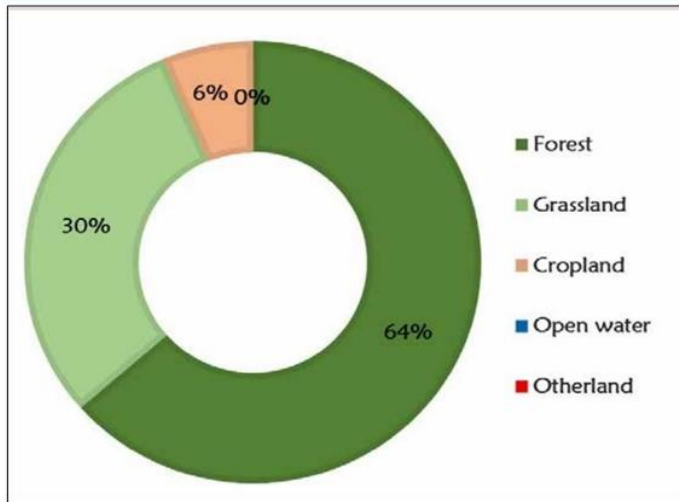


**Figure 13:** Land cover and land use in MMWT in 2022  
(Source: Researcher, 2022)



**Figure 14:** Spatial representation of land cover and land use in MMWT  
(Source: Researcher, 2022)

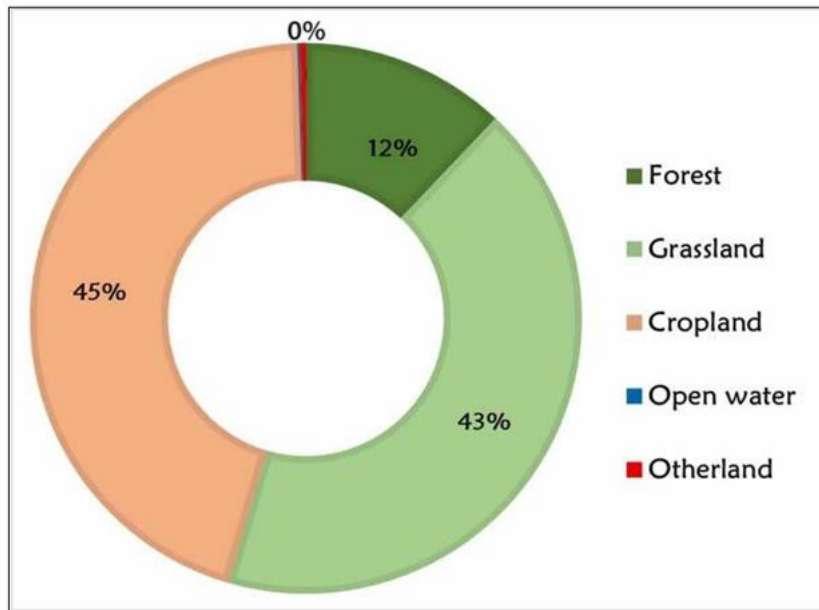
Within the forest zone, the dominant land cover is forestland covering an area of 29,395 Ha (64%) followed by grassland at 13,851 Ha (30%) then cropland 2,967 Ha (6%) as show in Figure 15. It was established that within the forestland class, the dense forest covered 16,899 Ha while moderate forest covered 12,496 Ha. The area under cropland is mainly at the North-Eastern and Southern section of the Water Tower, in Olokurto, Naituyupaki, Nkareta and Lower Melili locations.



**Figure 15:** Land cover and land use within Maasai Mau Forest zone as of 2020

(Source: Researcher, 2023)

Within the buffer zone, the dominant land cover was cropland covering 22,757 Ha (45%) followed by grassland at 21,733 Ha (43%) then forestland at 6,035 Ha (12%) as depicted in Figure 16. This is attributed to the main socio-economic activities of the local communities being crop farming and livestock keeping. Other land (built-up and bare areas) and open water covered 174 Ha and 76 Ha respectively.

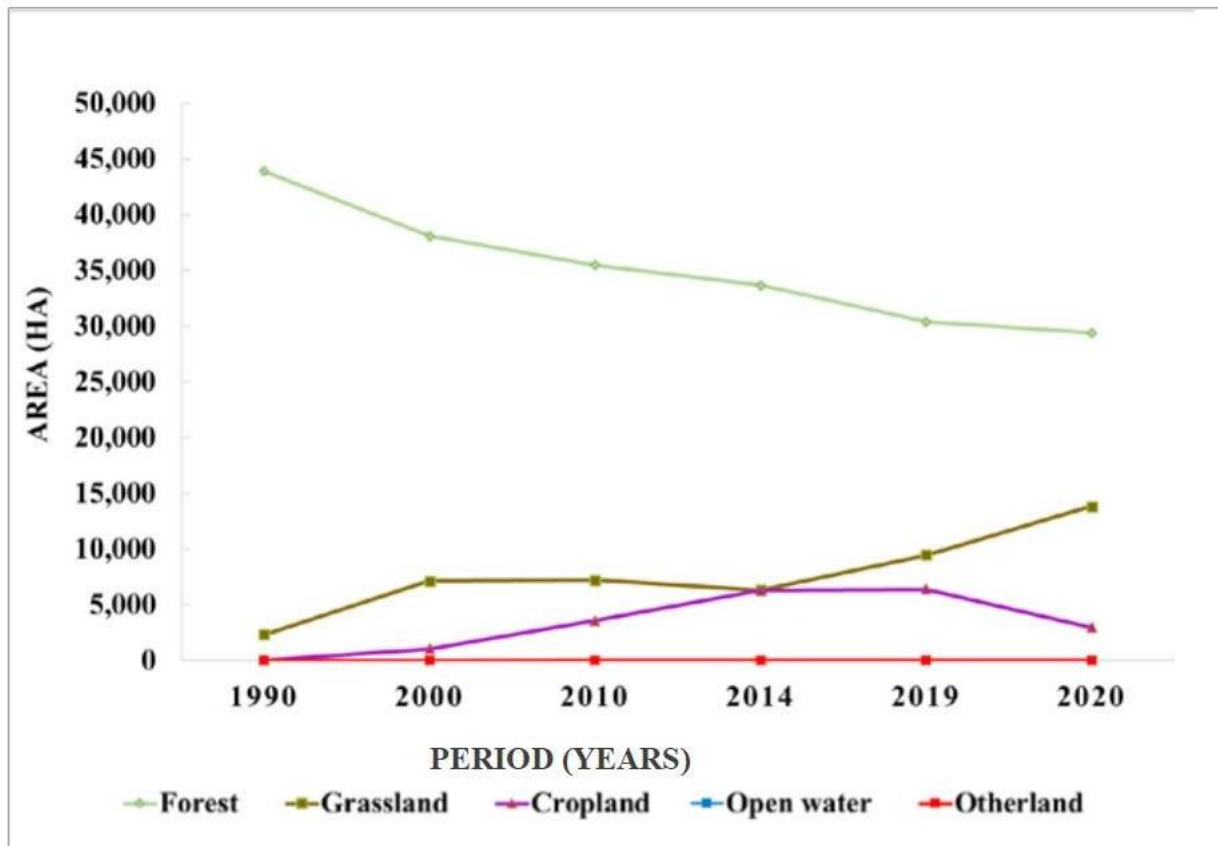


**Figure 16:** Land cover and land use within the buffer zone as of 2020

(Source: Researcher, 2023)

#### 4.3.4 Land Cover and land Use Changes

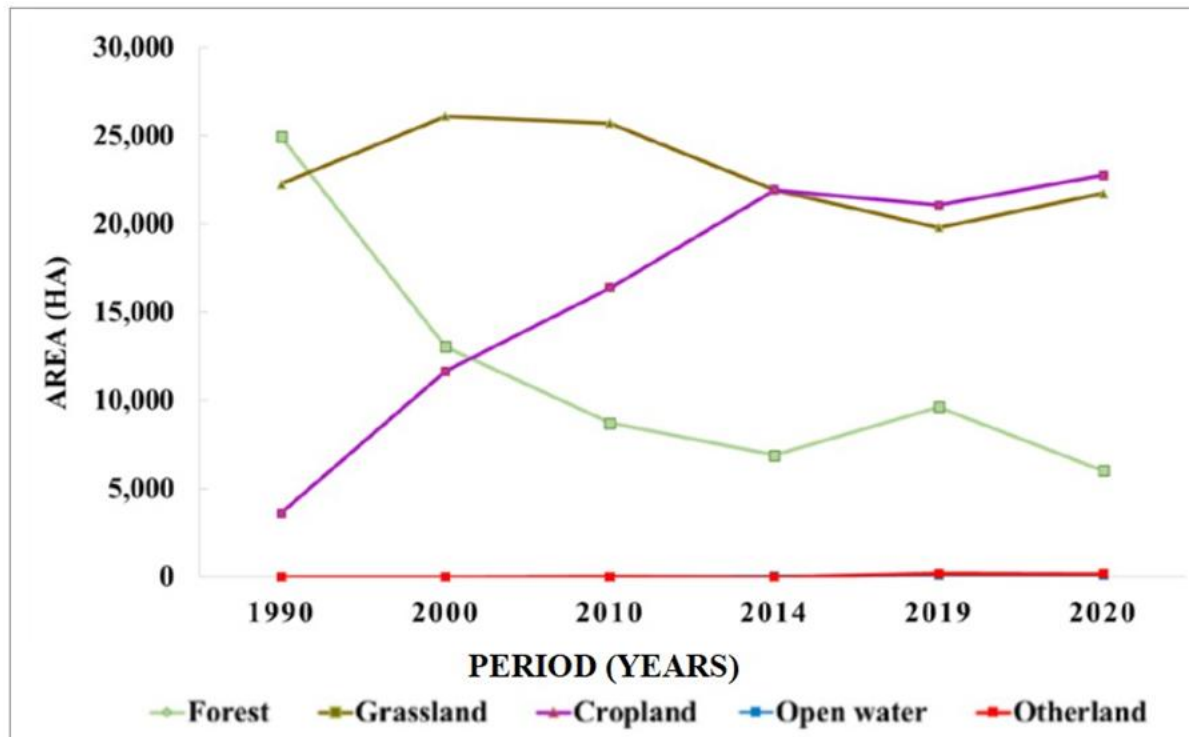
Within the forest boundary of MMWT, forest cover declined by 14,485 Ha between 1990 and 2020, translating to 33% loss. On the other hand, grassland increased by 11,519 Ha with the largest increase being between 2019 to 2020 (4,405 Ha) while cropland increased by 6,322 Ha between 1990 and 2019 due to encroachment then decreased by 3,414 Ha between 2019 and 2020 as indicated in Figure 17. The increased grassland cover and decreased cropland is mainly attributed to evictions of illegal settlers from the forest in 2018 and 2019 hence an indication of recovery and restoration of forest cover. Other land increased by 18 Ha due to encroachment between 1990 and 2019 then decreased by 12 Ha between 1990 and 2020.



**Figure 17:** Land cover trends within the forest boundary in MMWT

(Source: Researcher, 2023)

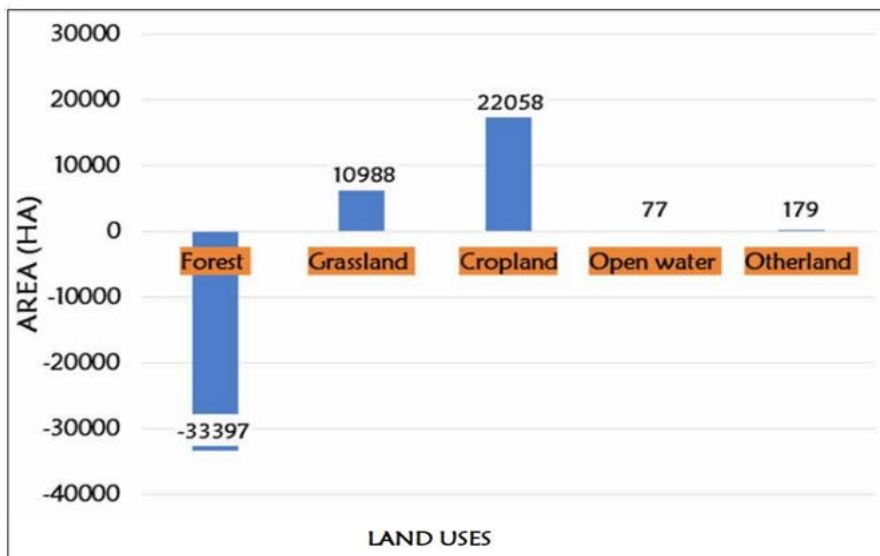
Within the buffer zone in MMWT, forest cover decreased by 18,912 Ha which translated to 76% decline between 1990 and 2020. Grassland increased by 3,851 Ha between 1990 and 2000 then decreased by 4,382 Ha between 2000 and 2020 while cropland increased by 19,149.7 Ha between 1990 and 2020 as shown in Figure 18. These changes are an indication of the expansion of agricultural activities in the area. Other land (built up and bare area) increased from 1 Ha to 174 Ha from 1990 to 2020 due to increased population hence increased land under settlement as well as the growth of town centers.



**Figure 18:** Land cover trends within the buffer zone in MMWT

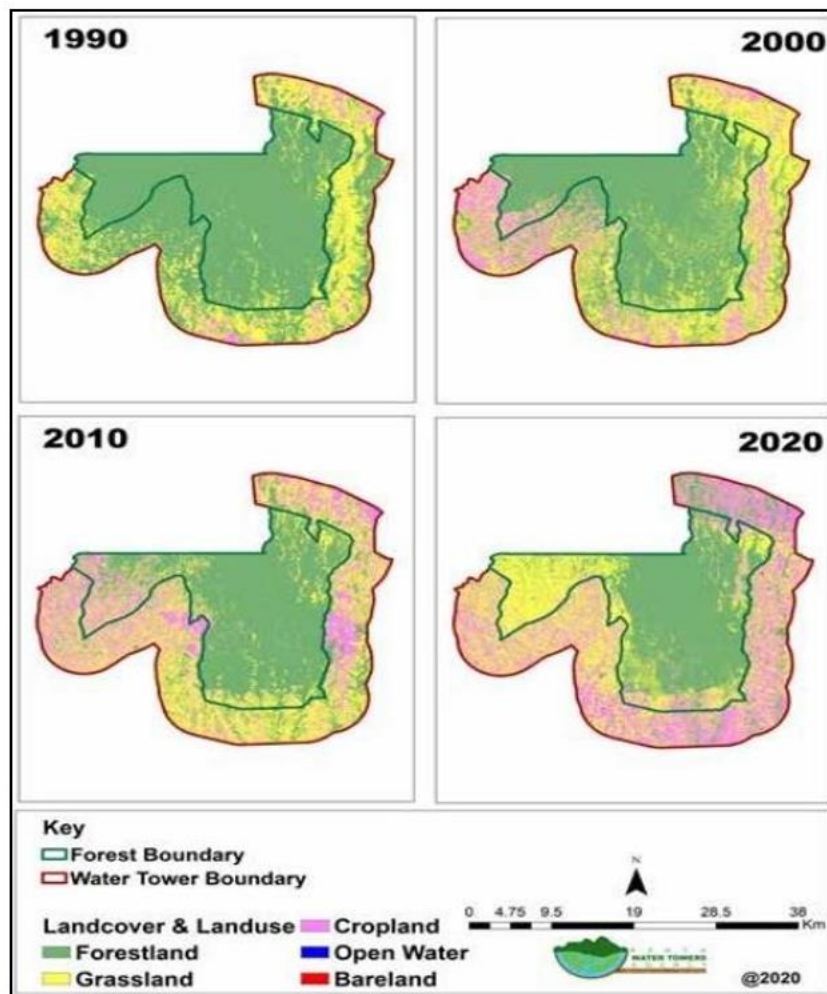
(Source: Researcher, 2023)

Between 1990 and 2020, the forest cover decreased by 33,397 Ha in the Water Tower while grassland and cropland increased by 10,989 Ha and 22,058 Ha respectively as shown in Figure 19 and 20.



**Figure 19:** Net gain and loss of land cover classes in MMWT between 1990 and 2020

(Source: Researcher, 2023)



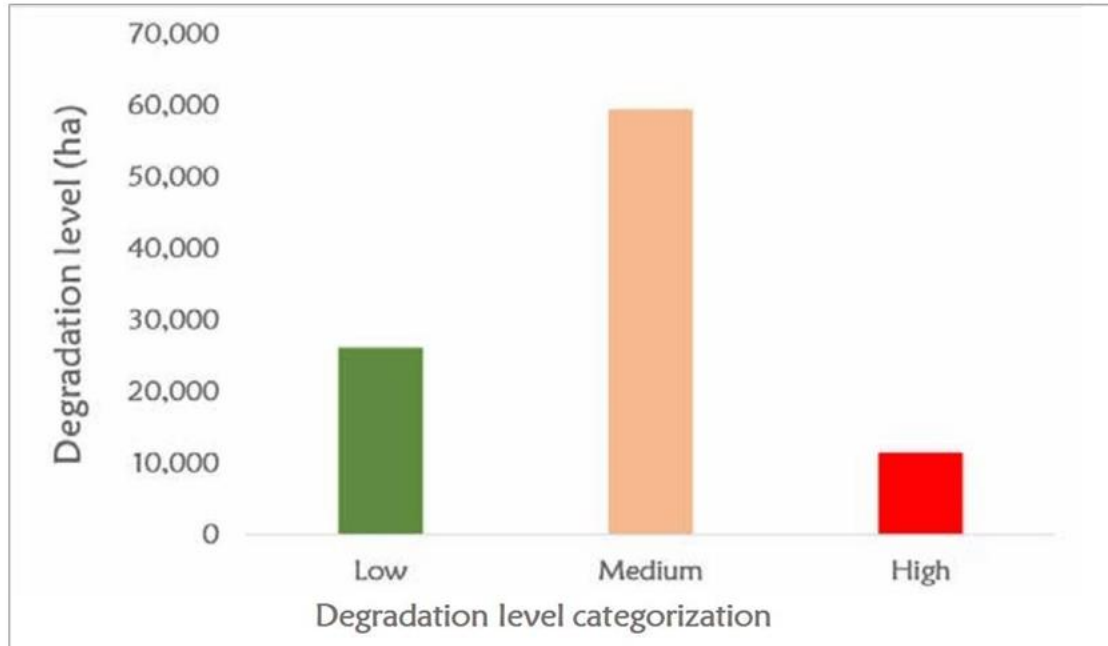
**Figure 20:** Land cover and land use trends in MMWT

(Source: KWTA, 2020)

#### 4.3.5 Assessment of Degradation Status

The degradation level in MMWT as of 2020 is mainly medium covering an area of 59,425 Ha (61%) (Figure 21). This is due to the dense forest cover, riparian vegetation and reclamation of encroached areas. The highest degradation level covered 11,391 Ha (12%) while low level covered 26,164 Ha (27%). In the forest zone, there is low level of degradation covering 23,057 Ha (50%) and is attributed to the dense and moderate forest cover and the reclamation of encroached areas. The high degradation level is mainly found at the north-eastern side of the forest in Olokurto area due to encroachment for farming and settlement. Within the buffer zone, the highest level of degradation covered an area of

10,029 Ha as expansive area is under farmlands and settlement hence minimal vegetation cover in the area. The most affected areas are in the Eastern section of the Water Tower in Enabelbel, Naituyupaki and Olokurto.



**Figure 21:** Degradation levels in MMWT

(Source: Researcher, 2023)

#### 4.4 Effects of JEU on Access to Forest Products

##### 4.4.1 Legal pluralism in MMWT

Various stakeholders support conservation activities and management of MMWT. They are from state and non-state organizations. The JEU forms part of the state organizations and include KWTA, KFS, KWS, NCG and the NPS. Other state actors involved in protection and conservation activities in MMF are Ewaso Ngiro South Development Authority (ENSDA), National Environment Trust Fund (NETFUND), Water Resources Authority (WRA), Kenya Forestry Research Institute (KEFRI) and National Environment Management Authority (NEMA). Table 4 highlights non-state actors include Community Based Organizations, Non-Governmental Organizations and local communities. Stringent legislative and legal measures that prioritize creating synergy among the many parties are



urgently needed to safeguard and conserve water towers. However, this shows that there is a need for coordinated efforts to ensure the management, protection and conservation of water towers. The existence of multiple participants in the administration of water towers is a positive indication of the shared interests and roles. A coordinated strategy could result in resource pooling, improved governance, effective and efficient utilization of resources, and monitoring and evaluation.

**Table 4:** State and Non-state Actors within MMWT

S/No.	Institution	Mandate
<b>State Actors- JEU</b>		
1.	KWTA	Overseeing and coordinating the preservation, restoration, preservation and environmentally friendly operation of every water tower
2.	KFS	The preservation, sustainable growth, administration, and application of the nation's forest resources
3.	KWS	Conservation and management of wildlife and enforcements of related laws and regulations
4.	NCG	Protection and conservation of MMWT
5.	NPS	Provide security, arrest those who undertake illegal activities within the forest block and carry out community mobilization and administration
<b>Other State Actors (Non JEU)</b>		

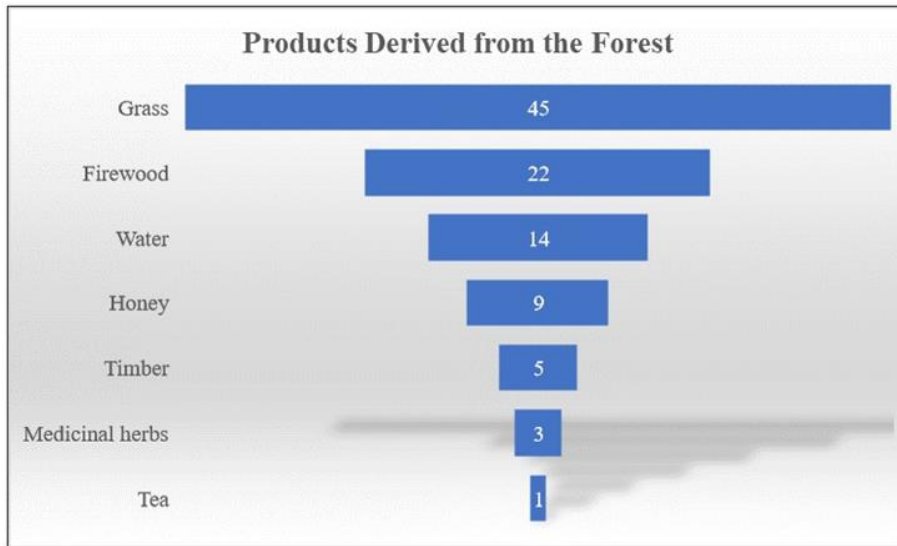
1.	ENSDA	Creation, organization, and execution of fair, integrated socioeconomic development initiatives via the sustainable use of basin-based resources.  encouraging investments under its purview to raise living standards in the ENSDA area
2.	NETFUND	Facilitate research that aims at furthering therequirements of environmental conservation, capacity building etc.
3.	WRA	To protect the right to clean water by appropriately controlling the use and handling of the watershed
4.	KEFRI	Carrying out studies and disseminating knowledge and technology to support the long-term advancement of forestry and related ecosystems for economic development.
5.	NEMA	Harmonizing the primary institutions' numerous environmental governance initiatives
<b>Non-State Actors</b>		
1.	World Wildlife Fund	Protects the environment and lessens the grave dangers to the variety of life on Earth.
2.	Community Forest Association	Jointly protect and conserve the forest with KFS and other key stakeholders
3.	Water Resource Users Association – Amala, Engare Ngiito, Upper Amala, Enoosagami, Enkare Narok	Conservation of the riparian areas

4.	Kenya Forest Working Group	Promotion of sound forest management and conservation practices by working with individuals, organizations and institutions
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(Source: Researcher, 2023)

#### 4.4.2 Forest products depended on by community in MMWT

An interview with the community revealed products they derive from the forest and which constantly push them to encroach the forest. Majority of the respondents (45%) said that they depend on the forest for grazing of their livestock, while the rest rely on the forest for firewood (22%), water for domestic use (14%), honey (9%), timber for construction purposes (5%), medicinal herbs (3%) and tea (1%). This is illustrated in Figure 22.



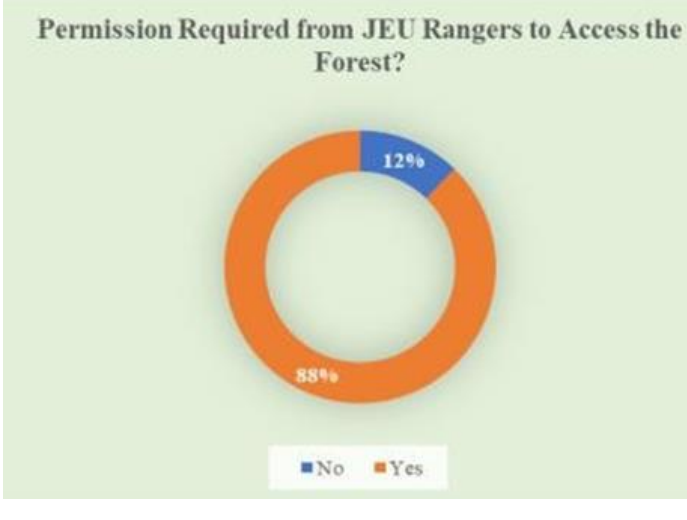
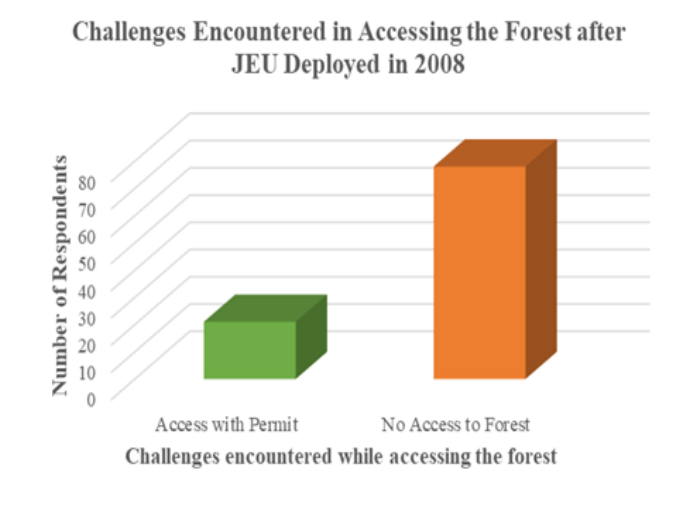
**Figure 22:** Products Derived from the Forest

(Source: Researcher, 2023)

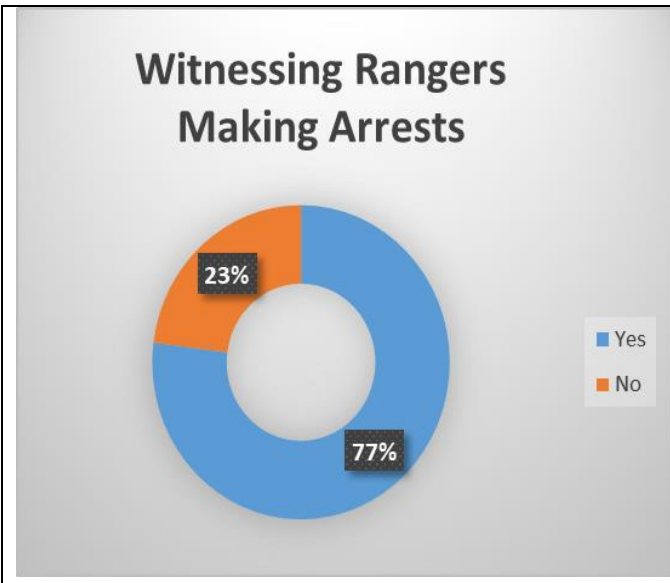
#### 4.4.3 Effects of JEU on access to forest products

Majority of respondents (88%) reported that accessing the forest was not easy after reclamation and fencing was done by the Government as shown in Figure 23. This was attributed to the limited gates

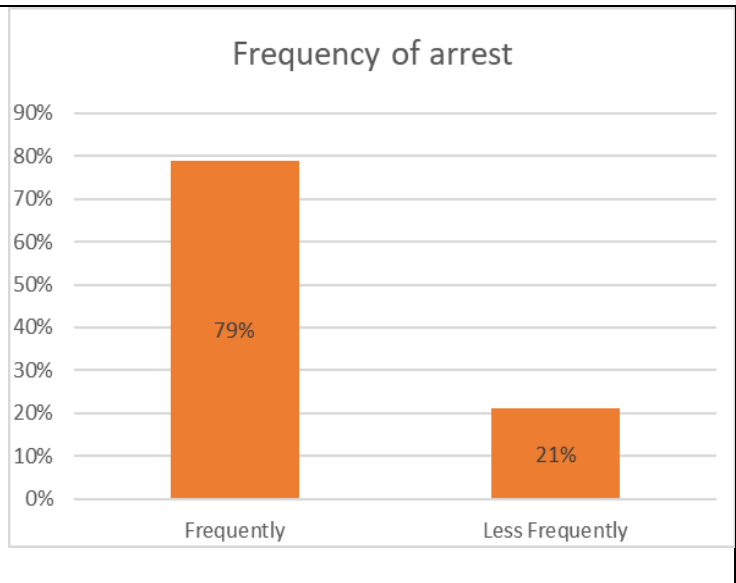
along the 30Km stretch electric fence line which made it difficult for the locals to access the forest. Through the FGDs, the study found out that the community was allowed to *Cut and Carry grass* from the forest to their homes as livestock was not allowed. Figure 24 illustrates how this made access limited and if granted permission into the forest the time for access was limited.

 <p><b>Permission Required from JEU Rangers to Access the Forest?</b></p> <table border="1"> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>No</td> <td>12%</td> </tr> <tr> <td>Yes</td> <td>88%</td> </tr> </tbody> </table>	Response	Percentage	No	12%	Yes	88%	 <p><b>Challenges Encountered in Accessing the Forest after JEU Deployed in 2008</b></p> <table border="1"> <thead> <tr> <th>Challenge</th> <th>Number of Respondents</th> </tr> </thead> <tbody> <tr> <td>Access with Permit</td> <td>35</td> </tr> <tr> <td>No Access to Forest</td> <td>85</td> </tr> </tbody> </table>	Challenge	Number of Respondents	Access with Permit	35	No Access to Forest	85
Response	Percentage												
No	12%												
Yes	88%												
Challenge	Number of Respondents												
Access with Permit	35												
No Access to Forest	85												
<p><b>Figure 23:</b> Permission Required from JEU Rangers (Source: Researcher, 2023)</p>	<p><b>Figure 24:</b> Challenges encountered in accessing the forest after JEU Deployment (Source: Researcher, 2023)</p>												

Most of the survey participant also indicated that they have frequently spotted rangers making arrests in their area. Figure 25 shows that 77% of the respondents had witnessed arrests in their area. 79% of the witnesses indicated that the arrests took frequently in a week. Based on these findings, it can be inferred that JEU enforcement activities, particularly arrests, are relatively common and occur with high frequency in the surveyed area. The high percentage of respondents who reported witnessing arrests suggests that the rangers are actively involved in carrying out their duties in conserving the MMWT.

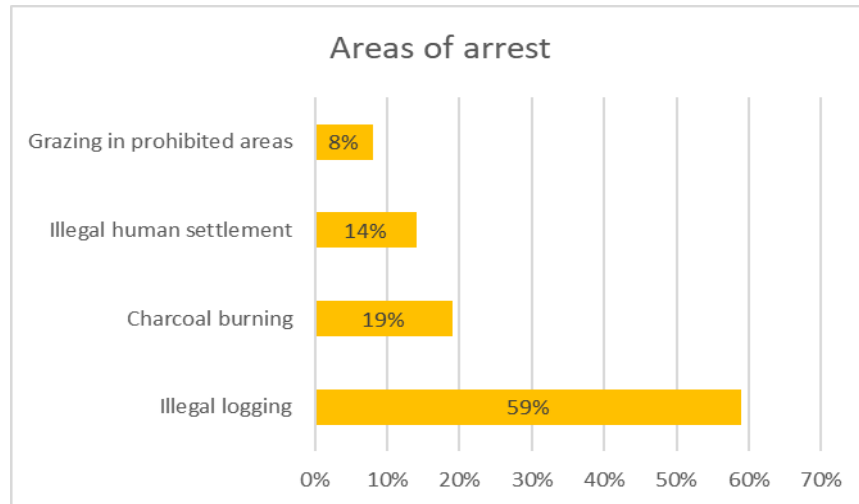


**Figure 25:** Spotting rangers making arrests  
(Source: Researcher, 2023)



**Figure 26:** Frequency of Arrest in a week  
(Source: Researcher, 2023)

The survey participants were also requested to indicate the areas where rangers mostly make arrests. From the findings in figure 27, 59% of the respondents indicated that more arrests were done on illegal logging, 19% indicated that more arrests were done on charcoal burning while, 14% indicated that arrests were done on Illegal human settlement/ encroachment, while 8% indicated that more arrests were done on grazing in the prohibited areas. These findings provide insights into the specific areas of focus for JEU enforcement efforts by the rangers. It suggests that combating illegal logging, charcoal burning, illegal human settlements, and unauthorized grazing are key priorities in maintaining environmental protection, conservation, and adherence to regulations in the surveyed area.



**Figure 27: Areas of Arrest**

Regression analysis was conducted to find out the effect of JEU on access of forest products by the forest adjacent community in the MMWT. Table 8 shows the model summary:

**Table 8: Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	-.897a	0.807	0.785	3.568

**Regression Coefficients**

Model		Unstandardized		Standardized	t	Sig.
		Coefficients		Coefficients		
		B	Std. Error	Beta		
1	(Constant)	1.287	6.72		1.976	0.003
	JEU enforcement	-0.575	0.168	-0.234	3.394	0.001

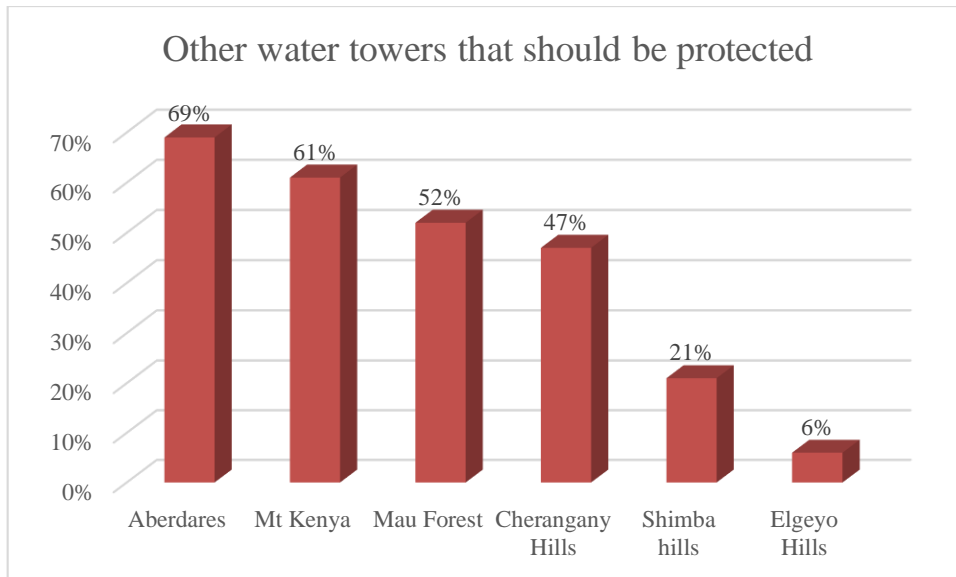
From the findings, the access to forest products by the forest adjacent community in the MMWT was explained by the presence of the JEU. The strong correlation coefficient(R) of -0.897 implies that presence of JEU and access to forests products are inversely related. This means that the more

execution of the JEU, the less or the hard it becomes for the communities to access the forest products. The R adjusted square of 0.785 implies that 78.4% of the limited access to the forest products by the forest adjacent community in the MMWT is explained by the execution of the JEU, while 21.5% is explained by other factors not included in the model. The regression coefficient of -0.234 and  $p=0.01<0.05$  implies that a unit enforcement of the JEU results to reduction in forest access by 0.234 units. The findings imply that the implementation of JEU measures, which involves enforcing conservation policies, preventing illegal activities, and protecting forest resources, limits the communities' traditional access to forest products.

#### **4.5 Sustainability and Replicability of the JEU in other Kenya's Water Towers**

The interviewed participants expressed strong support for the continuation of the joint execution unit for protecting the Maasai Mara water tower. They emphasized the vital role the water tower plays in sustaining agricultural activities in the region. They also emphasized that the unit's efforts in preventing deforestation and illegal activities around the water tower have been crucial in maintaining a sustainable water supply for both farming and the local community. They expressed belief that without the continued efforts of the joint execution unit, the water tower could face irreparable damage, negatively impacting the livelihoods of many in the community. The key informants also stressed that the unit's work has helped protect endangered species and maintain the ecological balance of the water tower. They strongly advocated for the unit's continuation, suggesting that it should even receive increased support and resources to further enhance its conservation efforts. Furthermore, the respondents indicated the need to protect other water towers in other regions in Kenya, with execution of the JEU. From the findings in figure 28, 69% suggested that aberdare ranges should be given similar treatment, that is, protection from human settlement and illegal logging. Similarly 61% suggested that the Mt. Kenya water towers should be protected from the charcoal burning activities and illegal logging. Additionally, 52% of the respondents suggested that

a JEU should be enforced and implemented in the Mau Forest Complex while 47% suggested the protection of the Cherangany Hills water tower. Further 21% of the interviewed participants suggested the execution of JEU in Shimba Hills water Tower and 6% suggested its enforcement of JEU in Elgeyo Hills Water Tower.

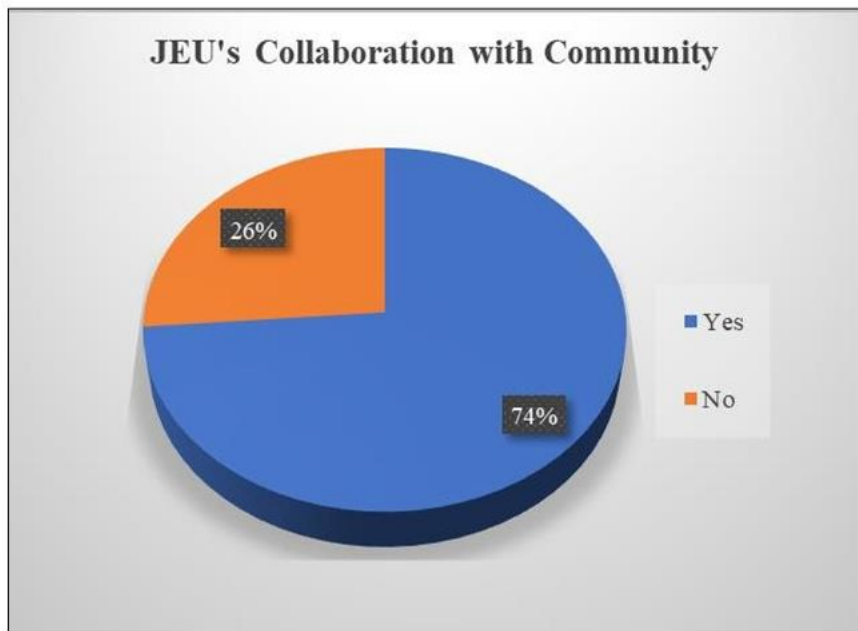


**Figure 28:** Protection of other water towers

#### 4.5.1 Collaboration between Community and JEU in Conservation Activities

From the KII's conducted with JEU Sector Commanders and Narok South Deputy County Commissioner, the study found out that the community was engaged in conservation activities. The government through KWTA engaged and facilitated community scouts in the protection of the Water Tower to supplement the works of the JEU rangers. Additionally, the community was also engaged in the production of seedlings in the nurseries and during rehabilitation/ tree planting activities. A majority (74%) of the community members interviewed indicated that there was partnership between the Government and the community as depicted on Figure 29. This collaboration has encouraged community ownership of protection and rehabilitation projects and subsequently led to enhanced conservation of the water tower.





**Figure 29:** JEU’s Partnership with the Community

(Source: Researcher, 2023)

#### 4.6 Discussion

The study found out that the illegal land adjudication which led to the “ballooning” of the Group ranches was the main cause of illegal settlement in Maasai Mau that saw illegal occupation of over 40,000Ha of the forest land. The Mau Task Force Report (2009) confirmed these massive illegal human encroachments that led to forest degradation through illegal logging and charcoal production thereby jeopardizing the ecological potential in the provision of ecosystem services.

The study further observed a decrease in the cases of illegal encroachment, charcoal production and illegal logging after the JEU Rangers were deployed to MMWT in 2008 which was attributed to enhanced protection of the water tower through regular patrols, seizures, arrests and prosecutions made by the JEU Rangers; heightened sensitization forums; stakeholder support and the inception of the 30km Amalo-Masaita electric fence project that has helped in deterring forest offenders from easily accessing the forest. The observed decrease in illegal activities such as encroachment, charcoal production, and logging after the deployment of Joint Enforcement Unit (JEU) Rangers to the Maasai

Mara Water Tower (MMWT) in 2008 aligns with findings in existing literature on the effectiveness of ranger-based interventions in environmental conservation. Numerous studies have highlighted the positive impact of ranger patrols and law enforcement on reducing illegal activities in protected areas (Ogutu et al., 2016; Watson et al., 2018). Increased surveillance and regular patrols, as noted in the study, have been shown to be effective deterrents against illegal activities, contributing to the preservation of ecosystems. Moreover, the success attributed to seizures, arrests, and prosecutions by the JEU Rangers echoes literature emphasizing the importance of stringent law enforcement in mitigating environmental crimes and promoting sustainable resource management (Leader-Williams et al., 2010; Lindsey et al., 2017).

Furthermore, the literature supports the idea that community engagement and stakeholder support, mentioned as contributing factors in the observed decline of illegal activities, are crucial components of successful conservation efforts. Studies have consistently emphasized the importance of involving local communities in conservation initiatives, fostering a sense of ownership and responsibility (Berkes, 2014; Agrawal & Gibson, 2019). Sensitization forums, as indicated in the study, have been identified in the literature as effective tools for raising awareness and promoting sustainable practices among local communities (Bump et al., 2019; Ghimire & Pimbert, 2017). Additionally, the implementation of physical barriers, such as the Amalo-Masaita electric fence project, is a strategy supported by literature to deter unauthorized access to protected areas. This approach has been documented in various conservation projects worldwide as a means to reduce human-wildlife conflicts and enforce protected area boundaries, contributing to the overall success of conservation initiatives (Naughton-Treves et al., 2013; Sitati et al., 2013).

The study however found out that Maasai Mau Water Tower is still the most threatened block of the 22 forest blocks in Mau Forest Complex. This is due to the encroachments being undertaken by the Ogieks in Sasimwani and Olokurto areas. The main socio-economic activities of the local

communities are crop farming and livestock keeping. As a result, the community's need to improve their livelihoods led to them to infringe on the forest where large tracts of forested lands were cleared for agriculture (KWTA Status Report, 2018). This report confirmed this study's findings where majority of the respondents reported that they mainly depended on the forest for grazing of their livestock; while the rest relied on the forest for firewood, water for domestic use, honey, timber for construction purposes and medicinal herbs. Poor farming practices such as cultivating on riparian areas, steep slopes and encroachment on wetlands were rampant before the JEU was deployed in 2008. The results of these poor farming practices are erosion of soil, soil exhaustion, flooding, landslides, and shortage of water, siltation and low crop yields.

After reclamation and restriction of access to the water tower, the forest adjacent community is relying on the area's favorable micro-climatic conditions to practice agriculture. The rich volcanic soils and good climatic conditions enable the community to grow wheat, barley, maize, beans, peas, tomatoes, potatoes, cabbages, onions, and carrots. Livestock rearing is also practiced within the area where livestock such as cattle, sheep, donkey and goats are kept. Additionally, poultry, beekeeping and small-scale businesses are other socio-economic activities practiced in the area to avoid over-reliance on the water tower.

Findings showed that there was a negative and significant relationship between JEU activities and access to forest products by the communities neighbouring MMWT. This was shown by a strong correlation coefficient(R) of -0.897 implies that presence of JEU and access to forests products are inversely related. Furthermore, regression analysis depicted a strong negative and significant influence of JEU's activities on accessibility of forest products by the neighbouring communities. The observed negative and significant relationship between Joint Enforcement Unit (JEU) activities and community access to forest products around the Maasai Mara Water Tower aligns with existing literature on the impact of law enforcement and conservation interventions on resource accessibility.

Studies have consistently demonstrated that the presence of well-implemented enforcement measures, such as those carried out by enforcement units like JEU, act as effective deterrents to unauthorized access to natural resources (Ingram, 2008; Naughton-Treves et al., 2005). The strong negative correlation coefficient (R) of -0.897, as reported in the study, implies a robust inverse relationship between JEU activities and community access to forest products, underscoring the potential efficacy of enforcement initiatives in curbing unsustainable resource extraction. Effective enforcement, as exemplified by JEU activities, is crucial for maintaining the integrity of protected areas and ensuring sustainable resource management practices. The study's results contribute to the growing body of evidence supporting the idea that well-implemented enforcement measures not only contribute to biodiversity conservation but also influence the behavior of local communities in their interaction with natural resources.

The study found out that the local community also practices minimal agroforestry where both exotic and indigenous trees are planted. The study observed the main exotic trees planted which include Cypress, Eucalyptus and *Gravellia Robusta* while the indigenous trees planted are mainly *Prunus Africana*, *Olea Africana*, acacia, *Juniperus Procera*, *Casuarina Equisetifolia*, *Olea Europaea*, and *Podocarpus Falcutus*. The community sells some of these trees as timber and poles as a way of sustaining their families.

Income diversification has been linked to livelihood improvement and subsequent reduced pressure on natural resources (KwTA, 2020). In the Maasai Mau Water Tower, livelihood improvement is enhanced through implementation of various interventions that include; utilization of local labour for rehabilitation, establishment of apiaries, briquette making and rural electrification. The study found out that through the *Adopt a Block* initiative that was implemented by Government, various institutions adopted blocks for rehabilitation which was done by the local community. As a result, the local labour was promoted and this provided income streams to the forest adjacent community.

Maasai Mau Water Tower provides ecosystem services ranging from regulatory, provisioning, cultural and supporting. The estimated total economic value for Maasai Mau and East Mau is KES 17 billion (Kipkoech et al., 2011). Results from the analysis of this study observed that access to the forest and forest-based products became restricted after reclamation of encroached areas that was carried out in 2018 and 2019, and the subsequent fencing of the forest. The Government has however implemented a *Cut and Carry Policy* where the community is allowed to access the forest, cut grass and carry to their homes as a way of discouraging grazing inside the forest.

When an area is gazetted as a tower of water, a public forest, a national park, or a wildlife conservancy, it becomes evident how complicated water tower protection is (KWTA, 2020). According to the study's findings, three distinct public agencies operating in the same region and frequently with comparable legislative powers are a reflection of this reality. In other cases, there are extremely important regions that are not taken into account when allocating responsibilities. This makes management of such sites challenging since various organizations use disparate conservation criteria, which leads to a lack of standardization. The research found that disputes over payments for ecosystem services also occurred between several public organizations, with a given region being gazetted by many agencies, wearing out the consumers of the natural resource. In this instance, legal plurality becomes an impediment to water tower protection and environmentally friendly operation.

According to KWTA (2020), the JEU has reduced illegal forest related activities in Maasai Mau Water Tower by seventy (70%) and was one of the major milestones in securing this ecosystem. Since 2008, the JEU aided in the reclamation of over 40,000 Ha of encroached areas within the Mau Forest Complex including 21,601 Ha in MMWT and also deterred further encroachment into the forest. The study also observed significant natural regeneration within the forest that happened as a result of protection of the water tower. The study also found out that the Government through KWTA had established a framework for the promotion of participatory water towers management. A community

scouting programme was initiated in the MMWT through recruitment of community scouts who support the JEU in surveillance, protection and coordinate community sensitization and mobilization. Due to these key achievements, the study recommends establishment of such a special Unit in seriously threatened water towers in order to reverse their degradation.

The strong support expressed by the interviewed participants for the continuation of the Joint Execution Unit (JEU) aligns with existing literature on the positive outcomes of community involvement and collaborative conservation efforts. Numerous studies emphasize the significance of local communities in the success of conservation initiatives, particularly in regions where human activities directly impact critical ecosystems (Berkes, 2004; Mascia & Pailler, 2011). The participants' recognition of the vital role played by the Maasai Mara water tower in sustaining agricultural activities echoes findings in the literature highlighting the interconnectedness of ecosystems and local livelihoods (Kellert et al., 2000; Pretty et al., 2003). These sentiments underscore the importance of considering the socio-economic context and community perspectives in conservation strategies.

The emphasis on the JEU's role in preventing deforestation and illegal activities around the water tower resonates with studies that underscore the effectiveness of law enforcement and patrol units in safeguarding natural resources (Lindsey et al., 2017; Naughton-Treves et al., 2005). The participants' belief that the discontinuation of JEU efforts could lead to irreparable damage to the water tower is consistent with literature stressing the fragility of ecosystems and the need for sustained conservation interventions (Turner et al., 1990; Vitousek et al., 1997). Furthermore, their acknowledgment of the unit's contribution to protecting endangered species and maintaining ecological balance aligns with broader conservation goals highlighted in global biodiversity strategies (CBD, 2020; Millennium Ecosystem Assessment, 2005)

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

The chapter provides a summary of the study in terms of answering the research questions, the key findings as well as the research recommendations.

#### 5.2 Summary of the Research Findings

The study sought to assess the status of MMWT before and after the JEU's establishment. From the findings, the introduction of the JEU in Maasai Mau Water Tower was a big win to conservation due to the reclamation of encroached areas within the water tower. This activity led to enhanced protection of the water tower through installation of the electric fence and rehabilitation activities through the *Adopt a Block Initiative*. The study however found out that areas like Sasimwani and Olokurto encroached by the Ogieks require reclamation.

Between 1990 and 2020, the Maasai Mara Water Tower (MMWT) witnessed a 33% decline in forest cover (14,485 Ha), countered by an 11,519 Ha increase in grassland. Cropland initially rose by 6,322 Ha (1990-2019) but decreased by 3,414 Ha in 2019-2020, attributed to the eviction of illegal settlers, indicating forest recovery. Other land increased by 18 Ha (1990-2019) and decreased by 12 Ha (1990-2020) due to encroachment. The comparative analysis and trend of forest cases prosecuted and recovered forest products by JEU across the sectors within MMWT drawn over a period of ten years showed that there was a declining trend on the number of arrested persons and impounded forest produce as a result of increased patrols and surveillance by officers of the JEU. A drastic decline of forest cases and recoveries have been realized between 2020 and 2022 as a result of heightened sensitization forums, sustenance/ dominance efforts by enforcement officers, stakeholder support and the inception of the 30km Amalo-Masaita electric fence project that has helped in deterring forest

offenders from easily accessing the forest.

Community access to the forest was automatically restricted after fencing was done. This enhanced natural regeneration as the water tower is no longer disturbed. The Forest Adjacent Community resorted to crop and livestock farming and also practiced agro-forestry as a way of sustaining their livelihoods. The *Cut and Carry Policy* is also providing an opportunity to the community to fetch grass for their livestock.

Majority of respondents (88%) reported that accessing the forest was not easy after reclamation and fencing was done by the Government. This was attributed to the limited gates along the 30Km stretch electric fence line which made it difficult for the locals to access the forest. Through the FGDs, the study found out that the community was allowed to Cut and Carry grass from the forest to their homes as livestock was not allowed.

The interviewed participants strongly support the continuation of the Joint Execution Unit (JEU) for protecting the Maasai Mara water tower, emphasizing its crucial role in sustaining agricultural activities and preventing deforestation. They believe the JEU's efforts are essential for maintaining a sustainable water supply, preventing irreparable damage, and safeguarding livelihoods. The key informants stress the unit's contribution to protecting endangered species and maintaining ecological balance, advocating for increased support. Additionally, respondents express the need to extend JEU protection to other water towers in Kenya, with the majority recommending similar treatment for Aberdare Ranges (69%), Mt. Kenya (61%), Mau Forest Complex (52%), Cherangany Hills (47%), Shimba Hills (21%), and Elgeiyo Hills (6%) to combat human settlement, illegal logging, charcoal burning, and other threats.

### **5.3 Conclusion**

The study concluded that the reclamation of encroached areas in Maasai Mau that was carried out in



2018 and 2019 saved the forest from further degradation. This coupled with JEU's regular patrols and the government's effort of fencing the most threatened section of the forest drastically reduced human pressure on the water tower thereby increasing natural regeneration. This meant that the JEU still plays a critical role in the protection, restoration and conservation of Maasai Mau.

The second study objective was to evaluate how legal pluralism in relation to JEU impacts the conservation of water towers in Kenya by focusing on MMWT. It was concluded that majority of MMWT neighbours experienced difficulty accessing the forest after reclamation and fencing by the Government, primarily due to the limited gates along the 30km stretch of the electric fence. The study showed that the community's access to the forest was restricted, allowing only the cutting and carrying of grass to homes, as livestock entry was prohibited.

It was also concluded that there is strong support for the continuation of the Joint Execution Unit (JEU) for protecting the Maasai Mara water tower. The participants emphasized the essential role of the water tower in sustaining agricultural activities and the unit's crucial efforts in preventing deforestation and illegal activities. They believed that without the JEU's continued presence, the water tower could face irreversible damage, negatively impacting livelihoods and the ecological balance of the area. Moreover, the participants highlighted the need to extend similar protection to other water towers in Kenya, including the Aberdare Ranges, Mt. Kenya, Mau Forest Complex, Cherangany Hills, Shimba Hills, and Elgeiyo Hills. The findings suggest that the JEU model has the potential for replication and should receive increased support and resources for enhanced conservation efforts in these areas.

#### **5.4 Recommendation**

The study recommended both short, medium and long-term measures in order to enhance sustainable management of Maasai Mau Water Tower. One of the short term recommendation is a need for community sensitization on the importance of conserving MMWT in order to create goodwill and

enhance community ownership of protection and restoration activities. The second short-term recommendation is the need for coordination of organizations working in the water tower to avoid duplication of efforts and encourage synergy in restoration and conservation.

On the medium-term, the study recommended the need for the JEU Rangers to increase patrols and surveillance of the forest in order to curb illegal activities such as overgrazing, illegal logging, charcoal production and firewood collection. The remaining encroached areas of Sasimwani and Olokurto areas should be reclaimed and fenced off to prevent further encroachment and massive rehabilitation activities should be undertaken by both state and non-state actors through planting of indigenous trees and bamboo.

On the long-term measures, the study recommended more research to be undertaken on participatory management of water towers, which will assist in strengthening existing policies in the environment, forestry and other related sectors. The study also underscored the need for supporting the community with alternative sources of livelihoods such as bee keeping, briquettes, and water projects to reduce the rate of over-reliance on forest products and encroachment into critical water catchment areas.

## REFERENCES

- Agrawal, A., & Gibson, C. C. (2017). Enchantment and disenchantment: The role of community in natural resource conservation. *World Development*, 27(4), 629-649.
- Alase, A. (2017). The Interpretative Phenomenological Analysis (IPA): A Guide to a Good Qualitative Research Approach. *International Journal of Education and Literacy Studies*, 5(2), 9-19.
- Andam, K. S., Ferraro, P. J., Pfaff, A., Sanchez-Azofeifa, G. A., & Robalino, J. A. (2008). Measuring the effectiveness of protected area networks in reducing deforestation. *Proceedings of the National Academy of Sciences*, 105(42), 16089-16094.
- Beckmann, B. Franz von. (2012) Who's afraid of legal pluralism. *Journal of Legal Pluralism and Unofficial Laws*, 47(1), 37-82.
- Bennun, L., & Njoroge, P. (2011). Important Bird Areas in Africa and associated islands-Kenya, 54.
- Berman, P.S. (2016) Global legal pluralism. *Southern California Law Review* 80 (1), 1155–1237.
- Berkes, F. (2004). Rethinking community-based conservation. *Conservation Biology*, 18(3), 621-630.
- Berkes, F. (2004). Rethinking community-based conservation. *Conservation Biology*, 18(3), 621-630.
- Boelens, R., Crow, B., Hoogesteger, J., Lu, F. E., Swyngedouw, E., & Vos, J. (2017). *Hydrosocial territories and water equity: theory, governance, and sites of struggle*. Routledge.
- Borowy, I. (2013). Intergenerational equity: An exploration of the 'fair innings' argument. *Environmental Values*, 22(5), 609–624. <https://doi.org/10.3197/096327113X13736417406118>
- Brosius, P. J. (2016). Common ground: The cultural content of biodiversity conservation. In J. Peter Brosius (Ed.), *Indigenous peoples and protected areas: The law of mother earth* (pp. 78–99). Arizona University Press.

- Bump, J. K., Alexander, S. M., Robertson, M. P., & Gann, G. D. (2019). A test of spatial contagion among central African elephants. *Oecologia*, 159(1), 161-171.
- CBD (Convention on Biological Diversity). (2020). Global Biodiversity Outlook 5. Retrieved from <https://www.cbd.int/gbo/gbo5/publication/gbo-5-en.pdf>
- Challenges and Opportunities*. London and New York: Routledge.
- Dilwyn, A. (2015). Legal pluralism and Human Rights in the idea of Climate Justice. *Oslo Law Review*, (3), 200-224. doi: <http://dx.doi.org/10.5617/oslaw2766>.
- Dressler, W., & Pulhin, J. M. (2010). The shifting ground of swidden agriculture on Palawan Island, the Philippines: A response to social and environmental change. *Geoforum*, 41(2), 234–244. <https://doi.org/10.1016/j.geoforum.2009.09.006>
- Duckett, B. (2005). ‘Concise Oxford English Dictionary (11<sup>th</sup> edition) 200532 Edited by Catherine Soanes and Angus Stevenson. Oxford University Press
- ENSDA (2015). Maasai Mau Forest (MMF) Status Reports (pp. 32). Nairobi: Ewaso Ng’iro South Development Authority (ENSDA).
- ENSDA, 2018. Maasai Mau Forest (MMF) Rapid Assessment Report (Revised). Nairobi: Ewaso Ng’iro South Development Authority (ENSDA).
- Environmental Policy and Law*, 42(6), 371-375.
- FAO, & UNESCO. (n.d.). FAO-UNESCO soil map of the world, Vol. 6: Africa, VI.
- Ghimire, K. B., & Pimbert, M. P. (2017). Social change and conservation: An overview of issues and concepts. In K. B. Ghimire & M. P. Pimbert (Eds.), *Social change and conservation: Environmental politics and impacts of national parks and protected areas* (pp. 3-29). Earthscan.
- Githiru M., Musila W., Kanga E.M., Malonza P.K. and Warui C., 2018. Maasai Mau Forest Biodiversity Assessment Technical Report. Kenya Forest Working Group, Nairobi.

- Githiru, M., Musila, W., Kanga, E., Malonza, P., & Warui, C. (2008). *Maasai Mau Forest Biodiversity Assessment: Technical Report*. Nairobi, Kenya.
- Griffiths, J. (2016). What is legal pluralism?. *The Journal of Legal Pluralism and Unofficial Law*, 18(24), 1-55.
- Hathaway, O. A. (2012). Do human rights treaties make a difference?. *The Yale Law Journal*, 111(8), 1935-2042.
- Hidalgo, J. P., Boelens, R., & Vos, J. (2017). De-colonizing water. Dispossession, water insecurity, and Indigenous claims for resources, authority, and territory. *Water History*, 9(1), 67-85.
- Hsiao, E. (2012). Whanganui River Agreement –Indigenous Right and Rights of Nature-.
- Ingelaere, B., Ansoms, A., & Verhofstadt, E. (2017). The Banality of Good: Land rights, eviction and citizenship in Rwanda. *African Affairs*, 116(462), 371–390.  
<https://doi.org/10.1093/afraf/adx002>
- Ingram, J. C. (2008). Networks, land use, and environmental decline: The case of forest loss in Southern Belize. *Annals of the Association of American Geographers*, 98(3), 507-527.
- Interim Coordinating Secretariat (ICS). (2011). Report on the Validity of the Title Deeds issued in the Extension of Five Group Ranches beyond their adjudicated boundaries into the Maasai Mau Forest.
- Interim Coordinating Secretariat, 2011. Report on the Validity of the Title Deeds issued in the Extension of Five Group Ranches beyond their adjudicated boundaries into the Maasai Mau Forest.  
*Issues*, 21(3), 1-9.
- Jackson, S. (2018). Water and Indigenous rights: Mechanisms and pathways of recognition, representation, and redistribution. *Wiley Interdisciplinary Reviews: Water*, 5(6), e1314.
- Jentoft, S. (2019). Legal pluralism and the governability of fisheries and coastal systems. *The Journal*

*of Legal Pluralism and Unofficial Law*, 43(64), 149-172.

- Jentoft, S., Bavinck, M., Johnson, D., & Thomson, K. (2019). Fisheries co-management and legal pluralism: how an analytical problem becomes an institutional one. *Human Organization*, 68(1), 27-38.
- Kanui, T., Kibwage, J., & Murangiri, M. (2016). Water Tower Ecosystems Services and Diversification of Livelihood Activities to Neighbouring Communities; A Case Study of Chyulu Hills Water Tower in Kenya. *J. Geogr. Environ. Earth Sci. Int*, 6, 1-12.
- Kellert, S. R., Mehta, J. N., Ebbin, S. A., & Lichtenfeld, L. L. (2000). Community natural resource management: Promise, rhetoric, and reality. *Society & Natural Resources*, 13(8), 705-715.
- KFWG, 2010. Maasai Mau Strategic Management Plan -2010-2020. Kenya Forest Working Group, Nairobi.
- KWS. (2009). Report of the Prime Minister Taskforce on the conservation of the Mau Forest Complex, 2009, Nairobi, Kenya
- Leader-Williams, N., Milledge, S., Adcock, K., Brooks, M., Conway, A., Knight, M., Mainka, S., Martin, E., & Teferi, T. (2010). Trophy hunting of black rhino *Diceros bicornis*: Proposals to ensure its future sustainability. *The Journal of International Wildlife Law & Policy*, 13(3), 259-273.
- Lee, R. G., & Gereffi, G. (1993). The formal structure of commodity chains and its effect on market performance. In G. Gereffi & M. Korzeniewicz (Eds.), *Commodity chains and global capitalism* (pp. 67-89). Greenwood Press.
- lessons from the Narmada Valley struggle in India. *LJIL*, 18, 345.
- Lindsey, P. A., Balme, G., Becker, M., (2017). The bushmeat trade in African savannas: Impacts, drivers, and possible solutions. *Biological Conservation*, 214, 296-307.

- Lindsey, P. A., Balme, G., Becker, M., Begg, C., Bento, C., Bocchino, C., Dickman, A., Diggle, R. W., Eves, H., Henschel, P., Lewis, D., Marnewick, K., Mattheus, J., McNutt, J. W., McRobb, R., Midlane, N., Milanzi, J., Morley, R., Murphree, M., ...Ripple, W. (2017). The bushmeat trade in African savannas: Impacts, drivers, and possible solutions. *Biological Conservation*, 214, 296-307.
- Maguire, R., Lewis, B. & Sampford, C. (2013). *Shifting global powers and International Law*.
- Mascia, M. B., & Pailler, S. (2011). Protected area downgrading, downsizing, and degazettement (PADDD) and its conservation implications. *Conservation Letters*, 4(1), 9-20.
- Mau Task Force Report. (2009). Task Force, 2009. Report of the Government's Task force on Conservation of Mau Forest *Mau Complex Reports*: Prime Minister's Office.
- Mc Arthur, J. (2013). International Environmental Law: Can it overcome its Weaknesses to Create an Effective Remedy for Global Warming? *Santa Clara Journal of International Law*, 10(2), 253-282.
- Middleton, C., & Ojha, H. R. (2013). Conservation as territorialization: Individualization of tenure rights in community-based conservation. *Human Ecology*, 41(1), 107–122.  
<https://doi.org/10.1007/s10745-012-9559-z>
- Millennium Ecosystem Assessment. (2005). *Ecosystems and Human Well-being: Biodiversity Synthesis*. World Resources Institute.
- Miller Keyes, A. (2015). *Building a state of water conservation: GA EPD strengthens water conservation in policy and planning*. Georgia Institute of Technology.
- Mulleta, F. F., Merlet, P., & Bastiaensen, J. (2014). Questioning the “regulatory approach” to large-scale agricultural land transfers in Ethiopia: A legal pluralistic perspective. *Law and Development Review*, 7(2), 401-431.

- Mwangi, K. K., Musili, A. M., Otieno, V. A., Endris, H. S., Sabiiti, G., Hassan, M. A., ... & Kanyanya, E. (2020). Vulnerability of Kenya's water towers to future climate change: an assessment to inform decision making in watershed management. *American Journal of Climate Change*, 9(3), 317-353.
- Naughton-Treves, L., Alix-Garcia, J., & Chapman, C. A. (2011). Lessons about parks and poverty from a decade of forest loss and economic growth around Kibale National Park, Uganda. *Proceedings of the National Academy of Sciences*, 108(34), 13919-13924.
- Naughton-Treves, L., Alix-Garcia, J., & Chapman, C. A. (2011). Lessons about parks and poverty from a decade of forest loss and economic growth around Kibale National Park, Uganda. *Proceedings of the National Academy of Sciences*, 108(34), 13919-13924.
- Naughton-Treves, L., Mena, J. L., & Treves, A. (2013). Wildlife survival beyond park boundaries: The impact of slash-and-burn agriculture and hunting on mammals in Tambopata, Peru. *Conservation Biology*, 17(4), 1106-1117.
- Nwankwo, C. I. (2012). Theories of justice: The perspective of Nigerian environmental law. *Journal of Sustainable Development*, 5(3), 131–141. <https://doi.org/10.5539/jsd.v5n3p131>
- Nygren, A. (2014). Competing claims on disputed lands: The complexity of resource tenure in the Nicaraguan interior. *Latin American Research Review*, 123-153.
- Odawa, S., & Seo, Y. (2019). Water tower ecosystems under the influence of land cover change and population growth: focus on Mau water tower in Kenya. *Sustainability*, 11(13), 3524.
- Ogutu, J. O., Kuloba, B., Piepho, H. P., & Kanga, E. (2016). Wildlife population dynamics in human-dominated landscapes under community-based conservation: The example of Nakuru Wildlife Conservancy, Kenya. *PLoS ONE*, 11(6), e0156719.
- Omondi, L., & Musula, P. (2011). Land Degradation of the Mau Forest Complex in Eastern Africa: A



Review for Management and Restoration Planning. *Environmental Monitoring*. <http://doi.org/10.5772/28532>

Oyéjídé, S. O. (2016). Customary tenure and sustainable development in Nigeria: A critique of current legal initiatives. *GeoJournal*, 67(2), 75–88. <https://doi.org/10.1007/s10708-006-0015-4>

Oyéjídé, S. O. (2016). Customary tenure and sustainable development in Nigeria: A critique of current legal initiatives. *GeoJournal*, 67(2), 75–88. <https://doi.org/10.1007/s10708-006-0015-4>

Pomade, A. (2012). Thinking of interdisciplinarity through internormativity. Illustration in environmental law. *Interdisciplinary Journal of Legal Studies* , 68 (1), 85-106.

Pospisil, L. (1971). *Anthropology of law: A comparative theory*. New York: Harper & Row Publishers.

Rajagopal, B. (2015). The role of law in counter-hegemonic globalization and global legal pluralism:

Pretty, J., Adams, B., Berkes, F., de Athayde, S. F., Dudley, N., Hunn, E., Maffi, L., Milton, K.,

Rapport, D., Robbins, P., Sterling, E., & Stolton, S. (2003). The intersections of biological diversity and cultural diversity: Towards integration. *Conservation and Society*, 1(1), 1-20.

Russell, A. J., Ongugo, P., & Banana, A. (2016). *Lessons Learned for Improving Policies Affecting Forest Conservation and Climate Change Adaptation in Kenya's Water Tower Communities*. Center for International Forestry Research..

Sambroek, W. ., Braun, H. M. ., & Vander, P. B. J. . (1980). *Exploratory soil map and agro-climatic zone map of kenya, 1980, scale 1:1,000,000 1982, pp.56.pp* (1st ed.). Nairobi, Kenya: Kenya Soil Survey.

Schmitz, T. (2020). Investing in ecosystems for water security: the case of the Kenya water towers. *The Palgrave handbook of climate resilient societies*, 1-19.

Sikor, T. (2002). The allocation of forestry land in Vietnam: Did it cause the expansion of forests in the northwest? *Forest Policy and Economics*, 4(2), 101–113. <https://doi.org/10.1016/S1389->

- Sikor, T. (2012). The commons in a globalizing world: Globalization from below. *Politics & Society*, 30(2), 215–247. <https://doi.org/10.1177/0032329202030002002>
- Sitati, N. W., Walpole, M. J., & Leader-Williams, N. (2013). Factors affecting susceptibility of farms to crop raiding by African elephants: Using a predictive model to mitigate conflict. *Journal of Applied Ecology*, 40(4), 698-709.
- Tamanaha, B.Z. (2011). *Rule of law and legal pluralism in development, legal studies research papers*.
- Taylor, A. L. (2018). International Law and Public Health Policy. In Heggenhougenand, K. & Quah, S. (Eds.), *International Encyclopedia of Public Health*, 3. (pp. 667-678). San Diego, United States: Academic Press.
- Techera, E. J. (2010). Legal pluralism, customary law and environmental management: the role of international law for the South Pacific. *Macquarie University Law School Legal Studies Working Paper*, (2010-01).
- Teubner, G. (2012). *Constitutional fragments: societal constitutionalism and globalization*. Oxford University Press.
- Tsing, A. L. (2015). *Friction: An ethnography of global connection*. Princeton University Press.
- Turner, B. L., Clark, W. C., Kates, R. W., Richards, J. F., Mathews, J. T., & Meyer, W. B. (1990). *The Earth as transformed by human action: Global and regional changes in the biosphere over the past 300 years*. Cambridge University Press.
- Uwizeye, A. (2013). Integrating conservation with rural development: A case study of Volcanoes National Park and its surrounding local communities in Rwanda. *Journal of Sustainable Tourism*, 21(3), 418–435. <https://doi.org/10.1080/09669582.2012.729675>
- Vitousek, P. M., Mooney, H. A., Lubchenco, J., & Melillo, J. M. (1997). Human domination of Earth's

ecosystems. *Science*, 277(5325), 494-499.

Von Benda-Beckmann, F. (2012) Who's afraid of legal pluralism? *Journal of Legal Pluralism* 47(8), 37-83.

Von Benda-Beckmann, F., & von Benda-Beckmann, K. (2012). The dynamics of change and continuity in plural legal orders. *The Journal of Legal Pluralism and Unofficial Law*, 38(53-54), 1-44.

Warman, K., Isra, S., & Tegnan, H. (2018). Enhancing legal pluralism: The role of adat and islamic laws within the Indonesian legal system. *Journal of Legal, Ethical and Regulatory* Washington University in St Louis, School of Law.

Watson, J. E. M., Dudley, N., Segan, D. B., & Hockings, M. (2018). The performance and potential of protected areas. *Nature*, 515(7525), 67-73.

Yamane, Taro. (1967). *Statistics, An Introductory Analysis*, 2<sup>nd</sup> Ed., New York: *Harper and Row*

# APPENDICES



UNIVERSITY OF NAIROBI

## Appendix 1: Household Survey

### RESEARCH TITLE

Impacts of Legal Pluralism in Conserving Water Towers in Kenya. A Case Study of Maasai Mau Forest  
(Water Tower)

### INTRODUCTION

**NB:** This research study will entail administering questionnaires to key informants operating in Maasai Mau Water Tower (MMWT), including the leadership of the Joint Enforcement Unit (JEU), the forest adjacent community (household surveys) and relevant government institutions working in the water tower.

**Dear Respondent,**

My name is **Domnic Sironga Ntialei**, a student pursuing a **Master of Science degree in Environmental Governance** at the **University of Nairobi** (Wangari Maathai Institute for Peace and Environmental Studies). In partial fulfillment of the requirement of this course, I am conducting my academic research entitled **‘Impacts of Legal Pluralism in Conserving Water Towers in Kenya. A Case Study of Maasai Mau Water Tower’**. The University has permitted me to carry out this research and I will treat

your opinions confidentially. This study is purely for academic purposes and not for any other hidden intention. Your honesty is therefore both critical and paramount when you respond to this questionnaire.

**SECTION A: PERSONAL BACKGROUND/ INFORMATION**

**Please fill and tick (✓) where applicable.**

1. Name of the respondent (optional): .....

2. Gender of the respondent:                      Male [    ]                      Female [    ]

3. Age of Respondent in years

(a) Between 1-17 years                      [    ]

(b) Between 18-35 years [    ]

(c) Between 36-60 years [    ]

(d) Over 60 years                      [    ]

4. Respondent's highest completed level of education?

(a) Primary    [    ]

- (b) Secondary [ ]
- (c) Tertiary (College/University) [ ]
- (d) Never been to school [ ]

5. Your Sub-Location within Sagamian Location

- (a) Tendwet [ ]
- (b) Sagamian [ ]

6. For how long have you resided in this area (years)

- (a) Between 1-10 years [ ]
- (b) Between 11-20 years [ ]
- (c) Between 21-30 years [ ]
- (d) Over 30 years [ ]

7. Occupation of the respondent:

- (a) Farmer [ ]
- (b) Employed [ ]
- (c) Business [ ]
- (d) Others (please specify .....

8. What is your household size- how many members in your house? .....

9. How far is your home from the edge/ boundary of Maasai Mau Forest?

..... Kms

10. Household GPS Coordinates ....., I .....

11. Date interviewed (**optional**): .....

**SECTION B: Status of Maasai Mau Water Tower Before and After the JEU's Establishment**

1. In your opinion, what do you consider to be the **major** threats to MMWT? Please tick (√) **one or all that apply**

- (a) Illegal human settlement/ encroachment [ ]
- (b) Charcoal burning [ ]
- (c) Illegal logging [ ]
- (d) Others (please specify .....

2. Have you ever heard of the JEU Rangers Yes [ ] No [ ]

If yes, how frequent do you see the Rangers patrolling?

Please Tick (√) appropriately;

- (a) Daily [ ]
- (b) Weekly [ ]
- (c) Monthly [ ]
- (d) Quarterly [ ]

(e) Annually [ ]

3. Which Rangers have you encountered carrying out patrols? Tick (✓) appropriately;

(a) KFS [ ]

(b) KWS [ ]

(c) NCG [ ]

(d) RDU [ ]

(e) None [ ]

4. How do you agree with the statements presented in the table below?

Please tick (✓) in the appropriate box

<b>Statement</b>	<b>Strongly Disagree (1)</b>	<b>Disagree (2)</b>	<b>Neither Agree nor Disagree (3)</b>	<b>Agree (4)</b>	<b>Strongly Agree (5)</b>
<b>Before JEU Rangers were Deployed to Maasai Mau in 2008</b>					
Illegal human settlement/ encroachment was high					
Charcoal burning was rampant					
Illegal logging was rampant					
Access to forest products had no restrictions					
Forest products were easily available					



There was plenty of water from the Water Tower					
The surrounding community had more conflicts over forest based products (like fodder, water, tree products)					
<b>After JEU Rangers were deployed in Maasai Mau in 2008</b>					
Illegal human settlement/ encroachment reduced					
Charcoal burning was stopped					
Illegal logging reduced					
Access to forest products became restricted					
Forest products are easily available					
There is plenty of water from the Water Tower					
The surrounding community had more conflicts over forest related products and resources					

5. What **challenges** have you encountered in accessing forest resources:

<b>Before JEU Rangers were Deployed to Maasai Mau in 2008</b>	<b>After JEU Rangers were deployed in Maasai Mau in 2008</b>
<p>.....</p> <p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p> <p>.....</p>

**SECTION C: JEU’s Influence on the Access to Forest Products by the Forest Adjacent Communities**

1. What forest products do you derive from the forest?

.....

.....

2. Do you require permission from the JEU Rangers to access the forest?

Yes [ ]                      No [ ]

If yes, how does the permission acquired from JEU affect your access to forest products?

.....

.....

3. Have you ever spotted the Rangers making arrests in your area?

Yes [ ]                      No [ ]

If yes, how often in a week?

(a) Most frequent [ ]

(b) Less frequent [ ]

4. Have you or any member of your household been arrested, by JEU, while accessing forest products

Yes [ ] No [ ]

5. On what areas do the Rangers make arrests mostly? Please tick appropriately;

(a) Illegal human settlement/ encroachment [ ]

(b) Charcoal burning [ ]

(c) Illegal logging [ ]

(e) Others (please specify .....

6. How do you agree with this statement: With the existence of JEU Rangers, it is very difficult to gain access to the forest.

i. Strongly Disagree [ ]

ii. Disagree [ ]

- iii. Neutral [ ]
- iv. Agree [ ]
- v. Strongly Agree [ ]

7. In your opinion, do you think the JEU Rangers are protecting the forest?

- i. Strongly Disagree [ ]
- ii. Disagree [ ]
- iii. Neutral [ ]
- iv. Agree [ ]
- v. Strongly Agree [ ]

8. Has the JEU Rangers' presence increased or reduced access to forest products?

- i. Increased [ ]
- ii. Reduced [ ]

9. In your own opinion, does JEU partner with Community Forest Associations (CFA) in protecting the forest? Yes [ ] No [ ]

If yes, in what ways does JEU work/ partner with Community?

.....

.....

If no, how has JEU affected the Community in forest protection?

.....

.....

**SECTION D: Sustainability and Replicability of the JEU in other water towers in Kenya**

1. In your opinion, do you think the Rangers should continue protecting the Maasai Mau forest?

Yes [ ]                      No [ ]

Please give reasons for your answer in (1) above

No.	<i>If Yes give Reason...</i>
i.	
ii.	
<i>If No give Reason...</i>	
i.	
ii.	

2. In your opinion, for how long do you think the Rangers should continue protecting the forest?

Please tick (√) **one**

(e) Between 1-10 years                      [ ]

(f) Between 11-20 years [ ]

(g) Between 21-30 years [ ]

(h) Forever                                      [ ]

3. (i) In your opinion, which **other forests in Kenya** do you propose should be protected by a Joint Enforcement Unit?

.....

.....

(ii) Please give reasons for your answer in (3) above

.....

.....

4. In your opinion, do you think **community scouts** could protect the forest better than JEU Rangers?

**Yes** [  ]      **No** [  ]

Please give reasons for your answer in (4) above

<i>No.</i>	<i>If Yes give Reason...</i>
i.	
ii.	
	<i>If No give Reason...</i>
i.	
ii.	

## **Appendix II: Focused Froup Discussion- Checklist**

1. How many Rangers are deployed under JEU?
2. Do you think this number is adequate?
3. How many Rangers should be added?
4. How many Camps exist in MMWT?
5. How are the Camps distributed in Maasai Mau Water Tower? Please mention the areas they are located?
6. Does each Camp have a sector commander?
7. How many Rangers are deployed in each Camp?
8. Does the Sector Commander call for meetings/ briefs within the Camp?
9. Does the Sector Commander submit progress reports to the JEU Overall Commander?
10. Are Rangers trained on matters forest protection and securing?
11. Are Rangers provided with equipment like GPRS gadgets for taking coordinates?
12. Are Rangers provided with vehicles for patrols in the forest?
13. Are the vehicles maintained and serviced when the need arises?
14. Are Rangers facilitated with allowances?
15. How is the condition of the Camps?
16. Are Rangers covered in any medical/ insurance scheme?
17. Do the Rangers have access to medication in case of an emergency?
18. Do you make arrests to illegal loggers, charcoal burners?
19. Do you think the concept of JEU in Maasai Mau is sustainable?
20. In your opinion, do you think the JEU Concept can be applied in other water towers in Kenya?
21. Which other water towers (forests) in Kenya do you propose should be protected by a Joint Enforcement Unit?

**Appendix III: Key Informants Interviews**

**Questionnaire for One (1) JEU Overall Commandant & 4 Sector Commanders**

**Questions on JEU Ranger(s)**

22. How many Rangers are deployed under JEU? .....

- a) Kenya Forest Service (KFS) .....
- b) Kenya Wildlife Service (KWS) .....
- c) Narok County Government (NCG) .....
- d) NPS/RDU .....

Do you think this number is adequate?      Yes [    ]      No [    ]

**If no,**

i. Why?

.....  
.....

ii. How many Rangers should be added? .....

**Questions on JEU Camp(s)**

23. How many Camps exist in MMWT? .....

Do you think this number is adequate?      Yes [    ]      No [    ]

If no, how many Camps do you think should be established? .....

24. How are the Camps distributed in Maasai Mau Water Tower? Please mention the areas they are



located?

.....

.....

.....

25. Does each Camp have a sector commander?      Yes [ ]      No [ ]

26. How many Rangers are deployed in each Camp? .....

Do you think this number is adequate?      Yes [ ]      No [ ]

If no, how many Rangers do you think should be deployed in each Camp? .....

**Questions on Meetings**

27. Does the Sector Commander call for meetings/ briefs within the Camp?

Yes [ ]      No [ ]

If yes, how frequent in a month? .....

**Questions on Reporting**

28. Does the Sector Commander submit progress reports to the JEU Overall Commander?

Yes [ ]      No [ ]

If yes, how often are the reports submitted? .....

**Questions on Facilitation of JEU Operations/ Trainings**

29. Are Rangers trained on matters forest protection and securing?

Yes [ ] No [ ]

If yes, how often are they trained in a year? .....

30. Are Rangers provided with equipment like GPRS gadgets for taking coordinates? Yes [ ]

No [ ]

If yes, are Rangers trained on their use? .....

31. Are Rangers provided with vehicles for patrols in the forest?

Yes [ ] No [ ]

If yes, are the vehicles adequate? .....

32. Are the vehicles maintained and serviced when the need arises?

Yes [ ] No [ ]

33. Are Rangers facilitated with allowances? Yes [ ] No [ ]

If yes, is the facilitation done on a monthly basis? Yes [ ] No [ ]

34. How is the condition of the Camps? Good [ ] Bad [ ]

35. Are Rangers covered in any medical/ insurance scheme?

Yes [ ] No [ ]

36. Do the Rangers have access to medication in case of an emergency?

Yes [ ] No [ ]

If yes, by what means .....

37. Do you make arrests to illegal loggers, charcoal burners? Yes [ ] No [ ]

If yes, are actions taken to the victims? Yes [ ] No [ ]

What actions are taken?

(a) .....

(b) .....

**Questions on Sustainability &Replicability of JEU in other Water Towers**

38. Do you think the concept of JEU in Maasai Mau is sustainable?

Yes [ ] No [ ]

Please give reasons for your answer in (17) above

No.	<i>If Yes</i>
1.	
2.	
	<i>If No</i>
1.	
2.	

