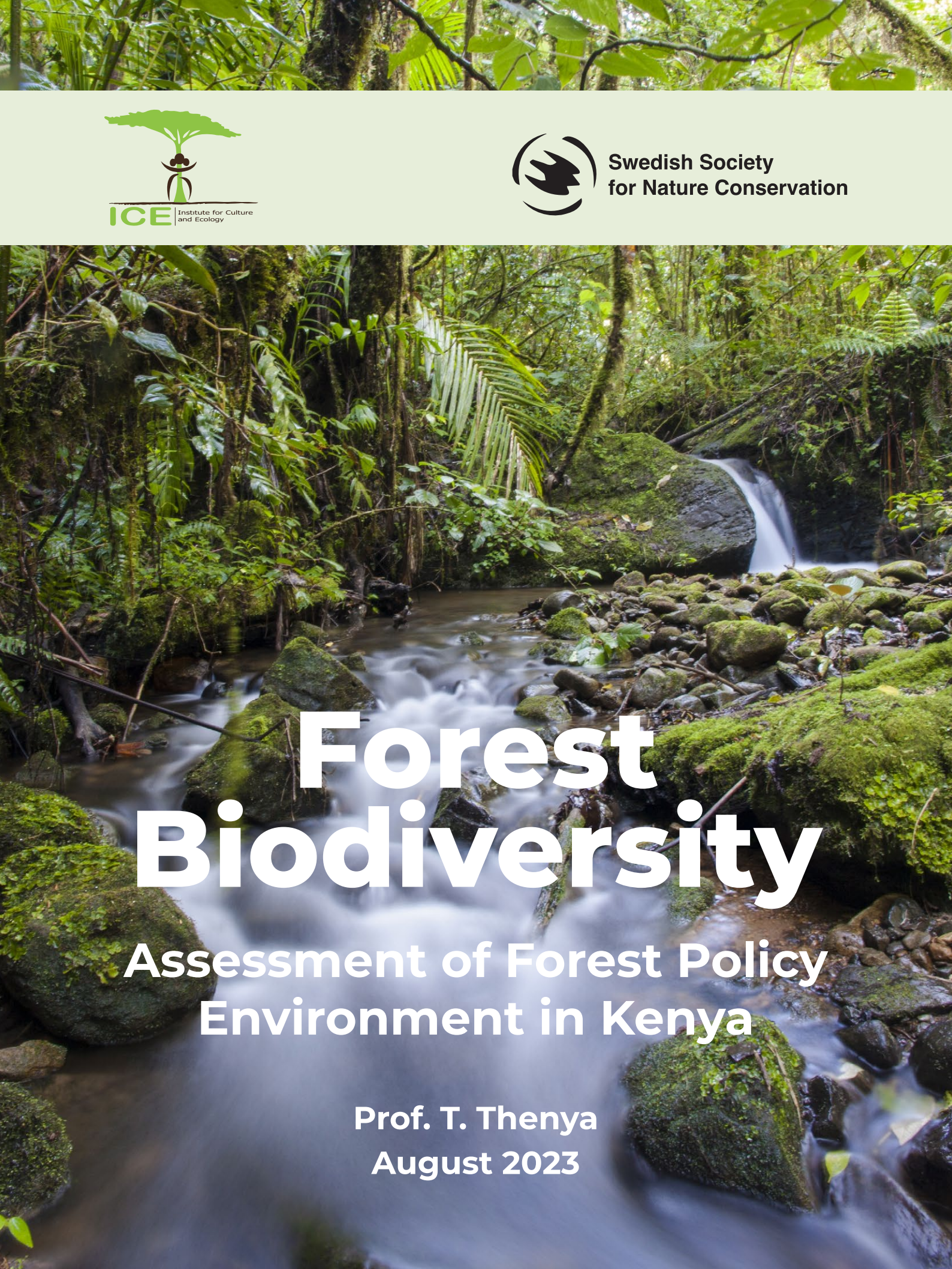

ICE Institute for Culture and Ecology

Swedish Society for Nature Conservation

Forest Biodiversity

Assessment of Forest Policy Environment in Kenya

Prof. T. Thenya

August 2023

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Executive Summary

The forest ecosystem remains an important reservoir for biodiversity globally and locally. However, forest clearing and degradation are a major source of biodiversity loss. In Kenya, forest planning and management evolved from largely being informed by the establishment of plantation forests between 1900 and 1970s. This mainly involved the conversion of indigenous forests into plantation areas through the establishment of exotic monoculture. Management of plantations has had a chequered history associated with forest encroachment and mismanagement largely due to interference by the political system. There have been limited attempts to include biodiversity as part of forest landscape management since 1900.

The first attempt was in the 1980s when indigenous forest conservation started being promoted, although the first comprehensive initiative close to biodiversity conservation was the Kenya Indigenous Forest Conservation Programme (KIFCON) in the 1990s. However, no biodiversity records were done, and today, forest station have no biodiversity data. Reforms in the forest sector in the early 2000s, which culminated in the forest Act 2005 (revised 2016), provided good intentions for biodiversity conservation, but this has not been practised in any forest station.

This status is replicated in public, private and community forests. Community forest areas lack both financial and human resources, and thus, they fare poorly in biodiversity ecosystem management. While the private sector, though having almost 50 per cent of the plantation area, is characterised by poor extension services and equally lack biodiversity data. In gazetted forests, this is further complicated by plantation practices that have no safeguards for biodiversity as farm chemicals are extensively used in forest plots, impacting biodiversity negatively. Forest adjacent communities, through Community Forest associations, are strongly attracted by plantation establishment areas since they have immediate benefits in terms of food and income but pay no attention to biodiversity management.

At the same time, some stakeholders working in forest ecosystems such as water, have a low focus on biodiversity in spite of overlap with the forest sector and the potential to use biodata to monitor water quality. Again, stakeholders working in the forest landscape such as KFS and WRA, have a low collaborative approach within the forest landscape, creating a lacuna for the loss of biodiversity. Both the community forest association and water users' association have great potential to assist in collecting and monitoring of biodiversity at the forest landscape level. The recent biodiversity international

meeting COP 15 provides a beacon of hope for biodiversity management, especially if viewed through a climate change lens as a form of indicating landscape restoration especially through the 30x30 target. In conclusion, there is a huge gap in forest biodiversity recording and management, which needs to be addressed, especially from planning, practices perspective and attitude change.

Acronyms and Abbreviations

ALFA	Agriculture, Livestock, Fisheries, and Food Authority
CBD	Convention on Biological Diversity
CFA	Community Forest Association
CIDP	County Integrated Development Plan
COP	Conference of the Parties
CTNFM	Close-to-Nature Forest Management
CSO	Civil Society Organisation
DDC	District Development Plan
EAWLS	East African Wild Life Society
EMCA	Environmental Management and Coordination Act
EPT	Environmental Performance Tracking
ETCAP	Ecosystem-Based Multipurpose Planning
ESIA	Environmental and Social Impact Assessment
FCPF	Forest Carbon Partnership Facility
FD	Forest Department
FMA	Forest Management Agreement
GBF	Global Biodiversity Framework
GEF	Global Environment Facility
ICE	Institute for Culture and Ecology
IIED	International Institute for Environment and Development
IUCN	International Union for Conservation of Nature
KCCG	Kenya Climate Change Group
KEFRI	Kenya Forestry Research Institute
KEMFRI	Kenya Marine and Fisheries Research Institute
KENGEN	Kenya Electricity Generating Company Limited
KENVO	Kereita Environmental Volunteers
KFMP	Kenya Forest Master Plan
KFS	Kenya Forest Service
KFWG	Kenya Forests Working Group
KIFCON	Kenya Indigenous Forest Conservation Programme
KWS	Kenya Wildlife Service

KWTA	Kenya Water Tower Agency
MEA	Multilateral Environmental Agreement
MENR	Ministry of Environment and Natural Resources
NACOFA	National Association of Community Forest Associations
NBSAP	National Biodiversity Strategy and Action Plan
NCCRS	National Climate Change Response Strategy
NEAP	National Environmental Action Plan
NEMA	National Environment Management Authority
NFP	National Forest Programme
NGO	Non-Governmental Organisation
NLC	National Land Commission
NMK	National Museums of Kenya
NRC	Non-Residential Cultivation
NRM	Natural Resources Management
NTZDC	Nyayo Tea Zones and Development Corporation
PELIS	Plantation Establishment and Livelihood Improvement Scheme
PFM	Participatory Forest Management
PFMP	Participatory Forest Management Programme
PPP	Public-Private Partnership
REDD	Reducing Emissions from Deforestation and Forest Degradation
R-PP	Readiness Preparation Proposal
SCAMP	Sub-Catchment Management Plan
SDG	Sustainable Development Goals
SWOT	Strengths, Weaknesses, Opportunities, Threats
TELIS	Trees Establishment & Livelihood Improvement Scheme
TIP	Transfer Implementation Plan
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WCMC	World Conservation Monitoring Centre
WRA	Water Resources Authority
WRUA	Water Resource User Association

Acknowledgement

We wish to acknowledge the following for their great input in the consultative process and finalisation of this report;

Martin Muriuki	- ICE
Gathuru Mburu	- ICE
Patricia Mambo	- ICE
Dr. Kamau Karugia	- ICE
Prof. Thuita Thenya	- Landscape ecologist expert - Project Consultant
Research Assistant	- Ms Patience Wakesho
	- Ms Beatrice Kinyua

Institute for Culture and Ecology (ICE)

The Institute for Culture and Ecology (ICE) is a national indigenous non-governmental organisation started in 2006 and registered with the NGO Coordination Board. ICE was founded out of a visible need to promote the inherent and natural role of culture in environmental and resource management in Kenya. ICE works with community groups and schools in Tharaka Nithi, Machakos, Meru, Murang'a, Embu, Kilifi and Kiambu counties.

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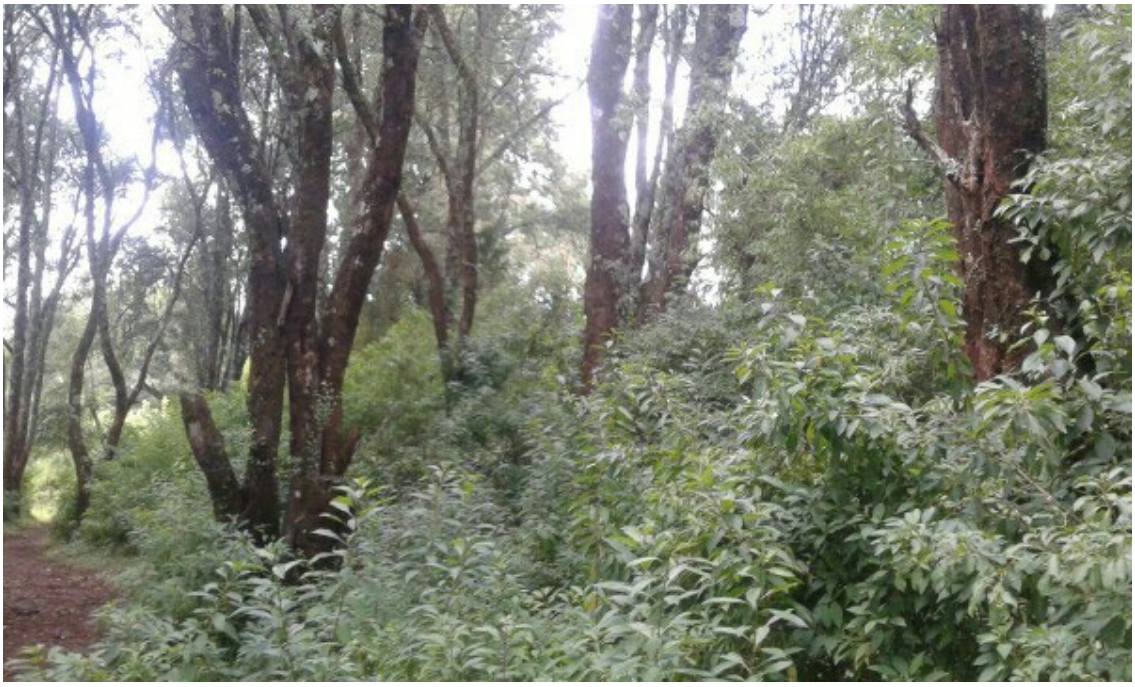


Kimothon Forest Reserve, Mount Elgon Forest Ecosystem, 2018.

The National Biodiversity Strategies and Action Plan (NBSAP) seeks to conserve Kenya's biodiversity, to sustainably use its components, to fairly and equitably share the benefits arising from utilisation of biodiversity resources among all stakeholders, and to enhance technical and scientific cooperation nationally and internally, including the exchange of information.

Introduction

1. Introduction

1.1 Background

Forests are home to a third of all vulnerable and threatened species in the world (Lindenmayer *et al.*, 2006). According to Boncina (2011), sustainable forest management is a strategy that ensures the continued diverse use of the forest for extractive and non-extractive commodities while preserving the ecosystem's biodiversity and productivity. This management system may include programmes like silvicultural techniques that could have conflicting effects with forest biodiversity management as they are geared towards drastic landscape transformation through the establishment of monocultures. Such a system involves the initial clearing of natural forests or replacing mature plantations with new crops. Therefore, to ensure enhanced biodiversity management, forest biodiversity conservation and management are important components incorporated into both national and international forest management programmes and agreements. Forest management programmes are human efforts meant to promote sustainable resource management in the forest sector, which also includes biodiversity, among others (Mcfadden *et al.,* 2018).

At the global level, renewed efforts towards biodiversity conservation were marked at COP 15 in December 2022 with the signing of the Kunming-Montreal Agreement (Global Biodiversity Framework - GBF). This agreement recognised that the planet is experiencing a dangerous decline in nature because of human activity. It further acknowledged that a possible one million plant and animal species are likely to disappear in the coming years if no corrective actions are taken. Among other issues, GBF recommended putting 30 per cent of degraded ecosystems under protection by 2030.

In Kenya, the Global Forest Watch has reported that 81 per cent of tree cover loss between 2013 and 2021 occurred within natural forests. The loss is equivalent to 48.4 metric tonnes of carbon dioxide emissions. This happened despite the country having an elaborate forest policy regime based on the constitution, among other several environmental policies. The government has acknowledged this loss, especially in the National Biodiversity Strategy and Action Plan (NBSAP) 2019-2030.

Kenya's forest sector is managed through the Forest Act 2016, a precursor of the Forest Act 2005, which introduced participatory stakeholders' engagement through the formation of Community Forest Associations (CFAs) and Participatory Forest Management Plans (PFMPs). This Act makes

provisions for the conservation and management of public and private forests and areas of forest land that require special protection, defines the rights in forests, and prescribes rules for the use of forest land. Prior to this Act, forests were managed through the 1960 Forest Act Cap 385, which utilised command and control with little participatory engagement with stakeholders.

Overall objective: Assess the current forest policy environment to promote the protection and conservation of forest ecosystems.

1.2 Specific objective sought to;

1. Document the impacts of the Shamba system on biodiversity and water catchments and develop information highlights for the community and duty bearers.
2. Document successes and challenges of Plantations Establishment and Livelihoods Improvement Scheme (PELIS) and make recommendations.
3. Assess the impacts of overlapping mandates on protection of forests by reviewing the Forest Act 2016, Water Act 2016, Wildlife Act, Heritage and Museums Bill 2021, National Environment Coordination Act 2012, and National Biodiversity Strategy and Action Plan 2019-2030, (among others) and suggest strategies to address the overlaps.
4. Establish management challenges in public forests, community forests and private forests and recommend actions to reduce their impacts.

Pinus patula forest plantation, Aberdare Forest. Credit T. Thenya, 2018.

Methodology

2. Methodology

The assignment made use of both primary and secondary data. Secondary data was gathered through a desk review of scientific journal articles, unpublished reports, project implementation reports, books and other relevant sources. The primary data involved conducting interviews with stakeholders in the forest sector and landscape management, including representatives of government institutions, civil society, and community members. Specific site meetings were conducted in Aberdare (Kereita and Kieni forest stations), Mt Kenya forest ecosystems (Gathiuru and Kabaru forest stations), and Karima hill community forest.

2.1 Approach and methodology

To successfully undertake the assignment, the following activities were undertaken in close consultation with ICE:

Stage one: Consultative meetings and inception report

Consultative and planning meetings were held with ICE, where logistics and modalities of assessment of the Forest Policy Environment in Kenya were laid out, including the selection of field sites.

Field site selection: Since plantation establishment is mainly concentrated in humid regions, attention was paid to selected sites in central highlands as a representation of the country's plantation areas. These sites included those that had functional PELIS sites, CFA, PFMP and Forest management agreements. These sites were;

a) Public forest - Aberdare areas - Kereita and Kieni Forest Stations

b) Public forest - Mt Kenya - Gathiuru and Kabaru Forest Stations

c) Community forest – Karima Hill Forest

Stage two: Literature review and stakeholders' consultations

In order to prepare adequately for field work, the second stage involved policy gaps and overlaps analysis. This was undertaken in two levels;

Desktop review and analysis

This involved analysis of policy gaps and overlaps and their impact on forest management and governance. The review also reviewed management challenges facing the three forest categories in Kenya (public forests, community forests and private forests) and explored policy recommendations.

Stakeholders' interviews

This involved interviews with stakeholders in the forest sector in government institutions, civil society organisations, individuals, community-based organisations and the private sector. Attention was paid to the three categories of forests that is public forests, community forests and private forests, with special interest in timber plantation sites. Stakeholder interviews also included online interviews for those who were not physically available. An interview schedule and checklist, prepared during the inception report, were used in data collection.

Stage three: Field survey

This involved a field survey in selected field sites as indicated above, paying attention to the three categories of forest which are public, community forest and private forest, with special interest in timber plantation sites. The field survey paid attention to documenting the impacts of Shamba system on biodiversity and water, documenting successes and challenges of PELIS and proposing policy recommendations, and documenting CFA and other stakeholders' perceptions on PFMP development and implementation process. Two -meetings were conducted; the first set was in the Aberdare in Kereita and Kieni forest station, followed by Kabaru and Gathiuru forest station in Mt Kenya and Karima hill community forest meeting.

Consultative meeting at Kabaru and Gathiuru Forest Stations, 2023.

Consultative meeting at Kieni and Kereita Forest Stations, 2023.

Stage four: Data analysis and report generation

This involved the analysis of data collected in the field, which was mainly qualitative and analysed along thematic areas. In data organisation and analysis, attention was paid to the objectives of the assessment of the forest policy environment.

Policy

Four one-page policy statements were developed as part of the consultative process.

Stage five: Validation

This stage involved validating the report generated from the literature review and consultative session. The validation also served as a moment to enrich the report by various stakeholders.

Validation meeting on forest policy and biodiversity at Luke Hotel, Nairobi, July 2023.

Forest Management and Biodiversity

3. Forest Management and Biodiversity

3.1 Introduction

Sustainable forest management is described and assessed by criteria and indicators applicable for evaluating and monitoring the status and variations in the forest ecosystem. These indicators capture the qualitative and quantitative data regarding the extent of forest resources, forest biodiversity, productive functions of forest resources, forest health and vitality, and socioeconomic functions of the forest, among others (Beaudrot *et al.*, 2016). Operational forest biodiversity indicators should be used to monitor and assess the impacts of different management approaches aimed at maintaining and protecting endangered species, increasing biodiversity as well as the general management of the forest ecosystem (Lindenmayer *et al.*, 2006).

Indigenous Forest in Kimothon Forest.
Credit T. Thenya, 2018.

According to Van der Plas *et al.*, (2016), there is a shift in European regions towards more diverse –multipurpose forest management strategies. This aims at delivering a range of ecological services, enhancing biodiversity conservation and reversing ecological degradation as well as benefiting generations in future. The region's transition from a management approach of conventional even-managed forests focuses on monocultures of conifer to the promotion of a more diverse management approach referred to as "Close-to-nature" forest management (CTNFM) that consist of mixed uneven-aged forest ecosystems,

which are ecologically more stable. Countries such as Turkey have taken into perspective the integration of biodiversity into forest management plans by adopting Ecosystem-Based Multipurpose Planning (ETCAP) through the functional planning management approach (UNEP, 2018).

According to UNEP-WCMC (2016), the species population is rapidly declining in Africa. Currently, there are more than 150,300 species on The IUCN Red List, with more than 42,100 species threatened with extinction, including 41 per cent of amphibians, 37 per cent of sharks and rays, 36 per cent of reef-building corals, 34 per cent of conifers, 27 per cent of mammals and 13 per cent of birds are listed as endangered on the International Union for Conservation of Nature (IUCN) Red List. For example, African birds have been on the decline for the past 25 years, putting them at risk of extinction (IUCN, 2020).

According to a study by Kerichu (2023) on the assessment of the biodiversity component in the community forest of Masai Mau, the biodiversity conservation component was not adequately integrated into the planning processes in the Maasai Mau Forest. Hence, there is a limited focus on species conservation. According to a study by Thenya (2014), which analysed the implementation of Participatory Forest Management (PFM) in different forest ecosystems in Kenya, the main goal of implementing the PFMP was to ensure general protection of the forest from fires and illegal logging but had no focus on biodiversity. Thus, although a general list of species (flora and fauna) is included in all PFMPs, CFAs and KFS do not have a follow up programme for biodiversity monitoring in the respective forest ecosystems.

According to a study by Kerichu (2023) on the assessment of the biodiversity component in the community forest of Masai Mau, the biodiversity conservation component was not adequately integrated into the planning processes in the Maasai Mau Forest.

3.2 Plantation forests

In Kenya, the total plantation forest area barely makes up 5 per cent of the total gazetted forest cover. In total, plantation forests in gazetted, community and private land covers about 186,716 hectares, with 53 per cent being on public land and 47 per cent in private forest plantations, according to the Ministry of Environment and Natural Resources (2016). Just before independence,

the then Forest Department (FD) prepared a guide to long-term industrial plantations investment and forest-based industries, particularly pulp and paper.[1] The target was 136,000 hectares of sawn timber plantations and 24,000 hectares of pulpwood plantations to be established by 1980.[2] At the moment demand for wood products including firewood, charcoal, timber and poles stands at approximately 45 million cubic metres against a supply of 35 million cubic metres. It should be noted that the officially sanctioned[3] conversion of natural forests to plantations in Kenya stopped in the 1970s. The impact of plantations on forest biodiversity and water catchment has been a big debate in the country but with little documentation.

However, there has been limited and unsustained development of on-farm forestry, which often lacks the necessary support from government agencies. KFS's core programme focuses on the management and conservation of the natural forests. The objective is to intensify conservation and sustainable management of natural resources for environmental protection and socio-economic growth. Socio-economic growth involves support activities like grazing, fuelwood collection, water abstraction and herbal collection, among other user rights activities. While records are kept for grazing and fuelwood, no records are kept on the other activities, thus the impact on forest landscape, including biodiversity, cannot be accessed. Forest management, to some extent, is carried out in conjunction with community forest associations, a major provision introduced by the Forest Act 2005, which allowed multi-stakeholder involvement in forest management under the Participatory Forest Management (PFM).

The involvement of CFA starts with the registration of a community group with an interest in forest management and conservation. To facilitate this engagement with KFS, the CFA develops a participatory forest management plan (PFMP), followed by negotiation for a forest management agreement. While PFM provides an opportunity for improved forest management, there are no scheduled funds for PFMP implementation, and thus, its implementation is mainly dependent on ad-hoc donor funding. While KFS participate in PFMP preparation, the development of the plantation plan is done exclusively by KFS without the involvement of CFA. This is not the only area of divergence; the PFM programmes of activities within the natural forest involve CFA patrol with or without KFS guards and protection of water catchment, which is mainly

1 David Mbugua, 'Forest Outlook Studies in Africa (FOSA)' Food and Agriculture Organisation of the United Nation <http://www.fao.org/3/a-ab569e.pdf> accessed 25 November 2019.

2 *Ibid.*

3 Ministry of Environment, Water and Natural Resources, *Water and Natural Resources, Analysis of Demand and Supply of Wood*

geared towards reducing human activities. Some activities in natural forest, such as firewood collection, impact biodiversity negatively, as dry woods are habitats for various species, especially invertebrates.

3.3 Forest management dynamics and implication for biodiversity

3.3.1 Natural forests

According to Kigomo (1991), starting from the late 1890s, forest management in Kenya was focused on the establishment of industrial plantations, primarily in the highlands. This was until the 1990s when the establishment of indigenous forests and arid area afforestation began to receive major attention. According to the Kenya Forestry Master Plan (KFMP) 1994, in the early 1930s, forestry research was primarily focused on the natural regeneration of commercially relevant indigenous species and the trial of exotic species (MENR, 1994). From the 1930s to the 1970s, research focused on supporting softwood plantation development programmes for timber and pulpwood in the highlands (Mugo *et al*., 2010). This forest management engagement did not focus on the biodiversity component.

There was a significant movement in forest policy in the 1980s in favour of conservation and rationalised use of natural forests and indigenous tree species. However, Kigomo (1991) noted that there was little information available on the ecological status of distinct forest ecosystems, species regeneration, and the possibility of sustainable and multi-purpose usage of indigenous forests. This is pointer to the fact that forest landscape biodiversity has been omitted even in past forest operational and management, gap that needs to be filled.

There have been attempts to include biodiversity as part of Kenya's forest management programme. The first comprehensive attempt was the Kenya Indigenous Forest Conservation Programme (KIFCON), which aimed at preparing conservation management recommendations to be included in the Kenya Forest Master Plan (KFMP) and also setting up a monitoring system covering all indigenous forest ecosystems (Kenya Forests Working Group, 2008). According to Kenya's fifth national report to the Conventional of Biological Diversity (CBD) (GoK, 2015), relatively inadequate attention has been given to research on the ecological functioning of indigenous forests and prescriptions for their sustainable management in the past decades. A recommendation was given to establish strong programmes for indigenous forests with an emphasis on the management of mixed and pure forest biodiversity. It also highlighted that there was little commitment to developing

technical guidelines and technical orders on the management of natural forests and the indigenous species found within. This, again, highlights the missing gaps in biodiversity data, meaning that a more systematic focus has been on plantations, as highlighted earlier.

Sustainable Development Goal 15 is about "Life on land", one of the 17 Sustainable Development Goals established by the United Nations in 2015. Specifically, SDG15 is very strong on promoting natural forests as it aims at protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, and halting and reversing land degradation and biodiversity loss.

Recognising the multiple functions of forests, the various SDGs set out strong forest-based targets;

- By 2020, ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems with their services, particularly forests, wetlands, mountains and dry lands, in line with obligations under international agreements (SDG15.1).
- By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests, and increase afforestation and reforestation (SDG15.2).
- Significantly mobilise resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance sustainable forest management, including conservation and reforestation (SDG15.b).
- By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes (SDG6.6).
- By 2030, achieve sustainable management and efficient use of natural resources (SDG12.2).

According to the Kenya National Forest Programme 2016-2030 (MENR, 2016), the SDGs do not capture the true value of forests, tackle drivers of deforestation, nor ensure more focus on social balances in the use of and benefit from forests. Such priorities must instead be refined and adopted through a national strategic forest framework, notably, national forest programmes adapted from IIED 2014a; IIED 2014b; IIED 2014c (MENR, 2016). This means that there must be deliberate effort to focus on biodiversity taxa-based system for forest management, based on the past attempt to include biodiversity and other ecosystem functionality in management. It might also be important to explore why the process has not taken off in spite of the gazetted natural forest

covering 95 per cent and both KFS and KEFRI having components related to natural forest.

3.3.2 Plantation establishment dynamics

From the onset of formal forest management in Kenya, the sector has maintained a low focus on forest biodiversity. For example, as part of forest sector development in 1910, Kenya's colonial administration introduced the Shamba (farm) system to provide raw materials for the expanding timber industry and reduce pressure on natural forests. Under the Shamba system, farmers grow both plantation trees and food crops on small plots, tending the trees and harvesting the crops until the trees have become established when the canopy closes in about three years. If available, the farmers then move to another plot to establish a plantation or vacate the forest area.

The system was revised in 1975 when the then FD permanently employed resident workers and were subsequently required to rent shambas. Tenancy offers were extended to other people beyond the former resident workers. The number of cultivators thus rose significantly, and supervision became problematic. Many new cultivators did not understand the Shamba system and tree survival rates were low. The system was consequently banned by a presidential decree in 1987. In 1988, all forest residents were evicted from forest areas. The Shamba system was banned due to forest destruction as a result of political infiltration of the system. Politicians took advantage of the cultivators and saw them as voting blocks, which was a major drive to retain them in the same plot over the years. The destruction had major impact on natural forests due to encroachment, resulting in loss of biodiversity and degradation of water catchment. However, this was not quantified.

Under the Shamba system, farmers grow both plantation trees and food crops on small plots, tending the trees and harvesting the crops until the trees have become established when the canopy closes in about three years.

After the 1987 ban, no arrangements were put in place to continue with silviculture practices of plantation establishment and management. Therefore, reforestation programmes stagnated in the country. Less than 20 per cent of clear-felled areas were replanted; 80 per cent of replanted areas were not weeded. The situation was aggravated by the 1994 civil service retrenchment programme, leading to an acute shortage of labour in forest stations.

Cupressus lusitanica, Kimothon Forest.

In response to the FD's increasing backlogs and inadequate resource capacity within the FD to re-establish plantations, the Shamba system was reorganised and reintroduced in a few districts as Non-Resident Cultivation (NRC) in 1994. Under the new system, cultivators were not allowed to reside in forest areas, and the final authority in the management of NRC was vested with District Development Committees (DDC). The committee was composed of heads of government officers at the district level, which meant that forest management was no longer a forest department affair but was a collective effort among several departments.

By 1997, NRC had started in all major forest plantation districts in the country. The new system also struggled with many failures. The strong influence of politicians and administrators in the DDCs overshadowed advice from technical departments, including the forest department, and provided opportunity for forest plunder using administrative system. By 1999, large areas - some unsuitable for plantation establishment - had been cleared for cultivation, with little meaningful replanting of trees. This was another area where biodiversity was lost through encroachment on natural forests and sensitive ecosystems. There was no documentation of biodiversity being lost as forest stations did not keep or have no information on biodiversity. In addition, some of these unsuitable areas also had a huge impact on water catchment.

The plantation areas harvested in some places were not replanted, while in other areas the planted trees were destroyed to make way for food production. These practices contributed to the accumulation of planting backlogs, from

17,650 hectares in 1996 to about 46,000 hectares in 1999. In the same period, overharvesting was done in all major planting areas.

In 2000, the FD Headquarters reissued NRC management guidelines and established an inter-institutional task force with representation from the FD, the Kenya Forestry Research Institute (KEFRI), Kenya Wildlife Service (KWS) and the Nyayo Tea Zones and Development Corporation (NTZDC) to review the implementation of the NRC. Again, NRC was banned in 2003 due to mismanagement and associated forest destruction but in early 2008 it was re-branded under the acronym PELIS meaning Plantation Establishment and Livelihood Improvement Scheme and field trials were initiated for its reintroduction. A number of forest stations initiated the PELIS programme with varying results, which included good performance, such as in Kabaru forest station, providing hope for orderly forest plantation management.

3.3.3 Challenges of plantations establishment and livelihoods improvement scheme

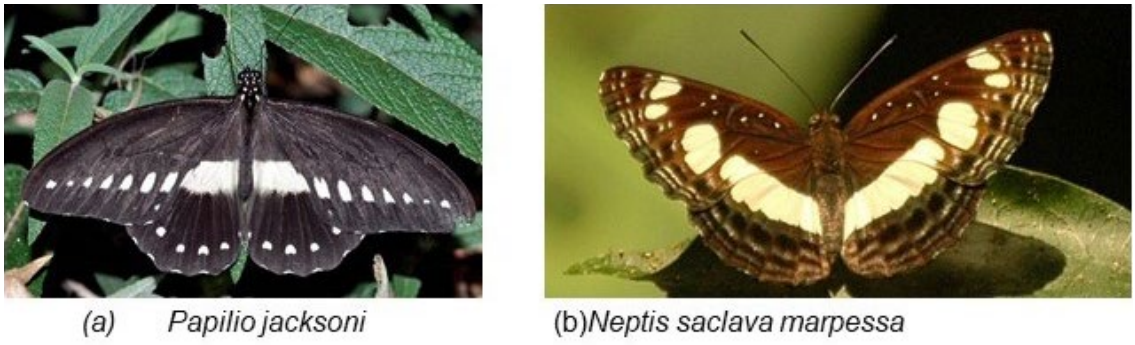
The Shamba system involves farmers tending tree saplings on state-owned forest land in return for being permitted to intercrop annual food crops until canopy closure, usually after three years. The system should theoretically be mutually beneficial to the local people, the government and the environment. However, the system has had a chequered past in Kenya due to widespread malpractice and associated environmental degradation, as outlined earlier in this report. As a result of stakeholders' agitation of change in forest management started in mid-1995, this culminated in a structural legal framework laid down by the 2005 Forests Act. Under the new legal system, the Shamba system was re-introduced with field trials initiated under the new Plantation Establishment and Livelihood Improvement Scheme (PELIS) in early 2008 in selected forest areas.

However, the PELIS system as it is now is still weak because there is insufficient authority devolved to local people, casting them merely as 'forest users' and the shamba system as a 'forest user right'. This is in spite of the Forest Act 2005's central philosophy being of multi-stakeholder involvement in forest management. In so doing, the system's potential to both facilitate and embody the participation of local people in forest management is limited, which threatens the long-term sustainability of the new system. Enhanced involvement of CFA in the PELIS system value chain including plot allocation, plantation plans development to tree harvesting would increase buying from the stakeholders and reduce misconceptions.

Public participation in forest management has been laid out in the various legislations in Kenya, including the Constitution 2010, the Forest Management and Conservation Act 2016 and the public participation and engagement in forest management rules 2009. However, prior to 2005, the rules on stakeholder participation including indigenous people were not very clear as to how they can participate in decision-making in the forestry sector, including in enhancing biodiversity conservation. The current framework is to engage multi-stakeholders in aspects of forest biodiversity.

3.3.4 Impacts of PELIS on biodiversity and catchments

The process of establishing a plantation involves clearing the initial vegetation formation, either natural or man-made vegetation, as happened from 1910 until the 1980s. Alternatively, previous plantation areas are felled, and a successive crop of tree species is established with the involvement of the local community, which cultivates crops while caring for the trees for a period of three years. Currently, under the Forest Act 2005 (revised 2016), the process involves the allocation of plots to CFA members by KFS, who cultivate, plant trees and take care of them for a period of three years. The clearing of natural vegetation and efforts to keep the plots free of weeds by the use of chemicals, plus the addition of fertilisers in a monoculture of trees, have a negative impact on the biodiversity and water resources.



Species common in forest areas Papilio *jacksoni* and Neptis *saclava marpessa,* at risk of farm chemical use in plantation areas.

Tomato production contributed to biodiversity loss in Kajiado County mainly due to heavy use of herbicides and pesticides, use of inefficient irrigation practices as well as conversion of previously forested lands to tomato production (Kagombe et al., 2022).

For example, farmers have noticed a difference in those crops growing at the border of the natural forest and plantation area. Crops planted in the plantation plots near the border with the natural forests tend to be healthier. This could be attributed to the fact that natural forest edges have wetter soils, temperatures are cooler, and soils are fertile compared to those far from the natural forest. Again, more pollinators are available close to the border of the natural forest compared to those plots further away from the natural forest. The leaves falling from indigenous vegetation provide a source of natural nutrients, which enhances soil micro-biodiversity. However, within the plantation, the soils have to depend on artificial fertilisers or animal manure for extra nutrients.

An African honey bee (*Apis mellifera*) foraging for nectar and pollen in an Ipomea flower in Berese, Elgeyo Hills Water Tower. Credit V. Muchai 2021.

Threats impacting the forests include charcoal production, logging, settlements, agriculture (crop farming), and livestock grazing.

On the other hand, those PELIS plots near the natural forest edge often suffer from wildlife invasion. Hence, farmers need more investments in terms of crop protection, which includes the use of scarecrows and animal traps. In contrast, wildlife damage is reduced in plots that are far from the natural forest edge. Farmers at the natural forest border tend to plant crops that are less prone to attack by wild animals in order to reduce losses compared to plots far from the edge of the natural forest.

Some of the other direct impacts of plantation on forest ecosystem biodiversity include reduced provision of habitat, which translates to reduced biodiversity. Within the plantation area, the use of chemicals like pesticides and herbicides contribute to increased loss of biodiversity. For example, some pollinators like bees are highly impacted by chemicals, contributing to a reduction in species numbers or total elimination in some areas. In addition, the use of chemicals also contributes to the loss of soil micro-fauna, negatively impacting soil development and functionality. Soil forming fauna invertebrates such as earthworms, safari ants are negatively impacted by chemicals. When the plantations are cleared for farming or during tree harvesting, soil erosion leads to river siltation both in the forest and outside. This negatively impacts aquatic biodiversity such as water beetles, an indicator of clean water. The intermittent loss of vegetation means that the area under plantation allows higher overland surface flood, therefore less seepage, which is important for the recharge of underground water. This negatively impacts the ecosystem and landscape functionality.

According to Heinrich-Böll-Stiftung 2022, the use of pesticides does not only lead to health problems, many of them are also toxic to crucial natural resources like bees, soil and surface waters. In order to document the impact on the ecosystem health, there is a need to monitor insect diversity, water and soil in areas where crops are cultivated. This is important as food production relies heavily on health natural ecosystems.

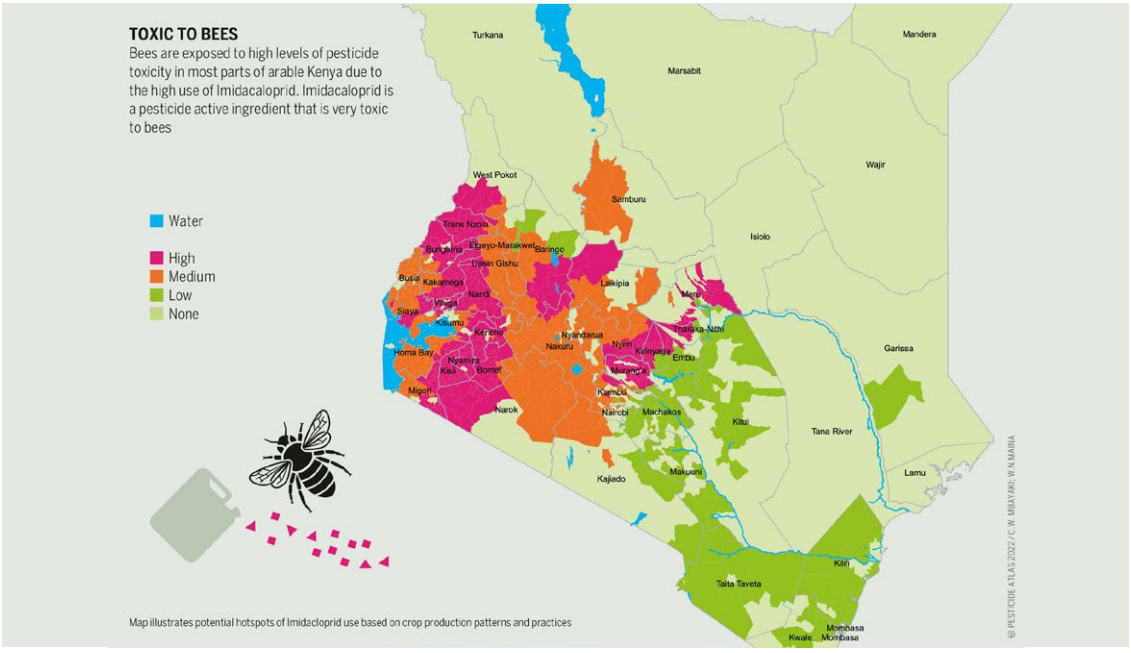


Figure 3-1: Pesticide use and potential impacts on bees. This map illustrates potential hotspots of Imidacloprid use based on crop production patterns and practices: Source: PESTICIDE ATLAS 2022/C.W. MBAYAKI; W.N. MAINA.

Beyond crops, pollinators contribute to maintaining plant biodiversity in natural vegetation. Other insects, such as moths, wasps, flies, beetles and ants, also contribute to pollination. The close interaction of pollinators with cultivated crops, makes them vulnerable to unsustainable crop management practices such as pesticide misuse. Benefits of diverse biodiversity can be demonstrated by ladybugs, which feed on aphids, but pesticides kill these beneficial insects and contribute to the comeback of harmful insects (Heinrich-Böll-Stiftung et al., 2022).

Plantation, by the very nature of their establishment, means they have limited undergrowth, limiting habitat development and diversification. In addition, plantations lack canopy cover, which means more sunlight hits the ground, contributing to a high level of evapotranspiration and water loss, which limits natural regeneration. This is in contrast to the cool nature of indigenous natural forests, which tends to preserve water areas and promote ecological dynamics. The monoculture in plantation provides a low platform for bee habitation since flower diversity is low. The use of plantation areas by forest-adjacent communities is also limited in terms of extractive products like medicinal plants, vegetables, and fruits by the local community.

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The frequent anthropogenic activities in the plantation area, including cultivation, grazing and pruning, disrupt fauna and avifauna habitats, discouraging the development of a biodiversity network. At the same time, it is noted that most of the research on forest ecosystems has been concentrated in the natural forests, leaving a high lack of biodiversity data in plantation forests. This is because the forests are perceived as low-biodiversity areas, attracting little attention in terms of biodiversity research. This was confirmed during the validation workshop, where stakeholders noted that those who have worked on biodiversity have mainly concentrated on the natural forest ecosystem. This points to a need to rethink the forest biodiversity assessment to include both natural forests and also plantation areas in order to track biodiversity changes over the growth period before harvesting.

3.3.5 Positive impact on biodiversity

Colobus monkey (*Colobus guereza*) and her young one basking in the canopy. *Source:* http://elelur.com/mammals/mantled-guereza.html.

Significant positive contribution of PELIS towards biodiversity conservation in natural forests include providing alternative sources of firewood, timber, poles, fuel wood and charcoal, which would otherwise be sourced from natural forests. This ensures that natural forests continue to provide habitat to diverse species, in addition to other ecosystem services like carbon sequestration and air purification. By allowing the extraction of exotic species, the natural forest is protected, which then allows it to provide ecosystem services like water catchment, in the process supporting diverse aquatic biodiversity both in the forest and downstream ecosystem.

3.3.6 Species affected by various PELIS operations

Species distribution varies across plantation and natural forest ecosystems. For example, some of the species found in plantation areas include porcupines, hares, primates, and a variety of birds, which are always displaced during the pruning and harvesting of trees. On clearing bushes in plantations, a diverse number of species, such as butterflies, ladybirds, caterpillars, worms, birds, beetles, bees, crickets, snakes, and rodents, are displaced. Pruning reduces the habitat areas for birds and other species, while harvesting destroys almost all habitats for biodiversity. In addition, water sources are likely to be contaminated by farming inputs in areas where inorganic fertilisers and agro-chemicals are used as overland flow ends up in the water systems.

3.3.7 Potential improvement in PELIS

While PELIS establishment has negative impacts on the forest ecosystem services and products, there are potential areas that could be adjusted for improved biodiversity conservation. On water sources management, deliberate

efforts should be made to create a natural buffer between plantation and proximity water sources such as swamps and springs. Such a buffer will provide a habitat for specific species depending on the biogeographical zone. This is likely to diversify as the buffer zone undergoes natural ecological succession coupled with enrichment planting based on species ecological site matching. Suppose we treat the plantation zone as a farming area based on monoculture and crop cultivation. In that case, the legally prescribed buffer between water bodies or water resources and cultivation should apply. This is important as no attention has been paid to farming activities and their impact on water resources, including chemical and fertiliser residues in forest ecosystems.

Managing other ecological services like pollinators will need more innovative approaches. Among these include creating awareness of the importance of pollination and crop production among farmers, which could encourage them to plant vegetation species that support pollinators like bees. One way of increasing pollination is creating natural islands or strips within plantation areas that increases bee habitat. In addition, to encourage pollinators, the farmers should also be encouraged to use agro-ecology farming techniques and reduce the use of chemicals. The removal of chemicals in farming areas would create a conducive environment for bees and other pollinators to recover, but this should be enhanced by planting of natural flowering plants for specific ecological zones. It is notable that the swarm of bees is a rare occurrence due to land use system that does not support their existence.

3.4 Effect of PELIS on water catchment

Areas within plantation have low infiltration due to low vegetation cover, especially in the first 3-4 years since there is minimal undergrowth to slow overland flow and encourage infiltration. This is partly attributed to human activities such as cultivation and grazing, which suppress developing vegetation cover. While plantations are normally not sited in water sources, areas like swamps and springs in close proximity reduce recharge unless deliberate efforts are made to create a buffer zone between such resources and plantation areas. According to forest management, plantations that were wrongly sited are supposed to revert to natural forest after harvesting, or those in steep areas abandoned to revert to natural forest. These areas need to be closely monitored in terms of landscape changes in the process of reverting to natural forest by computing ecological data, including changes in various biodiversity taxas.

3.5 Successes and challenges of PELIS

Plantation establishment is characterised by several benefits to the local community and government. These include;

- Source of food, for domestic and commercial use during the first three years. This creates food security in the area where PELIS is practised coupled with monetary gains.
- Creation of jobs in the farms during the cultivation period, usually in the first three years, which brings financial income at the household level.
- General economic improvement to CFA members who are involved in PELIS programme at station level.
- Fodder supply to livestock either through cut and carry or grazing.
- Provides props during pruning and harvesting in addition to fuel wood supply in the two stages.
- The plantation provides timber when mature.

3.6 Enhancement of PELIS benefits/success

Silviculture practices can be enhanced through good practice at the PELIS sites by ensuring that prescribed PELIS rules and regulations are practised by the CFA members and KFS personnel involved in PELIS. For example, CFA should also ensure that their members adhere to the agreed good practices, including the protection of water catchment by retaining natural vegetation around those sites. Again, the plantation location should observe the requisite distance from the water resources' location. The CFA members should also ensure that some of the income raised is ploughed back into the CFA as an organisation to create sustainability to re-invest in natured-based business-like beekeeping.

> According to Kagombe (2014), case studies on plantation cost-benefit analysis have shown farmers benefiting from PELIS with a net present value for four years at Kenya Shilling 1,272,573/ha. In addition, a better benefit-sharing arrangement between KFS and CFA will add to the incentives for CFA to be more effective in their space and make PELIS better.

According to Kagombe (2014), case studies on plantation cost-benefit analysis have shown farmers benefiting from PELIS with a net present value for four years at Kenya Shilling 1,272,573/ha. In addition, a better benefit-sharing arrangement between KFS and CFA will add to the incentives for CFA to be more effective in their space and make PELIS better. Again, good governance by KFS in the allocation of plots at the start of plantation establishment, during pruning and timber harvesting is important. Where plantations were wrongly sited, a firm decision to revert such sites to natural forests should be made and monitored.

3.7 Challenges associated with PELIS

Though the PELIS programme has had some good benefits, as highlighted above, there are however some challenges associated with the PELIS scheme that hinder the realisation of a healthy functioning ecosystem that is able to fully provide ecosystem services, which include;

- The use of chemicals in PELIS plots by farmers in the first three years before vacating the land impacts biodiversity negatively by killing invertebrates, which are part of the pollinators and pests. For example, the use of pesticides negatively impacts pollinators, resulting in reduced crop productivity for crops dependent on pollinators, as observed by the farmers in the PELIS scheme. However, it is notable that some of these observed phenomenon-like reduced crop productivity could also be attributed to other effects of climate change.
- The use of chemicals also affects ecosystem health by killing soil microbes and invertebrates like earthworms, among others, which are responsible for nutrient cycling, in the process affecting not only crops but also tree growth. Observed stunted growth in crops could be a result of poor ecosystem health, especially soil-related microbes and invertebrates. Farmers noted that some crops like maize do not grow as tall as they used to due to what they related to changes within the ecosystem.
- PELIS scheme also contributes to catchment degradation, which affects forest ecosystem health in two ways: a) by failing to provide buffer zone to water resources, leading to siltation and inflow of chemicals to water resources, and b) absence of deliberate natural buffer to encourage infiltration for recharge of water catchment.
- The two statutory community-based organisation, that is WRUA and CFA do not necessary work together in all forest sites to promote forest

ecosystem health through protection of water resources as well as biodiversity. This is often because of a lack of effort by their leadership and the absence of structural arrangement by KFS and WRA for harmonised and combined activities.

- Apart from ecosystem health issues, in the plantation areas, some animal species, such as monkeys, remove tree barks, allowing water to enter the tree resulting in stunted growth or deformation, which hinder the trees from reaching their full potential, and cannot be sold for timber.
- The PELIS value chain does not provide an opportunity for CFA to benefit from PELIS mature trees during harvesting, resulting in low morale among CFA members. This is attributed to restrictive procurement laws that do not provide reservations for CFA members for materials such as branches during harvesting, which could be used for fuelwood.

3.8 Possible intervention

To promote good forest ecosystem health and address some of the challenges confronting the PELIS programme, a number of interventions are necessary. In order to promote improved forest ecosystem health, there is a need for deliberate and legislated efforts to reduce the use of farming chemicals and training on agro-ecology approaches. For example, assistance from agricultural agencies, including civil society organisations (CSOs) involved in organic or agro-ecology farming systems, could help to reduce the use of chemicals, that negatively impact the ecosystem and biodiversity. Such an organisation could help promote the use of technologies such as push and pull and planting of nitrogen-fixing plant species and crops in order to improve soil fertility and enhance yields.

Improved co-management should also be enhanced further to include sharing some of the proceeds from PELIS, especially offcuts during tree harvesting, to be used as fuelwood by CFA members. Securing a portion (%) of the forest investments, such as plantation harvesting income, and tourism operations among other forest activities for CFA, would help in uplifting the morale of the members and allow investments such as nature-based group members investments.

The PELIS scheme should ensure the protection of water catchment and water resources such as streams, wetlands or rivers by having a buffer zone of natural vegetation between the PELIS and water resources areas. The buffer zone would help prevent the overland flow of silt and agro-chemicals in PELIS

sites from reaching water zones and encourage infiltration. For this to work effectively, it would involve combined harmonised planning and execution between WRUA and CFA activities, which should be backed by structural arrangements by WRA and KFS.

Since biodiversity is critical as part of the ecosystem health, there should be clear arrangements to monitor changes within the ecosystem, through the use of tools like citizen science. This will ensure that both positive and negative changes are monitored in the forest landscape and clearly documented with the data used to track forest ecosystem health. Local community groups such as CFA and WRUAs can be trained on the use of citizen science. Both the KFS and WRA could have this implemented as part of their ecosystem management tools.

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3.9 Highlights for community and duty bearers

The following are important considerations for both community-based groups and duty bearers as one of the pathways towards promoting improved forest ecosystem health;

- Biodiversity is only partly included in ecosystem planning and mainly mentioned based on data from other sources but is never part of active forest management activities since no records are maintained by either KFS, CFA or WRUA.
- CFA activities are mainly focused on livelihood and problem animals such as primates, but they have no specific arrangement for biodiversity data capturing along other forest activities.
- KFS have information on exotic species but no information on biodiversity across the various taxa, leaving out significant indicators of forest ecosystem health.
- While CFA and WRUAs work in the same ecosystem unit or landscape, there is limited formal or informal arrangement to work together, and the same applies to statutory bodies like KFS and WRA.

3.10 Recommendations

To address the above challenges and boost forest ecosystem functions that would promote good ecosystem health and reduce undesirable impacts resulting from PELIS as part of the forest management approach, the following interventions should be considered;

- There is a need for greater effort to capture biodiversity status as part of the planning process and plan implementation in the ecosystem plan, PFMP and Plantation plan.
- The CFA should consider acting as an agent for biodiversity information collection using a citizen science approach as they are permanent residents in the landscape.
- KFS should consider maintaining biodiversity information across the various taxes such as plants, fungi, reptiles and amphibians (Herpetofauna), mammals, invertebrates, birds and fish in their forest station the same way plantation data is kept and updated. This information should be collected and updated regularly in both plantation and natural forests as part of forest ecosystem health.
- WRA should also consider the use of biodata to monitor water ecosystem health of the water being supplied to the citizens using WRUAs.
- There is need for a joint CFA-WRUAs working committee or formal working arrangement at the forest station level to help in capturing water catchment management and biodiversity data.
- Integration of strips of natural vegetation in between the PELIS blocks that could act as habitat for the various species such as birds, mammals, insects, and micro-organisms, among other species, and also serve to encourage infiltration.
- KEFRI and National Museums of Kenya could prescribe suitable tree species for the natural strips that could encourage biodiversity to thrive in plantation blocks.
- Overall removal or complete ban of inorganic agro-chemicals and adoption of organic farming in PELIS plots.
- Consider the re-introduction of firebreaks in plantation blocks, which will act as a habitat for different species and as infiltration buffer zones.
- Undertake, trainings, seminars and community engagement activities that promote forest ecosystem health, encourage biodiversity data capture and conservation of water resources within forest landscapes.

3.11 Forest policy and biodiversity

3.11.1 Forest policy

According to the draft Forest Policy 2020, the colonial forest policy focused on extracting forest resources, leading to the clearing of large areas of the country's indigenous forest until the 1970s. Although attempts were made to grow indigenous trees in plantations, it was found that they took too long to mature compared with exotic tree species. Consequently, the large areas of indigenous and bamboo forests that had been cleared were replaced with plantations of exotic species such as pine, cypress, and eucalyptus. In the post-independence period, additional indigenous forest areas were allocated to farmers and communities for subsistence and cash crops such as tea and livestock grazing, leading to the clearing of large forest areas.

Other forest areas were lost due to illegal excisions starting in the 1980s. According to the draft Forest Policy 2020, forest plantations supply industrial wood but also, to some extent, play a role in conserving biodiversity, providing habitat for wildlife, conserving soils, regulating water supplies and sequestering carbon dioxide. Apart from supplying wood products, forest plantations play an important role in reducing pressure on the indigenous forests. Various legislations are outlined below in terms of how they affect forest ecosystems, including biodiversity management.

3.11.2 Forest Act 2016 provision on biodiversity

The Forest Act 2016 provides several provisions for biodiversity conservation and management, which indicates the Act's intention and philosophical focus. However, there is limited indication of the same in forest practice in terms of documentation by both the forest service and community forest association. The following are extracts of those sections that refer to biodiversity conservation in the Act;

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34. (1) Any person may petition the National Assembly or the Senate, for the variation of boundaries of a public forest or the revocation of the registration of a public forest or a portion of a public forest.

    (2) A petition under subsection (1) shall demonstrate that the variation of boundaries or revocation of the registration of a public forest or a portion of a public forest does not-

    (a) endanger any rare, threatened or endangered species; or

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(b) adversely affect its value as a water catchment area; and prejudice biodiversity conservation, cultural site protection of the forest or its use for educational, recreational, health or research purposes.

35. (1) Upon the recommendation of the Service or the relevant County Government, the Cabinet Secretary may, by notice in the Gazette, declare any community or private forest, which in the opinion of the Service is mismanaged or neglected, to be a provisional forest.

(2) A notice in accordance with the provisions of this section shall only be made where-

(a) the forest-

(i) is an important catchment area or a source of water springs;

(ii) is rich in biodiversity and contains rare, threatened or endangered species;

(iii) is of cultural or scientific significance; or

(iv) supports an important industry and is a source of livelihood for the surrounding forest communities.

38. (1) Any person who is registered as proprietor of land in accordance with the provisions of any written law may donate or bequeath all or part of that land to the Service, County Department responsible for forestry, an educational institution, an association or a non-governmental organisation for the development of forestry and the conservation of biodiversity.

41. (1) A forest owner may enter into an agreement with any person for the joint management of any forests for a period to be specified in the agreement.

(2) The agreement referred to in subsection (1) may enjoin such person to use or refrain from using such forest or any part thereof in order to ensure the conservation of biodiversity.

42. (1) All indigenous forests and woodlands shall be managed on a sustainable basis for purposes of-

(a) conservation of water, soil and biodiversity;

(b) riparian and shoreline protection;

(c) cultural use and heritage;

(d) recreation and tourism;

(e) sustainable production of wood and non-wood products;

(f) carbon sequestration and other environmental services;

(g) education and research purposes; and

(h) habitat for wildlife in terrestrial forests and fisheries in mangrove forests.

44. (1) Where the Service is satisfied that utilisation of a public forest can be done through the granting of a concession, the Service shall grant the concession subject to the provisions of the Constitution, this Act and any other relevant written law.

(2) The Service shall not recommend any such proposal unless-

(e) ensure that the forest areas under his management are maintained for the conservation of biodiversity, cultural or recreational use.

48. (1) A member of a forest community may, together with other members or persons resident in the same area, register a community forest association in accordance with the provisions of the Societies Act.

(2) A community forest association registered in accordance with this section may apply to the Service for permission to participate in the conservation and management of a public forest:

Provided no such application shall be made where there is an existing prior agreement or license in relation to that forest.

(3) An application made in accordance with this section shall be in the prescribed form and shall provide-

(e) the association's proposals concerning-

(i) use of forest resources;

(ii) methods of conservation of biodiversity;

(iii) methods of monitoring and protecting wildlife and plant populations and enforcing such protection.

49. (1) Where a community forest association has been granted permission to participate in the management or conservation of a forest in accordance with the provisions of his Act, that association shall-

(f) inform the Service of any developments, changes and occurrences within the forest which are critical for the conservation of biodiversity.

(3) Subject to sub section (1)-

(a) none of the activities specified in this section shall be carried out so as to conflict with the conservation of biodiversity; and

(b) the Chief Conservator of Forests may, in consultation with the association, prescribe rules for the conduct of the activities specified in this section.

51. (1) The Chief Conservator of Forests may terminate a management agreement with a community forest association that has been granted permission to participate in the management or conservation of a forest or withdraw a particular user right where-

(a) the association breaches the terms and conditions thereof;

(b) it is necessary for the purpose of protecting or conserving biodiversity.

Species mentioned 14 times in the Act 2016;

36. (1) Subject to sub-section (2), the Service may, in consultation with the relevant government agencies and stakeholders, and with approval of the Cabinet Secretary, exchange part of a forest area with private land with the consent of the owner of such land where-

(d) the forest area to be exchanged does not contain rare, threatened or endangered species and is not a water catchment area or a source of springs.

39. (1) The Cabinet Secretary may, upon the recommendation of the Board of the Service and after consultation with the relevant County Government and relevant stakeholders, by notice in the Gazette, declare any national, county, community or private forest, as a nature reserve.

(3) Every nature reserve shall be established for the following purposes-

(a) the conservation of forestland of particular environmental, cultural, scientific or other special significance;

(b) the preservation of biological diversity and threatened or endangered species.

40. (1) The Cabinet Secretary, on the advice of the Kenya Forestry Research Institute, by order published in the Gazette, declare any tree species or family of tree species to be protected in the whole country or in specific areas thereof, and shall cause this information to be disseminated to the public.

(4) The Cabinet Secretary may prescribe Regulations or guidelines for the protection and regeneration of a protected tree species.

46. (1) The Service shall only give its Consent for quarrying operations in a forest area where-

(a) the area does not contain rare, threatened or endangered species.

71. (1) The Cabinet Secretary may, on the recommendation of the Board, make Regulations for or with respect to any matter which is necessary or expedient to be prescribed for carrying out or giving effect to this Act.
(2) Without prejudice to the generality of the foregoing, Regulations may be made under this section for-

(e) providing for protection of endangered and threatened tree species.

Analysis of the various sections of the Forest Act 2016, as outlined above, reveals the very good intention of the drafters for forest management to focus on biodiversity, including documentation, inventory, and monitoring. Issues of forest biodiversity are referred to and implied in several sections. However, forest management activities have no systematic management geared towards specific species, nor are records kept on biodiversity status in respective forest stations. Although there have been attempts in the past to deal with biodiversity components, for example during the KIFCON project, the efforts were quickly abandoned.

The lack of activities on biodiversity within KFS beyond the natural forest protection is also reflected in low staffing capacity that would focus on biodiversity across various taxa. This means that whenever issues arise like alteration of boundary, KFS may suffer serious challenges in terms of the provision of biodiversity data to support their case as provided in Forest Act sections 34 and 36, among others. Ad-hoc impact assessment based on need may not provide the requisite biodiversity information, including in areas approved for quarrying that contribute to significant landscape transformation.

Some biodiversity species are seasonal, meaning that depending on the time of assessment, they might be missed out. Again, section 49 clearly states that one of the functions of the CFA is to inform the service on changes in biodiversity. This is not possible considering that the CFA does not keep records of biodiversity. This is a huge gap in forest sector policy implementation that needs to be addressed urgently.

3.11.3 Water Act 2016 and biodiversity

The purpose of the 2016 Water Act is to align the water sector with the Kenya Constitution's primary objective of devolution. The Act recognises that water-related functions are a shared responsibility between the national and County Governments. This means that the water, which is the focus of the Water Act 2016, depends on production from natural landscapes, which also provide habitat for biodiversity and more water from a healthy ecosystem. However, the Water Act 2016 does not refer to biodiversity in any of its clauses in spite of using products from vital biodiversity conservation areas. Most important water catchment and water resources are located in gazetted forest ecosystems such as Aberdare, Mt Elgon and Mt Kenya, among other important forest landscapes. These ecosystems are also key biodiversity areas, and the Water Act, in some ways, indirectly implies, biodiversity conservation. Some of the areas in the Act that imply biodiversity conservation include the following;

—water resource management means the conservation, including soil and water conservation, protection, development and utilisation of water resources.

104. (1) A licensee may enter into an agreement with any person with respect to the execution and maintenance, by any party to the agreement, of such works as the licensee considers necessary or as the conditions of the license may require for the purpose of protecting the catchment areas, drainage of land, carrying out soil conservation measures, the control of vegetation or effectively collecting, conveying or preserving the purity and quantity of water which the licensee is for the time being authorised to take.

132. All income through water permits, abstraction and water user fees shall be entirely used for the conservation and management of water resources.

156.(1) The Water Act 2002, is repealed.

(5) The provisions of the Environmental Management and Coordination Act, 1999 relating to water resources conservation and protection and water pollution control shall be exercised subject to the relevant provision of this Act and only in the event that the Board has failed or neglected to take appropriate action to exercise its powers and functions under this Act.

While the Water Act does not directly address biodiversity, it makes provision for conservation of landscapes, thus promoting practices towards good ecosystem health. For example, polluted water lacks critical biodiversity that indicates good health like water beetles. Specifically, mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) (EPT), are great bioindicators of good water quality. Mayflies are sensitive to oxygen depletion in flowing water, which means that these species could be used to monitor ecosystem health in water. These biodiversity gaps can be filled by using biodata as indicator of healthy catchment areas.

Indigenous Forest, Kimothon Forest, Mt Elgon, 2018. Credit T. Thenya.

WRUAs - CFA nexus

Water and forest resources are closely intertwined, and the management of these two resources closely overlap as they operate in the same landscape. Resources dependent or symbiosis is a common; water flow depends on a healthy forest ecosystem, while forest functionality, in turn, depends on water resources.

The Water Resource Authority (WRA) is mandated to perform management functions through the Water Act 2016. The law provides for the decentralisation of natural resource management like water, allowing the participation of the community in water management through institutions like water users associations. However, this sectoral approach lacks proper coordination among the community institutions mandated to co-manage resources

like water and forests. While the Water Act provides for the establishment of the Water Resource User Association (WRUA), the Forest Act provides for community participation through CFA. Working separately, the CFA develops Participatory Forest Management Plans (PFMPs), whereas WRUA develops Sub-Catchment Management Plans (SCAMPs), each giving a specific set of activities in the same ecosystem but separately. However, these community institutions however lack clear coordination mechanisms, resulting in low synergies between the CFAs and WRUAs in their respective landscapes. There is clearly a lack of a framework for synergistic engagement between stakeholders in natural resources management. The integration of forests and water management approaches within the landscape is essential for the success of a healthy and functioning ecosystem. For example, while water institutions constantly accrue income from water resources, investments in catchment landscape are not mandatory and rarely occur. However, forest institutions continue to invest in forest ecosystems, including catchment, with little reciprocating actions.

3.11.4 Legal frameworks

Several legal frameworks in Kenya provide for forest biodiversity conservation or imply biodiversity conservation or biodiversity data, both at the national and county levels as well as multi-later agreements (MEAs). Some of these highlights are provided below;

Table 1: Legal framework and the implication for forest biodiversity

No	Legal framework	Focus	Relevancy to forest & biodiversity management
1.	The Constitution of Kenya (2010)	Devolved County Government and the Central National Government	Chapter 5 focuses on environment and participation. The constitution also promotes participatory approach in natural resources management. The land and environment clauses in chapter 5 have specific provisions relevant to biodiversity management in forested ecosystems. Under the Kenyan Constitution, management of gazetted protected forests is under the National Government and this has implication of enhancing biodiversity management. While extension services and community forests are under County Government.

No	Legal framework	Focus	Relevancy to forest & biodiversity management
2.	Sessional Paper No. 3 of 2009 on Land Policy 2009	Sections 3.4: The provisions provided below provide for land use planning; 3.4.3.1 (131a): To sustainably manage land based natural resources, the Government shall encourage preparation of participatory environmental action plans by communities.	Provides for land use planning at the local level. To sustainably manage land-based natural resources, the Government shall encourage preparation of participatory environmental action plans by communities and individuals living near environmentally sensitive areas to preserve cultural and socio-economic aspects. Forest PFMP preparations are part of local planning. Section 3.4.3.1 (131a) responds to this as well. Local planning compliments and enhances forest biodiversity including zoning areas of biodiversity importance.
3.	Forest Policy 2014	Forest development in the country.	The policy focuses on the integration of the forestry sector with other sectors, as well as addressing new concerns and realities in forestry and natural resource management. The 2014 policy emphasises the devolution of community forest conservation and management, rehabilitation of degraded forest areas and a 10 per cent forest cover target. Apart from supplying wood products, forest plantations play an important role in reducing pressure on the indigenous forests. This is important when silviculture is well practiced in specific ecosystems.
4.	Forest Conservation and Management Act, 2016	Forest resources management, Section 42 provides for PFM and PFMP preparation; Provides for preparation and gazettement of rules and regulations, such as Participation in Sustainable Forest Management rules, 2009, the Forests (Charcoal) rules, 2009 and the Forests (Harvesting) rules, 2009.	Provides for the preparation of the ecosystem plan and specific forest PFMP, negotiation of Forest Management Agreement (FMA) between CFA and KFS, which highlights zonation of biodiversity zones. The Forests Act 2016 strongly supports the participation of stakeholders in the conservation and management of forest resources through collaborative management. The recognition of forest-adjacent communities as key stakeholders and users of natural resources is considered vital if successful management is to be attained. These provide for the preparation of rules and regulations such as plantation harvesting as well as zoning of forest ecosystems that help conserve landscapes and are important for biodiversity.

No	Legal framework	Focus	Relevancy to forest & biodiversity management
5.	Wildlife Conservation and Management Act, 2013	Management of wildlife resources in gazette and community areas framework for conserving, in perpetuity, Kenya's rich diversity of species, habitats and ecosystems for the well-being of its people and the global community.	Forest provides critical habitat for wildlife species. The Wildlife Act addresses two main concerns. First, penalties for major crimes such as poaching of elephant tusks and rhino horns have now been increased. Secondly, the Act allows for stakeholder consultation in relation to benefit sharing. In line with this, the Act now allows for the establishment of rules and regulations for benefit sharing, which, although not yet completed, encourage biodiversity conservation. By allowing participation, the Wildlife Act compliments biodiversity conservation but also leaves a lacuna where specific ecosystem managers do not work in harmony as collaboration is at the ecosystem. Many forest stations, such as the Aberdare, Mt Elgon and Mt Kenya, have both KWS and KFS stations at different geographical areas in the same ecosystem, creating potential collaboration but also conflicts in resource management. This has been recorded in Mt Kenya. Plantation destruction is a significant source of fauna and flora conflict and loss.
6.	National Environment Action Plan (NEAP)	Assess the environmental challenges facing Kenya and how they underscore the sustainability of Kenya's economic and social development.	The NEAP provides a framework for the implementation of the Environment Policy and the realisation of the National Development Goals and Vision 2030. The plan outlines measures to combat climate change, including mitigation and adaptation, improving inter-sectoral coordination, mainstreaming sustainable land management into national planning, policy and legal frameworks and undertaking research on the impact of climate change on the environmental, social and economic sectors, identifying challenges and planning to promote sustainability. This provides for biodiversity complimentary conservation.
7.	Environmental Management and Coordination Act of 2015	Overarching law on environmental management in Kenya.	The Act has been a great boost in addressing environmental concerns and safeguarding against ecological degradation within and outside protected areas. This Act is relevant in guiding the undertaking of activities requiring Environment and

No	Legal framework	Focus	Relevancy to forest & biodiversity management
		Provides for environmental and social impact assessment (ESIA) and annual audit.	Social Impact Assessment (ESIA) and Audits, which compliment biodiversity conservation where ESIA highlights critical biodiversity conservation areas and key species.
8.	Land Act 2012 (Revised Edition 2019)	Legislative structure for land governance and rights in Kenya, largely aligned with that required by the Constitution. Defines the land types (public, community and private).	The Act recognises three categories of land (public, community and private) and gives parameters for conversions between these categories. The Land Act contains guiding values and principles, incorporating a comprehensive list of land governance principles from the Constitution. It helps categorise the forest ecosystem into private, community, and public land, removing grey areas. This is a positive in terms of biodiversity conservation.
9.	National Land Commission Act 2012	Provide broad functions and authorities in land governance advice government on land title registration, initiating claims for historical injustices, encouraging the application of alternative and traditional dispute resolution mechanisms, managing and administering all unregistered trust land and unregistered community land on behalf of the County Government, developing and maintaining an effective land information management system at national and county levels, and monitoring and oversight over land use planning.	In addition to affirming the NLC's management authority over public lands, the Act also grants the Commission responsibility for, among other things, advising the national government on a comprehensive program for land title registration, initiating claims for historical injustices, encouraging the application of alternative and traditional dispute resolution mechanisms, The NLC Act also establishes the County Land Management Boards, which share authority over governance of public lands and will be closely linked to the NLC.

No	Legal framework	Focus	Relevancy to forest & biodiversity management
10.	Water Act 2016	Framework for water resources management, including community participation, and underwater resource uses association.	The Act provides for the establishment of Water Resources Users Associations (WRUAs). The main aim of WRUAs is to regulate and coordinate water usage. In forest areas, WRUAs should be guided by this Act, but it often overlaps with CFA. This overlap provides complimentary effects and conflicts as the same community members play different roles in the same ecosystem. Protection of catchment areas 22: Water Act: (1) Where the Authority is satisfied that in order to conserve a vulnerable water resource, special measures are necessary for the protection of a catchment area or a part thereof, it may by Order publish in the Kenya gazette declaring such a catchment area to be a protected area.
11.	Agriculture Fisher-ies and Food Authority Act, 2015	Framework for management and investment in crops, livestock and fisheries.	The Act aims to transform farming into a professional, well-paid, internationally competitive, and attractive field for the youth in order to drive Vision 2030. Establish an overarching regulatory body, the Agriculture, Livestock, Fisheries, and Food Authority (ALFA), to oversee the operations of Kenya's agricultural sector. It is important for PELIS and farming initiatives around forest areas including soil erosion management. By encouraging fish farming, this helps in conserving biodiversity.
12.	National Climate Change Response Strategy (NCCRS)	Engagement in handling climate change aspects such as weather information release and advice to resources managers and community Investment in carbon business. including REDD+.	Agriculture intensification is one of the adaptation strategies promoted by NCCRS. Some of the agriculture adaptation measures in NCCRS are the provision of downscaled weather information and farm inputs. Climate change is likely to continue affecting forest biodiversity and has the potential for carbon investments and plantation areas to provide a leakage for carbon and loss of biodiversity through habitat transformation during harvesting.

No	Legal framework	Focus	Relevancy to forest & biodiversity management
13.	Energy Act 2019	A framework for management and energy sources, including promotion of energy savings and alternative energy sources. It provides an enabling environment for the provision of energy services.	Promotes sustainable energy sources. The Energy Act 2019 provides the framework for energy in Kenya and hopes to ensure that the relevant ministries, non-government organisations (NGOs) and other organisations address environmental problems associated with the supply and use of energy (charcoal and fuel wood). This has the potential to transform the energy sector, encouraging less harvesting of biomass and conserving biodiversity.
14.	Multilateral and Environmental Agreements	Sustainable Development Goals (SDGs) goals 15- focus on Life on land. The Convention on Biological Diversity- promote biodiversity conservation. The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. Reducing Emissions from Deforestation and Degradation (REDD). Kenya obtained support from the Forest Carbon Partnership Facility (FCPF) to prepare and implement a Readiness Preparation Proposal (R-PP)	Kenya is party to international agreements including those on Biodiversity, Climate change, Climate Change–Kyoto Protocol, Desertification, Endangered species, Hazardous wastes, Law of the sea, marine dumping, marine life conservation, ozone layer protection, ship pollution, wetlands, whaling. Kenya is a signatory to the above MEAs, and thus, the laws apply to biodiversity management aspects. Conservation of endangered species like *Prunus Africana*-mwiritsa-Lu, and *Juniperus procera*. Some of these include a focus on climate change, and forest prone to the effects of climate change. SDG 15: Life on land focuses on "protect, restore and promote sustainable use of terrestrial ecosystems, sustainable management of forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". The CBD COP15 resolution can make use of forest areas, especially private and community forests, to increase 30x30 biodiversity areas. Planning in plantation areas like zoning takes recognition of these MEAs provisions. These MEAs have a complimentary role in biodiversity conservation when ratified, and Kenya has ratified several MEAs.

No	Legal framework	Focus	Relevancy to forest & biodiversity management
15.	Global Forest Principles	Non-legally binding authoritative statement for a global consensus on management, conservation and sustainable development of forests. Encourages forestry development by promoting the participation of local communities.	The Forest Principles are a non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests in the world. The Forest Principles arose from the realisation of the importance of forest resources and concern over the threats to these resources worldwide. Continued good forest practices and community involvement can help in enhancing biodiversity conservation by zoning critical biodiversity areas.
16.	National Forest Programme	A strategic framework for forest policy, planning and implementation. The goal of the programme is to develop and sustainably manage, conserve, restore and utilise forests and allied resources for socio-economic growth and climate resistance.	The National Forest Programme (2016–2030) is the first cross-sectoral and multi-stakeholder national framework for developing and coordinating forest development aimed at meeting the needs of Kenyans in the next 15 years. It builds on the constitutional values and principles of the Kenya Vision 2030 and advances forest development to 2030. NFP recognises the role of the private sector in forest management, especially since 50per cent of plantations are outside the gazetted forest ecosystem. Forest needs sustainable forest management, repair of degraded ecosystem for biodiversity conservation.
17.	Vision 2030	To create “a globally competitive and prosperous country with a high quality of life by 2030.” This is to be achieved under economic, social, political and enabler macro pillars.	The Kenya Vision 2030 aims to transform Kenya into a newly industrialising, middle-income country, providing a high quality of life to all its citizens by 2030 in a clean and secure environment. Environment is captured under the social pillar that seeks to build a just and cohesive society with social equity in a clean and secure environment. Forest areas are essential in facilitating the achievement of Vision 2030 by providing forest products and services and recognising the role of forests in livelihood support.

No	Legal framework	Focus	Relevancy to forest & biodiversity management
18.	Transition Implementation Plans (TIPs)	Framework to provide for a smooth transfer of the identified devolved forestry functions that were previously implemented by the Kenya Forestry Service, such as farm forestry, extension services.	TIPs focus is on the transfer of some forestry activities to County Government. One of the devolved forestry functions is extension services. These include on-farm forestry activities like tree planting and species selection. This could be used to enhance biodiversity conservation in private land, where most of the 30x30 based on COP15 might be realised.
19.	County Integrated Development Plan (CIDP) – at County level	It contains detailed information on several sectors, including environment and forest. It also outlines country development programmes.	CIDP sets out plans, programmes and priorities at the County level. Forestry is one the key sector earmarked to support economic development. Other activities include tree planting on farms and supporting alternative sources of domestic fuel to ease pressure on gazetted and community forest areas. The planning could be used to enhance biodiversity conservation in private land, where most of the 30x30 based on COP15 might be realised.
20.	The National Museums and Heritage Act 2009 (amendment bill 2023)	Provides for the management and conservation of natural, physical and cultural heritage.	"Natural heritage" means — (a) natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view; This involves inventory and storage of biological specimen, which are part of biological diversity. The Act also provides for preservation of sacred sites such as Mt Kenya, which is site managed by statutory bodies like the KFS.

National policies

The various policies reviewed above operate at different levels, from global to local level, but have made some contributions to the forest landscape. Some legislation like the Forest Act, the Agricultural Act, the Forest Policy and the Wildlife Conservation and Management Act have direct implications on forest landscape management, including biodiversity conservation. However, the same legal framework negatively affects biodiversity by facilitating the conversion of landscapes into other land uses such as agriculture. The

harmonisation of riparian land by the National Land Commission (NLC), helps protect the watersheds, unlike in the previous scenario where agriculture, physical planning and EMCA had different provisions. The Agricultural Act is the most impactful in terms of landscape conversion, especially on private land, as it provides for minimal land conversion, including inputs. However, extension services under the Agricultural Act could be used to promote sustainable land management, such as supporting afforestation, including agroforestry, while also reducing the application of chemicals. The failure to enact the Forest Policy affects the full realisation of forest sector development, especially biodiversity conservation.

Multilateral environment agreements

Multilateral Environmental Agreements are formulated to address specific global environmental problems, which are later domesticated at the national level. For example, the Convention on Biological Diversity (CBD) is specific to biodiversity. The CBD has three main objectives: the conservation of biological diversity, the sustainable use of the components of biological diversity, and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources. During the 2022 UN biodiversity conference, COP15, countries reached a landmark agreement that aims to reverse the unprecedented destruction of nature. One of the agreement's twenty-three targets, known as 30x30, aims to protect at least 30 per cent of the planet's land and water by 2030. This is known as the Kunming-Montreal Global Biodiversity Framework (GBF), which established four overarching goals and 11 action-based targets. The GBF established 30×30 as the headlining goal, which sets out to protect 30 per cent of the planet and restore 30 per cent of degraded land by 2030.

The 30x30 targets will help maintain global biodiversity and defend against climate crises. This target aims to preserve the integrity of ecosystems on which all life depends upon, provide safe havens to help wildlife adapt to climate change, and sustain natural systems that store carbon, such as forests, mangroves, seagrasses, wetlands, and grasslands. As a country, the forest sector has the opportunity to initiate biodiversity-led initiatives to serve as an indicator of national landscape restoration. In 2016, the Kenya Forest Service led a process to map degraded landscapes and a total of 5.1 million hectares were mapped. It is on these landscapes, among others, that biodiversity indicators could serve as a mark of ecosystem functioning recovery beyond tree growing. Landscape restoration is mainly driven by tree growing with little or no focus on biodiversity change. Yes, ecosystem functionality depends on services provided by various biodiversity taxa.

While the CBD recognises the sovereign right of states over their natural resources in areas within their jurisdiction, the Nagoya Protocol is a supplementary agreement to the Convention on Biological Diversity. It provides a transparent legal framework for the effective implementation of one of the three objectives of the CBD: the fair and equitable sharing of benefits arising from the utilisation of genetic resources (Muigua et al., 2015).

UNESCO world heritage

World Heritage sites are designations for places on Earth that are of outstanding universal value to humanity. As such, they have been inscribed on the World Heritage List to be protected for future generations to appreciate and enjoy.

Kenya has seven UNESCO World Heritage sites, and the National Museums are the focal point in Kenya. The Sacred Mijikenda Kaya Forests is a UNESCO World Heritage site comprised of 11 separate sites, among them Kaya Kauma. The total number of forest patches managed by traditional beliefs and practices is 56, among them Mijikenda sacred kayas, out of which 39 are National Monuments, four are forest reserves, and 13 are unprotected.

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The National Museums of Kenya (NMK) is a state corporation that manages museums, sites and monuments in Kenya. It carries out heritage research, and has expertise in subjects ranging from paleontology, archeology, ethnography and biodiversity research and conservation. According to the National Museums and Heritage Act 2023 bill, “heritage” includes cultural and natural heritage. NMK is mandated to conduct environmental and heritage impact assessments, subject to the provisions of national laws and international treaties and conventions on such sites.

With the coming of a devolved government, NMK is supposed to liaise with the County Governments and the relevant national, regional and international institutions on heritage management. Some of the sites within the forest ecosystem where biodiversity and water catchment are important include,

the Thaai Sacred Lake (2003) and Gitune Sacred Forest (2003) in Meru, Karima hill (2001) in Nyeri, Dugumura hill sacred grove (1992) in Kwale and Kayas Forest (1992) in Kwale County, among others. For example, Karima Hill in Nyeri is under the County Government and thus is managed in consultation with the Nyeri County government and KFS. NMK is especially critical in the inventory and archiving biodiversity heritage across the country, including sacred sites.

While NMK has a large deposit of biological and cultural resources from these sites, at the local level, like Karima Hill, there is hardly any recorded information. This could be due to the low capacity of the County Government for forest resources management.

3.12 Management challenges in forests landscapes

3.12.1 Forest management challenges and stakeholders' engagement

The forest landscape in Kenya varies in terms of coverage and status among private, public and community. Natural forests in Kenya constitute 3,945,108 hectares with 23 per cent of which are gazetted public land and 77 per cent of which are community/private owned areas. Natural montane forests occupy about 2 per cent of the total land area (1.14 million hectares). Public and private plantations constitute 186,716 hectares, constituting 53 per cent public and 47 per cent private forests, according to the National Forest Programme of Kenya (Kenya, Ministry of Environment and Natural Resources, (2016). Except for farm and private forests, other types of forests are declining in either coverage or quality, or both, which includes loss of biodiversity and water catchment functionality.

Among the plantation forests, the preferred species revolve around fast-growing exotic species and few retained or planted indigenous species, though differing according to ecological conditions. The key species planted in the country include *Eucalyptus grandis* and *E. saligna, Pinus patula, Cupressus lusitanica* for highlands and *E. camaldulensis* and *E. terreticorni, Casuarina equisetifolia, Tectonia grandis* and *Gmelina arborea* for lowlands. Proper management and governance of exotic species are important for the preservation of natural forests as utilisation pressure are eased from natural forests by being directed by exotic species in public, community and private forest landscapes. This eased pressure on natural forests allow them to provide ecosystem services such as water catchment and biodiversity habitats.

3.12.2 Public forests

These are forest areas found within gazetted land. Some challenges confronting these forest landscapes include a lack of clear benefit-sharing arrangements between Kenya Forest Services and other stakeholders such as CFA. While the CFA is involved in forest protection and conservation, its benefits are largely confined to user rights, which are mainly traditional forest uses. Often, activities related to forest conservation geared towards reducing pressure on the forest ecosystem, such as biogas for counteracting the uptake of firewood and income-generating activities such as beekeeping, among others, primarily come from donor-driven projects, not forest proceedings. Those who benefit are often a few members due to limited resources and for a short time.

In several forest areas where PFMPs have been formulated since the mid-2000s, their implementation is highly limited by a lack of financial resources. PFMPs have no direct financial allocation from the government. Therefore, they rely mainly on donors, development patterns, well wishes and KFS government-funded projects, meaning that implementation is ad-hoc and intermittent. Often, a lack of incentives for CFA members volunteering on forest patrol leads to low morale over time.

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This failure is occasioned by the Forest Act 2005 (revised 2016), which did not provide an overarching benefit-sharing arrangement beyond the user rights. Hence, each forest provides benefits depending on members of CFA's ability to negotiate beyond the traditional user rights such as grazing, fuelwood and herbs collection. This needs to be harmonised and streamlined across the forest sector. For example, companies like Carbacid working in the Kereita forest sometimes budget for the community, and at other times, there is no budget. When activities like the Kereita Marathon are held in forest areas or hotel investments, benefits to CFA vary disproportionately depending on the event.

Across the forest landscape in public forests, gender-segregated participation in the plantation sector varies depending on the operation segment activities. For example, in nursery, planting and maintenance operations, there are equal opportunities for youth, men and women. However, women tend to dominate due to the light duty and gentleness requirements in handling seedlings. Thinning, pruning and logging operations are heavy duty activities that are dominated by men due to physical nature of the work and type of machinery and equipment deployed. There are hardly any reports or evidence of biodiversity work from forest management perspectives.

3.12.3 Biodiversity documentation and management

Community and stakeholders' awareness of forest landscape biodiversity management is high in terms of who is responsible for what component. It is clear that KWS is more focused on mammals and carnivores with minimal focus on insects, fungi and invertebrates. While KFS mainly maintains data on plantation species, both exotic and indigenous, such as those in Mt Kenya, Aberdare, Maua and other parts of the country, but it keeps no data on natural forests. Similarly, KFS does not also collect biodiversity data on fauna or avifauna or other taxa in forest landscapes.

While formulating a management plan or responding to impact assessment, biodiversity data on forest landscapes is obtained from other stakeholders such as the National Museums of Kenya, KEFRI, and research institutions like universities. This data has not been updated, along with other forest management activities, to indicate change. There is also limited knowledge among CFA members awareness on biodiversity (flora and fauna) in respective forest landscapes, and neither do they keep records of any taxa during their forest-based activities. Again, they have no knowledge of its links to land use productivity, the impact of chemical use on plantation biodiversity, and its contribution to crop and forest productivity. This means that biodiversity is not used as an indicator for planning and management, despite section 49 (f) pointing out CFAs role of informing KFS of changes that have an impact on biodiversity. Thus, with both KFS and CFA having no records of biodiversity and not using biodiversity taxa as a management tool, the health of the forest ecosystem remains largely unknown in both natural forest and plantation, meaning that it is hard to assess the impact of plantation on biodiversity or on the plantation itself.

Hartlaub's Turaco is a forest specialist (FF), frugivore and an Afrotropical Highland biome indicator species that thrives in intact, indigenous forests.

However, the absence of a systematic process of documenting biodiversity does not mean that the community or CFA members are unaware of several flora and fauna species. Discussions with CFA members reveal wide knowledge of biodiversity ranging from insects, and soil biota like earthworms to birds, mammals and plants. In addition, they are quite conscious of the species loss and changes that have taken place among the different forest ecosystems in terms of species disappearing to new invasive species. These range from a reduction in pollinators, loss of bird species, and reduction in the swarm of bees or noticeable moving clouds of bees in respective forest areas. This means that with the strategic and structural arrangement in terms of biodiversity recording and the use of various taxes as indicators, the recording of forest health can greatly improve. With CFA members being localised at forest stations, the use of citizen science could be deployed as a variable tool and contribute immensely to forest landscape monitoring.

The natural forest stratum is dominated by trees with overlapping crowns and thick undergrowth. Natural forests have higher plant and fauna diversity, high nutrient cycling, more litter varieties, and deposition. They also have high microbial and enzymatic activities. Their mycorrhizal association, the association between root systems and fungi, is high, benefiting the soils, plants, and the micro-organisms. Soils in natural forests have high carbon and nitrogen levels.

Soils in plantation forests, unlike those in natural forests, are characterised by low carbon and nitrogen contents, lower mycorrhizal networks, and decreased homogenous characteristics. With monoculture in plantation, the litter fall is homogenous; hence, the organic matter quality is lower as compared to those in natural forests.

3.12.4 Community forests landscapes

The community forests are those forest landscapes under the custodian of the County Government. While some of these forests have participatory forest management plans and community forest associations, they are characterised by very weak governance systems largely due to a lack of support from the County Government. The counties have two forest functions under the devolved government. This includes extension services, which are supposed to help farmers with on-farm forestry activities. This hardly functions and, in most scenarios, farmers seek services from KFS sub-county officers.

The other county forestry function is the management of community forest such as Karima, Nyeri Hill and Tumutumu in Nyeri County, among others. There are several such community forests in other counties, such as the expansive Masai Mau forest in Narok. Some of these forest landscapes have developed participatory forests management plans through support of various stakeholders, including KFS, but they are hardly implemented due to lack of financial support and low CFA capacity. The County responsible is supposed to provide a forester to be stationed on site but often this is lacking, and only one or two forest guards would be stationed at specific forest station. In most of these community forest landscapes, due to human capacity and financial resources, there is hardly any visible management activity or control access, including lack of office facility. In addition, these forest areas are often left out in capacity development, including that of the CFA and are also not considered in financial allocation at the county level.

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Karima Hill in Nyeri County has a management plan outlining the responsibilities of all stakeholders. However, the CFA receives little or no support towards implementation of these activities. Again, the County Government of Nyeri has not prioritised enterprising activities in Karima Forest. These management challenges limit the benefits that could accrue from the forest, which is only 5km from Othaya town and could be used as a recreation site.

Sacred sites

Karima Hill in Nyeri district, central Kenya has two sacred sites namely Kamwangi and Gakina. Kamwangi sacred site is a territorial shrine consecrated by the Mwangi ruling generation in 1900, while Gakina is a clan shrine. Most of the plants found on Karima Hill are used in traditional ceremonies and have medicinal value.

3.12.5 Private forests

The private sector makes almost half of the plantation-related material in the country. The sector in the past was dominated by tea estates owned by multinationals and local companies that planted mostly eucalyptus, commonly referred to as blue gum, for tea curing to substitute expensive furnace oil. However, the inability of the public forest plantations to meet local timber needs has attracted several investors into the forest sector, including leading wood-based companies, syndicated private investors and large-scale farmers who are attracted by lucrative business in tree-based enterprises (Cheboiwo, 2016).

The expanded electricity power generation and distribution starting late 2000s in the country created a high demand for transmission poles, mostly sourced from *Eucalyptus grandis* trees, making it one of the leading short-rotation crops grown by private investors and mostly for commercial purposes. Large companies have been purchasing land for tree growing, but the sector has limited room for expansion due to a shortage of land and competition from agricultural enterprises and settlements. The competition for land in the country has made land prices skyrocket, which is likely to limit the land available for future forest expansion. However, all indicators show that private-sector forests are here to stay and will leverage efficiency in land use, efficient technologies and high demand for forest products to compete in local and regional timber markets. The private sector players are also gearing for the potential opening of public plantations for forestland concessions under public-private partnership (PPP) provisions as outlined in the proposed National Forest Policy 2015 and National Forest Conservation and Act 2016.

However, such plans have previously been opposed by the community forest associations alliance.

Eucalyptus plantation in Tea estate, Nandi County, Kenya. Photo credit: Dr. Joshua Kiplongei Cheboiwo

According to MENR (2016), investments in forestry will increase substantially if information on the state of forests and opportunities for investment are made available to potential investors. At the moment, such information is not available in a form that investors can use. Also lacking is information on wood resources available on farmlands and private forests. Mapping and inventorying resources outside government forests and packaging the information for investors are important steps towards linking tree farmers to major markets.

3.12.6 Recommendations

According to the National Forest Programme 2016–2030, plantation development: Intervention strategies and outcomes, the programme strategy is to diversify forest plantation species, which aims at increasing the number of species for forest plantation development, creating a diverse supply of forest products, and enhancing biodiversity, which is supposed to eventually lead to a change in the biodiversity index. However, the NFP lists the following risks for improved theory of change in forest management in Kenya. These risks include external interference, resistance to change and inadequate funding. In the management of natural forests, the poor appreciation of the links between conservation, biodiversity, heritage and livelihood is listed as a major weakness in the strength, weakness, opportunities and threats (SWOT) analysis.

3.13 Impacts of overlapping mandates on protection of forests

3.13.1 Stakeholders' engagement and mandates

At the policy level, different policies articulate different mandates for forests, as outlined in Table 1, which also provides a link with biodiversity. These include the Water Act 2016 on water sources and abstraction, the Forest Act 2016 on forest management, the Wildlife Act 2013 on fauna management in the forested ecosystem, the NMK Heritage and Monument Bill 2021 on natural, biological and physical heritage, the National Biodiversity Strategy and Action Plan 2019-2030 covering both flora and fauna and the IUCN World Heritage. This overlap of mandates, as provided by different legal frameworks, either creates conflicts or synergies that positively impact the forest landscapes.

In other instances, the conflicts generate neglect of the ecosystems or associated species, which could lead to further destruction and degradation of species. For example, while the Water Act focuses on water as a product of a functioning ecosystem and WRUA members interact with CFA members on the same landscape, their activities vary significantly. The water sector is much more concerned with water sources and not necessarily with the forest ecosystem and its health, and they rarely invest in the forest sector. WRUA activities are mainly along riverine and riparian areas, while CFA covers the whole forest, which provides the wider catchment focusing on general conservation geared towards a healthy ecosystem. Income generated from the water sector, much higher than that generated by forest products, is not necessarily structured to be invested back into the forest.

The water sector is much more concerned with water sources and not necessarily with the forest ecosystem and its health, and they rarely invest in the forest sector.

Similarly, the wildlife sector is much more concerned with the protection of wildlife species, especially fauna, and patrols are mainly geared towards fauna species welfare. The Aberdare ecosystem and Mt Kenya are the two central water towers where KFS and CFA are mainly involved in landscape protection while drawing minimal from forest products like water. Other stakeholders, like Kenya Electricity Generating Company (KENGEN), are highly dependent on water from the two well-conserved ecosystems but do minimal re-investments in the catchment. Often, there are no formal collaborative agreements between the various stakeholders and forest custodians.

Lack of clarity in terms of legal framework creates lapses or lacunas. Kenya has several sacred sites such as the Kaya Forest, and the UNESCO heritage sites: Karima Hills in Othaya, Thaai Sacred Lake (2003) and Gitune Sacred Forest (2003) in Meru. Others include Karima Hill (2001) in Nyeri, Dugumura Hill Sacred Grove (1992) in Kwale and Kayas Forest (1992) in Kwale County. While the sacred sites and monuments are nominated through the NMK Act, the NMK as an institution lacks the capacity to manage forest ecosystem sites, and this is left either to KFS if it is a national forest or county government if it is a community forest. Thus, the forest ecosystem often suffers degradation due to a lack of adequate protection. In some cases, sacred sites have been converted into plantation sites, like Karima Hill in Othaya. Community forests under County Governments remain weak, with low financial and management support and top-down decision-making. Since some of these forests have the potential for plantation establishment, they hardly receive any funding. At times, KFS is forced to respond through their local forester or extension system.

A number of stakeholders engage with CFA in the PELIS scheme as well as in forest conservation. These include KFS, KWS, Rhino Charge, WRA, WRUA, East Africa Wildlife Society, Nature Kenya, NEMA, CARBACID, KENVO, CFA, KEFRI and KEMFRI, among others. The engagement with these organisations varies and has varying outcomes. For example, the members of CFA work well with the WRUA members in some forest landscapes in undertaking conservation activities such as tree planting and catchment protection. In other instances, the CFA joins WRUA in riparian land conservation and creation of awareness, but in some landscapes, the two do not undertake joint activities. All this takes place in informal arrangements as there is no policy guidance in such collaboration, and it is purely dependent on goodwill. At the same time, the CFA members in forest areas where KWS is present have a local working arrangement where they report illegal activities.

These working arrangements can be strengthened if there is clarity on the mode of creating synergies in the management, use, and protection of forest resources. In reality, underlying power structures and incentives or disincentives for sustainable NRM are invariably motivated by different factors which shape and realign stakeholders into different roles. Building synergies among different stakeholders relative to their position within the larger policy space is constrained by suspicion, thereby affecting collective action. Ultimately, accommodating and balancing multiple interests is inherently a tedious and conflict-ridden process.

What stake do they have, and how will this be enhanced through complementary activities? Again, it is essential to have clear communication

channels that ensure misunderstandings and conflicts are resolved easily when they arise. This is common during the dry season, especially when water resources are rationed, and forage is highly reduced, meaning that prior planning in resource management would help to sustain resource utilisation. For instance, even without a cooperation law, the stakeholders can work out differences amicably. This is mainly due to the results of awareness and sensitisation on conflict management that have, over time, brought organisations close together.

3.13.2 Conflicts and their management

Some of the common areas of conflict include the coverage of a sub-catchment management plan (SCAMP), which often covers forest areas but does not necessarily involve CFA members in terms of harmonising the activities of the two organisations. Both KFS and WRA operate a decentralised-centralised system, where although both have grassroots organisations in the form of CFA and WRUAs, they are highly regulated at the national and local levels. In instances where buildings have been erected in forest ecosystem landscapes, as is the case in Gathiru Forest in Mt Kenya, there is a lack of clarity on how to use these buildings or how to share benefits arising from them. Like in many forest landscapes, benefit sharing is a source of major conflicts and discontent due to the lack of a guiding framework.

In all CFA sites within the country, there is a lack of benefit-sharing framework of income accrued from activities within the forest among the stakeholders such as CFA, saw millers, tourism ventures and KFS. The CFA members often feel that they do not get enough value for the time devoted to forest conservation since there are no resources provided by KFS. This is a significant area of concern in forest management, in which the government can intervene to ensure increased benefits in return for involvement in forest resource conservation. For example, the PFMP forest management agreement confers mainly traditional user rights such as grazing, firewood, and herbs, but does not provide any clarity on benefit sharing from timber harvesting or investment opportunities in the forest ecosystem.

Highlights from Validation Meeting

4. Highlights from Validation Meeting

This summary captures the key points for consideration suggested by stakeholders participating in the validation meeting, focusing on the need for comprehensive integrated forest biodiversity management, stakeholder collaboration, education, and research to ensure sustainable forest management and conservation. Some of these areas include;

1. **Endangered species and biodiversity:**
    - Research not capturing biodiversity in forest management plans, nor is it updated.
    - Wildlife management plans focus more on animals and not plant biodiversity and other taxa.
    - Biodiversity documentation, creating biodiversity registers for effective management at the local level.

2. **Policy and legislative framework:**
    - PFMP and CFA formation: PFMP formulation and CFA formation regulations need to be part of the Forest Act, among those regulations to be formulated by a minister.
    - Need for policy formulation to encourage and support recording and keeping updated information on biodiversity.
    - Lack of monitoring activities in management plans focusing on biodiversity changes.
    - Suggest policies for supporting biodiversity monitoring in plantations.
    - Reviewing policies and providing clauses for policy harmonisation or collaboration in biodiversity data recording and management.

3. **Curriculum and mindset change:**
    - There is a need for updated university curricula to incorporate holistic forest management with more focus on diverse forest use, including biodiversity.
    - Cultural and ecosystem services value should be emphasised by undertaking a valuation.

4. **Stakeholder engagement:**
    - CFAs' co-management role needs to be better practised at the station level for improved governance.
    - Forest use needs to shift focus from quick activities like PELIS to broader forest use, including biodiversity benefits.

- The current Civil Society Engagement is weak and needs to be strengthened as part of forest governance oversight.

5. **Biodiversity implementation policies and plans:**
    - Biodiversity implementation challenges are restricted by insufficient staffing, low prioritising and facilitation.
    - Need for biodiversity monitoring to be integrated into management plans.
    - Emphasising restoration, especially for degraded areas, through the use of Trees Establishment & Livelihood Improvement Scheme (Telis), among other techniques to be captured in the legal framework.
6. **Collaboration and landscape approach:**
    - Suggest a landscape approach integrating ecological benefits like water, biodiversity, and landscape patch connection.
    - CFAs should work closely with WRUAs for integrated landscape management.
    - Encourage collaboration among institutions for biodiversity management.
7. **Livelihood diversification and research:**
    - Promote non-extractive forest uses like beekeeping and nature-based income-generating activities.
    - More research is needed on invasive species control, such as *Lantana camara* proliferation in forest ecosystem.
8. **Ecosystem valuation and research:**
    - Valuing biodiversity for sustainable forest management and ecosystem value as part of natural capital.
    - Use of Payment for Ecosystem Services as incentives and source of forest landscape benefits with communities.
    - Hydrological Services Framework are missing in forest landscapes.
9. **Increased funding:**
    - Requesting more government funding for biodiversity data at the forest landscape level.

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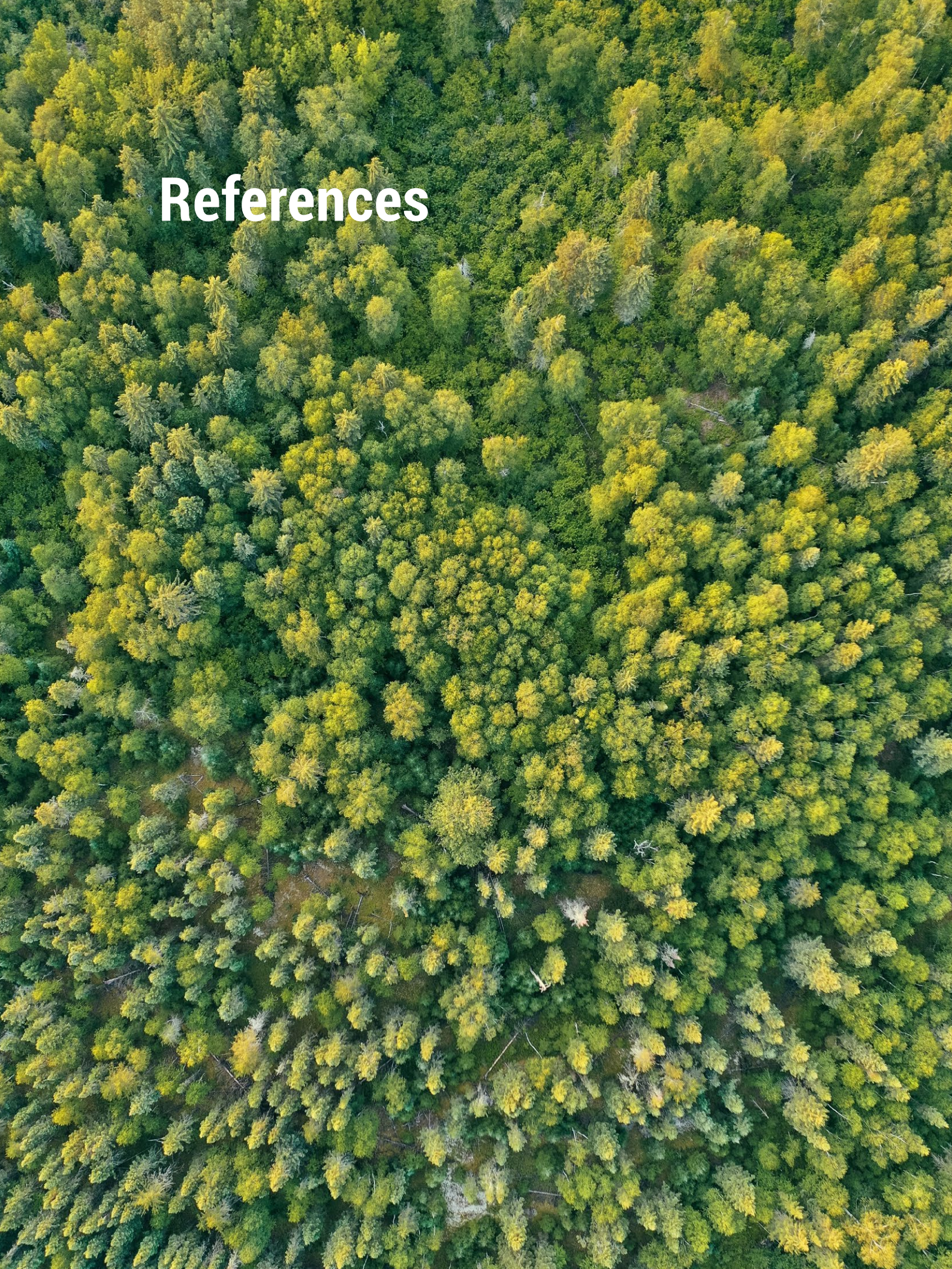

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Appendix 1: Survey Checklist

The following checklist will be used to guide discussion during meetings with the Community Forest Association and other stakeholders. Discussions will be customised

based on the stakeholders by the consultant;

1. To document the impacts of the Shamba system on biodiversity and water catchments and develop information highlights for the community and duty bearers.
   - Is biodiversity inventory part of PELIS?
   - How has PELIS impacted biodiversity, positively or negatively?
   - Which species are most affected at various stages of clearing, pruning, harvesting?
   - How is the water catchment affected by PELIS?
   - What improvement can be incorporated in PELIS?

2. To document successes and challenges of Plantations Establishment and Livelihoods Improvement Scheme (PELIS) and make recommendations.
   - List five success of PELIS in your area and at country level.
   - How can these be enhanced?
   - List five challenges associated with PELIS implementation.
   - How can these be addressed?

3. To assess the impacts of overlapping mandates on the protection of forests by reviewing Forest Act 2016, Water Act 2016, Wildlife Act, Heritage and Museums Bill 2021, National Environment Coordination Act 2012, National Biodiversity Strategy and Action Plan 2019-2030 (among others) and suggest strategies to address the overlaps.
   - How do the various government agencies work with CFA/Forest
   - Which are areas of complementarity and how can this be strengthened
   - Which are the areas of conflict and how this be resolved
   - How are MEAs included on forest management with respect to biodiversity management

4. To establish management challenges in public forests, community forests and private forests and recommend actions to reduce the impacts of the challenges.
   - List challenges in various forest types in terms of;
     - Management of forest.
     - Stakeholders' engagement.
     - Benefit sharing.
     - Biodiversity documentation and management.
   - What can be done to address these changes?
   - How do you see the forest ecosystem playing a part in advancing biodiversity conservation, especially based on the Kenya legislation and MEAs, including COP 15, 30x30?

Appendix 2: Stakeholders Consultation

Kabaru Forest CFA Members

Members present during the training held on 15th June 2013

Name		User Rights
1.	Grace Nyokabi	PELIS
2.	Susan Kabui	PELIS
3.	Doughlas Gitonga	Water
4.	Shelmith Wanjiru	Firewood collection
5.	Mary Wambui	Firewood collection
6.	Benson Mwangi	Fish farming
7.	Bernard Gikonyo	Bee farming
8.	Peter Wachira Muchemi	CFA chairman
9.	Peter Ndwiga	Security in charge
10.	Stephen Kamau	CFA secretary
11.	Maina Muriuki	Herbal

Gathiuru Forest Station

Members present during the training held on 16th June 2013

Name		User Rights
1.	Damaris Gitonga	Vice-chair CFA
2.	Munyua Miano	Education and research
3.	Patrick Kimathi	Nursery management
4.	James Muriuki	Eco-tourism
5.	Jacinta Wanjiku	Nursery
6.	Patricia Gichuru	Water
7.	Alex Karuiru	Mt Kenya biodiversity
8.	Simon	Herbal
9.	Kariuki Peter	Forester in charge

Karima Hill Community Forest

Members present during the training held on 17th June 2013

Name		User Rights
1.	Gideon Kibe	
2.	John Wachira	Sec CFA
3.	Lucy Waruguru Ndiritu	Environment
4.	Joseph Maina	
5.	Peter Mwangi	CFA chairman, fish farming

Kereita Forest

Members present during the training

S/N	Name	Organisation
1	Goerge Ngugi	Kireita CFA
2	Lydia Kinuthia	Kireita CFA
3	Joseph Githinji N	Keita CFA Secretary
4	Lydia Wambui Njihia	Farmer
5	David H Kahanda	Chairman CFA
6	James Mariga Mwaura	CFA Kereita
7	Tabitha Watiri Wangari	Farmer
8	Martin Rarega	Kereita CFA
9	Joan Wangeci Kinyanjui	Kereita CFA
10	Beth Nduta Thiong'o	KFS
11	Milka Wangari Ngugi	KFS College, Intern
12	Susan Kariuki Mwihaki	KFS College, Intern
13	Thuita Thenya	EMS
14	Patience Mnyaara	EMS
15	Gathuru Mburu	ICE
16	Elijah Kamau	ICE

Kieni Forest

Members present during the training

S/N	Name	Organisation
1	Samuel Gichuru Mathiu	KFS
2	Robert Mwangi Ngaruya	CFA Kieni
3	Susan Wanjiku Chege	CFA Kieni
4	Francis Kimani Mburu	CFA Kieni
5	Daniel Mugu Njoroge	CFA Kieni
6	Dedan Kinyanjui	CFA Kieni
7	Mary W. Wainana	CFA Kieni
8	Racheal W. Kainifa	CFA Kieni
9	Simon Ngariuku Njathi	CFA Kieni
10	Joyce M. Kamau	CFA Kieni
11	Joseph K. Kiarie	CFA Kieni
12	Thuita Thenya	EMS
13	Patience Mnyapara	EMS
14	Patricia Mambo	ICE
15	Gathuru Mburu	ICE
16	Elijah Kamau	ICE

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Appendix 4: Validation Workshop Pictures

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