# MTWAPA, TAKAUNGU, AND KILIFI MANGROVE RESTORATION PLAN (2024-2028)

# APPROVAL PAGE

**Mtwapa, Takaungu, and Kilifi Mangrove Restoration Plan (2024-2028)**

The Mtwapa, Takaungu, and Kilifi Mangrove Restoration Plan (2024-2028) is hereby approved for implementation. Any amendments to this Restoration Plan shall be affected only through mutual agreement between Kenya Forest Service (KFS) and Mtwapa-Takaungu-Kilifi (MTAKIMAU) Community Forest Association.

The implementation of the Restoration Plan will be in line with Mtwapa, Takaungu, and Kilifi Participatory Forest Management Plan and guided by the Forest Management Agreement signed between the Kenya Forest Service and the Mtwapa-Takaungu-Kilifi (MTAKIMAU) Community Forest Association.

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**JAMES MBURU**
REGIONAL FOREST CONSERVATOR,
COAST CONSERVANCY
**KENYA FOREST SERVICE**

**20th JUNE 2024**

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Date

## FOREWORD

The Mtwapa, Takaungu, and Kilifi mangrove ecosystems are some of the most important coastal forests in Kenya. They host an exceptional array of marine species with significant biodiversity value. These ecosystems are not only ecologically important but also serve as a cherished tourist attraction, contributing to the economic well-being of the community and residents of Kilifi County.

Unfortunately, these invaluable ecosystems face numerous threats due to the heavy reliance of households and industries on fuelwood, construction materials, urbanization, agricultural expansion, and other essential resources driven by population growth. This has accelerated the degradation of natural resources, including mangroves, in recent times.

The Mangrove Restoration Plan for the Mtwapa, Takaungu, and Kilifi mangrove ecosystems has been developed as a blueprint to restore the ecological components and vital processes of these mangrove ecosystems through collaborative restoration and conservation efforts. Its objectives are twofold: to benefit both mangroves and the people of Mtwapa, Takaungu, and Kilifi.

The development of this mangrove restoration plan was made possible through the support of the Sustainable Use of Mangroves in the Western Indian Ocean Region Project, with funding from the BENGO funding line provided by BMZ through Engagement Global. Among the BENGO project's aims is to conduct mangrove resource assessments and develop collaborative management plans to guide the sustainable restoration of mangrove forests in the Western Indian Ocean (WIO) region.

At the core of the BENGO project's objectives is the development and strengthening of capacities at the County level, particularly in the realm of Ecological Mangrove Restoration approaches. Collaboration has been forged with forest-adjacent communities through WWF-Kenya, KFS, KEFRI, the County Government of Kilifi, GRO Foundation, Earthlungs Reforestation Foundation, Eden: People+Planet, Ceriops Environmental Organization, LEAF Charity, and the Mtwapa, Takaungu, and Kilifi CFA in the formulation of the Mangrove Restoration Plan. This plan aims to promote sustainable mangrove restoration practices.

The Mangrove Restoration Plan will serve as a guiding tool for the development and sustainable restoration of mangrove ecosystems and associated resources, all in pursuit of socio-economic development.

We urge all stakeholders to join hands in supporting the Kenya Forest Service (KFS) and the forest-adjacent community members in the successful execution of this plan. In doing so, we will collectively address the pressing environmental and livelihood challenges in Kilifi while simultaneously contributing to the broader national development agenda.


**DR. ASMA AWADH**
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COASTAL KENYA LANDSCAPE, WORLD WIDE FUND FOR NATURE (WWF)-KENYA

# EXECUTIVE SUMMARY

The Mangrove Restoration Plan for Mtwapa, Takaungu, and Kilifi aims to conserve biodiversity and support the livelihoods of nearby communities in Kilifi County. Covering about 2550 hectares, these mangrove forests—including Mtwapa (716 ha), Takaungu, and Kilifi (1834 ha)—host nine species of mangroves that provide essential resources like firewood, poles, roofing materials, and canoes, along with crucial ecosystem services.

Despite their benefits, these mangrove ecosystems face significant management challenges due to limited resources and capacity. The restoration plan seeks to address these challenges with the vision: " To restore the Mtwapa, Takaungu and Kilifi mangrove ecosystems, enhancing biodiversity and improving livelihoods for the local community." It offers a framework to enhance community participation in managing these mangrove forests, benefiting both nature and local socio-economic well-being.

Developed through extensive stakeholder consultations involving KFS, KEFRI, NGAO, WWF, and the Kilifi County Government, the Mtwapa, Takaungu, and Kilifi Restoration Plan (2024-2028) was facilitated by KFS and funded the Bengo project under WWF-Kenya.

The restoration plan includes five management Programmes with specific strategies, activities, and timelines:

1) Mangrove Forest Conservation and Restoration Management Programme: Focuses on conservation, site rehabilitation, and developing a blue carbon credit project.
2) Fisheries Management Programme: Restores fish populations and promotes investment in seaweed farming.
3) Water Resources Management Programme: Addresses water-related issues affecting communities.
4) Community Participation and Development Programme: Raises awareness and involves forest-adjacent communities in conservation activities.
5) Research and Education Programme: Bridges the gap between data and research needs.

Chapter six covers plan implementation, including financial management, resource mobilization and revenue generation. It also includes monitoring, evaluation, and environmental impact assessment activities. A Forest Level Management Committee (FLMC) under the Mtwapa, Takaungu and Kilifi PFMP, comprising representatives from KFS, CFA, the Kilifi County Government, and other strategic partners, will support the plan's implementation.

# ACKNOWLEDGEMENTS

The development of the Mangrove Restoration Plan would not have been possible without the invaluable contributions and collaboration of various organizations. We would like to extend our sincere gratitude to the following organizations for their active participation and support:

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|  | We recognize and extend our profound gratitude to Kenya Forestry Research Institute (KEFRI) for your participation and technical support in preparing the restoration plan. We are grateful to the KEFRI Kilifi team represented by Kevin Muema (Research Scientist). |
|  | Special appreciation goes to Gro Foundation represented by Mr. Robert Banda (Regional Coordinator) for critical professional support they provided regarding management of mangroves. We look forward to working together as we move together to the next stage of implementing the Mtaki restoration plan to restore the integrity of mangrove ecosystems. |
|  | We would like to express our sincere gratitude to Eden: People + Planet led by Mr. David Erasto for their exceptional contribution to the development of the restoration plan. Your invaluable input and unwavering commitment were key to the success of the process. |
|  | We extend our heartfelt thanks to Earthlungs Reforestation Foundation for their invaluable partnership in crafting the restoration plan. We especially want to acknowledge Mariam Ali's exceptional contributions and dedication. |
|  | We are deeply grateful to Leaf Charity for their exceptional collaboration in developing the restoration plan. We particularly want to recognise Wincate and Caroline for their outstanding contribution. Your teamwork and expertise have been essential in formulating a successful plan. |
|  | We express our heartfelt appreciation to COBEC represented by Edward and Rose for their excellent collaboration in developing the restoration plan. We commend their remarkable commitments, efforts and dedication, which were instrumental in the development of the plan. |

| | |
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|  | We are deeply grateful for Kwetu Training Centre's participation in the development of the restoration plan. We especially want to acknowledge the contribution of Mr Brendan Muli (the Chief Executive Officer). Mr Muli's involvement was instrumental and we appreciate his valuable insights. |
|  | We would like to express our sincere appreciation to Mtwapa, Takaungu and Kilifi community forest association, in particular to Mr Elijah Chivatsi (Chairperson) and Stephen Chai (Member of the CFA) for their invaluable contribution to the development of the restoration plan. Your insights were crucial in shaping the plan and ensuring its success. |

We are deeply appreciative of the dedication and hard work of all the staff and volunteers from these organizations. Their collective efforts have been instrumental in shaping a comprehensive and effective Mangrove Restoration Plan.

Since it is not possible to mention all the people, we take this opportunity to express our heartfelt gratitude to all individuals and institutions that played any role to make this process successful.

LILY MWASI
MARINE COORDINATOR
WORLD WIDE FUND FOR NATURE (WWF)-KENYA

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| CBD | Convention on Biological Diversity |
| CCF | Chief Conservator of Forests |
| CFC | County Forest Conservator |
| CFA | Community Forest Association |
| COBEC | Community Based Environmental Conservation |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CWA | Community Wildlife Association |
| CGK | County Environmental Conservation |
| EIA | Environmental Impact Assessment |
| EMCA | Environmental Management and Coordination Act |
| FAC | Forest Adjacent Community |
| ICRI | International Coral Reef Initiative |
| IGAs | Income Generation Activities |
| HH | House Hold |
| KFS | Kenya Forest Service |
| KeFS | Kenya Fisheries Service |
| KWS | Kenya Wildlife Service |
| KEFRI | Kenya Forestry Research Institute |
| LPT | Local Planning Team |
| MAB | Man and the Biosphere Programme |
| MEAs | Multilateral Environmental Agreements |
| MTAKIMAU | Mtwapa Takaungu Kilifi |
| NMK | National Museums of Kenya |
| NGAO | National Government Administration Officer |
| NFP | National Forest Programme |
| NCCRS | National Climate Change Response Strategy |
| PFM | Participatory Forest Management |
| PFMP | Participatory Forest Management Plan |
| SDGs | Sustainable Development Goals |
| STI | Science, Technology and Innovation |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNFCCC | United Nations Framework Convention for Climate Change |
| UNFF | United Nation Forum on Forests |
| VDFCC | Village Development Forest Conservation Committee |
| WWF-Kenya | Wild Wide Fund for Nature-Kenya |

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# CHAPTER ONE
# INTRODUCTION

## 1    Background

Mangroves are vital coastal ecosystems that provide numerous ecological, economic, and social benefits. They act as natural barriers against storm surges, prevent coastal erosion, support biodiversity, and serve as nurseries for many marine species. However, over the past few decades, mangrove forests have been significantly degraded due to human activities such as coastal development, aquaculture, and pollution. This degradation has led to the loss of biodiversity, increased vulnerability of coastal communities to climate change, and diminished fishery resources.

The Mangrove Restoration Plan was initiated to restore the health and functionality of the mangrove ecosystems in Mtwapa, Takaungu and Kilifi (MTAKIMAU) creeks. This comprehensive plan involves a multi-faceted approach that includes restoration, sustainable management practices, and community engagement. By focusing on the restoration of degraded areas and the protection of existing mangrove forests, the plan aims to enhance ecosystem services, improve local livelihoods, and increase resilience to climate change.

Collaboration among governmental agencies, non-governmental organizations, local communities, and international partners is central to the plan's success. The restoration activities are guided by scientific research and traditional knowledge, ensuring that they are both effective and sustainable. Through these concerted efforts, the Mangrove Restoration Plan strives to create a healthier, more sustainable coastal environment for present and future generations.

## 1.1    Justification of the restoration plan

This restoration plan is developed based on the Mtwapa, Takaungu and Kilifi Participatory Forest Management Plan (PFMP) process and fulfills the requirements of the Forest Conservation and Management Act 2016, Part IV, Section 47, which authorizes the development and implementation of forest management plans. The relevant legal provisions state that every public forest, nature reserve, and provisional forest must be managed according to a management plan that adheres to regulations set by the Cabinet Secretary. In doing so, the Service must consult with the relevant forest conservation committees. Additionally, the Chief Conservator of Forests is responsible for plans concerning public forests.

Forest resource mapping was conducted during the preparation of the PFMP and 1,104 hectares identified as degraded. The degradation was caused by natural and anthropogenic forces such as illegal harvesting and led to the loss of biodiversity, increased vulnerability of coastal communities to climate change, and diminished fishery resources. A well designed restoration plan will bring back these critical ecosystems.

## 1.2   Approach to plan development

The restoration plan for the Mtwapa, Takaungu, and Kilifi mangrove forests builds upon the Participatory Forest Management Plan (PFMP) process, funded by WWF through the Kilifi County Forest Conservator's office. The PFMP process began with community barazas to strengthen the Community Forest Association (CFA) and elect the Mtwapa, Takaungu, and Kilifi management committee, forming the Local Planning Review Team (LPRT). This was followed by an inception meeting and training on resource mapping and socio-economic surveys, and subsequent resource mapping and household surveys by LPRT members. The process concluded with the preparation and validation of the draft plan, followed by Forest Management Agreement negotiations between Kenya Forest Service and the community.

Using information from the MTAKIMAU PFMP, GIS, household surveys, ground truthing, literature review, historical data and local community knowledge, stakeholders developed a zero draft restoration plan for the degraded mangrove areas in Mtwapa, Takaungu and Kilifi. The stakeholders' writing workshop took place at Mnarani Club, Kilifi, from May 20-24, 2024. Participants included representatives from KFS, WWF-Kenya, KEFRI, Mtwapa, Takaungu and Kilifi CFA, Ceriops, Earthlungs Reforestation Foundation, LEAF Foundation, COBEC, GRO Foundation, Eden, and KWETU Centre. This was followed by a second writing workshop at Royal Court Hotel from June 18-19, 2024 to develop draft one. The draft one was later validated and the inputs from stakeholders incorporated in the final restoration plan.



*Plate 1: A group photo of stakeholders during the writing workshop at Mnarani club, Kilifi County*

*Plate 2: Photo of the Technical Team working on the zero draft during a workshop at Mnarani Hotel, Kilifi*



*Plate 3: Photo taken during the preparation of draft 1 at Royal Court Hotel, Mombasa County*

## 1.3 Title and Duration of the Plan

This plan, titled the **"Mangrove Conservation and Restoration Plan for Mtwapa, Takaungu, and Kilifi (MTAKIMAU) 2024-2028"** spans a period of five years

## 1.4 Implementation of the plan

### 1.4.1 Amendment/Revision of the plan

This plan is designed to be dynamic and flexible, allowing strategies to adapt to emerging issues and new information for practicality and sustainability. Revisions and amendments will align with the plan's vision, objectives, and timeframe. While the plan will be reviewed at the end of the five-year period, activities will be revised during implementation based on lessons learned, led by Kenya Forest Service (KFS) and Community Forest Association (CFA) with relevant stakeholders. The review process will consider emerging issues, new stakeholders, and updates in national, regional, and international laws, treaties, and conventions.

### 1.4.2 Funding of the plan

The funding for the plan will be secured through a combination of sources, including annual subscriptions from MTAKIMAU CFA members, resource mobilization from donors, contributions from stakeholders, and revenue generated from activities such as mariculture, bee keeping, and ecotourism. Additional financial support will be sought from national and county government budget allocations, as well as from strategic partners. All funds will be managed in accordance with relevant regulations and the CFA's by-laws.

# CHAPTER TWO
# DESCRIPTION OF THE FOREST

**2    Geographic Location**

The mangrove forest of Mtwapa, Takaungu, and Kilifi creeks are found in Kilifi County along the Kenyan coast. Mtwapa Creek is situated about 15 kilometers north of Mombasa city and borders both Mombasa and Kilifi counties. It encompasses the Mtwapa, Kidutani, and Mawasamba locations. Kilifi Creek is 55 kilometers north of Mombasa and 35 kilometers south of Malindi. Takaungu Creek is located approximately 10 kilometers south of Kilifi town, in the Kilifi North Constituency, specifically in the Mavueni/Takaungu area and the sub-locations of Takaungu and Kiriba.

The Mtwapa, Takaungu, and Kilifi creeks host mangrove forests, initially declared crown forests in 1897 and officially designated as forest reserves on 30th April 1932, under proclamation No. 34. The land between the high and low water marks is designated as mangrove areas. These forests are managed by the Forest Station Manager of Sokoke Station and fall under the jurisdiction of the Kilifi County Forest Conservator Office within the Coast Region Forest Conservancy, overseen by the Kenya Forest Service (KFS).
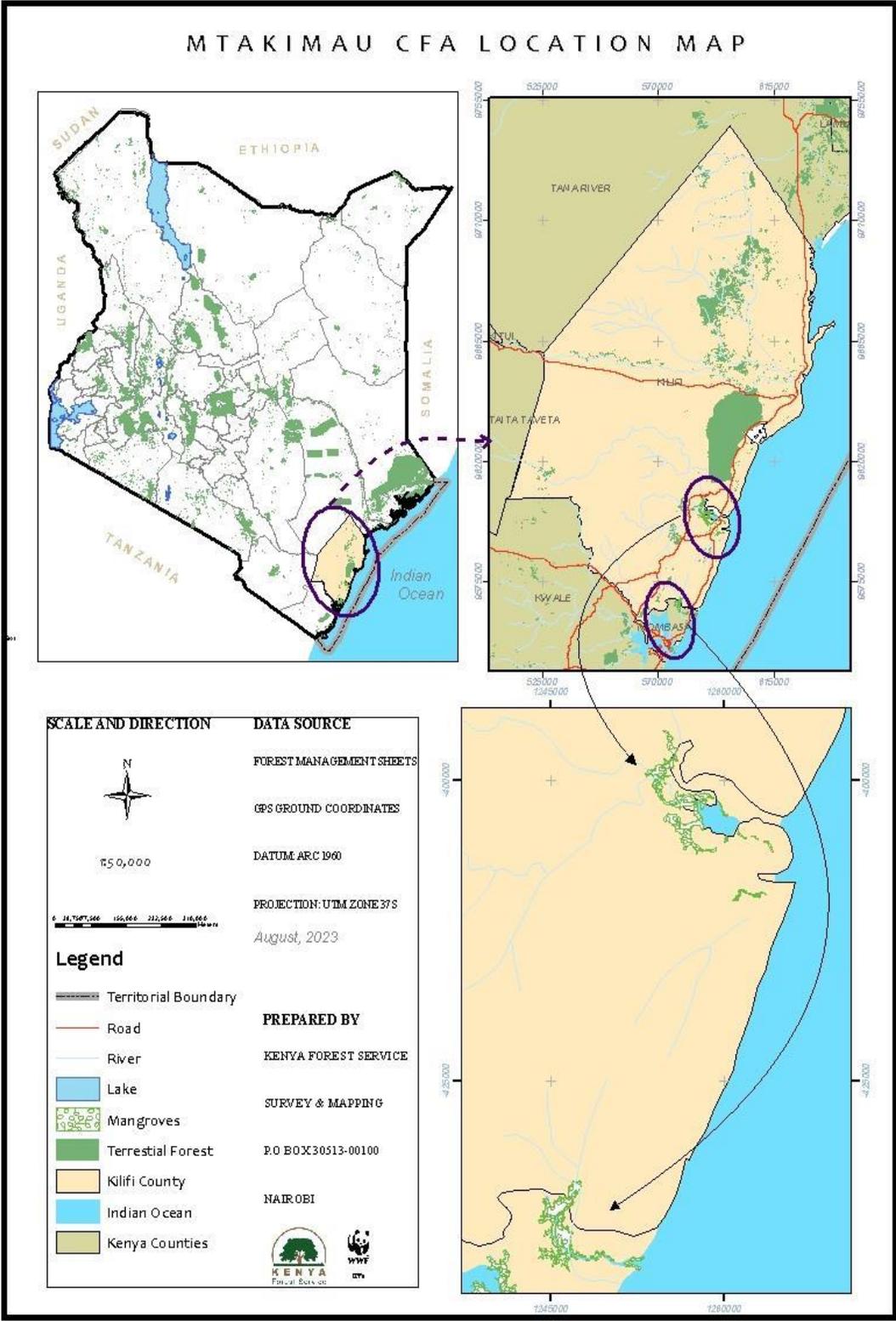
*Figure 1: Legal and Administrative Status / Location map of Mtwapa, Takaungu and Kilifi Creeks*

## 1.5 Biophysical Description of the Forest (topography, climate, geology and soils, hydrology)

Mtwapa, Takaungu and Kilifi Creeks are situated along the coastal margins. Mangrove forest ecosystems occupy these coastal creeks, marked by their unique topography and hydrological patterns. The terrain is typified by a network of water channels and estuarine environments, where freshwater from inland sources meets the saline waters of the ocean. This convergence fosters a dynamic and productive habitat for numerous flora and fauna species.

### 1.5.1 Topography

The topography of the Mtwapa, Takaugu and Kilifi Creeks is characterized by a diverse range of landforms and elevations, influenced by both natural processes and human activities. Situated along the coastal zone, the topography is predominantly low-lying, with elevations generally below 30 meters above sea level.

Key features include a semi-continuous fringing reef system, sandy beaches, protected bays, estuaries, and tidal creeks that support mangrove forests. The region's numerous creeks and water channels create intricate networks of estuarine environments and wetlands, crucial for sediment transport and the distribution of mangroves and other coastal habitats.

### 1.5.2 Climate

The average annual precipitation in Mtwapa, Takaungu, and Kilifi creeks ranges from 300 mm to 1,300 mm, reflecting a bimodal rainfall pattern. The short wet season occurs from October to December, while the long rainy season spans from March to May. Annual temperatures vary from 21°C to 30°C, with the hinterland experiencing higher temperatures ranging from 30°C to 34°C. Significant wind activity is also noted in the creeks, with moderate wind speeds ranging from 4.8 km/h at the shore to 12 km/h in the hinterland.

### 1.5.3 Soils and Geology
#### 2.3.3.1 Geology

The creeks are characterized by diverse geological formations. This includes sedimentary rocks such as sandstone, limestone, and shale, which are prevalent along the coastline stretching all the way from Kilifi to Mtwapa and Takaugu areas. Coral reefs are also prominent geological features, forming submerged structures that provide habitats for marine life and contribute to coastal protection. Additionally, volcanic rocks may be present in some areas, adding to the geological diversity of the region.

#### 2.3.3.2 Soils

The soils in the creek areas are influenced by both marine and terrestrial processes. Sediments deposited by tidal action and riverine inputs contribute to the formation of various soil types. Mangrove forests typically grow in muddy, waterlogged soils rich in organic matter. These soils are often saline and have low oxygen levels, creating unique conditions suitable for mangrove growth. Along the creek banks and adjacent wetlands, soils may vary from sandy to silty, depending

on factors such as tidal inundation, sedimentation rates, and vegetation cover. Inland areas adjacent to the creeks are always laden with soils driven from weathered sedimentary rocks, characterized by a mix of clay, silt, and sand particles.

### 1.5.4 Hydrology

The three creeks are inlets of seven main rivers (refer table 1). These water channels, with their varying lengths and hydrological characteristics, create diverse habitats within the mangrove forest, fostering a rich array of flora and fauna. They also play crucial roles in regulating water quality, sediment transport, and nutrient cycling, contributing significantly to the overall health and resilience of the coastal ecosystem.

*Table 1: Main rivers in Mtwapa-Takaungu-Kilifi-Creeks*

| Creeks | Main Rivers |
|---|---|
| | R.Mwandeje |
| | Mto Mkuu |
| Mtwapa | R. Mwanzai |
| Takaungu | R. Mbogolo |
| | R. Nzovuni |
| | R.Rare |
| Kilifi | R.Njora |

### 1.5.5 Biodiversity description (Flora and Fauna)

### 1.5.5.1 Flora

The Mtwapa, Takaungu, and Kilifi Creeks are characterized by a diverse array of mangrove species adapted to the brackish and saline waters. The predominant species along these creeks include *Rhizophora mucronata*, *Avicennia marina, Soneratia alba*, and *Ceriops tagal* (include the local names of these species). Other species (give examples of these species) are present but in smaller quantities, as shown in table 2. These salt-tolerant trees play a vital ecological role by stabilizing shorelines, trapping sediments, and providing crucial habitats for marine life. Additionally, coconut palms are common along the coast, offering shade and sustenance to local communities. Indigenous trees such as Mlagakuku and Mkingiri, along with other native shrubs, also populate the area.

*Table 2: Distribution of mangrove species within Mtwapa, Takaungu and Kilifi areas.*

| Creek | No. of species | Scientific and local name of species |
|---|---|---|
| Mtwapa and Kilifi | 9 | *Rhizophora mucronata* (Mkoko),*Ceriops tagal* (Mkandaa), *Bruguiera gymnorrhiza* (mkoko mwembe/Muia) *Sonneratia alba* (Mlilana), *Avicennia marina* (Mchu), *Xylocarpus granatum* (Mkomafi), *Xylocarpus moluccensis*(Mkomafi dume), *Heritieria littoralis* (Msikundazi) *and Lumnitzera racemosa* (Kikandaa). |
| Takaungu | 8 | *Rhizophora mucronata*(Mkoko),*Ceriops tagal* (Mkandaa), *Bruguiera gymnorrhiza* (mkoko mwembe/Muia) *Sonneratia alba* (Mlilana), *Avicennia marina* (Mchu), *Xylocarpus granatum* (Mkomafi), *Xylocarpus moluccensis*(Mkomafi dume), *and Lumnitzera racemosa* (Kikandaa). |

## 1.5.5.2   Fauna

The Mtwapa-Takaungu-Kilifi Creek mangroves serve as a crucial breeding and nursery ground for various fish species, including snappers, groupers, changu, tewa, taa, kolekole, kufi, tembo, and a variety of reef fish (vituguu), supporting local fisheries. The mangrove habitats also host numerous crustaceans like crabs and shrimps, benefiting from the muddy, complex root systems. The diverse avian population includes egrets, herons, kingfishers, and the iconic African fish eagle. Small mammals such as monkeys, bushbucks, dik-dik, and mongooses are occasionally spotted, while larger mammals are scarce. The area is also home to mollusks like snails and oysters, various snakes and lizards that nest along the shores, and a variety of insects including bees, wasps, stingless bees, and mosquitoes.

## 1.6   History of the Forest Reserve

In the 1960s, Mtwapa, Takaungu, and Kilifi creeks were believed to harbor invisible creatures that could cause death if seen, leading to minimal human interference and allowing biodiversity to thrive. By the 1980s, migrants seeking employment and livelihoods increased the population, putting pressure on mangrove resources for construction and fuel. During the 1970s and 1980s, the government, through the Forest Department, restricted community use of forest resources and enhanced restoration efforts, resulting in disputes with local communities. In 2005, the government established Kenya Forest Service and Community Forest Associations (CFAs) to promote sustainable forest resource use. Subsequently, NGOs have educated communities on resource management, conducted capacity building, and encouraged the formation of community conservation groups.

## 1.7   Forest degradation status

The mangroves within Mtwapa, Takaungu, and Kilifi creeks are facing different levels of degradation due to several factors. These include the overexploitation of mangrove resources for charcoal production, construction, fencing materials, and fuelwood. Additionally, encroachment by

developers, pollution from nearby communities, urbanization, sedimentation from poor farming practices, the excavation of fish ponds, and unsustainable fishing methods, particularly for crab and bait harvesting, are contributing to the degradation. The levels of degradation have been classified as follows:

**High degraded areas** were characterized by severely reduced tree density, large expanses of bare ground, extensive canopy gaps, severe soil erosion, sedimentation issues, significant alterations in water flow and tidal patterns, high pollution levels, and a substantial decline in biodiversity. Human activities in these areas include extensive resource extraction and infrastructure development. The total degraded area in Mtwapa is 435 Ha while in Kilifi is 438 Ha (Figure 1 & table 3). Recommended restoration initiatives in these areas include large-scale reforestation, hydrological adjustments, erosion control measures, and sediment management practices.

**Moderate degraded areas** exhibit reduced tree density, significant canopy gaps, moderate soil erosion, and sedimentation issues. Water flow and tidal patterns are altered, and pollution levels are moderate. Biodiversity is somewhat reduced, with some key species in decline. These moderately degraded areas cover 15 Ha in Mtwapa, 10 Ha in Takaungu, and 201 Ha in Kilifi (Figure 1 & table 3). Recommended restoration Initiatives in these areas include enrichment planting of endemic species and hydrological restoration.

**Low degraded areas** exhibit slight reductions in tree density, minor canopy gaps, some signs of soil erosion, and slight alterations in water flow and tidal patterns. Biodiversity is slightly reduced with minimal human impact. These low degraded areas cover 266 Ha in Mtwapa and 152 Ha in Kilifi (Figure 1 & table 3). Recommended restoration efforts focus on protection for natural regeneration, minor reforestation, and erosion control.
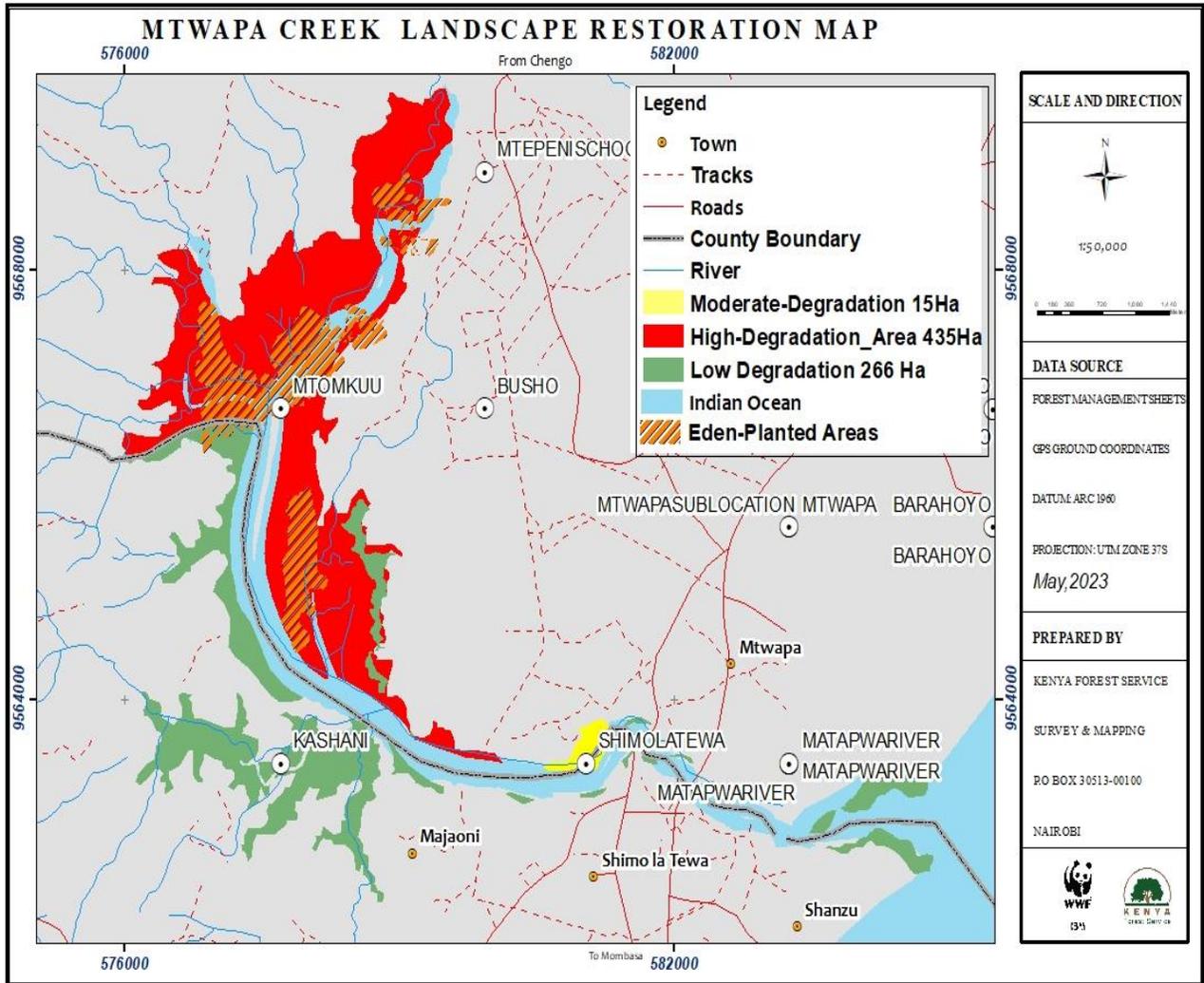
*Figure 1: Degraded areas in Mtwapa Creek*
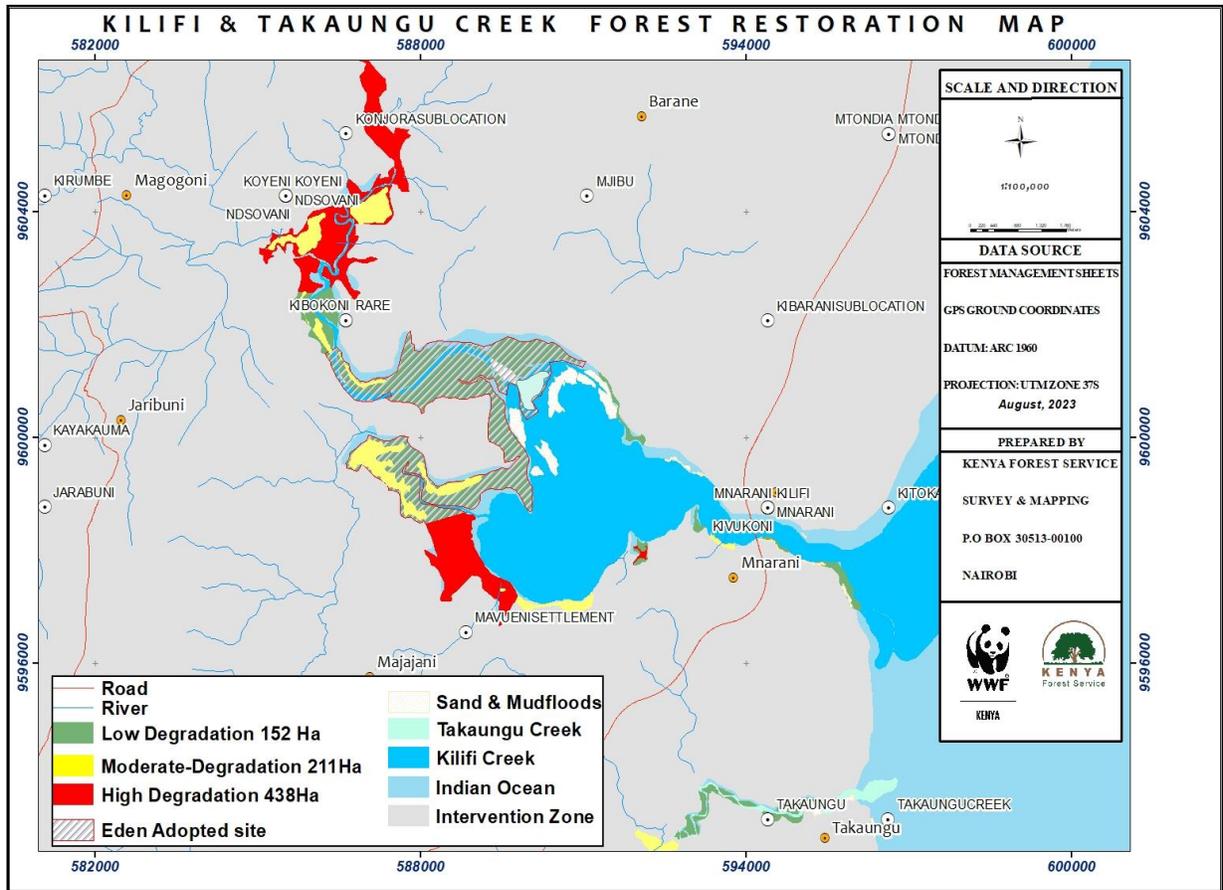
*Figure 2: Degraded areas within Takaungu and Kilifi Creek*

*Table 3: Sites, Degradation Levels, and Involved Organizations in Mtwapa Creek*

| Beat | Ha | Status | Responsible |
|---|---|---|---|
| Mtomondoni, | 15 | Moderate degradation | Kwetu-TC to formalize /WWF |
| Timbetimbe, | 25 | High degradation | RORO Foundation |
| Kidutani | 50 | High Degradation | Eden: People+Planet |
| Mwandoni, | 250 | High Degradation | Eden: People+Planet |
| Lutsanga | 80 | High Degradation | Eden: People+Planet |
| Babyloni | 4 | Low degradation | Kwetu TC |
| Customs | 2 | Low degradation | KFS |
| Miembe kumi (mtepeni) | 30 | High Degradation | RORO |
| Total Degradation | 456 | | |
| Grand Total (hectares) | 716 | | |

*Table 4: Sites, Degradation Levels, and Involved Organizations in Kilifi Creek*

| Kilifi Creek | | | |
|---|---|---|---|
| Beat | Ha | Status | Responsible |
| Kuchi, | 211 | High Degradation | Earthlungs Reforestation Foundation |
| Kuchi | 52 | Moderate Degradation | Earthlungs Reforestation Foundation |
| Kuchi | 117 | Conserved Area | Earthlungs Reforestation Foundation |
| Maya/ | 188 | Moderate Degradation | Eden: People+Planet |
| V-Island | 22 | Moderate Degradation | KFS |
| Kibokoni | 5 | Moderate Degradation | Eden: People+Planet |
| Sea horse | 1 | Moderate Degradation | Leaf proposed site |
| Fumbini | 2 | Moderate Degradation | Leaf proposed site |
| Kidundu | 35 | Moderate Degradation | Eden: People+Planet |
| Nzombere | 21 | Moderate Degradation | Earth Lungs/GRO Foundation |
| Total | 644 | | |
| **Grand Total Area Kilifi** | **1789** | | |

*Table 5: Sites, Degradation Levels, and Involved Organizations in Takaungu Creek*

| Takaungu creek | | | |
|---|---|---|---|
| Beat | Ha | Status | Responsible |
| Uwanja wa mafisi | 10 | Moderate Degradation | Plan International |
| Kivukoni/Kiriba | 35 | Low Degradation | KFS |
| Total | 45 | | |

*Table 6: Degraded areas compared to total Mangrove areas*

| Total Degraded Areas | 1,104 | | |
|---|---|---|---|
| Total Mangroves Area | 2550 | | |

## 1.8    History of CFA formation and current status

The MTAKIMAU Community Forest Association (CFA) initially covered the Mtwapa, Takaungu, Kilifi, and Mida (Matsangoni and Uyombo) creeks. Established in 2012 with support from Slovakian aid and Kwetu Training Center, the CFA aimed to protect mangrove forests through local awareness campaigns. In 2013, fourteen Village Development Forest Conservation Committees (VDFCCs) created a constitution, and the CFA was formally registered in June 2014 with 405 members. The first participatory forest management plan (PFMP) was launched on July 27, 2016, focusing on mangrove planting and the distribution of energy-saving Jiko stoves and Makiga interlocking machines. However, a weak management committee led to the CFA's decline.

On June 8, 2023, WWF Kenya launched the Bengo Project to restructure the MTAKIMAU CFA, aiming to improve community livelihoods and forest conservation. The focus remained on the Mtwapa, Takaungu, and Kilifi Creeks, while Mida Creek (Matsangoni and Uyombo) joined the Sokoke CFA. In collaboration with WWF and NGAO, KFS conducted village barazas, resulting in the formation of user groups for activities like fishing, ecotourism, mangrove nurseries, beekeeping, and fuel wood collection. Following leadership training, a new executive committee was elected on August 7, 2023. The CFA has undergone multiple training, including Local Planning Team Training (LPT), and has renewed its certificate.

# CHAPTER THREE
# SOCIO ECONOMIC SITUATION

## 3 Socio Economic Status off Mtwapa, Takaungu and Kilifi Mangrove FACs

### 3.1 Population distribution per location and sub location

Mtwapa Creek Mangrove Forest is located in Mtwapa, between the Shimo la Tewa and Kidutani Mawamba sublocations. Kilifi Creek Mangrove Forest spans Mavueni/Takaungu, Kilifi township, Jaribuni, Kauma, and Tezo, encompassing Mnarani, Mavueni, Majajani, Msanda, Konjora, Mdanagarani, Kibarani, and Hospital sublocations. Takaungu Mangrove Forest is situated in Takaungu, within the Kiriba Wangwani sublocation.

*Table 7: Population distribution per location and sub location*

| Forest | Location | Population | Sub location | Population |
|---|---|---|---|---|
| Mtwapa creek | Mtwapa | 127737 | Shimo la tewa | 70990 |
| | | | Kidutani mawamba | 12986 |
| Kilifi creek | Kilifi township | 75434 | Mnarani | 11253 |
| | Tezo | 44129 | Konjora | 15768 |
| | | | Kibarani | 21125 |
| | | | Hospital | 39776 |
| Takaungu | Takaungu | 8452 | Kiriba wangwani | 5451 |

### 3.2 Ethnicity

Mijikenda communities account for the majority of the population within the region. They include Giriama, Kauma, Kambe, Jibana, Ribe, Rabai, Duruma, Digo, and Chonyi. Other non-coastal communities in the area include Maasai, Kikuyu, Luhya, Kisii, and Kamba.
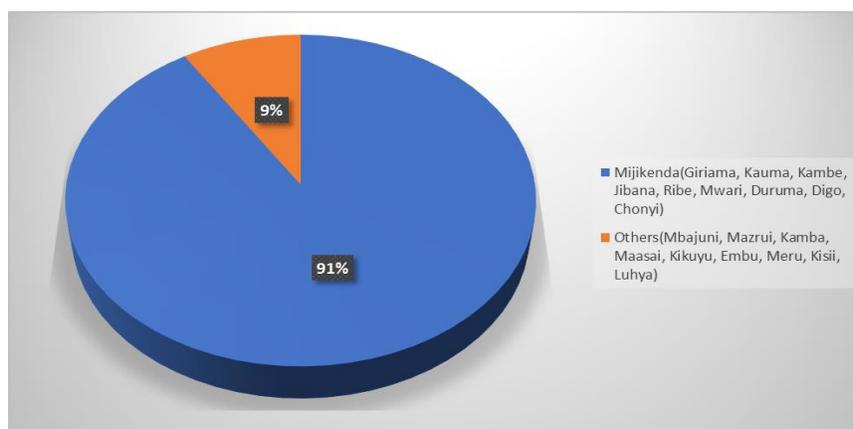


*Figure 3: Ethnicity*

The reason for other communities moving to the community adjacent to the forest is because of intermarriage, purchase of land and other reasons as shown below.
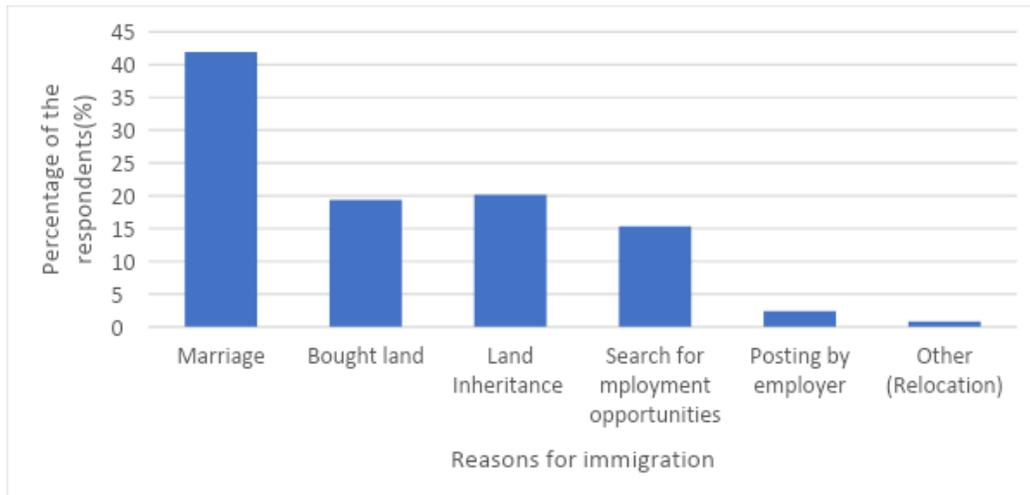


*Figure 4:  Reasons for moving to the Forest adjacent Community*

## 3.3    Gender and Age distribution

Men traditionally were responsible for responding to inquiries and handling issues regarding mangrove conservation. Initially, youth between 18 to 34 years participated in mangrove deforestation, but due to increased knowledge of the value of mangrove forest, deforestation has decreased. Men, women, and youths are now actively involved in mangrove protection and maintenance. They help in decision making, establishment of tree nurseries, planting of mangroves, promotion of ecotourism, beekeeping, mariculture, and sustainable harvesting of fuel food.

## 3.4    Family size of the forest adjacent community(FAC)

Families with six to ten members make up the largest percentage of the villages surrounding the forest. Families with a larger number of household members extract more resources from the forest such as poles and firewood for home use.Over extraction of forest resources lead to forest degradation This call for awareness creation for conservation and sustainable use of forest resources.

## 3.5    Education level of the forest adjacent community

The majority of people living close to the forest have a primary level of education followed by secondary and tertiary education. This low level of education results in limited income opportunities leading to pressure on forest resources. The existence of informed community members living close to the forest suggests that training and other capacity-building initiatives related to participatory forest management can easily penetrate in the community.
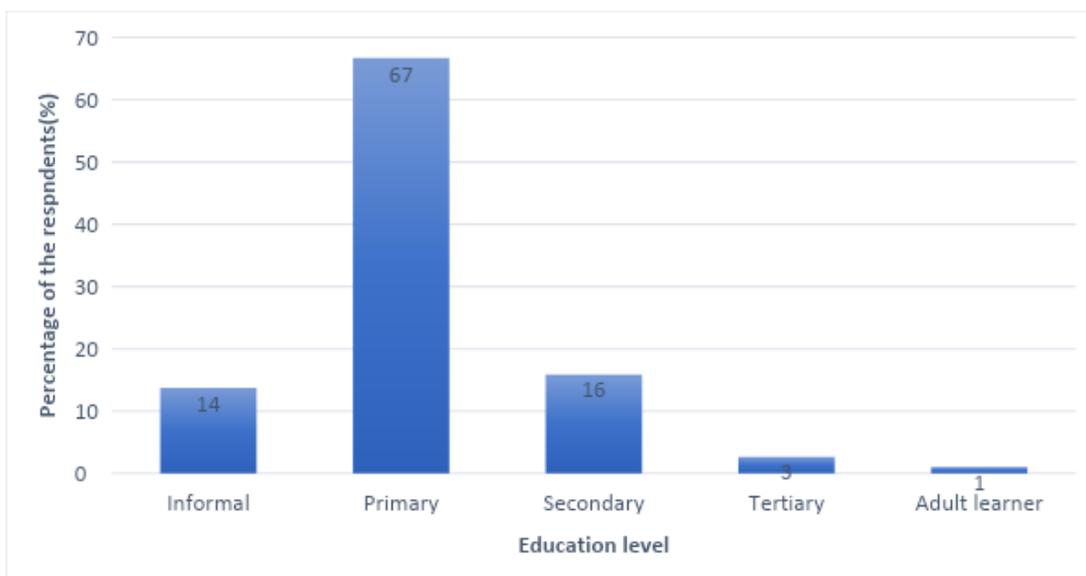
*Figure 5:Level of Education*

## 3.6 Local economic activities of the forest adjacent communities (FAC)

The primary economic activity for community members is casual employment, which accounts for 22% of all employment and includes jobs as security guards, farmers, and fishermen. Business ventures (17%), the sale of livestock (15%), and skilled laborers (9%) such as mechanics, carpenters, masons, plumbers, and health care providers. A small percentage of members (7%) depend on gifts and remittances from relatives.

*Table 8: Economic activities of the FAC*

| Income source | Frequency | % |
|---|---|---|
| Sale of agricultural food crops(Maize, vegetables, cassava) | 30 | 7 |
| Sale of agricultural cash crops(Coconut) | 6 | 1 |
| Unprocessed forest products (Firewood, from nurseries) | 12 | 3 |
| Processed forest products (Purified honey, poles) | 13 | 3 |
| Casual employment | 92 | 22 |
| Skilled laborers | 38 | 9 |
| Support from Government; especially for the elderly | 9 | 2 |
| Pension | 6 | 1 |
| Business enterprises | 70 | 17 |
| Sale of livestock (Goats, chicken, cows) | 64 | 15 |
| Fisheries resources e.g sea shells, cucumber, lobster, crabs | 22 | 5 |
| Sale of livestock products(eggs, meat, milk, manure) | 22 | 5 |
| Remittances and gifts | 30 | 7 |

| | | |
|---|---|---|
| Formal employment | 1 | 0 |
| Others | | 3 |

## 3.7   Farm sizes distribution

The majority of the population living adjacent to the forest resides on less than two acres of land. Importantly, though, a sizable fraction of the population has farms larger than 8.1 acres that are suitable for agroforestry, which, when practiced, can lower the demand for forest products.

*Table 9: Farm sizes of respondents*

| Farm size (acres) | No of respondents (%) |
|---|---|
| 0 – 2 | 52 |
| 2.1 – 4 | 20 |
| 4.1 – 6 | 9 |
| 6.1 – 8 | 3 |
| Over 8.1 | 16 |

## 3.8   Crops grown by the forest adjacent communities (FAC)

The majority of community members grew maize (31%) because it is staple food for the Mijikenda community. They also grew cassava (11%), cow peas (10%), vegetables (7%), beans (6%) and other as indicated table below. Other crops grown include Irish potatoes, coconut, mangoes, assorted vegetables (kales, mchicha, tomatoes, pumpkin, brinjal), green peas, green grams and okra. Promotion of these food crops improve food security in the region hence reduce pressure on forest for livelihood.

*Table 10: Crops grown by the FAC*

| Crop | Respondents (%) |
|---|---|
| Maize | 31 |
| Beans | 6 |
| Cassava | 11 |
| Vegetables | 7 |
| Green grams | 6 |
| Cow peas | 10 |
| Mangoes | 3 |
| Coconut | 3 |
| Green peas | 2 |
| Okra | 2 |
| Brinjal | 2 |
| Pumpkin | 1 |

## 3.9 Livestock husbandry

The majority of the community raises chickens (34%), goats (30%), cows (17%), and ducks (13%). Few individuals raise turkeys, pigs, rabbits, and kangas. Goat and chicken farming are more cost-effective than sheep farming, which is why they are placed higher.
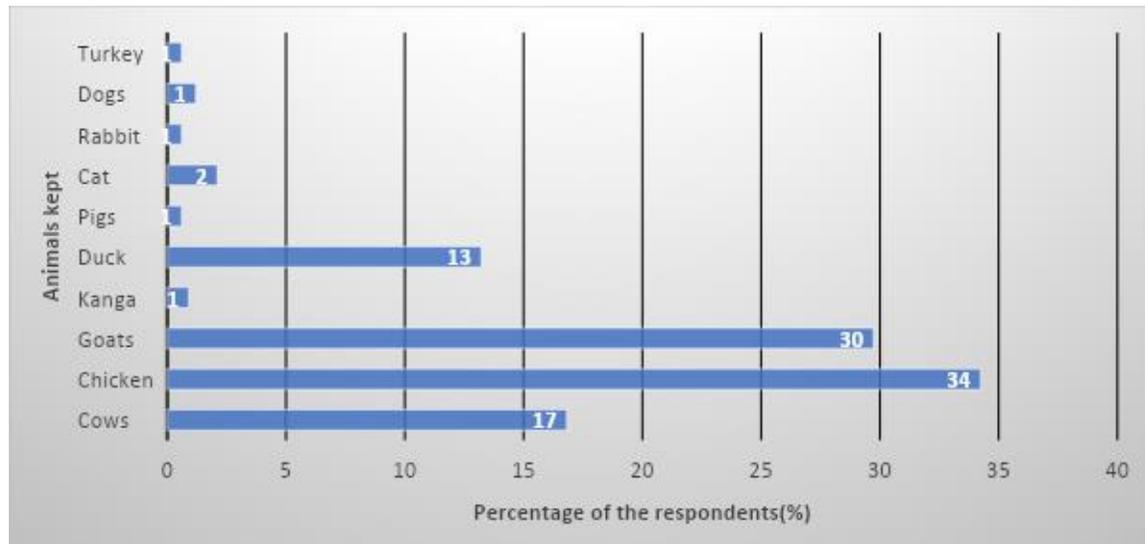


*Figure 6: Livestock kept by the forest adjacent communities*

Cattle and goats are primarily raised for their milk, while ducks and chickens are primarily raised for their meat and eggs because they require less upkeep and provide family members with meat (particularly chicken), milk, meat and eggs are mainly for both subsistence and sale. Manure produced is mainly for subsistence use. promotion of livestock improves livelihood hence reduces pressure on the forest.

*Table 11: Number and purpose of livestock kept*

| Livestock | Number kept (% of respondents) | | | | Purpose of keeping the livestock |
|---|---|---|---|---|---|
| | 1-5 | 6-10 | 11-15 | >15 | |
| Cows | 79 | 19 | 0 | 2 | Milk, meat, manure |
| Chicken | 28 | 35 | 18 | 19 | Eggs, meat, manure |
| Goats | 49 | 36 | 9 | 6 | Milk, meat, manure |
| Kanga | 67 | 33 | 0 | 0 | Meat |
| Pigs | 0 | 50 | 50 | 0 | Pork |
| Ducks | 53 | 21 | 10 | 16 | Eggs, meat |
| Rabbit | 0 | 100 | 0 | 0 | Meat |
| Turkey | 100 | 0 | 0 | 0 | Meat |
| Cats and Dogs | 100 | 0 | 0 | 0 | Security |

## 3.10 Grazing resources

The highest percentage of the community grazed their animals on on-farm pasture(48%), followed by roadside grazing (18%), zero grazing (11%), forest grazing (10%), commercial feeds (5%) and local feed from crop remains (5%). Forest grazing poses a threat to regeneration of the forest, there is a need to control forest grazing to promote natural regeneration of mangrove forest.
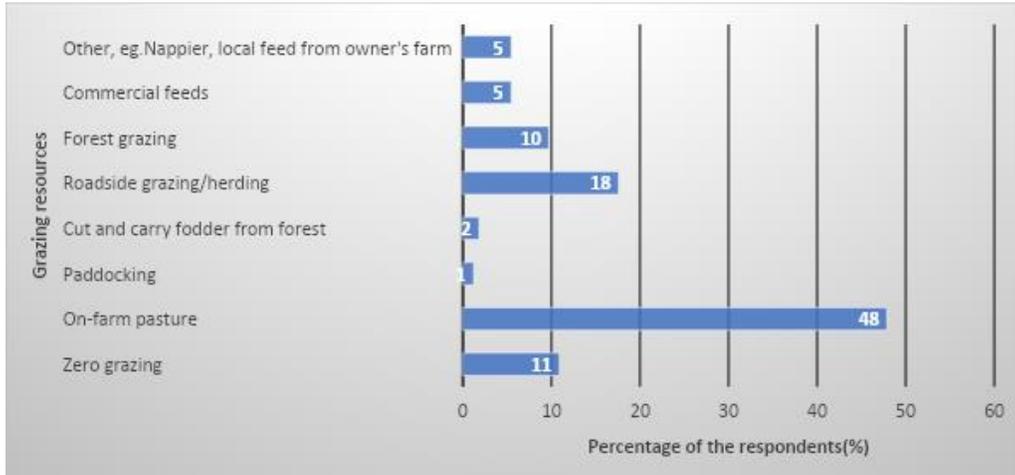


*Figure 7:Grazing Resources*

## 3.11 Sources of energy

The primary source of energy is firewood (31%), which is followed by solar panels (20%), electricity (15%), charcoal (12%), and other sources. The community's dependence on charcoal and firewood suggests that agroforestry has to be encouraged in the area as a buffer against illegal charcoal production and firewood cutting in the forest.
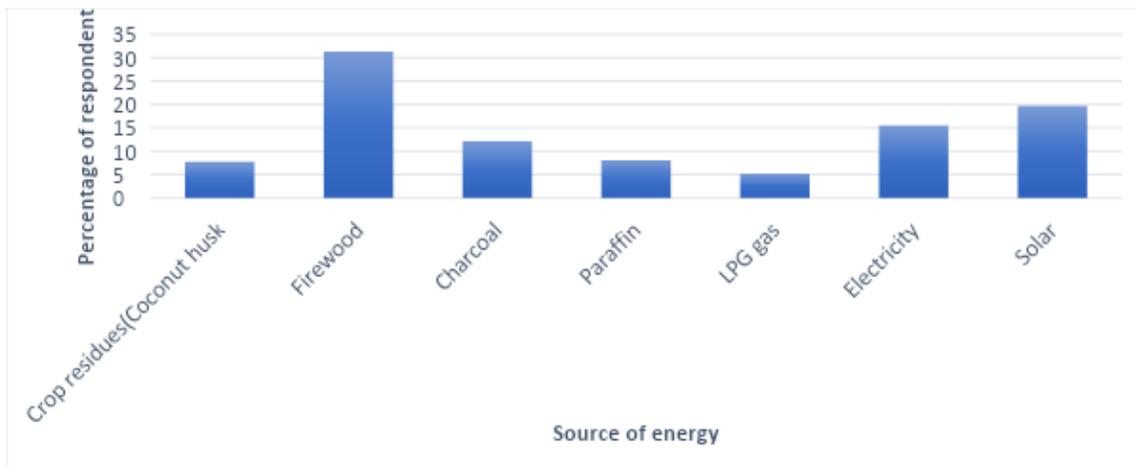


*Figure 8: Sources of energy*

### 3.12 Purpose of energy

The energy sources are used mostly for cooking or lighting. The crop residue, firewood, charcoal, biogas and liquid petroleum gas (LPG) are used for cooking while paraffin, electricity, solar and generators are used for lighting.

### 3.13 Types of firewood used

The community mostly uses three types of firewood: dead and fallen (44%), dry (41%) and crop residue (15%). There is no use of wet firewood in the areas.

*Table 12: Types of firewood used*

| Type of firewood | % | Main source |
|---|---|---|
| Dead and fallen | 44 | Mangoes, Mangroves, Neem tree, Vendors, Forest, Own farm |
| Dry | 41 | Vendors, Mgamu, Mango trees, Orange tree, Mangroves, Neem tree, Mratina, Mkanjo, Cashew nuts, Makumbi,Casuarina, Mvinje, Mwangati |
| Crop residue | 15 | Maize cobs, Neem tree, Coconut husk, Marifu |

### 3.14 Marine fishery resources obtained from the mangrove areas

Fish from the creeks are used by the greatest percentage of the community (38%) followed by prawns (31%), crabs (27%), oysters (3%) and cucumbers (1%). The harvesting of fishing baits and ill fish used for fishing destroys mangroves. Mangroves act as breeding ground for fish, crabs, prawns, oysters and cucumbers. This calls for the conservation and use of non-destructive methods of bait harvesting.
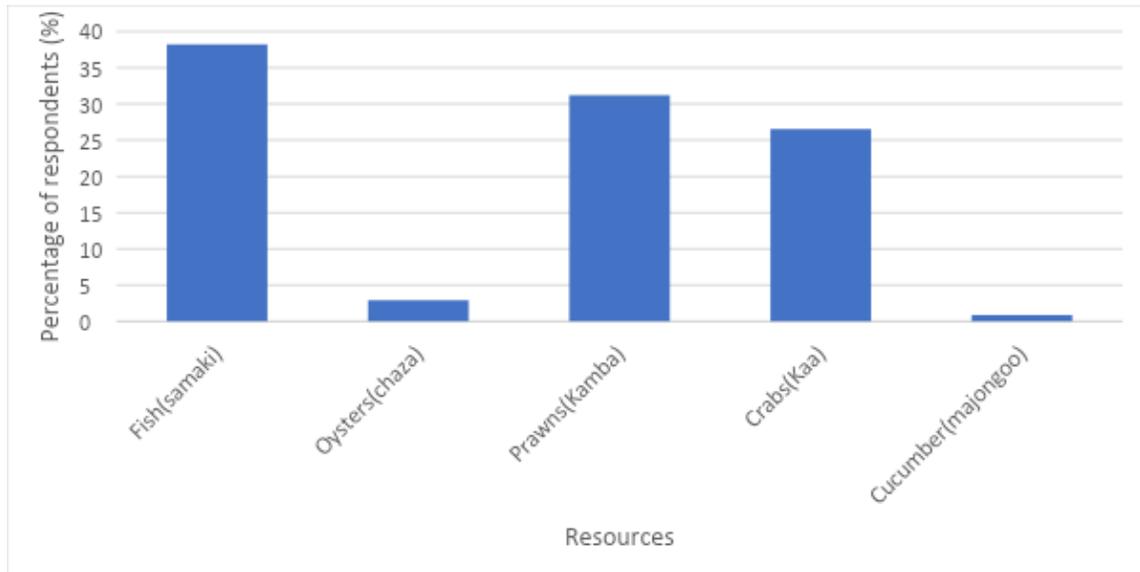
*Figure 9: Fishery resources*

## 3.15 On-farm tree planting

82% of the community members practice agroforestry on their farms, whilst 18% do not own land to grow trees. promotion of on farm tree planting will reduce the pressure on the forest by the community.
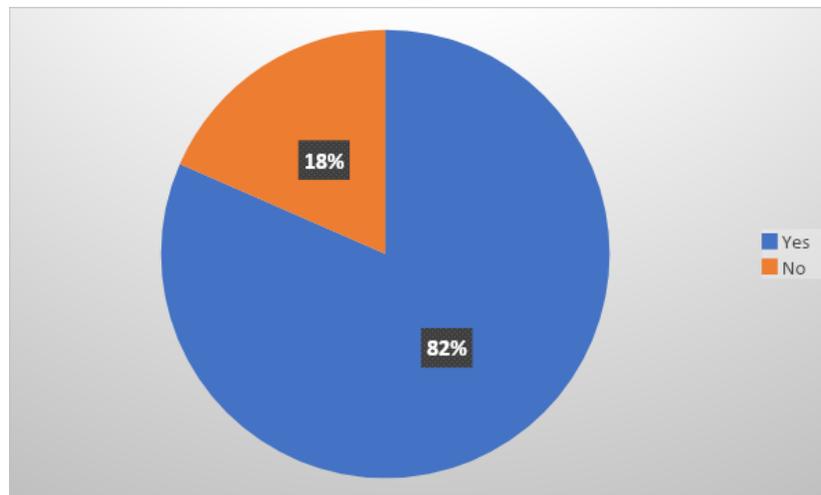


*Figure 10: On farm tree planting*

The tree species found on the farms are mostly *Cocos nucifera* Coconut (mnazi), Mango tree (mwembe), *Azadirachta indica* Neem tree (Muarubaini), Mkilifi, *Anacardium occidentale* Cashew nut (Mkanju), Orange tree (Mchungwa), *Annona reticulata (*Mtomoko), White oak (m-borea), Guava(Mpera), *Tarmarindus indica (*Mkwaju), *Senna siamea (*Msonobari), *Adansonia digitata* Baobab (mbuyu) and *Eucalyptus camaldulensis* Blue gum. Other species includes: Mkungu,

*Carica papaya* Pawpaw, Mgamu, Mwangati, *Kigelia africana (*Mratina), Mraster, Avocado, Lemon, Indiana, Bustani, *Casuarina equisetifolia* (Mvinje), *Ficus sycomorus (*mkuyu), msikuku, mikode, *Polyalthia longifolia* ashok, Mkudada, *Ziziphus mucronata (*mkunazi), mikorosho, *Afzelia quanzensis (*mubambakofi), *Delonix regia (*mkayamba), *Grewia plagiophylla (*mkone), mchumbu, mlukina, *Moringa oleifera* moringa (mzungwi), *Leuceana leucocephala*, *Terminalia spinosa (*mwanga), mtola, *Dalbergia melanoxylon (*mipingo), *Brachstegia spiciformis* (mirihi), *Melia volkensii* (mpenda bure), *Berchamia discolor (*mkulu), muyama, mkuha, mkula usiku and mdiro.

## 3.16  Purpose of on-farm trees

According to the data, 28% of community members plant trees for shade, 22% for firewood, 17% for cash income from the sale of poles and posts, and 8% for fruits and vegetables, as illustrated below. On-farm forestry plays a crucial role in reducing pressure on the natural forest.

*Table 13: Purpose of on farm trees*

| Purpose of on-farm trees | % | Species used |
|---|---|---|
| Cash income from sale of poles and posts | 17 | Casuarina, Neem tree, Mvinje, Mkulu, Eucalyptus, Leuceana, White oak, Misonobari, Mishilingi, Mkone, Coconut, Komaza, Mzungi, Aborea, Mrobwera |
| Firewood | 22 | Mkuhu, Mkulu, Muyama, Murihi, Mkanju, Makumbi, Mikudadi, Mango tree, Coconut, Neem tree, pruned mkilifi |
| Charcoal production | 6 | Mifunda, Mwangani, Coconut, white oak, mikanju |
| Live fence | 6 | Mikode, White oak, Msonobari, Moringa, Mboma, Mikudada, Flowers, Ashok, Coconut leaves |
| Shade | 28 | Mkulasiku, Coconut, White oak, Mkone, Mkwaju, Umbrella tree, Indiana, Mkilifi, Mikode, Mango tree, Neem tree, Mratina, Mraster, Borea, Mkungu, Mwangati |
| Ornamental | 4 | Christmas tree, Mikudada, Bougenvilla, Ashok, flowers |
| Livestock fodder | 2 | Grass, Lukina |
| Bee keeping | 1 | Mkone |
| Fruits & Vegetables | 8 | Mabuyu, Orange, Guava, Mikwaju, Mtomoko, Avocado, Mango, Coconut, Lemon,Mzungi, Mkungu |
| Soil improvement | 5 | Mkilifi, Grass, Mlukina, Misonobari, Mikudada leaves |
| Other e.g. Building materials like timber, cooking oil | 0 | Coconut |
| Cash income from sale of coconuts and other produce | 1 | Coconut, Maize, Cashew nuts |
| Herbal medicine | 1 | Mwarubaini, eucalyptus, mzungi, aloe vera, mchumu,mpera |

## 3.17 Involvement of Communities in forest management activities

33% of the community members access the forest, while 23% participated in tree planting, 13% engaged in ecotourism, 12% lawfully extracted products from the forest, 5% participated in decision-making, and 2% patrolled and policed the area. The willingness of the communities surrounding the forests to conserve and manage their forests was demonstrated by the participation of others in a variety of forest activities. For those who were unaware of PFM, awareness raising efforts should be made.
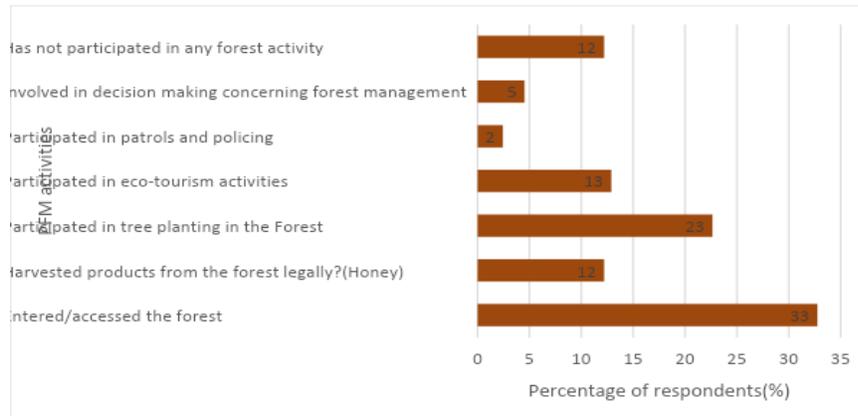


*Figure 11: PFM Activities*

## 3.18 Participation in organizations involved in environmental conservation

The participation in organizations involved in forest conservation is as shown below which shows that 55% of the community members were not members of any community-based organization involved in forest conservation. Nevertheless, most of the respondents (72%) were not aware of Mtakimau CFA. 66% of the respondents were members of the CFA and were aware of the roles and obligations of the CFA.

*Table 14: Participation in organizations involved in environmental conservation*

| a) Does the respondent or someone in his/her family belong to a forest user group or any community-based organization involved in forest conservation | Response | No | % |
|---|---|---|---|
| | YES | 86 | 45 |
| | NO | 105 | 55 |
| b) If the answer for (a) is "NO", is the respondent aware of the Community Forest Association? | YES | 31 | 28 |
| | NO | 78 | 72 |
| c) If the answer for (b) is "YES", is the respondent a member of the CFA | YES | 62 | 66 |
| | NO | 32 | 34 |
| d) If the answer for (c) is "YES", is the respondent aware of the roles and obligations of Community Forest Associations? | YES | 63 | 100 |
| | NO | 0 | 0 |

## 3.19 Perception on forest importance

Most community forest neighboring communities value forests for non-economic reasons such as pure air, soil, and water conservation. 41% believe trees are important for the goods they provide.
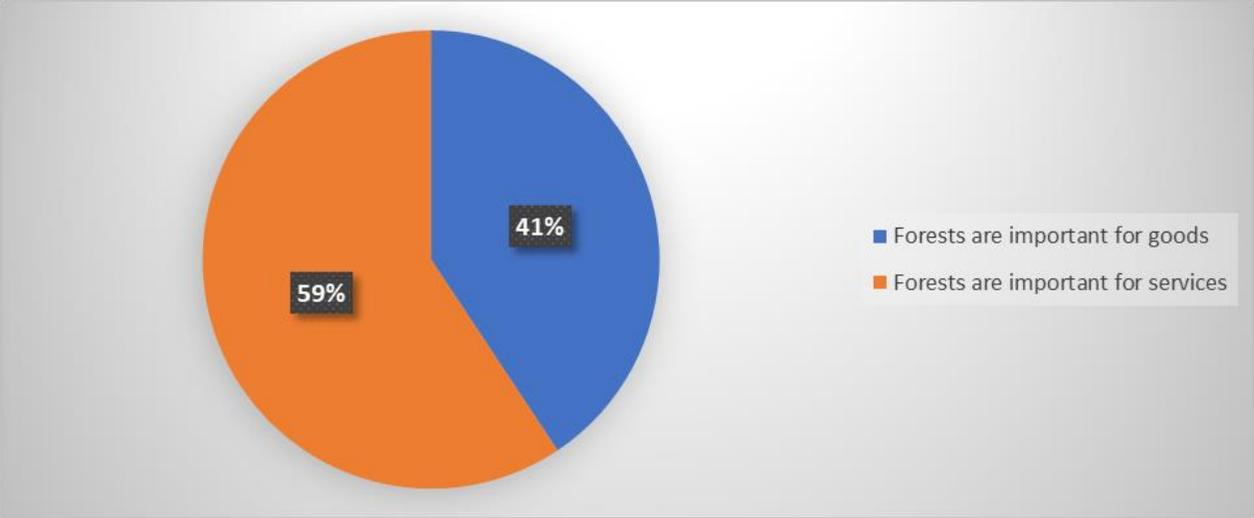
*Figure 12: Perception on the importance of forests*

## 3.20 Willingness to contribute for forest conservation

The majority of community members (77%) are willing to pay some amount for forest conservation. (31%) are willing to contribute between Ksh.100 and Ksh.499, 5% between Ksh.50 and Ksh.99, and 3% above Ksh.1000. 16% of community members were willing to contribute but lacked the funds to do so, 16% would contribute any amount once a week, and 4% once a month. However, 16% of the community is willing to donate zero shillings, while 7% are unwilling to contribute anything to forest conservation.
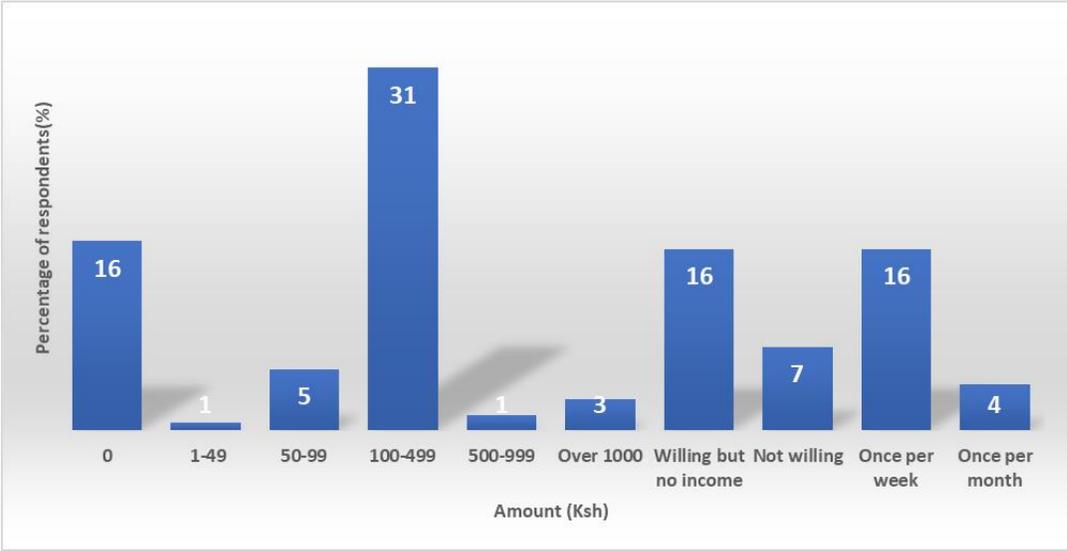


*Figure 13: Willingness to contribute to forest conservation*

## 3.21 Human Wildlife Conflict

34% of the community experienced human-wildlife conflicts while 66% did not experience human-wildlife conflicts.
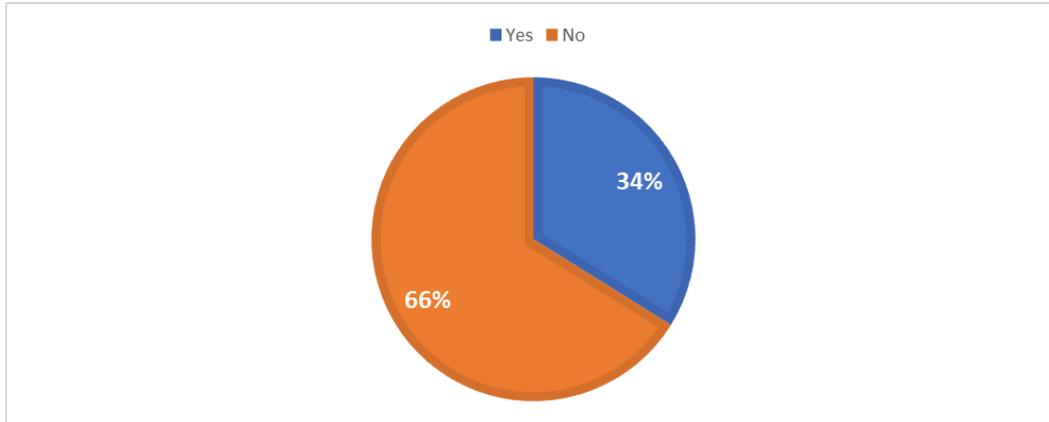


*Figure 14: Human wildlife conflict*

Monkeys (60%) are the most problematic animals, affecting 60% of the population, followed by baboons (11%). Wild animals eat and destroy crops that provide a source of income for local residents. Other wild animals included birds, squirrels, wild pigs, and rats that ate crops.
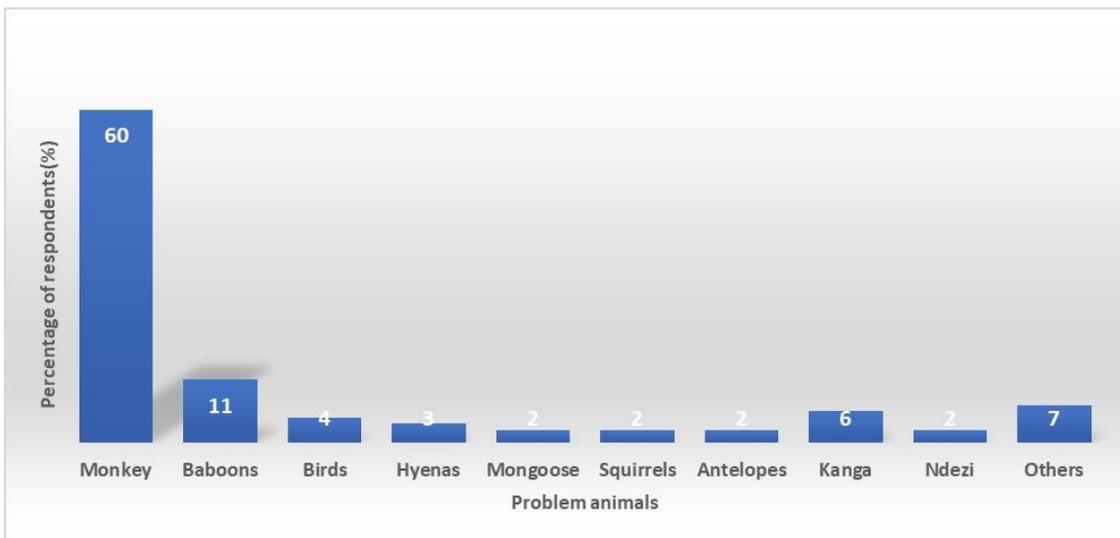


*Figure 15: Problem animals*

## 3.22 Problems in tree conservation

36% of the community mentioned illegal logging as the primary issue in forest conservation, followed by charcoal burning, unemployment and unawareness of the importance of forest. Other problems are listed in the table below.

Table 15: Problems in tree conservation

| Problems in tree conservation | Frequency | % |
|---|---|---|
| Drought | 16 | 6 |
| Encroachment | 1 | 0 |
| Unawareness of the importance of forests & matters concerning conservation by the community | 27 | 10 |
| Insufficient/ lack of seedlings | 1 | 0 |
| Unemployment/Poverty/ No payment | 27 | 10 |
| Misappropriation of funds by forest conservation leaders | 2 | 1 |
| Lack of community involvement | 6 | 2 |
| Destruction of tree seedlings by livestock/ Wild animals / Overgrazing | 9 | 3 |
| Destruction of breeding grounds | 1 | 0 |
| Lack of security personnel hence tress-passing | 4 | 1 |
| Lack of cooperation by community/ ignorance | 4 | 1 |
| Pollution in mangrove areas | 2 | 1 |
| Illegal logging | 102 | 36 |
| Scarcity of land | 2 | 1 |
| Lack of capacity/funds | 12 | 4 |
| Insecurity | 7 | 2 |
| Charcoal burning | 28 | 10 |
| Cutting of trees for animal feeds | 1 | 0 |
| Pests and diseases | 19 | 7 |
| Salinity | 12 | 4 |

## 3.23   Suggestions to improve forest governance

The recommendations made by the community to enhance forest governance and management are as in the table below.

Table 16: Suggestions to improve forest governance in Mtwapa-Takaungu-Kilifi

| Suggestions to improve forest governance and Management | Frequency | % |
|---|---|---|
| Plant more trees/Mangroves | 66 | 17 |
| Public education/awareness on the importance of trees | 103 | 27 |
| Establish tree nurseries | 5 | 1 |
| Recruit scouts | 26 | 7 |
| Irrigation | 1 | 0 |
| Rangers should work seriously/vigilantly | 3 | 1 |
| Provide employment opportunities | 18 | 5 |
| Recruit more rangers | 12 | 3 |
| Sensitize more people to join CFA | 3 | 1 |
| Waste management | 2 | 1 |
| Involving the community in conservation and management practices | 29 | 7 |

| Suggestions to improve forest governance and Management | Frequency | % |
|---|---|---|
| Insecticides and pesticides | 6 | 2 |
| Sustainable use of forest resources | 3 | 1 |
| Financial support/Gov't to support community in forest protection | 11 | 3 |
| Protect the forest/Security | 73 | 19 |
| Enforce appropriate laws and policies to avoid illegal logging | 6 | 2 |
| Addition /Strengthening of User Groups | 2 | 1 |
| Strengthening CFA | 11 | 3 |
| Ban logging and charcoal burning | 4 | 1 |
| Frequent meetings with CFA & KFS | 3 | 1 |

# CHAPTER FOUR
# PLANNING CONSIDERATIONS

## 4 Policy and Legal Framework

Mangroves are gazetted forest resources in Kenya under Forest Department in the legal notice No. 174 of 1964. The Mtwapa, Takaungu, and Kilifi mangrove restoration plan aligns with the Forest Policy 2024, the Forest Conservation and Management Act 2016, and other relevant regulations to ensure sustainable conservation and restoration of the mangrove forests. Effective enforcement of these laws is essential for the success of protection and restoration efforts. Here is a summary of the policies and laws that facilitate effective forest management. Additionally, some regional and global policies and agreements that may directly or indirectly impact the management of the mangrove forest are included.

### 4.1 The Constitution of Kenya, 2010

The Constitution of Kenya, promulgated in August 2010, addresses land and environmental issues in Chapter Five. Article 69 mandates that the state ensure the sustainable use and conservation of natural resources, equitable benefit sharing, and encourages public participation in environmental management and protection.

This document emphasizes the sustainable management and development of natural resources, including forests, within the Mtwapa, Takaungu and Kilifi area. To achieve this, legal institutions responsible for these resources must collaborate in a synchronized approach, recognizing and integrating various laws and policies, including both regional and global policies.

### 4.2 Environmental Management and Coordination Act (EMCA)

The Environmental Management and Coordination Act (EMCA) mandates the protection of forests and requires compulsory Environmental Impact Assessments (EIA) for any development in forestry. This ensures the well-being and sustainability of forests. Part V focuses on the protection and conservation of the environment, while Part IV addresses environmental planning, including the protection of coastal zones. This Act secures mangroves in Mtwapa, Kilifi and Takaungu creeks, preventing their indiscriminate cutting unless there is a well-justified reason. Even then, an EIA must be conducted, outlining the reasons and potential impacts. In addition, EIA shall also be conducted in development areas along Mtwapa, Kilifi and Takaungu mangrove ecosystems including land sites, development of ponds, boardwalks and ecotourism.

### 4.3 The Forest Conservation and Management Act No.34 of 2016

The Act outlines the importance of sustainable forest management and community participation, which are crucial for the success of the mangrove restoration plan. According to Part IV, 30 (1), forests are categorized as public, community, or private, with mangroves classified under public forests. This classification mandates that the government plays a key role in managing these areas to preserve existing mangroves and restore degraded ones. Part V, 49 (1) details the responsibilities of Community Forest Associations (CFA) in forest management and conservation. These

responsibilities include (b) creating programs that respect traditional forest user rights and (e) forming partnerships to ensure effective and sustainable forest conservation and management. This legal framework encourages the involvement of local communities through MTAKIMAU CFA to ensure proper management of mangrove forests. Effective governance and the sustainability of shared resources hinge on community involvement, making it essential for FACs Mtwapa, Kilifi, and Takaungu creeks to be included in decision-making processes, with their opinions valued and considered appropriately.

Part III, 42 (a) describes various methods for community involvement in forest management, including participation in forestry activities. Part IV, 43 (1) addresses effective community forest management agreements, highlighting the freedom of willing communities to use forests for livelihood, cultural values, and religious practices while also engaging in conservation efforts. Overall, this Act demonstrates a shift in the responsibility for managing forests in Kenya, including mangroves, from being solely under the oversight of the Kenya Forest Service (KFS) to a co-management approach with local communities. The co-management in mangrove conservation and restoration has been made possible through the local communities in Mtwapa, Kilfi and Takaungu in the mangrove zones being managed through MTAKIMAU CFA. This change has led to better resource management and has improved livelihoods through the implementation of mangrove restoration projects in the Mtwapa, Kilifi, and Takaungu creeks.

## 4.4    Water Act, 2016

The Act promotes conservation of water catchment areas and involves local stakeholders, supporting mangrove restoration by managing upstream water resources effectively.

Part II (d) reservoirs for impounding surface run-off and for regulating stream flows to synchronize them with water demand patterns which are of strategic or national importance.

Part II 10. (2)   The object of the National Water Resource Strategy shall be to provide the Government's plans and programs for the protection, conservation, control and management of water resources

Part II (3) (a) measures for the protection, conservation, control and management of water resources and approved land use for the riparian area. The strength of this Act is endeavored to promote participatory forest management in water catchment and sub-catchment areas. This is achieved through the devolution of roles and responsibilities to the stakeholders namely; Water based institutions, WRA, Water Resource Users Associations (WRUAs), Water Services Board and Water Regulatory Boards.

## 4.5    Tourism Act, 2011

The Tourism Act (2011) provides guidelines for sustainable tourism, overseeing activities and services across the country as per the national tourism strategy. It requires the registration, licensing, and grading of all tourism-related activities, and it monitors and evaluates these activities to ensure

they follow sustainable practices. Since mangroves are part of the tourism offerings in Mtwapa, Kilifi, and Takaungu, the development of tourism products and services from this resource should also support its effective conservation and management. All tourism activities included in the restoration plan will adhere to the provisions of this Act.

## 4.6 Climate Change (Amendment) Act No 9 of 2023

The Act establishes a climate response strategy, enhancing adaptive capacity and supporting the mangrove restoration plan through climate resilience and carbon credit trading. Section 3 (a) provide guidance in the development and implementation of carbon markets and non-market approaches in compliance with international obligations. Section 4 (f) provides guidance and policy direction on carbon markets to the national and county governments, the public and other stakeholders. Section 24 (1) of the Act allows for public participation when developing strategies, laws and policies relating to climate change. Article 24 (2) states that public consultations are undertaken in a manner that ensures the public contribution makes an impact on the threshold of decision making. The PFMP implementation will mainstream climate change responses into development planning, decision making and implementation of all activities earmarked hereto and has to take into account the building of resilience and enhancement of adaptive capacity to the impacts of climate change.

## 4.7 The Societies Act, Cap 108 of 2012

The Act establishes procedures for registering and regulating societies, replacing the previous Societies Act. The plan emphasizes community participation from residents living near forests. It mandates that communities form associations, leading to the registration of MTAKIMAU Community Forest Association by the Registrar of Societies, following the guidelines of the Societies Act. The CFA will execute a Forest Management Agreement to strengthen the implementation of this initiative.

## 4.8 The Land Act, 2012 (Revised Edition, 2016)

The Act amends the Land Act, 2012, Land Registration Act, 2012, and National Land Commission Act, 2012 to enforce constitutional provisions and ensure sustainable land management. The National Land Commission, established under Article 67, manages public land for both National and County governments (Section 8). Section 12 prohibits the allocation of public land in forests, wildlife reserves, mangroves, wetlands, and other environmentally sensitive areas for non-conservation purposes. This secures mangrove ecosystems in Mtwapa, Takaungu and Kilifi creeks from illegally being allocated for destructive activities.

## 4.9 The County Government Act, 2012

The Act aligns with the constitutional objectives and principles of devolution, emphasizing citizen participation by ensuring timely access to information and involvement in policy formulation and implementation. It also safeguards the interests and rights of minorities, marginalized groups, and communities, granting them access to relevant information. Additionally, under the County Governments Act Section 108, the County Government of Kilifi drafts County Integrated Development Plans (CIDP) to outline its development goals for a five-year period. MTAKIMAU

CFA will work with the Local County Government (LCG) to implement the County Forest conservation and Management Act.

## 4.10 Fisheries Management and Development Act (2016)

The Act establishes the framework for the development, management, exploitation, utilization, and conservation of fisheries. Through subsidiary regulations, it ensures the protection of fish breeding and feeding grounds. The Act promotes sustainable management of fisheries and aquatic resources, which is essential for maintaining healthy mangrove ecosystems critical for fishery health. Part V, 29 (2), emphasizes that conservation efforts should not deprive the user community of their right to benefit from the resource, especially if it is their livelihood. This is achieved by promoting the conservation and management of breeding and feeding grounds for various marine fish species in Mtwapa, Takaungu, and Kilifi creeks, where mangrove forests play a crucial role. The Act also acknowledges the inter-jurisdictional nature of marine fisheries and advocates for collaboration and cooperation in managing fisheries resources.

## 4.11 National Mangrove Ecosystem Management Plan (2017-2027)

This plan provides a strategic framework for sustainable management, conservation, and restoration of mangrove ecosystems, enhancing community participation and balancing ecological health with economic benefits.

## 4.12 Other Legal Legislations

**Agriculture (Farm Forestry) Rules, 2009**
The Farm Forestry Rules, 2009 aims at promoting and maintaining farm forest cover of at least 10 percent of every agricultural land holding and to preserve and sustain the environment in combating climate change and global warming. MTAKIMAU CFA will work towards supporting sustainable management of forest resources including rehabilitation of degraded areas, and promotion of on-farm forestry and agroforestry practices.

**Physical Planning Act, 2012**
The Act outlines provisions for creating and executing physical development plans. Sections 4 and 5 specifically emphasize environmental protection and the necessity for development to align with environmental considerations. These guidelines will be strictly followed in the development projects proposed in the MTAKIMAU CFA mangrove restoration plan. This ensures that all activities aimed at restoring and managing mangrove ecosystems in Mtwapa, Kilifi, and Takaungu creeks adhere to environmental standards and contribute to sustainable development practices as mandated by the Act.

**Public Benefits Organizations Act, 2013**
Provides a framework for CFAs to operate effectively.

### 4.13 Multilateral Environmental Agreements (MEAs)

**Sustainable Development Goals (SDGs)**

The Sustainable Development Goals (SDGs) represent a universal vision for progress towards a safe, just, and sustainable world for all. Sustainable forest management is crucial for biodiversity conservation and livelihood support, aligning with the provisions of this Act. The plan aligns with SDGs, addressing goals like ending poverty, ensuring clean water, promoting sustainable energy, combating climate change, and protecting ecosystems.

**United Nations Framework Convention for Climate Change (UNFCCC)**

The plan promotes forest conservation and rehabilitation as carbon sinks, supporting climate change mitigation and rural livelihoods. Ratified countries will provide nationally Determined Contributions (NDCs) with specific restoration and mitigation targets.

**Convention on Biological Diversity (CBD)**

The CBD promotes biodiversity conservation and sustainable use, aligning with the plan's goals to conserve diverse species in Mtwapa, Takaungu and Kilifi mangrove forests. This included 20 target goals, including the restoration of at least 15% of degraded ecosystems (target 15).

**Global Forest Goals**

Global Forest Goals emphasizes sustainable forest management, protection and restoration of forest cover and the mobilization of financial resources. The MTAKIMAU management programs align closely with the Global Forest Goals. These goals aim to halt deforestation, enhance economic and environmental benefits from forests, increase protected forest areas, and promote governance frameworks for sustainable forest management. Specifically, the MTWAPA, TAKAUNGU AND KILIFI plan supports these objectives through activities focused on conserving and restoring mangrove ecosystems in Mtwapa, Takaungu, and Kilifi. By implementing sustainable practices such as protection, restoration, and community involvement, the plan aims to contribute directly to achieving the Global Forest Goals, ensuring the resilience and sustainable use of these vital coastal forests.

### 4.14 Link to National Planning

**Vision 2030**

Kenya's Vision 2030 promotes environmental sustainability and aims to enhance forest cover and sustainable resource management. The vision seeks to elevate Kenya into a newly industrialized middle-income nation with a high standard of living for all its citizens by 2030. It is structured around three main pillars: Economic, aiming for 10% annual GDP growth; Social, focused on fostering a fair and cohesive society; and Political, striving for a democratic system founded on the rule of law and individual rights. Key environmental initiatives concerning the Mtwapa, Takaungu, and Kilifi Mangrove Forests include ensuring a clean and healthy environment, sustainable utilization of natural resources, and achieving a 10% increase in forest cover by 2030.

### National Forest Programme (NFP) 2016-2030

The NFP provides a strategic framework for sustainable forest management, emphasizing community involvement and research. The strategic objectives of the National Forest Programme are to increase forest and tree cover and reverse forest degradation.

### Kenya Forest Service (KFS) Strategic Plan, 2023-2027

The KFS Strategic Plan aims to increase forest cover and promote sustainable management, supporting initiatives like tree planting and forest protection. The strategic plan goal is to increase the forest cover by 1.15% during the plan period. This is the third medium term institutional blueprint document. It outlines the organization's roadmap to achieving the aspiration of Kenyans towards 10% tree cover after enactment of Forest Conservation and Management Act 2016. Key among outlined flagship projects relevant to this PLAN are:
- Rehabilitation of water towers and management of water catchments
- Farm and drylands tree planting initiatives
- Promotion of bamboo establishment and utilization
- Control of invasive species
- Forest parks and recreational areas initiative
- Forest protection and security

## 4.15  Rationale for Management Planning

### Value of Mtwapa-Takaungu-Kilifi Creeks

The Mtwapa, Takaungu, and Kilifi mangrove ecosystems are significant for various reasons. They provide a habitat for numerous bird species, making them popular tourist attractions. The creeks host historical sites such as Mtsanganyiko slave ruins, Mnarani, Takaungu, Kaya Kauma, Jumba ruins, and Mtwapa. They offer shoreline protection against waves and serve as refuges for juvenile fish from predators. The mangroves act as carbon sinks and provide food through fishery resources. These creeks are breeding sites for sea creatures like crustaceans, fish, crabs, and turtles, and they help in climate change control. The unique views promote eco-tourism, and the presence of shrines like Kwa Mganga and Mkupani supports religious practices. The creeks' water sources supply the community with domestic water. Mudflats offer potential areas for pond excavation,the mangroves harbor apiaries for beekeeping and the presence of islands enhances the creeks' value for various activities. Additionally, the creeks have wide and interesting landing sites and are sources of propagules.

### Threats to Mtwapa, Takaungu and Kilifi mangrove forests

The threats to Mtwapa, Takaungu and Kilifi mangrove forests include: degradation from both human and natural factors, overexploitation through charcoal production, fuelwood collection, and illegal logging. Urbanization and encroachment threatens mangroves and leads to the drying of rivers flowing to the creeks. Pollution from adjacent settlements like Mtwapa town, sedimentation due to poor farming practices, and bait harvesting are also significant threats.

### Management Constraints

Management constraints include inadequate knowledge by some stakeholders about the legal framework for forest conservation, inadequate resources for protecting mangrove forests, and insufficient community knowledge on mangrove conservation.

### Problem Analysis

The degradation of the mangrove forests in Mtwapa, Takaungu, and Kilifi creeks is caused by both human and natural factors. Key issues caused by human activities include; urbanization, illegal logging, poverty, lack of awareness about forest importance and insufficient stakeholder involvement. Natural factors causing degradation of mangrove forests are mainly caused by climate change such as sea rises and drying of rivers in Kilifi and Mtwapa creeks affecting the growth and survival of mangroves. To address these challenges, it is essential to assess the main drivers and implement effective strategies. Adopting participatory Forest Management, which involves engaging local communities and other stakeholders, can enhance conservation efforts and improve community livelihoods. Effective sensitization is crucial to achieve conservation and livelihood improvement objectives.

### Restoration Plan Vision and Objectives

**Vision**
*Restored mangrove ecosystems for Mtwapa, Takaungu and Kilifi creeks for enhanced biodiversity and improved livelihoods for the local community.*

**Objectives**:
- To restore the ecological integrity of Mtwapa, Takaungu and Kilifi Creeks mangrove ecosystem.
- To strengthen mangrove coastal protection, stability and biodiversity conservation.
- To support sustainable livelihoods for local communities through mangrove-related activities.
- To strengthen Mtwapa, Takaungu, Kilifi, and other stakeholders responsible for forest management.
- To promote research and education on forest protection, conservation, management, and utilization.

## 4.16 Zonation (In terms of low, medium and high)

The zonation of Mtwapa, Takaungu, and Kilifi mangrove forests considers the diverse uses of each area. The zones include:

**Conservation Zone**: Rich in biodiversity. This zone prohibits extractive utilization and focuses on biodiversity conservation, research, and education.
**Rehabilitation Zone**: Comprising degraded mangrove areas. This zone focuses on enrichment planting to support community livelihoods.

**Utilization Zone**: Used by the Forest Adjacent Communities (FACs) for extracting wood products like firewood and poles, and for beekeeping and other allowable materials.

**Intervention Zone**: Surrounding the mangroves and terrestrial areas within a 3 km radius of the forest boundary. This zone focuses on terrestrial tree planting, farming activities, and other livelihood improvement activities.

*Table 17: Zonation for Mtwapa, Takaungu, and Kilifi Mangrove Ecosystems*

| Zone | Zonation Criteria | Management Activity |
|------|-------------------|---------------------|
| Conservation Zone | Rich in biodiversity, primary forest areas, natural regeneration | Conservation of biodiversity, promote research and education |
| Rehabilitation Zone | Degraded natural forest areas | Rehabilitate degraded areas, support community livelihood, enrichment planting |
| Utilization Zone | Sustainable local use | Areas for FAC livelihood activities such as firewood collection, poles, beekeeping |
| Intervention Zone | Public/private land up to 3 km from mangrove forest edge | Investment in tree planting, improved farming, water harvesting, and conservation |

# CHAPTER FIVE
# MANAGEMENT PROGRAMMES

## 5    MANGROVE FOREST CONSERVATION AND RESTORATION PROGRAMME

### 5.1    Background

The mangrove forests in Mtwapa (716 ha), Takaungu, and Kilifi (1834 ha) cover a total of approximately 2550 hectares and are home to nine mangrove species, including *Rhizophora mucronata, Ceriops tagal, Bruguiera gymnorrhiza, Sonneratia alba, Avicennia marina, Xylocarpus granatum, Xylocarpus moluccensis, Heritiera littoralis,* and *Lumnitzera racemosa.* These forests are vital to the livelihoods of Kilifi County residents, providing resources for fishing, construction, and fuelwood, and hold national ecological importance.

However, the mangroves in areas around Mtwapa creek(Mtomondoni, Timbetimbe, Kidutani, Lutsanga, Mwandoni) and Kilifi Creek(Kuchi, Maya, Kibokoni, Fumbini and Wangwani) are highly degraded due to illegal activities. Conversely, areas around Mtwapa Creek(Mtepeni) and Kilifi Creek( Mnarani, Mandharini, Kwa Filden and Boat Yard) are low degraded areas. Protecting and conserving these mangroves is crucial for maintaining biodiversity. Additionally, terrestrial forest sections within Kilifi and Mtwapa creeks are being encroached upon by local communities, further threatening these ecosystems. Refer to Table xx below

*Table 18: Status of degradation in Mtwapa by beats*

| Beat | Ha | Status | Responsible |
|---|---|---|---|
| Mtwapa Creek | | | |
| Mtomondoni, | 15 | Moderate degradation | Kwetu-TC to formalise/Wwf |
| Timbetimbe, | 25 | High degradation | RORO |
| Kidutani | 50 | High Degradation | Eden: People+Planet |
| Mwandoni, | 250 | High Degradation | Eden: People+Planet |
| Lutsanga | 80 | High Degradation | Eden: People+Planet |
| Babyloni | 4 | Low degradation | Kwetu TC |
| Customs | 2 | Low degradation | KFS |
| Miembe kumi (mtepeni) | 30 | High Degradation | RORO |
| Total Degradation | 456 | | |
| Grand Total | 716 | | |

*Table 19: Status of degradation in Kilifi by beats*

| Beat | Ha | Status | Responsible |
|---|---|---|---|
| Kilifi Creek | | | |
| Kuchi, | 211 | High Degradation | Earth lungs |
| Kuchi | 52 | Moderate Degradation | Earth lungs |
| Kuchi | 117 | Conserved Area | Earth lungs |
| Maya/ | 188 | Moderate Degradation | Eden: People+Planet |
| V-Island | 22 | Moderate Degradation | KFS |
| Kibokoni | 5 | Moderate Degradation | Eden: People+Planet |
| Sea horse | 1 | Moderate Degradation | Leaf proposed site |
| Fumbini | 2 | Moderate Degradation | Leaf proposed site |
| Kidundu | 35 | Moderate Degradation | Eden: People+Planet |
| Nzombere | 21 | Moderate Degradation | Earth Lungs/GRO Foundation |
| Total | 644 | | |
| Grand Total Area Kilifi | 1789 | | |

*Table 20: Table 21: Status of degradation in Takaungu by beats*

| Beat | Ha | Status | Responsible |
|---|---|---|---|
| Takaungu creek | | | |
| Uwanja wa mafisi | 10 | Moderate Degradation | Plan International |
| Kivukoni/Kiriba | 35 | Low Degradation | KFS |
| | | | |
| Total | 45 | | |
| Total Degraded Areas | 1,104 | | |
| Total Mangroves Area | 2550 | | |

### 5.1.1  Management issues/challenges

- Illegal harvesting
- Encroachment by developers and adjacent communities.

### 5.1.2  Management objectives

- Create awareness about the environmental importance of mangrove forests.
- Accelerate restoration of 1104 ha of degraded mangrove areas
- Monitoring of the mangrove restoration areas

### 5.1.3 Management actions of Mangrove Forest Conservation and Restoration Programme

*Table 22:Management actions of mangrove forest conservation and restoration programme*

| Action | Unit | 5 yr targets | Means of verification | Annual targets (yrs) | | | | | Lead Agencies | Budget |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *1* | *2* | *3* | *4* | *5* | | |
| *Objective 1:* **Create awareness about the environmental importance of mangrove forests** | | | | | | | | | | |
| Organize and conduct barazas to raise awareness about mangrove forests | *No.* | 60 | *Reports Photos* | 12 | 12 | 12 | 12 | 12 | *KFS CFA CGK NGAO* Strategic partners | *1.2m* |
| Use various channels of communication such as print media, radio, TV and social media to share information and success stories about mangrove conservation | *No.* | 20 | *Reports Participant list Photos* | 4 | 4 | 4 | 4 | 4 | *KFS CFA CGK NGAO* Strategic partners | *1m* |
| Hold field / open days in areas near degraded mangroves to create awareness on mangrove issues | *No.* | 20 | *Reports* | 4 | 4 | 4 | 4 | 4 | *KFS CFA CGK NGAO* Strategic partners | *20m* |
| Participate in marking of international days like International Mangrove Day | *No of days* | 20 | *Reports* | 4 | 4 | 4 | 4 | 4 | *KFS CFA CGK NGAO* Strategic partners | *20m* |

| Action | Unit | 5 yr targets | Means of verification | Annual targets (yrs) | | | | | Lead Agencies | Budget |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *1* | *2* | *3* | *4* | *5* | | |
| and World Oceans Day. | | | | | | | | | | |
| *Objective 2:* **Accelerate restoration of degraded areas of mangroves** | | | | | | | | | | |
| Map all degraded areas in the three creeks. | *Sites* | *3* | *Maps Reports Photos* | *3* | | | | | *KFS CFA CGK NGAO* Strategic partners | *1.5m* |
| Conserve and protect low degraded areas for natural regeneration | *Ha* | *644* | *Reports Photos* | *644* | *644* | *644* | *644* | *644* | *KFS CFA CGK NGAO* Strategic partners | *2m* |
| Increase production of seedlings in existing tree nurseries in Mtwapa (6), Takaungu (1), and Kilifi Creek (8) located in or near degraded areas to raise adequate seedlings for restoration each year (millions) | *No.* | *5.6* | *Reports Photos* | *1.5m* | *1.5m* | *1m* | *1m* | *0.6m* | *KFS CFA CGK NGAO* Strategic partners | *10m* |

| Action | Unit | 5 yr targets | Means of verification | Annual targets (yrs) | | | | | Lead Agencies | Budget |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| Rehabilitate high and moderate degraded mangrove areas using seedlings and propagules | Ha | 1514 | Reports photos | 302.8 | 302.8 | 302.8 | 302.8 | **302.8** | KFS CGK CFA NGAO Strategic partners | 32.5m |
| Hydrological restoration of highly degraded areas. | Ha | 204 | Report photo | 204 | | | | | | |
| **Objective 3.** Monitoring of the mangrove restored areas | | | | | | | | | | |
| Develop a *biannual* monitoring plan with indicators and frequency of data collection for each site. | *No.* | *10* | *Report* | *2* | *2* | *2* | *2* | *2* | *KFS CGK CFA NGAO Strategic partner* | *1m* |
| Undertake survival count of planted areas | *No of counts* | *10* | *Reports Geo tagged photos* | *2* | *2* | *2* | *2* | *2* | *KFS CFA Strategic partner* | *20m* |
| Participatory assessment of natural regeneration ; Key Biodiversity Areas and hydrological conditions | *No.* | *5* | *Reports* | *1* | *1* | *1* | *1* | *1* | *KFS CFA Strategic partner* | *6m* |
| Prepare reports summarizing the monitoring | *No.* | *10* | *Reports photos dashboards* | *2* | *2* | *2* | *2* | *2* | *KFS CGK CFA NGAO* | *10m* |

| Action | Unit | 5 yr targets | Means of verification | Annual targets (yrs) | | | | | Lead Agencies | Budget |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| results and any observed changes. | | | social media | | | | | | Strategic partner Academia | |

## 5.2 FISHERIES RESOURCES PROGRAMME

### 5.2.1 Background

Mangroves play a crucial role in supporting the local fishing industry and marine life. They serve as essential habitats where fish breed, find shelter, and feed. These ecosystems are vital for the livelihoods of people living near the Mtwapa, Takaungu, and Kilifi mangrove forests, with many local residents relying on fishing as their primary source of income.

Fishing activities in these areas predominantly occur in shallow waters. Common fishing tools include fencing traps (uzio), fishing nets (nyavu za mkano), gillnets (nyavu za uzi), basket traps(malema), hand nets (juya), and fishing lines (mishipi ya mkono). However, several fishing grounds in Mtwapa, Takaungu and Kilifi Creeks have experienced significant degradation.

To address these challenges, a comprehensive fishery management Programme is essential to support mangrove restoration and ensure sustainable fishing practices. This Programme aims to enhance the health of mangrove ecosystems, thereby improving fish habitats and bolstering the local fishing industry.

### 5.2.2 Management Issues/Challenges

1. Insufficient awareness and engagement among local communities regarding sustainable fishing practices and the importance of mangrove conservation.
2. Significant areas of key fishing grounds have been degraded, impacting fish habitats and local fishing yields.
3. Overfishing and the use of unsustainable fishing methods threaten fish populations and the overall health of the mangrove ecosystem.
4. Fishing user groups need training in fish farming.

### 5.2.3 Objectives

- *Restore Degraded Fishing Grounds*
  - ○ Implement restoration projects to rehabilitate key fishing grounds and improve fish habitats in Mtwapa, Takaungu, and Kilifi mangrove areas.

- *Enhance Community Awareness and Participation*
  - ○ Conduct educational Programmes and community engagement initiatives to raise awareness about sustainable fishing and mangrove conservation.
  - ○ Training 12 fishing user group to enhance their capacities e.g. health and safety, financial and management literacy
- *Promote Sustainable Fishing Practices including mariculture*
  - ○ Encourage the adoption of sustainable fishing methods and regulate fishing activities to prevent overfishing and protect fish populations.
  - ○ Encourage adoption of sustainable mariculture (silvi-fisheries within the Mtwapa, **Kilifi and Takaungu creeks).**

### 5.2.4 Management actions of the fisheries programme

*Table 23: Management actions of the fisheries programme*

| Action | Unit | 5 year targets | Means of verification | Annual targets (years) | | | | | Lead Agencies | Budget (Ksh) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| **Objective 1: Restore Degraded Fishing Grounds.** | | | | | | | | | | |
| Implement restoration projects to rehabilitate key fishing grounds and improve fish habitats in Mtwapa, Takaungu and Kilifi mangrove areas | Sites | 16 | Progress reports | 4 | 8 | 4 | | | KeFS KMFRI CGK CFA Strategic partners KWETU | 4M |
| **Objective 2: Enhance Community Awareness and Participation** | | | | | | | | | | |
| Conduct educational programs and community engagement initiatives to raise awareness about sustainable fishing and mangrove conservation | No | 6 | Pictures Reports | 3 | 3 | | | | KMFRI CGK CFA Strategic partners KeFS | 2M |
| Training 12 fishing user group to enhance their capacities e.g. health and safety, financial and management literacy | No | 9 | Photos Reports | 6 | 3 | | | | KMFRI CGK CFA Strategic partners KeFS BMU's | 2M |

| Action | Unit | 5 year targets | Means of verification | Annual targets (years) | | | | | Lead Agencies | Budget (Ksh) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| **Objective 3: Promote Sustainable Fishing Practices including mariculture providing them with the necessary skills.** | | | | | | | | | | |
| Capacity building on governance and management of community structures. | No | 12 | Participant lists | 6 | 6 | | | | KMFRI CGK CFA Strategic partners KEFS BMU's KWETU | 4M\ |
| Education and learning visits focused on fish farming centres. | No | 10 | Participant lists | 2 | 2 | 2 | 2 | 2 | KMFRI CGK CFA Strategic partners KEFS BMU's | 10M |
| Resource mobilization for support from partners in mariculture e.g. pond excavation, cage farming (construction) and maintenance | No | 30 | Grants from strategic partners | 6 | 6 | 6 | 6 | 6 | Strategic partners CGK KeFS KWETU KMFRI | 30M |

## 5.3    WATER RESOURCES MANAGEMENT PROGRAMME

### 5.3.1    Background

Mangroves survive in the intertidal zone, where fresh water from rivers meets salt water from oceans. Mangrove growth and productivity depends on freshwater availability.Despite the ability to grow in saline water, their productivity is enhanced at salinities less than that of salt water. Sources of fresh water in these areas include rivers such as R. Mwania, R. Jibana, Mto Mkuu, R.Nzombere, R. Mwachinani, R. Kibumbu, R. Kombe, R.  Mbogolo, R. Kitumbo, R. Mwandeje, R. Nzovuni, R. Njora, R. Rare, R. Mwanzai and R. Kibokoni. However this resource is scarce since some of the rivers are drying due to effects of upstream water abstraction and climate change.This adversely affects mangrove ecosystems by altering salinity levels and reducing freshwater inflow. These changes stress mangroves, impact their growth and biodiversity, increase coastal erosion, and reduce their effectiveness in carbon sequestration and storm protection.

Water is vital for communities residing in Mtwapa, Takaungu and Kilifi. Perennial rivers such as R. Mwanzai, R. Mwandeje, Mto Mkuu in Mtwapa creek, R. Mbogolo in Takaungu and R. Nzovuni, R. Rare, R. Njora in Kilifi creek contribute to their water resources. Additionally, they also rely on seasonal rivers like R. Mwania, R. Kitumbo, R. Kidutani in Mtwapa creek and R. Kombeni, R. Fagio, R. Baya Dalado in Kilifi creek. However, this resource is affected as a result of pollution due to poor farming practices and improper waste disposal. Additionally, the resource is becoming scarce since some of the rivers are drying due to effects of upstream water abstraction for irrigation purposes and climate change. This adversely affects mangrove ecosystems by reducing freshwater inflow and altering salinity levels. Mangrove growth and productivity depends on freshwater availability. Despite the ability to grow in saline water, their productivity is enhanced at salinities less than that of salt water. Upstream land use influences the amount and composition of sediments in the rivers and in the mangrove ecosystems which affects the water quality. These changes stress mangroves, impact their growth and biodiversity, and reduce their effectiveness in carbon sequestration and storm protection.

### 5.3.2    Management challenges

- Siltation and sedimentation
- Water pollution caused by solid waste and chemical runoffs from farmlands
- Poor farming practices

### 5.3.3    Management objectives

*Reduce Siltation and Sedimentation*
- Implement soil conservation measures e.g. cover cropping, reforestation and increasing ground cover to reduce runoff and erosion.
- Promote sustainable farming practices to minimize sediment transport into water bodies.

*Mitigate Water Pollution*

- Develop and enforce regulations to control the discharge of solid waste and agricultural chemicals. Implement policies and regulations to monitor and control the discharge of industrial effluents, agricultural runoffs and solid waste into river systems.

- Implement community education programmes on proper waste disposal and pollution prevention. Implement community education programmes on effects of pollution, importance of clean water, and proper waste disposal practices.

-Establish robust water quality monitoring programs to track pollutant levels, sediments levels; to assess the overall health of the river and the effectiveness of management interventions over time.

### 5.3.4   Management actions

The management actions to be undertaken to accomplish these objectives were identified as shown in Table 22.

*Table 24: Management Actions for Water Resources Management Programme*

| Action | Unit | 5 yr targets | Means of verification | Annual target (yrs) | | | | | Lead Agency | Budget (Kshs) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| **Objective 1:***Reduce Siltation and Sedimentation*. | | | | | | | | | | |
| Implement soil conservation measures e.g. improving farming methods, agroforestry and increasing ground cover to reduce runoff and erosion. | No | 20 | Reports, Geo tagged photos, attendance sheets | 4 | 4 | 4 | 4 | 4 | CFA, KFS, NGOs, Strategic partners | 2m |
| Promote sustainable farming practices to minimize sediment transport into water bodies. | No | 15 | Reports, Photos | 3 | 3 | 3 | 3 | 3 | CFA, KFS, CGK, NGAO, NEMA, Strategic partners | 3m |

| Action | Unit | 5 yr targets | Means of verification | Annual target (yrs) | | | | | Lead Agency | Budget (Kshs) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| **Objective 2:** *Mitigate Water Pollution* | | | | | | | | | | |
| Develop and enforce regulations to control the discharge of solid waste and agricultural chemicals. | | | | | | | | | | |
| Implement community education programmes on proper waste disposal and pollution prevention. | | | | | | | | | | |

## 5.4 COMMUNITY DEVELOPMENT AND PARTICIPATION PROGRAMME

### 5.4.1 Background

The involvement of the community in the management of the forest was prompted by the need for stakeholder participation due to the various challenges that were faced in forest management. Such challenges include illegal cutting of mangroves for poles and posts, charcoal harvesting, and encroachment. Community participation is in accordance with the Forest Conservation and Management Act, 2016.The community conservation activities involve rehabilitation of degraded sites and forest protection through community scouts. Among the Mtwapa, Takaungu and Kilifi CFA user groups that have emerged their livelihood through mangrove forest resources include apiculture, mariculture, ecotourism, tree nurseries establishment and mangrove restoration. The management issues, objectives and actions are as indicated below.

**Management Issues/challenges**
- Inadequate wood and non-wood forest products
- Poverty
- Illegal extraction of forest products
- Encroachment through farming practice
- Degradation of mangrove forest
- Poor Waste management
- Destruction of riparian areas leading to drying of rivers
- Pollution by the adjacent settlement
- Sedimentation due to poor farming practices

### 5.4.2 Management objectives

- Enhance sustainable production of wood and non-wood forest products through agroforestry and community forestry initiatives.

- Develop and promote alternative livelihood Programmes to reduce dependence on forest resources.

- Strengthen enforcement of forest protection laws and engage local communities in conservation efforts.

### 5.4.3 Management actions of Community Development and Participation Programme

*Table 25: Management actions of Community Development and Participation Programme*

| Action | Units | 5 Year Targets | Means of Verification | | Time Frame (Years) | | | | | Lead Agency | Budget |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 3 | 4 | 5 | | |
| **Objective 1: Enhance sustainable production of wood and non-wood forest products through agroforestry and community forestry initiatives.** | | | | | | | | | | | |
| Sensitization and trainings on tree farming of 60 people | No | 3 | Reports | | 1 | 1 | 1 | - | - | KFS, KEFRI CGK Strategic partners | 1.2M |
| Establish tree nurseries | No | 40 | Pictures, Reports | | 10 | 10 | 10 | 10 | - | KFS, KEFRI CFA Strategic partners | 7M |
| Establish commercial/on farm woodlots in all households | HH | 500 | Reports/ photos | | 200 | 200 | 100 | - | - | KFS KEFRI Strategic partners | 7M |
| **Objective 2: Develop and promote alternative livelihood Programmes to reduce dependence on forest resources.** | | | | | | | | | | | |
| Capacity building and sensitization on IGAs and Market linkages | No | 4 | Reports, photos and No of sensitization forums and IGAs initiated | | 1 | 1 | 1 | 1 | - | KFS Strategic Partners | 5M |
| Support IGAs brick making, energy saving jikos, Mariculture, beekeeping, eco-tourism | No | 5 | No of IGAs Developed Report Photos | | 1 | 1 | 1 | 1 | 1 | KFS strategic Partners | 20M |
| **Objective 3: Strengthen enforcement of forest protection laws and engage local communities in conservation efforts.** | | | | | | | | | | | |

| Action | Units | 5 Year Targets | Means of Verification | | Time Frame (Years) | | | | | Lead Agency | Budget |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 3 | 4 | 5 | | |
| Training CFA Members on governance | No | 5 | Reports List of participants | | 1 | 1 | 1 | 1 | 1 | KFS KEFRI CGK Strategic Partner | 2M |
| Training of community scouts | No | 1 | Reports Photos List of trained scouts | | 1 | | | | | KFS Strategic partners | 2M |
| Training on conflict and resolution mechanisms CFA members | No | 5 | Reports list of participants Photos | | 1 | 1 | 1 | 1 | 1 | KFS CFA CGK Strategic partners | 5M |

## 5.5   RESEARCH AND EDUCATION PROGRAMME

### 5.5.1   Background

Research and education are important components in the adaptive management of ecosystems particularly in the assessment of progress, identification of changes and challenges. This programme is expected to provide the information base upon interventions in other management programmes. Education, research and monitoring are important to ensure that the integrity of mangrove ecosystems is enhanced and the issues of concern on the key features are articulated and addressed through integrated management. The purpose of the research and education programme is to; promote conservation and management of mangrove forests in Kilifi and Mtwapa creeks through problem-oriented research, education and training.

The research and education programme is designed to address issues and challenges such as habitat loss, degradation and loss of biodiversity. Other challenges include inadequate resources and capacity to undertake research and monitoring; poor adoption of research findings by relevant programmes; weak linkages between research and management of mangrove resources; poor dissemination of research findings; inadequate knowledge on interaction of mangroves, total economic value of mangrove and associated ecosystems and lack of long-term mangroves ecological data.

### 5.5.2 Research Issues and Challenges

- Inadequate knowledge by the community on the biodiversity status of the forest
- Inadequate linkage between forest adjacent communities and forestry research institutions
- Inadequate awareness creation in the community concerning forest management and conservation
- Inadequate incorporation of research in restoration actions
- Inadequate dissemination of research findings,
- Inadequate incorporation of indigenous knowledge in forest conservation

### 5.5.3 Research Objectives

1. Enhance community knowledge on forest biodiversity.
2. Strengthen linkages with forestry research institutions.
3. Incorporate indigenous knowledge and research findings into restoration efforts.

### 5.5.4 Management Actions for Research and Education Programme

*Table 26: Management actions for Research and Education Programme*

| Action | Unit | 5 year targets | Means of verification | Annual targets (yrs) | | | | | Lead Agency | Budget (KES) |
|--------|------|----------------|------------------------|---|---|---|---|---|-------------|--------------|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| **Objective 1: Enhance Community Knowledge on Forest Biodiversity** | | | | | | | | | | |
| Educate local communities about the biodiversity status of the forest. | No. | 4 | No of sensitization forums held Photos Reports | 1 | 1 | 1 | 1 | | KEFRI KFS Strategic partners | 1M |
| Conduct research, sensitize and invest in seaweed farming | Kshs | 10m | Grants from strategic partners | 2 | 2 | 2 | 2 | 2 | KEFRI KMFRI Strategic partners | 10M |
| **Objective 2: To promote knowledge sharing between communities and research institutions** | | | | | | | | | | |
| Hold dissemination forums on | No. | 3 | no. of field days held | | 3 | | | | KEFRI, KFS | 1.5M |

| Action | Unit | 5 year targets | Means of verification | Annual targets (yrs) | | | | | Lead Agency | Budget (KES) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | | |
| mangrove conservation | | | Reports Photos | | | | | | Strategic partners | |
| Prepare dissemination materials e.g. documentaries, brochures, fact-sheets, posters, press releases on mangroves issues | No. | 3 | Awareness materials Reports Photos | | 1 | 1 | 1 | | KFS, KEFRI, KMFRI. Universities | 1.5M |
| **Objective 2: To Incorporate Indigenous Knowledge and research findings into restoration efforts** | | | | | | | | | | |
| Hold training on importance of indigenous knowledge in conservation | No. | 1 | Report Photos List of participants | 1 | | | | | KEFRI KFS, CFA KEFRI, Strategic partners | 1M |
| Capacity building for scientists and managers on the Indigenous Knowledge | No. | 2 | Reports Photos | 1 | | | 1 | | KEFRI KMFRI. Universities | 2M |

# PLAN IMPLEMENTATION

### 5.6    Funding of the Management Plan

A financial management plan is essential for the effective implementation of the Mtwapa, Takaungu, and Kilifi mangrove restoration plan. Clear budgetary allocations are needed for all activities. Revenue collection should follow National and County Government regulations. Funds for MTWAPA, TAKAUNGU AND KILIFI CFA activities will come from annual member subscriptions and donor funds from stakeholders. Utilization of these funds must adhere to stakeholder regulations and the CFA's constitution and by-laws. Annual budget reviews will ensure prioritization of operations, considering emerging issues.

### 5.7    Financial Management

Funds will be needed for various restoration activities and developments for example purchase of vehicles and boats, training and remuneration for scouts, setting up nurseries, sensitization campaigns and research. All the resources required for capital development may not be met by KFS, CFA and other stakeholders in implementing the plan. Therefore, they should seek financial support in good time from various sources such as the annual budgetary allocations or support from strategic partners during the plan period. Development budgets will be managed following the financial regulations of the KFS and other applicable regulation. Annual recurrent budgets to cover the day to day running costs and restoration activities within the degraded MTWAPA, TAKAUNGU AND KILIFI mangrove Forest will be prepared by the respective implementing agencies.

### 5.8    Monitoring and Evaluation

Monitoring and evaluation serve as a tool for assessing project achievements, success and constraints. It also provides a feedback mechanism to improve proposed activities and make adjustment wherever necessary. The process also identifies problems, their sources to help come up with strategies in addressing them for a successful implementation and continuity of the proposed activities. It shall be done mainly through the quarterly and annual reports written by the Forest Level Management Committee (FLMC) and Station Manager to the County Forest Conservator office.

### 5.9    Guiding Principles for the Implementation of the Plan

Gender considerations are integrated across all phases of the plan's execution. The plan underlines the importance of ensuring equitable representation of all demographics in meetings and decision-making procedures to empower their involvement in preserving mangrove forest resources. Steps are taken to create gender parity and involve various groups such as youth, seniors, and marginalized individuals in sub-committees and management tasks. Moreover, the plan concentrates on raising awareness about the significance of engaging all stakeholder groups in conservation endeavors. The needs of minority groups are carefully weighed against the well-being

of larger communities, and the benefits derived from the ecosystem are equitably shared among all stakeholders, with a specific focus on the communities residing in and near the ecosystem.

## 5.10 Institutional Arrangements for Plan Implementation including members of County Mangrove Management Committee

*Table 27: Proposed members of Restoration Plan Implementation Committee*

|     | Institution | Position | No. | Remarks |
| --- | --- | --- | --- | --- |
| 1.  | Kenya Forest Service | Secretary | 1 | Forest Station Manager |
| 2.  | CFA | Chair, Secretary, Treasurer | 3 | CFA Executive |
| 3.  | Beach Management Unit | Chairman | 1 | Area chairman |
| 4.  | NGAO | Deputy County Commissioner | 3 | Area Chief or ACC |
| 5.  | County government | Directors – Environment and Fisheries | 2 | Sub-County Officers |
| 6.  | KEFRI | Regional Director | 1 | Coast Eco-region |
| 7.  | Strategic partner | WWF | 1 | Project Officer |
| 8.  | County Mangrove Management Committee | Chairman | 1 | Chairman or representative |
| 9.  | Co-opted member | As need arises | 1 | Available as need arises with no voting powers |
|     | Total |  | 14 |  |

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# APPENDICES

## 5.11 List of participants in all meetings and workshops

*Table 28: List of participants in all meetings and workshops*

| S/No | Name | Organization | Zero Draft | Draft One | Validation |
|------|------|--------------|------------|-----------|------------|
| 12 | Abdinur Abdi | WWF-KE | √ | √ | |
| 10 | Brendan Muli | Kwetu training centre | √ | √ | √ |
| 15 | Caroline | LEAF | √ | √ | √ |
| 17 | Daniel Chai Kalama | Mtakimau CFA | √ | | |
| 9 | David Erastus | EDEN | √ | √ | √ |
| 11 | Edward Mwamuye | COBEC | √ | | |
| 16 | Elijah Chivatsi Hali | Mtwapa, Takaungu and Kilifi CFA | √ | √ | √ |
| 3 | Elizabeth Wambungu | KFS | √ | √ | √ |
| 1 | Elvis K Fondo | KFS, CFC Kilifi | √ | √ | |
| 18 | Jimmy Yan | County government of Kilifi | √ | | |
| 4 | Kevin Muema | KEFRI | √ | √ | |
| 7 | Mariam Ali | Earthlungs Reforestation Foundation | √ | √ | √ |
| 13 | Nathaniel Mwangeka | WWF-KE | √ | √ | |
| 5 | Raymond Abok | KFS | √ | | |
| 14 | Rose | COBEC | | √ | √ |
| 8 | Samson Njoroge | CERIOPS | √ | | |
| 2 | Silas Tsuma | KFS, FSM- Sokoke | √ | √ | √ |
| 6 | Wincate Wanja | LEAF | √ | | |

## 5.12  Further details on degraded areas within Mtwapa, Takaungu & Kilifi mangrove areas

*Table 29: Degraded areas within Mtwapa, Takaungu and Kilifi mangrove areas*

| Beat | Ha | Level of Degradation | Interventions/Restoration Methods: |
|---|---|---|---|
| Kuchi | 200 | High | Objective: Implement extensive restoration to recover severely degraded ecosystems.<br>Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity.<br>Use techniques such as direct seeding and planting of nursery-grown seedlings.<br>Conduct major hydrological interventions to restore natural tidal flows and water quality.<br>Remove significant barriers and rehabilitate water channels.<br>Build larger, more effective erosion control structures such as revetments and breakwaters.<br>Implement sediment management plans to reduce further degradation. |
| | 100 | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species. Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration: Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| | 80 | Low | Objective: Prevent further degradation and initiate minor restorative actions.<br>Protection for natural regeneration<br>Restoration Methods:<br>Reforestation: Plant mangrove seedlings in areas where canopy gaps are beginning to appear & Use endemic mangrove species to maintain biodiversity.<br>Erosion Control: Implement measures such as planting vetiver grass or building small barriers to reduce erosion. |
| Total | 380 | | |
| Maya | 0 | High | |
| | 200 | moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species.Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration:Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| | 0 | Low | |
| Total | 200 | | |

| Beat | Ha | Level of Degradation | Interventions/Restoration Methods: |
|---|---|---|---|
| Takaungu Creek Uwanja wa mafisi | 10 | moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species. Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration: Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| | 0 | Low | objective: Prevent further degradation and initiate minor restorative actions.<br>Protection for natural regeneration<br>Restoration Methods:<br>Reforestation:Plant mangrove seedlings in areas where canopy gaps are beginning to appear & Use endemic mangrove species to maintain biodiversity.<br>Erosion Control:Implement measures such as planting vetiver grass or building small barriers to reduce erosion |
| Total | 10 | | |
| Kibokoni | 5 | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment lanting of endemic mangrove species.Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration:Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| Total | 5 | | |
| Sea horse | 1 | | |
| | 1 | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species. Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration: Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| Total | 1 | | |
| Fumbini | 2 | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species.Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration:Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| Total | 2 | | |

| Beat | Ha | Level of Degradation | Interventions/Restoration Methods: |
|---|---|---|---|
| Kidundu | 5 | High | Objective: Implement extensive restoration to recover severely degraded ecosystems.<br>Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity.<br>Use techniques such as direct seeding and planting of nursery-grown seedlings.<br>Conduct major hydrological interventions to restore natural tidal flows and water quality.<br>Remove significant barriers and rehabilitate water channels.<br>Build larger, more effective erosion control structures such as revetments and breakwaters.<br>Implement sediment management plans to reduce further degradation. |
| | 10 | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species.Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration:Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| | 20 | Low | objective: Prevent further degradation and initiate minor restorative actions.<br>Protection for natural regeneration<br>Restoration Methods:<br>Reforestation:Plant mangrove seedlings in areas where canopy gaps are beginning to appear & Use endemic mangrove species to maintain biodiversity.<br>Erosion Control:Implement measures such as planting vetiver grass or building small barriers to reduce erosion |
| Total | 35 | | |
| Nzombere | 21 | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species.Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration:Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| Total | 21 | | |
| Mtomondoni | | High | Objective: Implement extensive restoration to recover severely degraded ecosystems.<br>Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity.<br>Use techniques such as direct seeding and planting of nursery-grown seedlings. |

| Beat | Ha | Level of Degradation | Interventions/Restoration Methods: |
|---|---|---|---|
| | | | Conduct major hydrological interventions to restore natural tidal flows and water quality.<br>Remove significant barriers and rehabilitate water channels.<br>Build larger, more effective erosion control structures such as revetments and breakwaters.<br>Implement sediment management plans to reduce further degradation. |
| | | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species.Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration:Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |
| | | Low | objective: Prevent further degradation and initiate minor restorative actions.<br>Protection for natural regeneration<br>Restoration Methods:<br>Reforestation:Plant mangrove seedlings in areas where canopy gaps are beginning to appear & Use endemic mangrove species to maintain biodiversity.<br>Erosion Control:Implement measures such as planting vetiver grass or building small barriers to reduce erosion |
| Total | 15 | | |
| Timbetimbe | | High | Objective: Implement extensive restoration to recover severely degraded ecosystems.<br>Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity.<br>Use techniques such as direct seeding and planting of nursery-grown seedlings.<br>Conduct major hydrological interventions to restore natural tidal flows and water quality.<br>Remove significant barriers and rehabilitate water channels.<br>Build larger, more effective erosion control structures such as revetments and breakwaters.<br>Implement sediment management plans to reduce further degradation. |
| | | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species.Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration:Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |

| Beat | Ha | Level of Degradation | Interventions/Restoration Methods: |
|---|---|---|---|
| | | Low | objective: Prevent further degradation and initiate minor restorative actions.<br>Protection for natural regeneration<br>Restoration Methods:<br>Reforestation:Plant mangrove seedlings in areas where canopy gaps are beginning to appear & Use endemic mangrove species to maintain biodiversity.<br>Erosion Control:Implement measures such as planting vetiver grass or building small barriers to reduce erosion |
| Total | 25 | | |
| Kidutani | | High | Objective: Implement extensive restoration to recover severely degraded ecosystems.<br>Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity.<br>Use techniques such as direct seeding and planting of nursery-grown seedlings.<br>Conduct major hydrological interventions to restore natural tidal flows and water quality.<br>Remove significant barriers and rehabilitate water channels.<br>Build larger, more effective erosion control structures such as revetments and breakwaters.<br>Implement sediment management plans to reduce further degradation. |
| Total | 50 | | |
| Mwandoni | | High | Objective: Implement extensive restoration to recover severely degraded ecosystems.<br>Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity.<br>Use techniques such as direct seeding and planting of nursery-grown seedlings.<br>Conduct major hydrological interventions to restore natural tidal flows and water quality.<br>Remove significant barriers and rehabilitate water channels.<br>Build larger, more effective erosion control structures such as revetments and breakwaters.<br>Implement sediment management plans to reduce further degradation. |
| | | Moderate | Objective: Restore ecosystem function and structure.<br>Undertake enrichment planting of endemic mangrove species. Use nurseries to grow seedlings and ensure a steady supply for reforestation efforts.<br>Hydrological Restoration: Restore natural water flow by removing barriers such as debris<br>Community-based Restoration Projects |

| Beat | Ha | Level of Degradation | Interventions/Restoration Methods: |
|---|---|---|---|
| | | Low | objective: Prevent further degradation and initiate minor restorative actions. <br> Protection for natural regeneration <br> Restoration Methods: <br> Reforestation: Plant mangrove seedlings in areas where canopy gaps are beginning to appear & Use endemic mangrove species to maintain biodiversity. <br> Erosion Control: Implement measures such as planting vetiver grass or building small barriers to reduce erosion |
| Total | 250 | | |
| Lutsanga | | High | Objective: Implement extensive restoration to recover severely degraded ecosystems. <br> Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity. <br> Use techniques such as direct seeding and planting of nursery-grown seedlings. <br> Conduct major hydrological interventions to restore natural tidal flows and water quality. <br> Remove significant barriers and rehabilitate water channels. <br> Build larger, more effective erosion control structures such as revetments and breakwaters. <br> Implement sediment management plans to reduce further degradation. |
| Total | 80 | | |
| Miembe Kumi | 30 | High | Objective: Implement extensive restoration to recover severely degraded ecosystems. <br> Implement large-scale reforestation initiatives using a variety of endemic species to restore biodiversity. <br> Use techniques such as direct seeding and planting of nursery-grown seedlings. <br> Conduct major hydrological interventions to restore natural tidal flows and water quality. <br> Remove significant barriers and rehabilitate water channels. <br> Build larger, more effective erosion control structures such as revetments and breakwaters. <br> Implement sediment management plans to reduce further degradation. |
| Total | 30 | | |