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FOREST AND LANDSCAPE RESTORATION OPPORTUNITIES ASSESSMENT (ROAM) FOR MUKOGODO LANDSCAPES IN KENYA



TECHNICAL REPORT

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Cover page pictures: A stream within Mukogodo forest

(Photo credit: Ilmamusi CFA)

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ABBREVIATIONS AND ACRONYMS

| | |
|--------|--|
| ASALs | Arid and Semi-Arid Lands |
| BCR | Benefit Cost Ratio |
| EAA | Equivalent Annual Annuity |
| EMCA | Environmental Management and Co-ordination |
| FAO | Food and Agriculture Organisation |
| FLR | Forest Landscape Restoration |
| GoK | Government of Kenya |
| IRR | Internal Rate of Return |
| IUCN | International Union for Conservation of Nature |
| KEFRI | Kenya Forestry Research Institute |
| KES | Kenya Shillings |
| KFS | Kenya Forest Service |
| NGO's | Non-Governmental Organizations |
| NPV | Net Present Value |
| REDD+ | Reducing Emissions from Deforestation and Forest Degradation |
| ROAM | Restoration Opportunities Assessment Methodology |
| SDG | Sustainable Development Goals |
| SNFLRA | Sub-National Forest Landscape Restoration Assessment |
| UN | United Nations |
| WRI | World Resources Institute |
| WWF | World Wildlife Fund |

EXECUTIVE SUMMARY

This report presents the findings of a Sub-National Forest Landscape Restoration Assessment (SNFLRA) for Mukogodo forest landscape. The SNFLRA process was launched in December 2020 by the Kenya Forestry Research Institute, Food and Agriculture Organization of the United Nations and other concerned stakeholders. The Mukogodo forest landscape assessment was designed to identify needs and opportunities for the restoration of the productivity and ecological function of degraded and deforested landscapes in Mukogodo forest that contributes to ensuring Kenya achieves sustainable development goals related to food, water, and livelihood security and climate resilience.

The SNFLRA Report, provides the data, analyses and vision to achieve sub-national landscape restoration in Mukogodo. Successful restoration is achieved by strategically addressing the drivers of land degradation and deforestation that limit the overall ecosystem functioning. In addition, this report provides the framework for restoration of landscapes thus contributing towards achieving Kenya's commitment of 5.1-million-hectare national restoration commitment to the African Forest Landscape Restoration Initiative (AFR100) under the Bonn Challenge. The SNFLRA process involved a series of activities that were geared towards assessing the restoration opportunities for the Mukogodo forest landscape.

The SNFLRA Process: The SNFLRA process took into cognizance of the importance of stakeholder engagement throughout the process. The process began with the training of key personnel drawn from Kenya Forestry Research Institute, Kenya Forest Service, and National Museums of Kenya, Kenya Wildlife Service, Laikipia Wildlife Forum, Northern Rangeland Trust, Ilmamsi CFA and county representatives. The core implementation team was trained by experts from IUCN and WRI. The core implementation team was taken through the ROAM process and were equipped with the necessary skills for undertaking the sub-national forest landscape restoration opportunities assessment.

A data mining workshop was held in February 2021. This was organized by KEFRI in collaboration with FAO-Kenya. The workshop involved stakeholders working in Mukogodo landscape. The stakeholders included: Kenya Forest Service (KFS), National Museums of Kenya (NMK), Kenya Wildlife Service (KWS), Laikipia wildlife forum, Mukogodo CFA, Northern Rangeland Trust (NRT) and Ministry of Environment and Forestry. The objective of the workshop was to take stock of existing data for Mukogodo landscape was used in the

ROAM assessment. Specific objectives included to: Define the land degradation problem; Undertake data information mining on biophysical issues of the two landscapes; undertake data mining on socio-economics aspects of the two landscapes; Undertake stakeholder identification and mapping for Mukogodo landscape; Undertake stratification of the landscape and Develop of ROAM workplan.

The ROAM assessment was then undertaken through series of stakeholder workshops held in Iingwesi and Makurian within the landscape. Stakeholders were also drawn from the conservancies surrounding the forest and organizations working within the landscape. The stocktaking and mapping technical team completed two complementary spatial assessments, one which focused on the identification of appropriate areas for prioritized restoration interventions, and a multi-criteria analysis that used spatial data to help prioritize investment in FLR interventions. The policy and institutional technical team researched and delineated the laws, policies, and practices that both supported and hindered restoration activities in Kenya. Their analysis is based on interactions with key policy makers and a thorough review of Kenya's enabling framework as well as international laws and conventions.

The economics and finance technical team used the results of the intervention mapping to perform a cost benefit analysis on the transitions to "restored" land uses based on the financial capital and opportunities costs of each restoration transition and its estimated area in Mukogodo landscape. The financial analysis determined the total investment needed in FLR for Mukogodo landscape to achieve its restoration objectives and recommends ways these costs can be borne by both public and private financing sources.

SNFLRA activities were designed using the tools and methods documented in the publication 'Assessing Forest landscape restoration opportunities at the national level: A guide to the Restoration Opportunities Assessment Methodology (ROAM)' (IUCN & WRI, 2014), which provides a flexible framework to rapidly assess the opportunities for forest landscape restoration (FLR) at the national and sub-national levels.

Key Findings: Stakeholder consultations identified a number of biophysical (Soil erosion; Invasive species; Deforestation; Climate change; Reduced crop yields; Loss of biodiversity; Loss of vegetation cover; Reduced rangeland health; and Pollution from charcoal production) and socioeconomic (Limited income sources leading to unsustainable sand and charcoal production; Overgrazing; Land tenure issues; Limited entrepreneurial culture; Overdependence

on forests; Fire incidences; Human-wildlife conflicts; Encroachment for agriculture activities; and Poor infrastructure development) challenges related to land use that are most critical for restoration to address in Mukogodo landscape. To address these land use challenges, six priority FLR interventions (Rangeland's restoration, Rehabilitation of degraded natural forests, Tree-based Buffer Zones along Water Bodies and Wetlands, Agroforestry on Cropland, Afforestation and reforestation of natural forests and Tree-based Buffer Zones along Roads) were identified through stakeholder consultations as having potential for implementation in the Mukogodo forest landscape. The areas available for each of these interventions were then calculated in a GIS using a series of biophysical criteria to determine the hectares available for each intervention within Mukogodo forest and landscape. In total, nearly 311,496 hectares have potential for restoration. Restoration opportunities potential per option in Mukogodo landscape is as follows: Rehabilitation of degraded natural forests (23,406 ha); Agroforestry on Cropland (468 ha); Tree-based Buffer Zones along roads (5,453 ha); Tree-based Buffer Zones along Water Bodies and Wetlands (1,167 ha); afforestation and reforestation of natural forests (2,507 ha), and Rangeland's restoration (278,824 ha).

In terms of economic analysis of the restoration options, the findings revealed that the transition for each option is economically viable since they can pay for themselves within a 30 -year time. The economic benefits achieved through these interventions are sale of firewood, carbon sequestration, water flow regulation, air quality improvement, provision of shade, aesthetic, maize, timber, fruits, soil fertility improvement, provision of grass and hay, sale of bamboo culms and soil erosion prevention. A total of KES 71,587,637,551 is required for undertaking restoration in Mukogodo within a 30-year period. The cost of restoration per option in Mukogodo landscape is as follows: Rehabilitation of degraded natural forests (KES3,681,529,740); Agroforestry on Cropland (KES 239,749,344); Tree-based Buffer Zones along roads (KES 151,293,886); Tree-based Buffer Zones along Water Bodies and Wetlands (KES703,835,205); afforestation and reforestation of natural forests (KES 852,199,496) and Rangeland's restoration (KES 65,954,299,880). To ensure successful implementation of forest and landscape restoration programmes and plans, different financing mechanisms ranging from global commitments and pledges, regional and sub-regional partnerships with financial institutions such as African Development Bank (AfDB), World Bank; national budget to public private partnership financing models are proposed.

This analysis provides the information necessary to design FLR interventions that can be implemented with specific attention paid to the severity and type of degradation in these areas, and the contributions landscape restoration can make to food security, resilience against climate change, and biodiversity conservation. This necessary information can now be integrated into county planning for social and economic resilience and can unlock different streams of financing for restoration.

INTRODUCTION

1.1. Background Information

Forest and land degradation are a serious global problem. It is estimated that between one to six billion hectares of land globally is degraded (Gibbs & Salmon, 2015). Forest and land degradation pose a major threat to global food security and achievement of the Sustainable Development Goals (SDGs) thus compromising the well-being of at least 3.2 billion people around the world. The main cause of degradation is through conversions of forests to alternative land uses which has impacted negatively on productivity and diminished the flow of products and services for human well-being. Forest landscape restoration received global endorsement through the Bonn Challenge (Van Andel & Aronson, 2012). The global community pledged to restore 150 million hectares of the world's deforested and degraded land by 2020, and 350 million hectares by 2030 (www.bonnchallenge.org/content/challenge). Underlying the Bonn Challenge is the Forest and Landscape Restoration (FLR) approach, which aims to restore ecological integrity and improve human well-being through multifunctional landscapes. The idea of Forest and Landscape Restoration (FLR) was mooted more than 20 years ago to focus more on restoration beyond the industrial plantations (Stanturf et al., 2015). This was informed by the fact that continued land degradation has long-term effects on the overall human wellbeing, hence the need to address the issue to avoid negative impacts.

As part of its commitments to the Bonn challenge and Forest Landscape restoration to restore degraded land, Kenya has committed to restore of 5.1 million hectares by 2030. A national assessment of the feasible restoration options has been undertaken using the Restoration Opportunities Assessment Methodology (ROAM). ROAM was developed through a collective learning process that involved many organizations in Ghana, Mexico and Rwanda. On a landscape level, ROAM has been proposed for Mukogodo forest and Mt. Kulal landscapes. The two landscapes provide crucial forest products and environmental services to communities within the two landscapes. It is against this backdrop that a workshop was organized by KEFRI in collaboration with FAO-Kenya to take stock of existing data on biophysical, socio-economic, and policy and institutional framework for the two landscapes. Data mining is a crucial step in the ROAM process.

The Government of Kenya has taken various steps in terms of policy measures to increase its tree cover and restoring the ecosystem services in support of realization of its economic,

environmental and developmental goals. The National Climate Change Response Strategy and National Climate Change Action Plan call for growing 7.6 billion trees on 4.1 million hectares of land during the next 20 years. Kenya's pledge to the Bonn Challenge is to restore 5.1 million hectares by 2030, of which 1 million hectares is planned to be from restoration of forestlands. This will require a substantial amount of resources, both financial and technical and in this consideration, the Food and Agriculture Organization of the United Nations has collaborated with a variety of national and international partners to develop two Projects (GEF 5 and GEF 6). The project – 'Restoration of Arid and Semi-arid Lands of Kenya through Bio-enterprise Development and Other Incentives' - approved by the Global Environment Facility (GEF) for a total budget of 16.6 million dollars for a duration of 5 years.

The project is on restoration of Arid and Semi-Arid lands of Kenya through bio-enterprises development and other incentives. The Restoration Initiative (TRI) is being executed by FAO with KEFRI as the lead National implementing institution. The Project is being implemented in: Mount Kulal Biosphere Reserve (Marsabit County) and Mukogodo Forest and landscape (Laikipia and Isiolo counties). The overall objective of the project is to: restore deforested and degraded lands through the Forest Landscape Restoration (FLR) approach and enhance the socio-economic development of local communities through development of bio-enterprises of Non-Timber Forest Products and Services (NFTPS) in ASALs. The project strategy is built around four components. Component 1: Policy development and integration aims to build the gap from the FLR policy to a strategy, and to support the decentralization of FLR policy and the development of a NFTPS policy. Component 2 focuses on the implementation of FLR actions in two specific landscapes and the development of NTFPS bio-enterprises and includes an assessment of ecosystem services on project sites. Component 3 strengthens capacity of counties and communities to implement and coordinate FLR. Finally, Component 4 supports knowledge management and monitoring on FLR in Kenya, as well as knowledge sharing with other TRI projects.

The Kenya Forestry Research Institute (KEFRI) will be the implementing partner for this activity in collaboration with other key partners including Kenya Forest Service (KFS), Kenya Wildlife Service (KWS), National Museums of Kenya, Gums and Resins Association of Kenya (GARA), the County governments of Samburu, Marsabit, Isiolo and Laikipia, Community Forest Associations, Non-state actors, private sector actors and CB

DESCRIPTION OF MUKOGODO FOREST LANDSCAPE

2.1 Biophysical and Socio-Economic description of Mukogodo Landscape

The Mukogodo forest is a national forest reserve and one of the last remaining dry forests in Kenya. Mukogodo forest reserve is a mosaic of closed forest, open forest and open grasslands. It covers a landmass of 30,189 Ha, with cedar and olive trees being the major tree species. The forest and landscape falls in two adjacent counties; Laikipia and Isiolo counties. Surrounding the forests are vast rangelands which have been transformed into conservancies which in turn comprise a number of group ranches. The four conservancies within Laikipia County; Illngwesi (9,470 ha), Lekurruki (15,872 ha), Kurikuri (3,340 ha) and Makurian/ Mayanat (5,390 ha) located between 37° 14' and 37° 35' E latitude and 00° 35' to 00° 40' longitude while those in Isiolo county includes; Leparua conservancy (34,200 ha) located between 37° 36' and 37° 51' E latitude and, Oldonyiro (Narupa, Nanapa, Naapu and Nanapsho) (52,500 ha), 36° 29' to 36° 85' E latitude and 10° 00' longitude. It lies on an important historical elephants' migration route between the northern rangelands and Laikipia, traversing Borana and Lewa Conservancies, Ngare Ndare forest, and is part of the elephant corridor leading to Mount Kenya. The elevation ranges between 1,600 and 2,100 m.

The Mukogodo forest landscape receives an annual mean rainfall of 400-600 mm; the rainfall distribution is bimodal with peaks of long rains in March-April and short rains in October-December (Muiruru, 2008). Its landscape contains rugged terrains characterized by hilly masses of between 10 and 40 % slope (Paerl, 2001). The soils in the landscape were formed from basement rocks. There are two types of soils within Mukogodo Forest and landscape; One consists of deep, dark grayish brown dense compact clayey soils that crack extensively when dry and expand when wet (Black Cotton Soils). These soils are moderately well drained, very slowly permeable and are medium to high in natural fertility. However, they are droughty and generally have poor tilth. The other soils are deep, dark brown to reddish brown, well drained and have clay loam to clay sub-soils. These soils are medium to high in natural fertility and take in water at moderate to slow rates. The landscape is an important watershed, which maintains water quality, quantity, and regulates flow (Mbuvi *et al.*, 1995). It is an important

water catchment to the surrounding communities and the neighboring Counties (Ifejika et al, 2018; Okello, 2005) and is identified as one of Kenya's important water towers (KWTA, 2015).

The annual forest cover loss within Mukogodo is estimated to be 383 ha (KFS, 2018). The forest is also an important biodiversity hotspot with a vegetation characterized by different species of *Acacia*, *Boscia*, *Commiphora*, *Sansevieria*, *Salvadora persica*, and grass species of *Eragrostis superba*, *E. tenuifolia*, *Pennisetum mezianum*, *Chloris pycnothrix*, *C. roxburghiana*, *Cenchrus cenchroides*. The ecosystem hosts Kenya's second highest density of wildlife including the highest concentration of elephants outside of protected areas making it a potential tourist destination (Gadd, 2005).

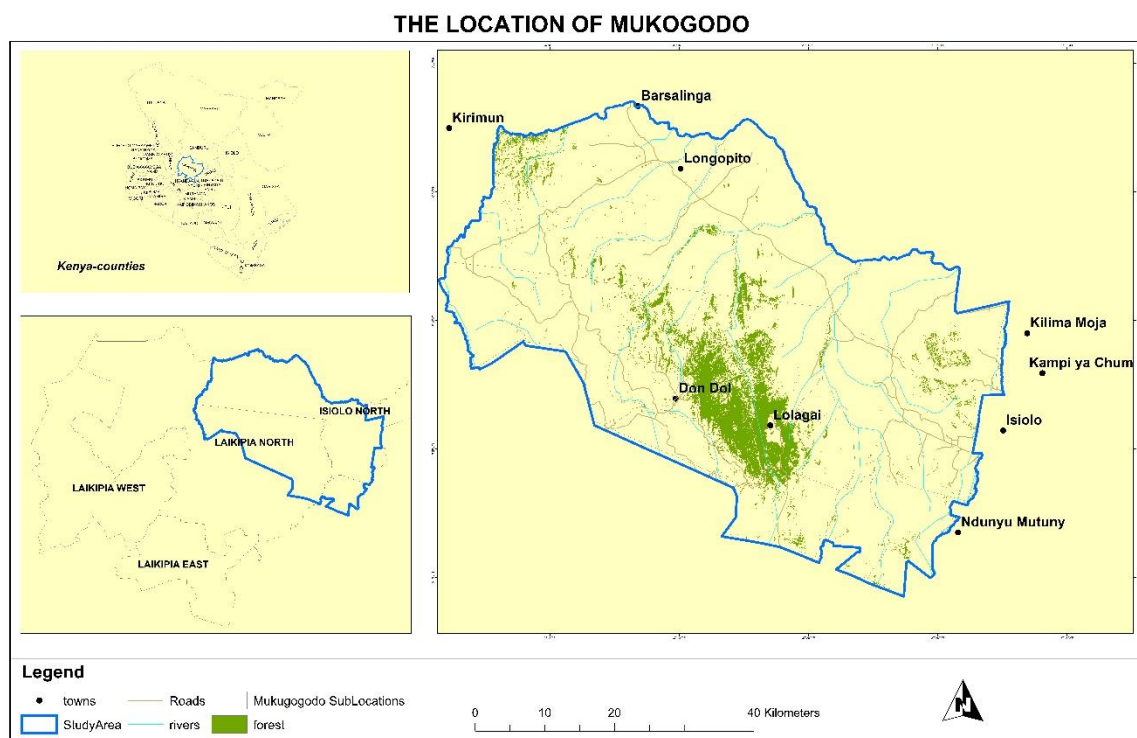


Figure 1: Location of Mukogodo Ecosystem

2.2 People

The main ethnic group in Mukogodo are the Maasai, more specifically the Laikipia Maasai, (Cronk, 2018) though the two Isiolo conservancies are mainly Samburu and Turkana in Oldonyiro and Ndorobo, Turkana, Somali, Borana, Samburu in Leparua. The area is also home

to the indigenous hunter-gatherer community Yiaku (Yaaku) also known as Mukogodo Maasai (Brenzinger, 2012).

2.3 Administrative Division and Population

Mukogodo Forest falls under Mukogodo Location in Laikipia North Subcounty. Mukogodo location is divided into Iingwesi, Ipolei, Makurian, Mukogodo, Mumonyot and Sieku sub-locations. It has an area of 939.7 sq. km and a population of 16,915 people consisting of 8,390 male and 8,525 female in 3551 households. The population density is 18 persons per sq. km (Table 1). (KNBS 2019).

Table 1: Population characteristics of Mukogodo Location Source: KNBS 2019

| Sub-location. | Total population | Male | Female | HH | Sq. Km | Persons per Sq. Km |
|-----------------------------------|-------------------------|-------------|---------------|-----------|---------------|---------------------------|
| ilngwesi | 1,364 | 659 | 705 | 286 | 154 | 9 |
| Ipolei | 3,310 | 1,742 | 1,568 | 771 | 190 | 17 |
| Makurian | 3,030 | 1,493 | 1,537 | 563 | 94 | 32 |
| Mukogodo | 3,690 | 1,795 | 1,895 | 854 | 165.8 | 22 |
| Mumonyot | 4,276 | 2,086 | 2,190 | 877 | 147 | 29 |
| Sieku | 1,245 | 615 | 630 | 237 | 188.9 | 7 |
| Total of mukogodo location | 16,915 | | | | | |

2.4 Land tenure and land use

Land is communally owned and divided into communally owned ranches (Makurian, Kurikuri, Iingwesi and Leikkuruki) and privately owned ranches that are used for livestock keeping. Various parts of the reserve are protected and set aside as conservancies which serve as protection areas for wild game (Seno and Shaw, 2002).

2.5 Source of Livelihoods

The primary sources of income among the communities in Mukogodo are livestock and bee keeping. Other sources of income are business, formal employment and subsistent farming, hunting and gathering (Kinuthia, 2005).

To assess the level of land degradation in project site, Restoration Opportunities Assessment Methodology (ROAM) approaches was undertaken in Mukogodo landscape. The ROAM is aimed to deliver six products namely;

- A shortlist of the most relevant and feasible restoration intervention types across the assessment areas;
- Identified priority areas for restoration;
- Quantified costs and benefits of each intervention type;
- Estimated values of additional carbon sequestered by these intervention types;
- A diagnostic of the presence of key success factors and identification of strategies to address major policy, legal and institutional bottlenecks; and
- An analysis of the finance and resourcing options for restoration in the assessment area.

RESTORATION OPPORTUNITES ASSESSEMENT METHODOLOGY (ROAM)

3.1 Training of LRPs

The ROAM process started with training of eighteen practitioners drawn from national government, county government, development partners and other key agents working in the project areas. The training was conducted from 24th to 26th August 2020 through web-based video conference by facilitators from BBC Research & Consulting Partners of US in collaboration with FAO-Kenya and Nature Kenya. The training was aimed to (1) provide participants with comprehensive training on Restoration Opportunities Assessment Methodology (ROAM) in FLR assessments at the National, Sub national or landscape level. (2) To prepare participants to lead own FLR assessments using ROAM and (3) To create a ROAM work plan for participants to apply ROAM to their programs and projects

3.2 Stakeholders' data mining workshop

The workshop on data mining for Restoration Opportunities Assessment Methodology (ROAM) was organized by KEFRI in collaboration with FAO-Kenya. The workshop involved stakeholders working in Mukogodo and Mt. Kulal landscapes. The stakeholders included: Kenya Forest Service (KFS), National Museums of Kenya (NMK), County government of Marsabit, Kenya Wildlife Service (KWS), Laikipia wildlife forum, Mukogodo CFA, Northern Rangeland Trust (NRT) and Ministry of Environment and Forestry. The workshop was facilitated by KEFRI and FAO-Kenya.

3.2.1 Objectives of the workshop

The workshop was organized to take stock of existing data for Mukogodo and Mt. Kulal landscapes to be used in the ROAM assessment. Specific objectives included to:

- Define the land degradation problem in the two landscapes (Mukogodo and Mt. Kulal)
- Undertake data information mining on biophysical issues of the two landscapes
- Carry out data mining on socio-economics aspects of the two landscapes
- Undertake stakeholder identification, analysis and mapping for each landscape (Mukogodo and Mt. Kulal)
- Undertake stratification of the two landscapes
- Develop ROAM plan for the two landscapes

3.3 Stakeholder Engagement

A multi-sector consultation workshop was conducted to introduce the concept and benefits of landscape restoration, and to gain an understanding of the land use challenges affecting Mukogodo and Mt. Kulal landscapes. The workshop participants identified the key land use challenges, drivers, effects as well as a list of restoration interventions that could potentially mitigate these challenges. A list of stakeholders working within the ecosystems was also developed by the communities within the landscapes to help in the proposed restoration interventions. (Annex- attendance, all relevant materials developed during the engagement)



Plate 1: Stakeholders engagement during data mining (a) and Validation (b) workshop

SUMMARY OF KEY FINDINGS

3.4 Stakeholder Identification and Mapping for Mukogodo Landscape

A stakeholder's identification and mapping was undertaken to identify key actors who will be key in supporting planning, mobilization of resources and undertaking restoration activities with the Mukogodo landscape. A total of 27 key stakeholders were identified and profiled in terms of their roles and contribution in implementing and supporting restoration initiatives within Mukogodo Landscapes (Appendix 1).

3.5 Land Use Challenges, Drivers, Effects and Interventions

Land use challenges are defined as problems arising from the way land is used and/or managed. Based on how socioeconomic factors such as increase in population density, land tenure, shifting cultivation, lack of land use planning and policy as well as environmental factors such as changes in climatic patterns, availability of rainfall, wildlife habitat affect the way land is used and managed. Stakeholders who attended ROAM assessment workshop identified the following land use challenges as roadblocks to achieving economic, social, and environmental goals at the Mukogodo landscape. Stakeholder consultations identified a number of biophysical and socioeconomic challenges related to land use that are most critical for restoration in Mukogodo landscape (Table 2). Detailed analysis of land-challenges, their drivers, effects and possible intervention are provided in Appendix 2.

Table 2: Biophysical and Socio-economic land-use challenges identified by stakeholders as priorities for restoration for Mukogodo landscape

| Biophysical challenges | Socio-economic challenges |
|------------------------------------|--|
| Soil erosion | Limited income sources leading to unsustainable sand and charcoal production |
| Invasive species | Overgrazing |
| Deforestation | Land tenure issues |
| Climate change | Limited entrepreneurial culture |
| Reduced crop yields | Overdependence on forests |
| Loss of biodiversity | Fire incidences |
| Loss of vegetation cover | Human-wildlife conflicts |
| Reduced rangeland health | Encroachment for agriculture activities |
| Pollution from charcoal production | Poor infrastructure development |

To address these land use challenges, six priority FLR interventions (Afforestation and reforestation of natural forests; Rehabilitation of degraded natural forests; Agroforestry on Cropland; Commercial Tree and Bamboo Plantations; Tree-based Buffer Zones along Water

Bodies and Wetlands and Rangelands restoration) were identified through stakeholder consultations as having the potential for restoring the Mukogodo landscape. The areas available for each of these interventions were then calculated in GIS using a series of biophysical and socio-economic criteria to determine the hectares available for each intervention as shown in Table 3.

Table 3: Priority restoration interventions and the estimated opportunity area based on geospatial analysis for Mukogodo forest and landscape

| No. | Priority restoration intervention | Opportunity area (ha) |
|--------------|---|-----------------------|
| 1. | Afforestation and reforestation of natural forests | 2,507 |
| 2. | Rehabilitation of degraded natural forests | 23,406 |
| 3. | Agroforestry on Cropland | 468 |
| 4. | Tree-based Buffer Zones along roads | 5,453 |
| 5. | Tree-based Buffer Zones along Water Bodies and Wetlands | 1,167 |
| 6. | Rangeland's restoration | 278,495 |
| Total | | 311,496 |

Table 4: Landscape restoration options and their potential to partially address identified land use challenges for Mukogodo forest landscapes

| Land use challenges | Afforestation natural forests | Rehabilitation of degraded natural forests | Agroforestry on Cropland | Commercial Tree and Bamboo Plantations | Tree-based Buffer Zones along Water Bodies and Wetlands | Rangelands |
|---------------------------|-------------------------------|--|--------------------------|--|---|------------|
| Soil erosion | X | X | X | X | X | X |
| Invasive species | X | X | X | | | (X) |
| Deforestation | (X) | (X) | X | (X) | | |
| Climate change | X | X | X | X | X | X |
| Reduced rangeland health | | (X) | | | | X |
| Loss of biodiversity | X | X | (X) | (X) | X | (X) |
| Overgrazing | (X) | (X) | X | | (X) | X |
| Overdependence on forests | (X) | (X) | X | X | (X) | |
| Pollution | X | X | | | | |
| Encroachment | | (X) | X | | | |

Legend:

X: this restoration option is important to address this land use challenge

(X): this restoration option is secondarily important to address this land use challenge

3.6 Restoration Interventions

Interventions that could directly or indirectly help address the land use challenges listed above (Table 4) were identified and prioritized based on their potential to help in restoration and the main ecosystem services desired. The following 6 national landscape restoration opportunities were identified as the most relevant to Mukogodo covering a total area of **311,496 ha**.

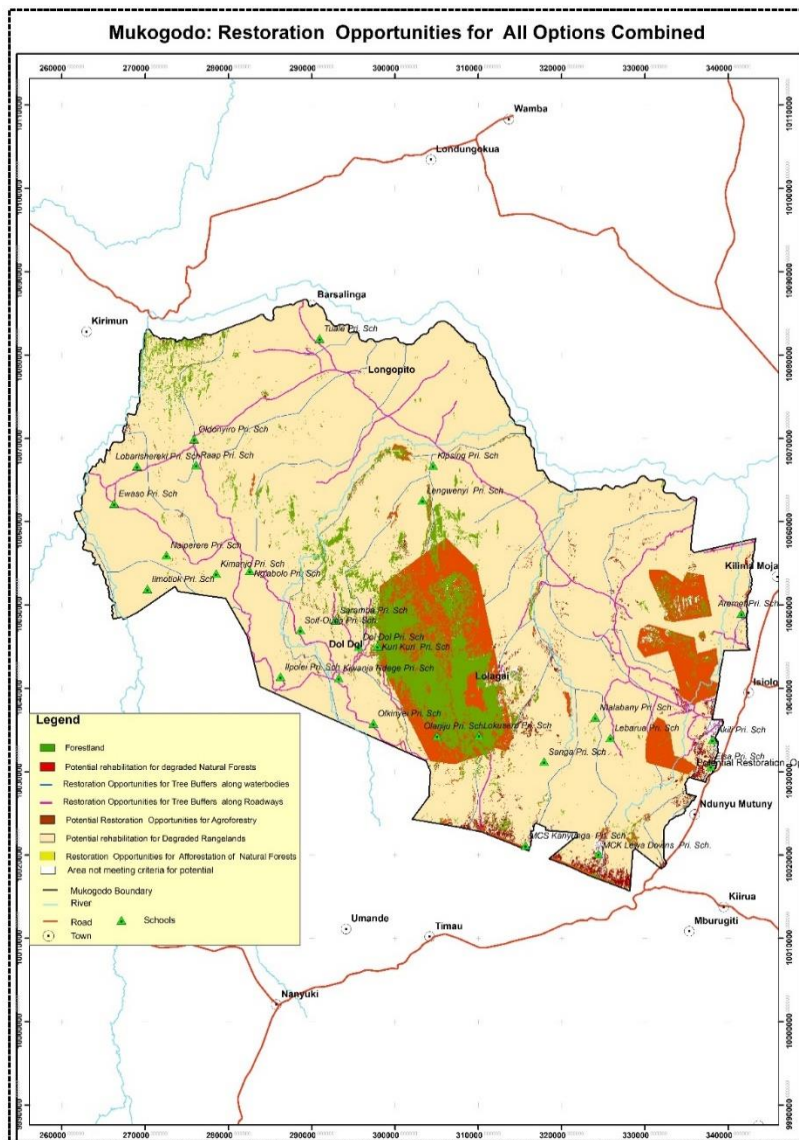


Figure 2: Restoration opportunities in Mukogodo Ecosystem

Option 1: Restoration Opportunities for Rangelands

Potential opportunities for restoration of degraded rangeland and grassland areas. Using this approach, **278, 495 ha** (Figure 2) were estimated for restoration this in ecosystem. Different grass

species were identified for use in the restoration. These species include; *Cenchrus cenchroides*, *Chloris pycnothrix*, *Eragrostis aspera*, *E. patula*, *E. superba*, *E. tenuifolia*, *Cynodon spp*, *Pennisetum mezianum*, *Chloris roxburghiana* and *Aristida spp*.

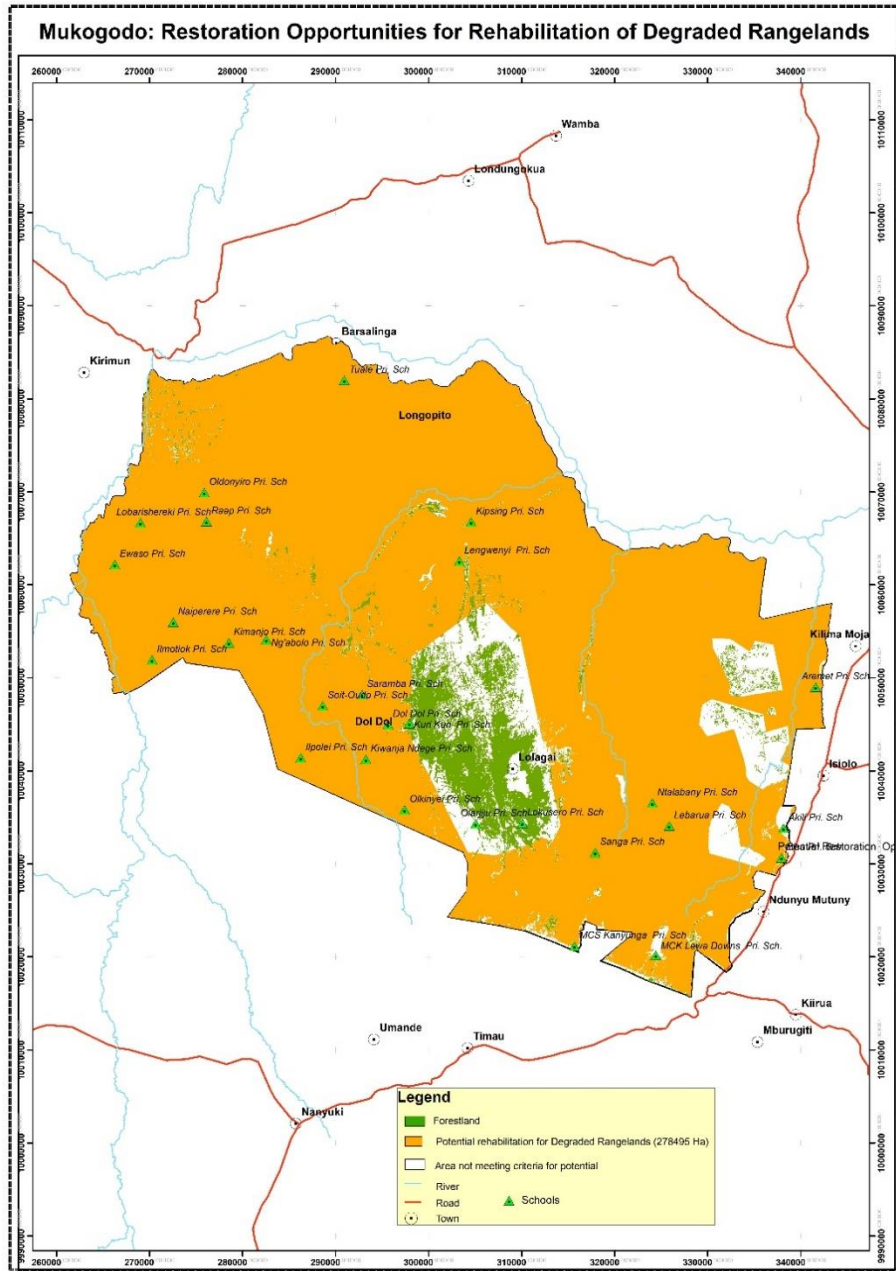


Figure 3: Restoration potential for rangelands in Mukogodo Ecosystem

3.6.1 Option 2: Restoration Opportunities for Rehabilitation of Degraded Natural Forests

This is a potential opportunity area for rehabilitating existing natural forests. A total of **23,406 ha** were identified and mapped for restoration under this approach (Fig. 4). Species identified for this

work are; *Acacia brevispica*, *Acacia mellifera*, *Acacia nilotica*, *Acacia reficiens*, *Acacia senegal*, *Acacia seyal*, *Acacia tortilis*, *Acacia xanthophloea*, *Boscia angustifolia*, *Boscia coriacea*, *Commiphora africana*, *Commiphora edulis*, *Commiphora schimperi*

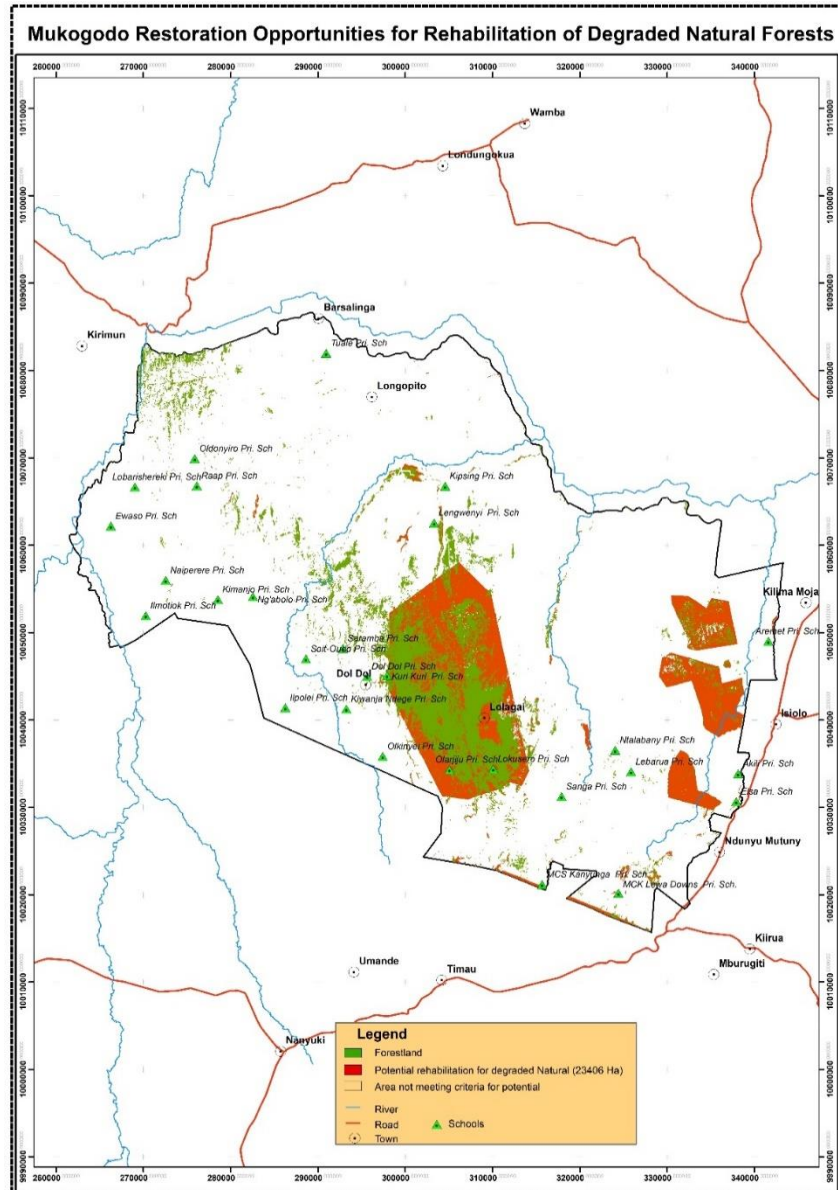


Figure 4 :Restoration potential for rehabilitation of degraded natural forests in Mukogodo landscape

3.6.2 Option 3: Restoration Opportunities for Tree-based Buffer Zones along Water Bodies and Wetlands

Potential areas along water bodies and wetlands where tree buffers can be established, and where currently there are no trees. These areas are critical due to the importance of trees in helping to

reduce erosion and sedimentation into waterways, and because of such, several laws and policies in Kenya require these buffers. It is important to note that while the total area where tree buffers could be established is relatively small, these areas play a key role in managing sediment and water quality and have the potential to provide high levels of ecosystem services and benefits to society and the environment. While there are no permanent rivers around and within Mukogodo ecosystem, several springs and seasonal rivers were identified where an area of **1,167ha** (Figure 3) was approximated to be suitable for restoration. Different plant species such as bamboo and vetiver grass were identified for planting in this area.

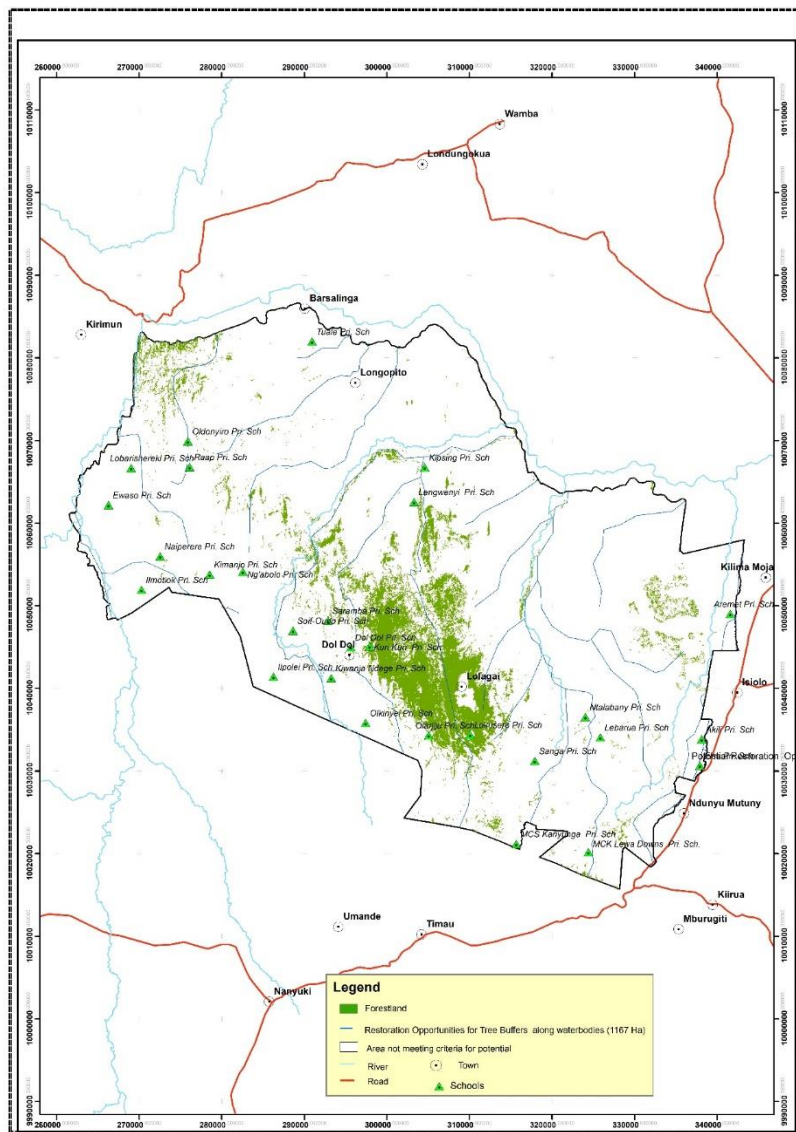


Figure 5: Restoration potential for tree-based buffer zones along water bodies and wetlands in Mukogodo Ecosystem

3.6.3 Option 4: Restoration Opportunities for Agroforestry on Cropland

Potential opportunity areas where on-farm trees or the use of agroforestry could be increased. This can be done through a number of different interventions such as field border plantings, woodlots, agroforests, and inter-planting trees with crops. An area of approximately **468 ha** (Figure 4) was identified to be suitable for restoration through agroforestry using different suitable plant species such as *Markhamia lutea*, *Osyris lanceolata*, *Podocarpus falcatus*, *Juniperus procera*, *Croton megalocarpus*, *Markhamia lutea*, Neem (*Azadirachta indica*), *Balanites aegyptiaca*, *Acacia senegal*, *Leucaena leucocephala*, *Senna siamea* and *Acacia tortilis*. Fruit plants (avocados, mangoes, oranges, pawpaws, passion, lemon, watermelon) were also identified as suitable for agroforestry in this area based on the specific elevation and rainfall of the specific area for planting.

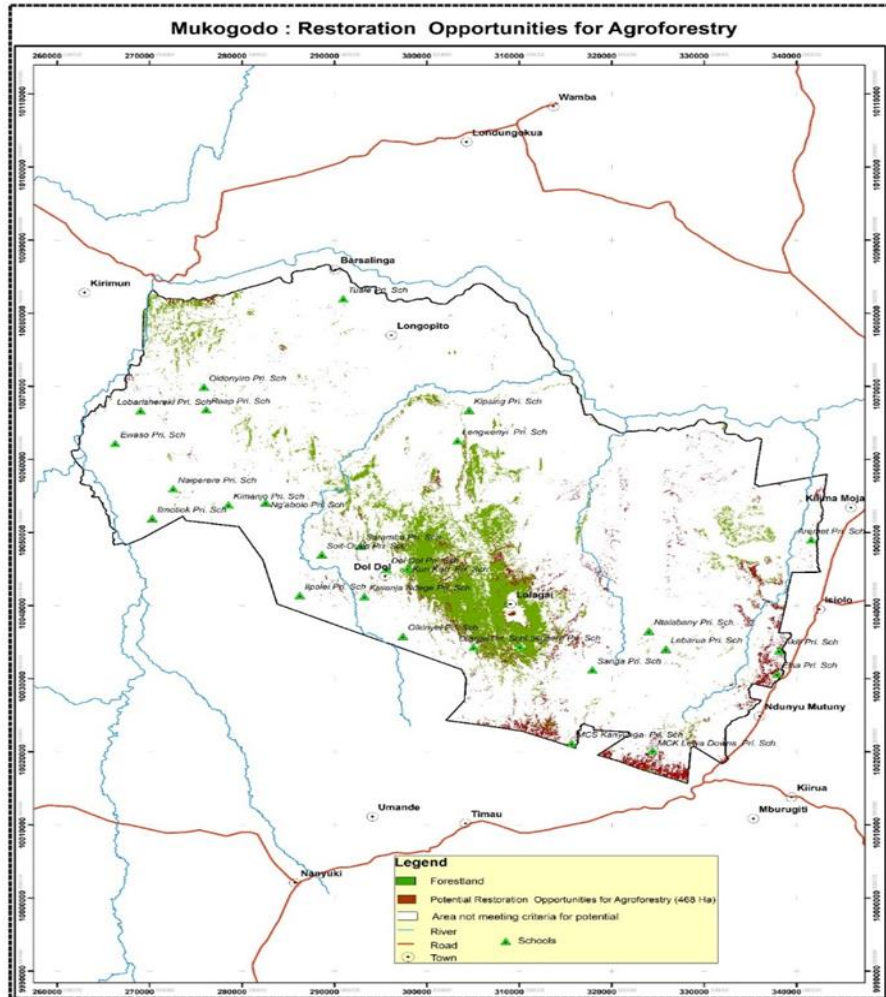


Figure 6: Restoration Opportunities for Agroforestry on Cropland

3.6.4 Option 6: Restoration Opportunities for Tree-based Buffer Zones along Roads

Potential areas along roads where tree buffers can be established. These buffers are important for controlling local air and noise pollution, as well as run off from road surfaces. Approximately **5,453.38 ha** area (Fig. 7) was identified. Different plants species will be used.

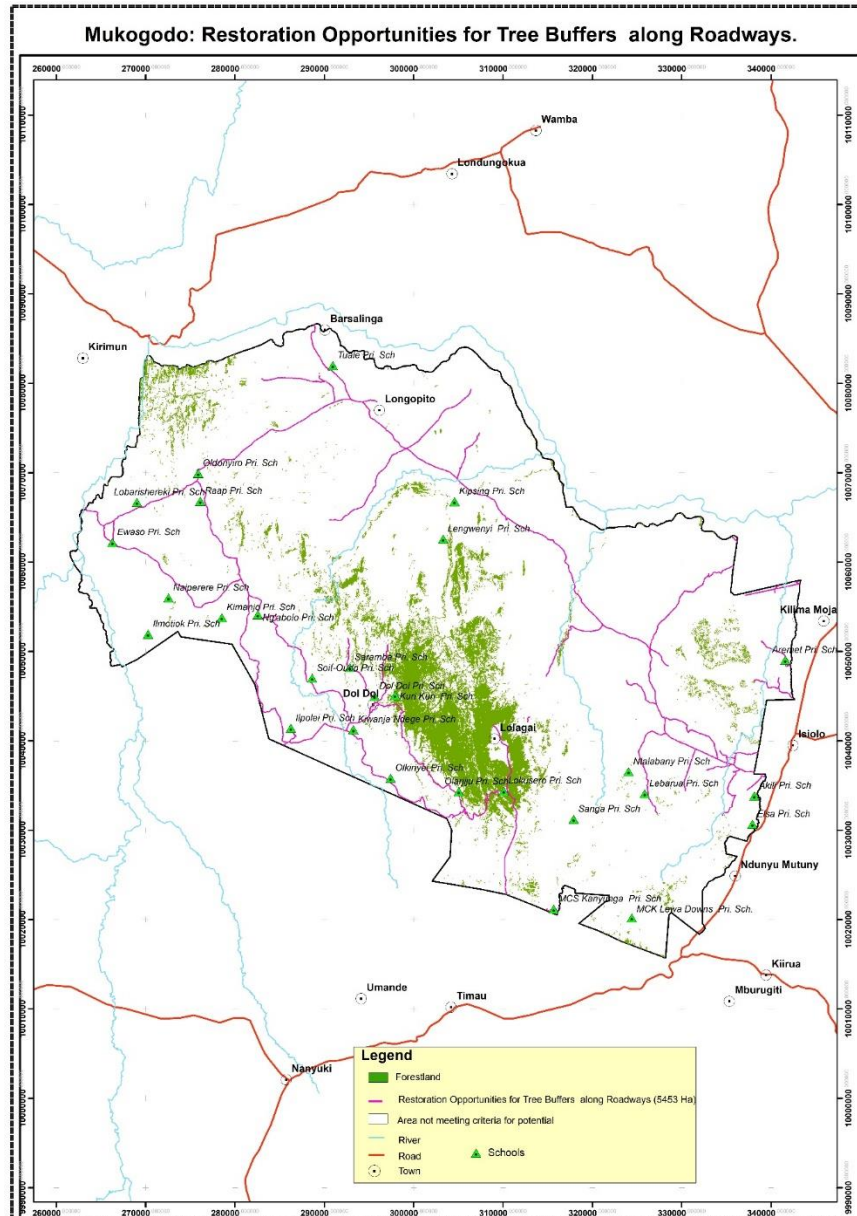


Figure 7: Restoration potential for tree-based buffer zones along roads in Mukogodo Ecosystem

ECONOMIC ANALYSIS OF FOREST AND LANDSCAPE RESTORATION OPTIONS FOR MUKOGODO LANDSCAPE

5.1. Restoration Transition from Degraded Natural Forests to Improved Natural Forests

One restoration approach, enrichment planting was considered in restoring degraded natural forests within the Mukogodo forest and landscape. Economic analysis of the restoration transition from degraded natural forests to improved natural forests through enrichment planting would generate a NPV of KES 318,559 per ha over the 30-year period. The economic benefits achieved through this intervention are sale of firewood, carbon sequestration, water flow regulation and soil erosion prevention. The BCR for the transition is 2.75 meaning for every 1 shilling in invested in the restoration process KES 2.75 will be generated within the 30-year period (Table 5). Species identified for being ideal for restoration are; *Acacia brevispica*, *Acacia mellifera*, *Acacia nilotica*, *Acacia reficiens*, *Acacia senegal*, *Acacia seyal*, *Acacia tortilis*, *Acacia xanthophloea*, *Boscia angustifolia*, *Boscia coriacea*, *Commiphora africana*, *Commiphora edulis*, *Commiphora schimperi*. The discounted cost value for the restoration opportunity is estimated at KES 157,290 per ha. This transition is economically viable since it has the ability to pay for itself within the 30-year time period.

Table 5: Economic Analysis of Transition from Degraded Natural Forests to Improved Natural Forests through Enrichment Planting

| Transition | Land use | Economic Evaluation Criteria @ 7% discount rate | |
|---|------------|--|------|
| | | Net Present Value (NPV) | BCR |
| Degraded natural forest to improved enriched natural forest | Baseline | 649,509 | |
| | Improved | 968,068 | |
| | Transition | 318,559 | 2.75 |

5.1.1. Restoration Transition from Degraded Agricultural Landscapes to Improved Agroforestry Systems

Agroforestry involves integration of trees with crops. The trees identified in Mukogodo landscape suitable for restoration through agroforestry using different suitable plant species such as *Markhamia lutea*, *Osyris lanceolata*, *Podocarpus falcatus*, *Juniperus procera*, *Croton megalocarpus*, *Markhamia lutea*, Neem (*Azadirachta indica*), *Balanites aegyptiaca*, *Acacia*

senegal, *Leucaena leucocephala*, *Senna siamea* and *Acacia tortilis*. Fruit plants (avocados, mangoes, oranges, pawpaws, passion, lemon, watermelon) were also identified

The economic benefits achieved through this intervention are maize, firewood, timber, fruits, carbon sequestration and soil fertility improvement. The BCR for the transition is 25.64 meaning for every 1 shilling invested in the restoration process KES 25.64 will be generated within the 30-year period (Table 6). The discounted cost value for the restoration opportunity is estimated at KES 511,708 per ha. This transition is economically viable since it has the ability to pay for itself within the 30-year time period.

Table 6. Economic Analysis of transition from degraded agricultural landscapes to improved agroforestry systems

| Transition | Land use | Economic Evaluation Criteria @ 7% discount rate | |
|---|------------|--|-------|
| | | Net Present Value (NPV) | BCR |
| Traditional Agriculture to Agroforestry <i>Grevillea robusta</i> , Maize and Avocado | Baseline | 97,183 | |
| | Improved | 1,088,598 | |
| | Transition | 991,415 | 25.64 |

5.1.2. Restoration of Degraded Rangelands and Woodlands

Grass reseeding restoration approach was considered in restoring degraded grasslands and woodlands within Mukogodo landscape; grass reseeding using improved grasses namely *Cenchrus cenchroides*, *Chloris pycnothrix*, *Eragrostis aspera*, *E. patula*, *E. superba*, *E. tenuifolia*, *Cynodon spp*, *Pennisetum mezianum*, *Chloris roxburghiana* and *Aristida spp*. Transition from degraded grasslands to reseeded grasslands would generate a NPV of KES 532,566 per ha over the 30-year period (Table 7). The discounted cost value for the restoration opportunity is estimated at KES 236,824 per ha. The economic benefits achieved through this intervention are grass (hay), grass seed and some minimal carbon sequestration.

Table 7. Economic Analysis of Transition from Degraded Rangelands and Woodlands to reseeded Grasslands

| Transition | Land use | Economic Evaluation Criteria @ 7% discount rate | |
|------------|----------|--|-----|
| | | Net Present Value (NPV) | BCR |

| | | Net Present Value (NPV) | BCR |
|--|------------|----------------------------|------|
| Transition from degraded grasslands to reseeded grassland | Baseline | (207,026) | |
| | Improved | 325,539 | |
| | Transition | 532,566 | 29.2 |



Plate 3: Degraded grassland (L) and a grass reseeded land (R)

5.1.3. Restoration transition from degraded buffer zones along rivers and wetlands to bamboo and grass strip

Restoration of degraded buffer zones along rivers involves the planting of bamboo and grass strip. This transition would generate a NPV of KES 1,105,203 per ha over the 30-year period. The economic benefits achieved through this intervention are sale of grass, bamboo culms and carbon sequestration. The BCR for the transition is 2.35 meaning for every 1 shilling invested in the restoration process KES 2.35 will be generated within the 30-year period (Table 8). The discounted cost value for the restoration opportunity is estimated at KES 603,115 per ha. This transition is economically viable since it has the ability to pay for itself within the 30-year time period.

Table 8. Economic Analysis of restoration transition from degraded buffer zones along rivers and wetlands to bamboo and grass strip

| Transition | Land use | Economic Evaluation Criteria @ 7% discount rate | |
|------------|----------|--|-----|
| | | Net Present Value (NPV) | BCR |

| | | | |
|---|------------|-----------|------|
| Degraded riparian zones to bamboo and grass strip | Baseline | (92,953) | |
| | Improved | 1,012,250 | |
| | Transition | 1,105,203 | 2.35 |

5.1.4. Indigenous trees buffer along roads

Restoration of bare buffer zones along major road networks involves the planting of indigenous trees as buffers for the roads. This transition would generate an NPV of KES 96,972 per ha over the 30-year period. The economic benefits achieved through this intervention are carbon sequestration, aesthetic value, soil erosion prevention, Shade provision, air quality improvement and storm water protection. The BCR for the transition is 6.1 meaning for every 1 shilling in invested in the restoration process KES 6.1 will be generated within the 30-year period (Table 9). The discounted cost value for the restoration opportunity is estimated at KES 28,662 per ha This transition is economically viable since it has the ability to pay for itself within the 30-year time period.

Table 9. Economic analysis of transition from bare buffer zones along major road networks

| Transition | Land use | Economic Evaluation Criteria @ 7% discount rate | |
|---|------------|--|-----|
| | | Net Present Value (NPV) | BCR |
| Bare roads to trees buffers along roads | Baseline | 25,365 | |
| | Improved | 122,337 | |
| | Transition | 96,972 | 6.1 |

4 ROAM - RESTORATION FINANCING AND RESOURCE MOBILIZATION

4.1 Forest Landscape Restoration Financing

Effective implementation of restoration initiatives requires massive mobilization of resources that can sustain interventions over the target period, more often in the long run. Overgrazing, human encroachment, overdependence of forests by neighbouring communities, climate change, poor farming practices, unsustainable sand harvesting, demand for settlement land among others contribute immensely to landscape degradation. Consequently, this results to reduced tree and forest cover, soil erosion, human wildlife conflict, loss of livelihoods and farm incomes, strain on natural resources, drought and flooding. Further, it puts pressure on governments to spend more on environment focused programs leaving little for infrastructure development and social protection.

Currently, 21.6 percent of Kenyan landscapes including forests, wetlands, coastal areas, rangelands and agricultural lands are faced with severe degradation. Nationally, it is estimated that over a five-year period (2021-2025) restoration activities can cost about 61 billion Kenya shillings (approx. USD 555 million). This underpins the need for resource mobilization and funds flow for effective multi-sectoral forests and landscapes restoration interventions.

Part of this cost is a measurement within the focus areas of Mukogodo and Mt. Kulal ecosystems which have their own unique share of challenges

The two ecosystems have a combined 8,700 hectares requiring various direct interventions with Mukogodo and Mt. Kulal having 7,000 and 1,700 hectares respectively with works to do in rangelands grass reseeding, agroforestry, forested areas and natural regeneration in rangelands segregated in hectares.

To achieve projected total basket of these resources, there is need for mobilization from the international community, National and County government's budgetary allocations, development partners, the private sector, NGOs and CBOs.

Some of the global based networks to tap resources from include Global Partnership on Forest Landscape Restoration (GPFLR); International Union for the Conservation of Nature (IUCN); Society Ecological Restoration (SER); Global Environmental Facility (GEF) and International Food and Agricultural Development (IFAD); United Nations Development Programme (UNDP) among others.

4.2 Justification for resource mobilization for FLR

It is estimated that more than US\$1500 (App KES 150,000) per ha is needed for restoration of degraded lands (Pistorius and Freiberg, 2014). This depends on types of landscapes and

interventions involved. The amount exceeds by far what global funding has pledged and committed for restoration efforts and it also much higher than the financing abilities of governments. The situation is more serious in developing world where the largest potential for restoration is found.

In Kenya, economic analysis on FLR restoration focuses on 5.1 million hectares of degraded areas is estimated to cost KES 1.9 trillion (Cheboiwo *et al.*, 2018). Based on this ROAM assessment for Mukogodo Forest and landscape restoration the required resources for restoration over a 30-year period is estimated at KES 71.85 billion Kenya shillings (Table 10)

Table 10: Priority Restoration Interventions And The Estimated Opportunity Area Based On Geospatial Analysis

| No. | Priority restoration intervention | Opportunity area (ha) | Cost Per Ha | Required Resources (KES) |
|--------------|---|-----------------------|----------------|--------------------------|
| 1. | Afforestation and reforestation of natural forests | 2,507 | 339,928 | 852,199,496 |
| 2. | Rehabilitation of degraded natural forests | 23,406 | 157,290 | 3,681,529,740 |
| 3. | Agroforestry on Cropland | 468 | 511,708 | 239,479,344 |
| 4. | Tree-based Buffer Zones along roads | 5,453 | 28,662 | 156,293,886 |
| 5. | Tree-based Buffer Zones along Water Bodies and Wetlands | 1,167 | 603,115 | 703,835,205 |
| 6. | Rangeland's restoration | 278,495 | 236,824 | 65,954,299,880 |
| Total | | | 311,496 | 71,587,637,551 |

4.3 Financing mechanisms and sources for FLR

The implementation of forest and landscape restoration programmes and plans especially in developing world more so in Africa has attracted different financing mechanisms ranging from global commitments and pledges, regional and sub-regional partnerships with financial institutions such as African Development Bank (AfDB), World Bank; national budget to public private partnership financing models. Each of these financing mechanisms and sources are described in the following sub sections.

4.4 Global financing mechanisms

There are a few global financing mechanisms and sources that are crucial in the implementation of the interventions. Some of these include but not limited to the following:

1. Global Environment Facility (GEF);
2. Green Climate Fund;
3. Adaptation Fund;
4. Bio carbon Fund;
5. Forest Carbon Partnership Facility;
6. Readiness Fund (RF) for reducing emissions from deforestation and forest degradation (REDD+);
7. Worldwide Fund for Nature (WWF); and
8. Multi-lateral and bilateral funding agencies such as Japan International Cooperation Agency (JICA), Swiss Agency for Development and Cooperation (SDC), Swedish International Development Cooperation Agency (Sida), United States Agency for International Development (USAID), Norwegian Agency for Development Cooperation (NORAD) among others

Applicants must be knowledgeable about proposal conditions and criteria for submission in different landscapes for restoration.

4.4.1 Continental/Regional financing opportunities

At the continental level, Kenya is party to African Union's Agenda 2063. The agenda focuses on building climate resilient economies and communities, anchored under the African Forest Landscape Restoration Initiative (AFR100) that aims to restore 100 million hectares of deforested and degraded land in Africa by 2030. Through this commitment of AFR100, a number of technical and financial partners have set forth an ambition of over one billion dollars of grants and loan financing to all relevant stakeholders engaged in the assessment of restoration opportunities and identification, testing and active up-scaling of promising FLR solutions.

Some of these technical and financial partners include:

1. Global Environment Facility (GEF) that has aligned some of its approaches with AFR100 in response to the Bonn Challenge and the Global Partnership for FLR,

supporting restoration initiatives which create multiple benefits and engaging local communities;

2. Federal Ministry for Economic Cooperation and Development of Germany that is providing support for the structure of the initiative and for selected AFR100 countries;
3. World Bank with a commitment of USD 1 billion in institutional investment in 14 African countries by 2030, as part of the Africa Climate Business Plan to support Africa's climate resilient and low carbon development;
4. TerrAfrica process, a partnership between FAO, World Bank and NEPAD. It brings together African countries and partners to share a common vision, exchange knowledge, and scale up Sustainable Land Management (SLM).

4.4.2 Sub-Regional Financing Frameworks and Initiatives

Kenya is a member of the East African Community (EAC), Intergovernmental Authority on Development (IGAD) and Common Market for Eastern and Southern Africa (COMESA). The shared terrestrial and aquatic ecosystems with neighbours host wildlife, flora and fauna which can generate incomes if effectively managed. The ecosystem is not without challenges including but not limited to depletion of natural resources, expansion in human activities.

In view of this, proposals can target:

- East African Community (EAC) Climate Change Policy and Strategy (2018-2023),
- Lake Victoria Basin Commission's Climate Change Adaptation Strategy and Action Plan,
- The Protocol for Sustainable Development of Lake Victoria Basin and the Protocol on Environment and Natural Resources for the EAC.
- The East African Community collaboration with the US Agency for International Development Kenya/East Africa (USAID/KEA) on the Conservation and Management of the Region's Natural Capital Programme that seeks to: improve the collaborative management and conservation of trans-boundary natural resources; reduce wildlife poaching and trafficking; and increase the perceived value of living wildlife. The community has also targeted to fund rising through the East African Community (EAC) Climate Finance Mobilization and Access Strategy.

4.4.3 National and County Governments Financing

Restoration will require also require funding from The National Treasury. Innovative financing instruments and structures like mainstreaming budgetary allocations within Ministries departments and agencies to a Restoration Fund and institutionalising special fee levy and taxes. For this to be achieved, good enabling environment require operationalization to create avenue for enhanced resource mobilisation internally.

Counties also need systematic approach in the County Integrated Development Plans (CIDPs) that considers and connects all aspects of the FLR resource provisions and mobilization. However, environmentalists, conservationists should have capacity to lobby for increased funding and have elaborate Policy Influencing Plans (PIPs) to ensure that planned and budgeted restoration funds are directed to restoration.

4.4.4 Private Sector financing

Globally, there is consensus among countries that the private sector must effectively contribute to restoration and conservation activities. A platform for the private sector in voluntarily and not through regulatory policy means in mobilizing resources for forest and landscape restoration in Kenya should lead to establishment of a fund.

The call for development and profits realization with the planet and people in mind, clean environment and conservation should motivate and drive the private investments in nature-based enterprises. Corporate Social Responsibility (CSR) should be up scaled to voluntary commitments to restoration. The demonstration by Equity foundation through its 35 million trees initiative, Brookside Dairy and EABL among others is a direction that can be a benchmark for others. Private sector can market for products bio enterprises products and create forward linkages for Small and Medium Enterprises (SMEs) engaged in alternative products to timber related products.

4.4.5 Public Private Partnerships (PPPs) financing

Governments globally are faced with budget deficits amidst increased demand for provision of critical services some of which are not directly revenue generating but are either vital enablers or are important for sustaining life to man and other organisms. Public Private Partnership arrangements are financing models that are gaining popularity to bridge this gap. The model is driven by the need to deliver public goods and services that are critical for socio and economic

development. Different actors combine strengths vertically or horizontally to achieve expected results. However, to generate resources for landscape restoration and conservation in selected ecosystems in Kenya, elaborate governance frameworks serving the interests of both private and public actors. Such frameworks include land adjudication, lease policies and guidelines, legislation for community land, payment for ecosystem services, gender mainstreaming, franchising, and benefit sharing.

But implementing PPPs in Kenya has had the following challenges:

- a) Projects investments lenders can only be repaid from revenue generated.
- b) Recourse for financing for the PPP in the country is limited.
- c) Only Direct Foreign Investment (DFI) funding is available for such big projects due to high risks involved
- d) Conservation of environment priority is not top on initial investment period
- e) Technical skills to develop and implement Private Public Partnership model is lacking.

In upscale PPPs, focus on elimination of bottlenecks in policy frameworks, strengthening governance and institutional coordination should be top on the agenda.

But with increasing popularity, PPP financing models are expected to address some restoration of degraded forests and landscapes through: Technology transfer and innovation for restoration of degraded lands and forests; Integrating quality of life in ecosystems that are sources of good and services; Creating peer check mechanisms where corporate organizations regulate themselves on restoration commitments; Providing for livelihoods options for vulnerable communities and ecosystems on a maximum social benefit perspective; and financing environmental education and awareness campaigns in all landscapes .

5. CONCLUSION AND RECOMMENDATIONS

Six types of mutually-supportive forest landscape restoration interventions were identified through stakeholders' consultation as having the greatest potential for scaling-up across Mukogodo landscape to address existing degradation and land-use challenges. These were: (1) Rangelands restoration (2) Rehabilitation of degraded natural forests (3) Tree-based Buffer Zones along Water Bodies and Wetlands (4) Agroforestry on Cropland (5) Afforestation and reforestation of natural forests and (6) Tree-based Buffer Zones along Roads. Based on the results of the Sub-National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology mapping assessment, the key recommendations are to:

- Adopt a phased approach for meeting restoration objectives for Mukogodo landscape. A proportion of the restoration opportunity areas could be targeted for a 2030 timeline, and the remaining areas would be restored in the future.
- Integrate these restoration interventions into County-level development and resource allocation decisions, using the estimates of intervention opportunities area from the SNFLRA as a guide for setting priorities and orienting interventions.
- Provide opportunities for the full participation and empowerment of women and take steps to enhance gender equity in all communications and outreach, training, technical assistance and other support for restoration interventions.
- Focus more resources on implementing rangeland restoration technologies, given that it is the most widespread Sub-National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology across Mukogodo landscape and is key to improving livestock productivity in Mukogodo which is predominately occupied by pastoralist communities
- Reinforce local environmental governance by supporting the adoption and enforcement of strong community by-laws to reduce the uncontrolled settlements, cutting of trees on and off farms and damage from fire and livestock
- Rehabilitate degraded natural forests and protect existing natural forest stands to capitalize on the soil erosion mitigation benefits and biodiversity value, and prioritize interventions protecting water bodies and wetlands which are the primary sources of water in Mukogodo

- Focus more resources on agroforestry within the landscape and encouraging private woodlots to remove pressure from forest reserves and other protected areas and help to alleviate poverty through provision of alternative livelihoods
- Enhance training and assistance for adopting sustainable honey harvesting technologies to reduce incidences of forest/wild fires which lead to loss of biodiversity
- Provide seedlings and other material resources and associated training to encourage enrichment tree planting along rivers, streams and water bodies to secure water resources and mitigate erosion risks.
- Reflect FLR as a national priority consistently across both county and national Governments. Apply an integrated, multi-sectoral approach undertaking restoration initiatives
- Harmonize laws and strengthen policies directly related to FLR including policies on physical planning, water management, forestry and agriculture. Where different policies and laws contradict each other, these contradictions should be addressed.
- Prioritize the implementation of restoration interventions with relatively lower costs and higher benefits including rangeland reseeded, farmer managed natural regeneration, and other forms of agroforestry

6. REFERENCES

- Gibbs, H. K., & Salmon, J. M. (2015). Mapping the world's degraded lands. *Applied Geography*, 57, 12–21.
- Stanturf, J. A., Kant, P., Lillesø, J.-P. B., Mansourian, S., Kleine, M., Graudal, L., & Madsen, P. (2015). *Forest landscape restoration as a key component of climate change mitigation and adaptation*. International Union of Forest Research Organizations (IUFRO) Vienna, Austria.
- Van Andel, J., & Aronson, J. (2012). *Restoration ecology: the new frontier*. John Wiley & Sons.
- Blair, A. (2009). Human-wildlife conflict in Laikipia north, Kenya: comparing official reports with the experiences of Maasai pastoralists.
- Blair, A. (2009). *Human-wildlife conflict in Laikipia north, Kenya: comparing official reports with the experiences of Maasai pastoralists*.
- Brenzinger, M. (2012). Lexical retention in language shift: Yaaku/Mukogodo-Maasai and Elmolo/Elmolo-Samburu. In *Language Death* (pp. 213–254). De Gruyter Mouton.
- Bussmann, R. W. (2002). Islands in the Desert—Forest Vegetation of Kenya's Smaller Mountains

- and Highland Areas (Nyiru, Ndoto, Kulal, Marsabit, Loroghi, Ndare, Mukogodo, Porrer, Mathews, Gakoe, Imenti, Ngaia, Nyambeni, Loita, Nguruman, Nairobi). *Journal of East African Natural History*, 91(1), 27–79.
- Cronk, L. (2002). From true Dorobo to Mukogodo Maasai: contested ethnicity in Kenya. *Ethnology*, 27–49.
- Cronk, L. (2018). *From Mukogodo to Maasai: Ethnicity and cultural change in Kenya*. Routledge.
- Gadd, M. E. (2005). Conservation outside of parks: attitudes of local people in Laikipia, Kenya. *Environmental Conservation*, 32(1), 50–63.
- Gibbs, H. K., & Salmon, J. M. (2015). Mapping the world's degraded lands. *Applied Geography*, 57, 12–21.
- Ifejika Speranza, C., Kiteme, B., Wiesmann, U., & Jörin, J. (2018). Community-based water development projects, their effectiveness, and options for improvement: lessons from Laikipia, Kenya. *African Geographical Review*, 37(3), 192–208.
- Kenya Forest Service (KFS) (2016). History of forestry in Kenya, http://www.kenyaforestservice.org/index.php?option=com_content&view=article&id=406&Itemid=563. Accessed June 16, 2020.
- Kenya National Bureau of Statistics (2019). County Statistical Abstract, Laikipia County.
- Kinuthia, H. M. (2005). *The total economic valuation of natural resources: perceived community livelihood values of Mukogodo Forest, Laikipia, Kenya*.
- M'mboroki, K. G. (2018). *Climate change impacts and adaptive mechanisms of pastoral communities in Mukogodo forested areas of Laikipia county in Kenya*. University of Nairobi.
- Mbuvi, J. P., Wanjogu, S. N., & Kironchi, G. (1995). Characteristics of soil crusts and their influence on some soil properties in Mukogodo catchment, Kenya. *African Crop Science Journal*, 3(4).
- Ministry of Environment and Natural Resources (2016). Technical Report on the National Assessment of Forest and Landscape Restoration Opportunities in Kenya
- Mkutu, K. (2020). *Security dynamics in conservancies in Kenya: the case of Isiolo County*.
- Muiruri, V. M. (2008). *Detecting environmental change and anthropogenic activities on Laikipia Plateau, Kenya*. University of the Free State.
- Mureithi, S. M., Verdoodt, A., Njoka, J. T., Olesarioyo, J. S., & Van Ranst, E. (2019). Community-Based Conservation: An Emerging Land Use at the Livestock-Wildlife Interface in Northern Kenya. *Wildlife Management-Failures, Successes and Prospects*.
- Pearl, F. B. (2001). *Late Pleistocene archaeological and geoarchaeological investigations in the Mukogodo Hills and Ewaso Ng'iro Plains of central Kenya*. Texas A&M University.
- Seno, S. K., & Shaw, W. W. (2002). Land tenure policies, Maasai traditions, and wildlife conservation in Kenya. *Society & Natural Resources*, 15(1), 79–88.
- Stanturf, J. A., Kant, P., Lillesø, J.-P. B., Mansourian, S., Kleine, M., Graudal, L., & Madsen, P.

(2015). *Forest landscape restoration as a key component of climate change mitigation and adaptation*. International Union of Forest Research Organizations (IUFRO) Vienna, Austria.

The Government of Kenya (GoK). (2010). *National Climate Change Response Strategy*. Chapter 4.2.1

Van Andel, J., & Aronson, J. (2012). *Res Blair, A. (2009). Human-wildlife conflict in Laikipia north, Kenya: comparing official reports with the experiences of Maasai pastoralists. toration ecology: the new frontier*. John Wiley & Sons

APPENDICES

Appendix 1: Stakeholder Identification and Mapping for Mukogodo Landscape

| No. | Stakeholder | Mandate | Contribution | Location/Address |
|-----|-----------------|--|---|---|
| 1. | ILMAMUSI CFA | <ul style="list-style-type: none"> • Co-management of Mukogodo forest | <ul style="list-style-type: none"> • To sustain community interest and active participation in conservation activities. • To enhance the conservation of rare, endemic, and threatened plant and animal species and their natural habitats. • Primary informant on forest and land restoration. • Provide local resource persons for forest conservation. • Implementation of PFMP | <p>Mukogodo forest</p> <p>Address: P.O Box 263 10406 Timau –Kenya.</p> <p>Phone: +254(0) 703 316 057</p> <p>Email: info@ilmamusicfa.org</p> |

| | | | | |
|----|-------------------------------|--|--|--|
| | | | <ul style="list-style-type: none"> • A platform for stakeholder engagement to support restoration and for livelihood improvement | |
| 2. | County Government of Laikipia | <ul style="list-style-type: none"> • Enact policies and laws at County level. | <ul style="list-style-type: none"> • Custodians of forests' devolved functions on natural resource management • Source of relevant information on Natural Resource Management. • Incorporating FLR in the CIDP for the subsequent period for sustainable forest restoration in the Counties. • To provide funding for restoration activities • Implementation of restoration activities | <p>Laikipia County P.O Box 1271-10400 Nanyuki Phone Number 0740 031 031 Mail: info@laikipia.go.ke</p> |
| | County Government of Isiolo | | | <p>Isiolo County info@isiolo.go.ke 020 -344194/ 0725624489 P.O. Box 36-60300 Isiolo</p> |

| | | | | |
|----|-------------------------------|---|---|---|
| | | | | |
| 3. | Northern Rangelands Trust NRT | <input type="checkbox"/> Established as a shared resource to help build and develop community conservancies, which are best positioned to enhance people's lives, build peace and conserve the natural environment. | <ul style="list-style-type: none"> • Technical support-GIS, Rangeland restoration. • Wildlife and habitat management and monitoring. • Governance strengthening for the conservation. • Capacity building of community conservancies in grazing management through grazing committees and conservancy leadership: | Northern Rangelands Trust, Private Bag, Isiolo 60300, Kenya |
| 4. | Ministry of Environment | <ul style="list-style-type: none"> • Formulation of environmental policies | <ul style="list-style-type: none"> • Lobbying for more resources for FLR | |

| | | | | |
|----|--------------|---|--|--------------------------|
| | and Forestry | <ul style="list-style-type: none"> • Forestry research • Wildlife conservation • Forest management and protection • Supervise and coordinate all environmental matters • Culture and research • Coordinate and oversee protection, rehabilitation, conservation and sustainable management of critical water towers • Coordination of all matters on drought risk management • Implementation of national government policies at grassroots level conservation. | <ul style="list-style-type: none"> • Policy formulation • Provision of information • Offer environmental and governance leadership • Provision of information • Capacity building • Conservation and development • Training, capacity building, extension services, | |
| 5. | Kenya Forest | <ul style="list-style-type: none"> • To provide for | <ul style="list-style-type: none"> • Conservation, | Mukogodo forest – Doldol |

| | | | | |
|--|---------|---|--|--|
| | Service | <p>development and sustainable management including conservation and rational utilization of all forest resources for socio-economic development.</p> <ul style="list-style-type: none"> • Conserve, protect and manage all public forests in accordance with the provisions of the Act; • Manage water catchment areas in relation to soil and water conservation, carbon sequestration and other environmental services in collaboration with relevant stakeholders | <p>protection, and sustainable development of forest resources.</p> <ul style="list-style-type: none"> • Technical support to FLR. • Allocate resources – human, forest land, vehicles. • Registration and nurture of Community Forest Associations | <p>Kenya Forest Service P.O BOX 30513 - 00100 Nairobi – Kenya 020-2014663</p> |
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| | | | | |
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| 6. | KEFRI | <ul style="list-style-type: none"> • Research and development in forestry and allied natural resources | <ul style="list-style-type: none"> • Research and capacity building on FLR. • Support productive and sustainable forestry and landscape initiatives • Technical support for establishment of tree nurseries. • Suitable species site matching | <p>Mukogodo forest 20412-00200 Nairobi, Kenya. +254 722 157 414 +254 (0) 724 259781/2 director@kefri.org</p> |
| 7. | Kenya Wildlife Service KWS | <ul style="list-style-type: none"> • Custodian of wildlife and coordination of wildlife conservation in Kenya • Wildlife conservation and law enforcement | <ul style="list-style-type: none"> • Technical support on wildlife conservation as per Wildlife Conservation and Management Act, 2013, revised in 2018 • Human Wildlife Conflict mitigation. • Support restoration activities within the landscape | <p>Mukogodo forest – Doldol P.O. Box 40241-00100,Nairobi Kenya Tel: +254(20) 2379407, +254(20) 6002345. Call Center: 0800 597000 or 08002215566 Email Address: kws@kws.go.ke</p> |
| 8. | Kenya Wildlife | <ul style="list-style-type: none"> • To support and | <ul style="list-style-type: none"> • Advocacy for | Mukogodo landscape, Laikipia |

| | | | | |
|-----|---|--|--|---|
| | Conservancies Association | strengthen Laikipia Conservancies <ul style="list-style-type: none"> • Sustainable conservation of critical wildlife and habitats | community wildlife conservation. <ul style="list-style-type: none"> • Alternative sources of livelihoods • Fundraising for community conservancies. | Kenya Wildlife Conservancies Association Magadi Tenting Centre, Karen Post Office Box 1038 – 00517, Uhuru Gardens, Nairobi, Kenya |
| 9. | Representatives of National Government At Local Level | <ul style="list-style-type: none"> • Execution and enforcement of Policies and Laws from national Government | <ul style="list-style-type: none"> • Mobilization of local participants. • Maintain law and order during stakeholders’ meetings. • Creating awareness on government directives such as 10% tree cover | Mukogodo forest - Doldol |
| 10. | Laikipia Wildlife Forum LWF | <ul style="list-style-type: none"> • To nurture and support stakeholders’ institutions that support wildlife conservation. | <ul style="list-style-type: none"> • Resource mobilization on Natural Resource Management • Integrated water resources management. • Institutional capacity building. • Forest and Landscape | Mukogodo forest Laikipia P.O Box 764,Nanyuki,Kenya Tel: +254 726 500260 Email: communication@laikipia.org |

| | | | | |
|-----|--------------------------------------|--|---|--|
| | | | restoration | |
| 11. | LEWA Wildlife Conservancy | <ul style="list-style-type: none"> • Conservation of key wildlife species, anti-poaching, and community development. • Conservation education, agro-forestry knowledge to communities for protection and management of forests | <ul style="list-style-type: none"> • Fundraising/ resource mobilization for livelihood and Natural Resource Management • Technical support on security and wildlife conservation. | <p>Lewa Downs</p> <p>KENYA</p> <p>Lewa Wildlife Conservancy Office Private Bag Isiolo 60300, Kenya</p> <p>Tel: +254-722 203562/3</p> <p>Email: info@lewa.org</p> |
| 12. | World Vision International (Kenya) | <ul style="list-style-type: none"> • Humanitarian aid, development, and advocacy. | <ul style="list-style-type: none"> • Farmer Managed Natural Regeneration. • Capacity building on FLR and bio enterprises development. • Policy influence at the County level | <p>Mukogodo forest</p> <p>World Vision Kenya, Karen Road, off Ngong Road, P.O. Box 50816-00200, Nairobi, Kenya. Office: +254 732 126 000, +254 711 086 000. E-mail: wv_kenya@wvi.org</p> |
| 13. | Food And Agriculture Organization of | <ul style="list-style-type: none"> • Work with the Government of Kenya (GoK) to help build a | <ul style="list-style-type: none"> • Sustainable natural resource and environmental | <p>Mukogodo forest (Isiolo and Laikipia Counties)</p> |

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| | the United Nations FAO | food-secure country, free of hunger and malnutrition, where food and agriculture contribute to improving the living standards of all, especially the poorest, in an economically, socially and environmentally sustainable manner. | management; food security and nutrition initiatives <ul style="list-style-type: none"> Restoring degraded landscape and enhancing the socio-economic development of local communities. | Block P, Level 3 United Nations Complex UN Avenue, Gigiri, Nairobi P.O Box: 30470,00100,GPO Nairobi Tel: +254 207625920 Email: FAO-KE@fao.org |
| 14. | Water Resources Authority | <ul style="list-style-type: none"> To safeguard the right to clean water by ensuring that there is proper regulation of the management and use of water resources, in order to ensure sufficient water for everyone- now and in the future | <ul style="list-style-type: none"> Water resources regulation Enforcement of the Water Act Tree growing initiatives Capacity building of Water Resources Users Association | Mukogodo forest, Laikipia County Water Resources Authority (WRA) NHIF Building, Wing B, 9 th Floor P.O. Box 45250 00100, Ngong Road, Nairobi – Kenya Tel: 0202732291/2729048/9 Emergency Hotline: 0700 056472 |
| 15. | National | <ul style="list-style-type: none"> Technical support with | <input type="checkbox"/> Law enforcement | Popo Road,South C, off Mombasa |

| | | | | |
|-----|---------------------------------------|---|---|---|
| | Environment Management Authority NEMA | <p>implementation of EMCA (1999)</p> <ul style="list-style-type: none"> Enforcement and implementation of environmental management | <p>☐ Climate-Smart Agricultural Research and Seed Systems</p> | <p>Road P.O.BOX 67839-00200, Nairobi, Kenya Mobile: 0724 253398, 0735 013046. Email:dgnema@nema.go.ke</p> |
| 16 | Ecotourism Kenya | <ul style="list-style-type: none"> Involved in sustainable tourism planning, and campaigns, community mobilization and sensitization, product identification and development and environmental/social audits. Promote responsible tourism practices | <ul style="list-style-type: none"> Enhancing ecotourism as an alternative livelihood. Rating of ecotourism facilities Capacity building for ecotourism governance A platform for profiling ecotourism | <p>KATO Place, Longonot Road, Upper Hill, Nairobi P.O. Box 10146-00100, Nairobi, Kenya +254 20 529 2078 +254 726 366 080 +254 780 815 683 info@ecotourismkenya.org</p> |
| 17. | Kenya Water Towers Agency KWTA | <ul style="list-style-type: none"> Coordinate and oversee the protection, rehabilitation, conservation and sustainable management of water | <ul style="list-style-type: none"> Support with tree seedlings for reforestation. Coordinate and oversee protection, rehabilitation, | <p>15th Floor, NHIF Building, Ragati Road. PO Box 42903-00100 Nairobi, Kenya Email: info@watertowers.go.ke Website: https://watertowers.go.ke</p> |

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| | | <p>towers in Kenya.</p> <ul style="list-style-type: none"> • Conducting research on the status of water towers, spatial analysis of land use, land cover changes and hydrological analysis of water towers in Kenya. | <p>conservation & sustainable management of critical water towers in Kenya.</p> <ul style="list-style-type: none"> • Design programmes that determine resource allocation for reclamation, restoration, rehabilitation and community livelihood interventions needed. • | <p>Greenline: 0748 222 222 Phone: +254 (0)20-2711437, Ext.1725</p> |
| 18. | NMK National museums of Kenya | <ul style="list-style-type: none"> • Collect, preserve, study document Kenya's cultural and national heritage. • Serve as a national repository for things of scientific, cultural, technological and human interest; • Serve as places where | <ul style="list-style-type: none"> • Indigenous people historical heritage documentation- Yiaku • Source of information contributing to formulation and other initiatives affecting indigenous communities in Kenya. • Creating institutional | <p>Mukogodo National Museum of Kenya. P.O. Box 40658 – 00100, Nairobi, Kenya. +254 (0)20 233 9158. 0724 255 299 0780 755 231</p> |

| | | | | |
|-----|--------------------------------------|---|---|---|
| | | <p>research and dissemination of knowledge/information in all</p> <ul style="list-style-type: none"> • fields of scientific, cultural, technological and human interest may be undertaken; • Identify, protect, conserve and transmit the cultural and natural heritage of Kenya. • Promote cultural resources in the context of social and economic development | <p>linkages that will promote in natural resources management, research, conservation</p> | |
| 19. | Community land management committees | <ul style="list-style-type: none"> • Management of land as per the Community Lands Act | <ul style="list-style-type: none"> • Resource mobilization • Coordination of rangelands restoration | Mukogodo |
| 20. | The National Drought Management | <ul style="list-style-type: none"> • Mandated to establish mechanisms which ensure that drought | <ul style="list-style-type: none"> • Capacity building on drought management • Coordination of | <p>P.O Box 53547 Nairobi 00200 Kenya Email: info@ndma.go.ke</p> |

| | | | | |
|-----|---|---|---|--|
| | Authority NDMA | does not result in emergencies and that the impacts of climate change are sufficiently mitigated. | drought interventions in the Counties <ul style="list-style-type: none"> • Implementation of drought resilience programs • Forest landscape restoration activities | Tel: +254(0) 20 2224324, +254(0) 20 2227982. Fax: +254 722 200656 Website: www.ndma.go.ke |
| 21. | Water Resources Users Association WRUA | <ul style="list-style-type: none"> • Conservation of water catchment areas | <ul style="list-style-type: none"> • Resolving water resource use conflicts • Protecting water catchments | Laikipia |
| 22. | Borana Conservancy | <ul style="list-style-type: none"> • Sustainable conservation of critical wildlife and habitats. | <ul style="list-style-type: none"> • Public – Private Partnership on livestock program. • Technical support on security and wildlife conservation. • Supporting the development of grazing management plans within Mukogodo forest and landscape • Support ecotourism | Borana Ranch, Laikipia Borana Conservancy P.O.Box 137 Nanyuki 10400, Kenya |

| | | | | |
|-----|---|--|---|---|
| | | | activities within Mukogodo landscape | |
| 23. | Resilience Project (Regional Pastoral Livelihoods Resilience Kenya) | <ul style="list-style-type: none"> • Conservation of dryland ecosystems | <ul style="list-style-type: none"> • Capacity building on resilience • Alternative income-generating activities eg beekeeping • The purpose is to enhance the livelihoods of pastoral and agro-pastoral communities in the project area through provision of affordable Livestock Health Services, Feed and fodder production, breed improvement and promotion of alternative livelihoods. | <p>Mukogodo</p> <p>Hill Plaza Building (10th Floor) Ngong, Road P.O Box 34188-00100 Kenya Email: rpl.resilience@kilimo.go.ke</p> <p>Tel: +254 (20) 2099167. Website: www.resilience.go.ke</p> |
| 24. | Impact Kenya (Indigenous Movement For Peace) | <ul style="list-style-type: none"> • Works with pastoralist communities to address the major problems faced by minority and | <ul style="list-style-type: none"> • Integrated risk management approach • Integrating ecosystems and climate change in | <p>Mukogodo forest</p> <p>Email:impactkenya2002@gmail.com Contact: +254 722663090</p> |

| | | | | |
|-----|---|--|--|--|
| | Advancement And Conflict Transformation). | indigenous peoples as defined by Kenyan Constitution article 260 <ul style="list-style-type: none"> • Conservation of dryland ecosystems • Capacity building | disaster risk reduction (Building community capacities to comprehend disaster preparedness, response). <ul style="list-style-type: none"> • Resource mobilization response and rehabilitation | Address: P.O Box 499-10400-Nanyuki, Kenya |
| 25. | Local Communities | <ul style="list-style-type: none"> • Conservation and restoration activities | <ul style="list-style-type: none"> • Participate in conservation and restoration activities • Participate in policy formulation • Establishment of grazing and settlement plans | Makurian/Mayanat, Iingwesi, Mukogodo, Sieku |
| 26. | Africa Nature Investors- Kenya | <ul style="list-style-type: none"> • Management of private conservancies | <ul style="list-style-type: none"> • Resource mobilization • Conservation management • Community outreach and engagement for rangeland management | Nature Conservancy ElMolo Drive off Maji Mazuri Road Lavington P.O. Box 19738-00100 GPO, Nairobi Phone: 254786650650 |

| | | | | |
|-----|----------------------------|---|---|---|
| | | | assistance | |
| 27. | The Nature Conservancy TNC | <ul style="list-style-type: none"> • Conserve the lands and waters on which all life depends. • Created Partnerships for Forests to achieve shared value from sustainable forests and sustainable land use. | <ul style="list-style-type: none"> • Funding • Technical support on rangeland improvement | Email: member@tnc.org africa@tnc.org |

Appendix 2: Land Use Challenges, Drivers, Effects and Restoration Interventions to Curb Land Degradation in Mukogodo Landscape

| Land use challenges | Drivers | Effects | Proposed Interventions |
|---------------------|---|--|---|
| Persistent drought | <ul style="list-style-type: none"> • Climate change • Deforestation | <ul style="list-style-type: none"> • Loss of pasture • Loss of biodiversity • Soil erosion • Scarcity of resources, livelihood options | <ul style="list-style-type: none"> • Reforestation • Rangeland's reseeded • Bio-enterprise development and value chain support • Conservation and protection of existing vegetation |
| Human encroachment | <ul style="list-style-type: none"> • Population increase • Land degradation • Insecurity | <ul style="list-style-type: none"> • Loss of biodiversity • Human-wildlife conflict | <ul style="list-style-type: none"> • Tree growing and restoration • Coordinated human settlement • Agroforestry |

| Land use challenges | Drivers | Effects | Proposed Interventions |
|---------------------|---|---|--|
| | <ul style="list-style-type: none"> • Farming activities • Inadequate knowledge on land carrying capacity for livestock • Uncoordinated human settlement | <ul style="list-style-type: none"> • Reduced forest/tree cover • Soil erosion | <ul style="list-style-type: none"> • Rangelands reseeding and natural regeneration • Capacity building for sustainable land management such as knowledge on the carrying capacity. • Enhancing natural regeneration • Local policy formulation and implementation of existing policies |
| Overgrazing | <ul style="list-style-type: none"> • Overstocking of livestock • Loss of traditional knowledge on carrying capacity • Lack of documented grazing plans • Insecurity | <ul style="list-style-type: none"> • Severe soil erosion • Reduction in vegetation cover • Resource-based conflicts • Reduction in rangeland health – degraded pasture land and reduced natural resource base | <ul style="list-style-type: none"> • Develop and adhere to grazing plans integrating traditional pasture management systems/Land use planning. • Tree growing and restoration. • • Diversification of livestock – higher concentration of sheep degrades grasslands. • Land rehabilitation – grass reseeding, soil conservation and Natural Regeneration. |

| Land use challenges | Drivers | Effects | Proposed Interventions |
|----------------------|---|---|--|
| | | | <ul style="list-style-type: none"> • Hay production to provide pasture to livestock during drought to reduce pressure on forest reserve. • Education and attitude change to influence overdependence on livestock. • Diversification of income – options of income sources NTFPs, joining livestock marketing SACCOs. |
| Wild Fire incidences | <ul style="list-style-type: none"> • Inappropriate honey harvesting methods • Satellite/Temporary settlements • Illegal charcoal burning | <ul style="list-style-type: none"> • Destruction of natural habitats • Reduction of pasture • Displacement of wildlife | <ul style="list-style-type: none"> • Community sensitization on the effects of wild fires • Increased level of preparedness such as having the capacity and equipment required • Adhering to proper coordinated settlement plans. • Development of early warning systems (both indigenous and conventional) and fire danger maps/charts • Capacity building on improved honey harvesting and charcoal production methods. |

| Land use challenges | Drivers | Effects | Proposed Interventions |
|-----------------------------------|--|--|--|
| Human-wildlife conflict | <ul style="list-style-type: none"> • Population increase • Scarcity of resources • Wildlife poaching/disturbance • Uncoordinated settlement plans • Conservancies bordering forest boundaries | <ul style="list-style-type: none"> • Loss of livelihood sources | <ul style="list-style-type: none"> • Demarcation and fencing of areas of interest • Coordinated settlement plans |
| Unsustainable sand harvesting | <ul style="list-style-type: none"> • Lack of alternative livelihood sources • Lack of policies guiding/regulating the sand harvesting | <ul style="list-style-type: none"> • Degradation of riverbanks. • Soil erosion | <ul style="list-style-type: none"> • Capacity building – awareness on environmental conservation; organized sand business for better bargaining. • Levy for conservation from sand business. • Alternative livelihoods – NTFPs through promotion of entrepreneurial culture, paradigm shift and innovations for other IGAs e.g., honey production, ecotourism • Alternative construction materials – innovations e.g., compressed blocks |
| Unsustainable charcoal production | <ul style="list-style-type: none"> • Poverty • Urbanization/modernization | <ul style="list-style-type: none"> • Pollution • Exposes landscape to erosion. | <ul style="list-style-type: none"> • Sustainable charcoal production. |

| Land use challenges | Drivers | Effects | Proposed Interventions |
|--|---|--|--|
| | | <ul style="list-style-type: none"> • Causes loss of vegetation. • Low carbon stocks | <ul style="list-style-type: none"> • Improved kilns to produce charcoal. • Alternative livelihoods -NTFPs through promotion of entrepreneurial culture, paradigm shift and innovations for other IGAs e.g., honey production, ecotourism • Promotion of alternative sources of fuel – briquettes, gas |
| Invasive species e.g., <i>Opuntia stricta</i> , <i>Vachellia reficiens</i> , <i>Sansiveria volkensii</i> | <ul style="list-style-type: none"> • Land degradation • Poor land use • Climate change | <ul style="list-style-type: none"> • Loss of grazing area. • Affect health of livestock, especially goats. | <ul style="list-style-type: none"> • Mechanical removal of Invasive species. • Biological removal of invasive species. • Commercial use of the invasive species |
| Uncoordinated settlement plans | <ul style="list-style-type: none"> • Population increase • Non-compliance to laws/governance within the community • Land tenure issues/tragedy of the common | <ul style="list-style-type: none"> • Conflict over resources | <ul style="list-style-type: none"> • Documenting/Adhering to the coordinated settlement plans |

Appendix 3: Discounted benefit flow analysis for enrichment planting in degraded natural forests

| Description of benefits and costs | Aggregate Discounted Values 2018 to 2048 @7% |
|--|---|
| Benefits flow | |
| Carbon sequestration | 1,087,391 |
| Soil prevention | 23,328 |
| Firewood | 10,726 |
| Water flow regulation | 3,912 |
| Discounted benefit value | 1,125,357 |
| Costs | |
| Purchase of indigenous tree seedlings | 63,084 |
| Transportation of seedlings | 4,673 |
| Preparation of stakes | 654 |
| Staking out | 2,290 |
| Pitting | 16,355 |
| Planting | 4,907 |
| Site maintenance and security | 22,336 |
| Fencing | 42,991 |
| Discounted cost value | 157,290 |
| NPV | 968,068 |
| Benefit cost ratio (BCR) | 6.15 |
| Internal rate of return (IRR) | 23.37% |
| Equivalent annual annuity (EAA) | 83,060 |

Appendix 4: Discounted benefit flow analysis for intensive agroforestry *Grevillea robusta*, maize and fruit trees (avocado)

| Description of benefits and costs | Aggregate Discounted Values 2018 to 2048 @7% |
|--|---|
| Benefits flow | |
| Revenue from sale of maize | 747,593 |
| Sale of fruits (Avocado) | 645,770 |
| Firewood (1st and 2nd Thinning) | 91,706 |
| Timber (Sawn timber) | 77,020 |
| Maize Stover | 18,606 |
| Carbon sequestration | 18,383 |
| Value of soil fertility improvement | 1,228 |
| Discounted benefit value | 1,600,306 |
| Costs | |
| Maize seed | 55,841 |
| Fertilizer | 99,273 |
| Ploughing and planting maize | 108,579 |
| Weeding | 62,045 |
| Grain Harvesting and threshing costs | 59,564 |
| Packaging costs | 11,168 |
| Maintenance | 59,564 |
| Cost of <i>Grevillea robusta</i> seedlings + Transportation | 12,243 |
| Manure | 584 |
| Planting of <i>Grevillea robusta</i> and avocado seedlings | 1,869 |
| Beating up | 218 |
| Harvesting timber and fruits (Avocado) | 31,483 |
| Cost of soil erosion | 9,277 |
| Discounted cost value | 511,708 |
| NPV | 1,088,598 |
| BCR | 2.13 |
| IRR | 20.50% |
| EAA | 84,964 |

Appendix 5. Discounted benefit flow analysis for grass reseeded using enclosures

| Description of benefits and costs | Aggregate Discounted Values 2018 to 2048 @7% |
|--|---|
| Benefits flow | |
| Revenue from grass | 384,074 |
| Revenue from grass seed | 158,211 |
| Carbon sequestration | 17,079 |
| Discounted benefit value | 559,363 |
| Costs | |
| Ploughing | 4,673 |
| Purchase of grass seeds | 7,034 |
| Planting of grass | 18,820 |
| Enclosures/Fencing | 129,906 |
| Maintenance and security | 22,336 |
| Harvesting of grass | 24,818 |
| Harvesting of grass seed | 24,818 |
| Cost of soil erosion | 4,418 |
| Discounted cost value | 236,824 |
| NPV | 325,539 |
| BCR | 2.25 |
| IRR | 9.06 |
| EAA | 27,931 |

Appendix 6: Discounted benefit flow analysis for riparian planting using bamboo and grass

| Description of benefits and costs | Aggregate Discounted Values 2018 to 2048 @7% |
|--|---|
| Benefits flow | |
| Revenue from sale of grass (Napier) | 974,089 |
| Revenue from sale of bamboo culms | 538,146 |
| Carbon sequestration | 103,130 |
| Discounted benefit value | 1,615,365 |
| Costs | |
| Ploughing | 4,673 |
| Purchase of bamboo seedlings | 25,701 |
| Transportation of seedlings | 4,673 |
| Planting of Bamboo seedlings | 5,336 |
| Beating up of Bamboo (labour) | 2,620 |
| Napier Grass cuttings | 51,920 |
| Weeding | 111,682 |
| Manure | 124,091 |
| Fertilizer (CAN) | 163,800 |
| Maintenance and security | 59,564 |
| Harvesting of bamboo | 48,924 |
| Cost of soil loss | 133 |
| Discounted cost value | 603,115 |
| NPV | 1,012,250 |
| BCR | 1.68 |
| IRR | 11.80% |
| EAA | 86,851 |

Discounted benefit flow analysis for roadside planting

| Description of benefits and costs | Aggregate Discounted Values 2018 to 2042 @7% |
|-----------------------------------|--|
| Benefits flow | |
| Carbon sequestration | 70,688 |
| Aesthetic value | 48,433 |
| Shade provision | 21,857 |
| Air quality improvement | 4,736 |
| Avoided cost of soil loss | 4,208 |
| Storm protection | 1,077 |
| Discounted benefit value | 150,999 |
| Costs | |
| Cost of tree seedlings | 5,140 |
| Transportation of seedlings | 2,336 |
| Planting of trees | 2,336 |
| Beating up | 873 |
| Fencing | 3,084 |
| Maintenance and security | 14,891 |
| Discounted cost value | 28,662 |
| NPV | 122,337 |
| BCR | 4.2 |
| IRR | 21.3% |
| EAA | 10,496 |

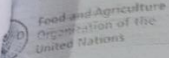


Appendix 4: Assumptions Used in the analysis

Table 1: Assumptions used to calculate costs and benefits for each land use and restoration intervention

| Restoration transition | Assumptions |
|--|--|
| Traditional Agriculture (Maize Farming) to Intensive Agroforestry Grevillea robusta, Maize and Avocado | <ol style="list-style-type: none"> 1. Normal Maize agronomic 2. Timber to firewood ratio is 20% 3. Harvesting cost of maize under traditional agriculture include: stacking, De-husking, transport and threshing@ KES 2500,3500,2100 and 1750 4. Harvesting cost under improved agroforestry of maize include: stacking, De-husking, transport and threshing@ KES 2500,4500,2850 and 4750 5. Cost of manure per tonne is KES 1000 6. Benefits from soil fertility/improvement are realised after the first Year 7. No allelopathic relationship between the trees and crops 8. Maize stovers for fodder and Grevillea robusta leaves used as fodder 9. The Price of maize stover is KES 50 per 30 kg bag 10. Fruit trees start producing at the end of 3 years 11. Grevillea robusta pruning's are used as firewood after 4 years and harvested for timber at 25- years. 12. Price of Grevilea firewood is KES 2000 per m3 13. On average households use 1 M³ of firewood per year |
| Degraded riparian zones to bamboo and grass strip | <ol style="list-style-type: none"> 1. The dimension of the buffered 1 ha is (30 m width by 334 m length) 2. Value of subsistence grazing is KES 3000/ha (Langat et al., 2018) 3. Napier Grass spacing=0.6*0.6 m 4. Yield of Napier per ha is 15.7 Metric Tonnes (MT) 5. Manure is applied at rate of 10 Metric Tonnes (MT) per ha @ KES 1000 per tonne 6. Conversion factor from green to dry matter for Napier is 0.3 7. Price of one bamboo culm is 50/- 8. Bamboo spacing is 6*6 9. Extraction rate of bamboo is sustainable (there is regeneration no net loss) |
| Degraded grasslands to grass reseeding | <ol style="list-style-type: none"> 1. Soil Loss (Tons/ha)-72 tons/ha in degraded scenario 2. Grass seed yield per ha 30kg/ha in un-improved and 287.7kg in improved scenario 3. 4.5 bales in un-improved and 178.25 bales in improved scenario 4. Maintenance and security (3,000 per person per month for 20 ha 5. Average selling price of grass seeds in Kenya is KES 425/= (Manyeki et al,2015) and price per bale is KES 175 |

| | |
|---|--|
| <p>Degraded forest to Improved protected natural forest (Enrichment planting)</p> | <ol style="list-style-type: none"> 1. Grazing and firewood collection will continue in the baseline 2. The average value of forest grazing in degraded forest is KES 3,000 per ha per year- we assume 50% benefits from degraded natural forest (Langat et al., 2018) 3. No extractive use of the enrichment planted area (grazing, timber) in rehabilitated forest for the first 10 years thereafter licensed extraction is permitted 4. Cost of unsustainable extraction is 5% of total benefits 5. Degraded natural forest holds about 10% -plant population (2*2 spacing) (10%) 6. Price of carbon sequestered is \$6 per tonne 7. Cost of sediment removal is KES 178 per tonne (Langat, 2016) 8. Maintenance and security (3,000 per person per month for 20 ha) 9. Average annual increment in aboveground biomass in natural regeneration by broad category (Metric Tonnes (MT) dry matter/ha/year) = 5 Metric Tonnes (MT) DM 10. Benefit from water flow regulation is 142,000 per ha-1yr after 6 years when there is full canopy closure |
|---|--|

Appendix 5: Participants' list

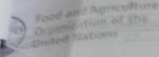






GEF-6: The Restoration Initiative Project

Restoration assessment workshops in Mukogondo and Mt. Kulal Landscapes

Date: 25/9/2021 Attendance Sheet

| Name | Organization/Group | Mobile No. | Email | Sign |
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GEF-6: The Restoration Initiative Project

Restoration assessment workshops in Mukogondo and Mt. Kulal Landscapes

Date: 25/9/2021 Attendance Sheet

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GEF-6: The Restoration Initiative Project

Restoration assessment workshops in Mukogondo and Mt. Kulal Landscapes

Date... 29/5/2021 Attendance Sheet

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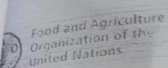


GEF-6: The Restoration Initiative Project

Restoration assessment workshops in Mukogondo and Mt. Kulal Landscapes

Date... 25/5/2021 Attendance Sheet

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MUKOGONDO

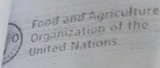






GEF-6: The Restoration Initiative Project

Restoration assessment workshops in Mukogondo and Mt. Kulal Landscapes

Date... 26/5/2021 Attendance Sheet

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GEF-6: The Restoration Initiative Project

Restoration assessment workshops in Mukogondo and Mt. Kulal Landscapes

Date... 26/5/2021 Attendance Sheet

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