



# RIVER SABAKI ESTUARY MANAGEMENT PLAN 2023 - 2032



## FORWARD

Sabaki Estuary is one unique wetland ecosystem within Kilifi County. The estuary is among the 67 Important Bird Areas in Kenya. The Management Plan of Sabaki River Estuary comes at a time when the estuary is exposed to threat from the sediment load of the Athi-Sabaki which has increased tremendously from 1950s to date. The development of the management plan and subsequently implementation is key to the ecosystem conservation and calls for participatory approach from all the partners involved. As a tool, the management plan will guide the estuary's sustainable development and management through a collaborative approach to create a sustainable future for the estuary and the adjacent community.

The approach used to develop this plan ensured both the legal requirement for public participation and consultation as well as incorporation of local needs, strategies and indigenous systems. This plan is cognizant of the status and needs of the adjacent communities who have rights to manage and benefit from the estuarine resources as well as bear responsibility for ensuring that the estuary is protected and resources are not depleted. The plan has five (5) objectives which include but not limited to: enhancement of governance of Sabaki River Estuary and associated resources, improved management and use of natural resources, promotion of sustainable local community livelihoods, sustainable tourism development and mitigation of pollution in Sabaki River Estuary.

Climate change and its impacts is the greatest challenge of our time globally. The impacts will only worsen as a result of increasing human activities. The frequency and magnitude of extreme weather events is projected to increase with far reaching impacts across the county. Along the estuary we will be expecting more frequent floods, reduced water levels, increased human-wildlife conflicts amongst other negative impacts.

Kilifi County government commits to support the implementation of the Sabaki Estuary Management Plan to ensure all the good plans are put to reality within the implementing period. Further, we acknowledge and call upon our partners both state and non-state actors to allocate resources for implementation of the plan top on the list being supporting community efforts towards climate change adaptation as is evident in Sabaki River Estuary. At the end of the management plan period, we hope to a conserved Sabaki estuary, increased biodiversity and livelihoods of the people enhanced.



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## ACKNOWLEDGEMENT

The Sabaki River Estuary Management Plan stands as a testament to the collaborative efforts of a diverse array of stakeholders, whose invaluable contributions we gratefully acknowledge. At the forefront, we extend our heartfelt gratitude to the Western Indian Ocean Strategic Action Programme (WIOSAP), in partnership with the Nairobi Convention, the United Nations Environment Programme (UNEP), and the Global Environment Facility (GEF), for their unwavering financial support throughout the entire process.

The national government institutions, spearheaded by the National Environment Management Authority (NEMA) in collaboration with Kenya Forest Service (KFS), Kenya Wildlife Service (KWS), Kenya Forest Research Institute (KEFRI), and Administration, played a pivotal role by providing substantial technical and logistical support. The proactive involvement of the County Government of Kilifi, particularly the Departments of Fisheries, Tourism, and Environment, showcased an exemplary commitment to the planning process, leaving no stone unturned to meet its demands.

A special acknowledgment goes to the dedicated efforts of Civil Society Organizations (CSOs), with Nature Kenya orchestrating most events and A-Rocha Kenya enriching the planning process with crucial biodiversity insights. Lastly, but by no means least, the vibrant representation of the community through the Sabaki River Conservation and Development Organization (SARICODO), Kichwa Cha Kati Beach Management Unit (BMU), and the Sabaki Village Development Committee brought forth the invaluable local context.

This plan stands as a testament to the power of unity and collaboration, and without the collective commitment and contributions of each stakeholder, it would not have come to fruition. We at NEMA extend our sincere applause to all involved, recognizing the significant impact of your collective dedication and cooperation.



**Mamo B. Mamo**  
Director General  
National Environment Management Authority (NEMA)

## EXECUTIVE SUMMARY

Sabaki Estuary is located at the end of River Sabaki which is Kenya's second-longest river. It covers an area approximately 1,100 ha. The core zone of the estuary is about 250Ha. This area comprises the sandbanks, mudflats, sand dunes and freshwater pools and marshes. The estuary is the lowest point of the Athi-Galana-Sabaki system that extends 390 km and drains a catchment area of 70,000 km<sup>2</sup>.

The estuary is one of Kenya's 67 Important Bird Areas with a total of 186 bird species and the north-most part of the of Malindi-Watamu-Arabuko-Sokoke UNESCO Man and biosphere reserve. The estuary and the nearby turbid coastal waters are also an important nursery ground for prawns and numerous species of fish and crustaceans of commercial importance.

The estuary is under threat from the sediment load of the Athi-Sabaki which has increased tremendously from 50,000 tons/year in the 1950s to the current rates of 5 to 13 million tons/year; caused largely by poor land-use practices up-stream. Other threats include unsustainable utilization of natural resources including illegal fishing, cutting of mangroves, sand harvesting, pollution, uncontrolled development and conflicting policies and institutional mandates. This calls for an organized approach to address the issues and create a sustainable future for the estuary and the adjacent community, which this management plan envisages to put in place.

Wetland ecosystems are managed under different policy legal and institutional frameworks. The aim is to enhance the conservation and management of wetlands resources. Sabaki Estuary is not gazetted; however, it is expected to be managed under different existing legal provisions including the international legal frameworks, national policy and legal framework and county legal frameworks. All these frameworks together provide for enablement and control of how things are done in implementation of the management plan.

The participatory approach used to develop this plan ensured both the legal requirement for public participation and consultation and well as incorporation of local needs, strategies and indigenous systems. This plan is cognizant of the status and needs of the adjacent communities who have rights to manage and benefit from the estuarine resources as well as bear responsibility for ensuring that the estuary is protected and resources are not depleted. The plan has five objectives derived from the issues that were identified by stakeholders which include: enhancement of governance of Sabaki River Estuary and associated resources, improved management and use of natural resources, promotion of sustainable local community livelihoods, sustainable tourism development and mitigation of pollution in Sabaki River Estuary. Programs have been proposed to implement the objectives and address the threats already identified and stakeholders have been assigned roles in the plan based on their mandates and expertise. The monitoring framework envisaged in the plan will ensure that the goals set will be achieved within the timeframes and resources allocated to them. It is expected that at the end of the 10-year planning period, the estuary will be conserved, its biodiversity protected and the livelihoods of the people enhanced in perpetuity.



## LIST OF ACRONYMS AND ABBREVIATIONS

UNESCO	United Nations Education Science and Cultural Organization
GOK	Government of Kenya
NEMA	National Environment Management Authority
KNBS	Kenya National Bureau of Statistics
ICZM	Integrated Coastal Zone Management
IBA	Important Birds Area
CL	Coastal Lowlands
GMT	Greenwich Mean Time
ENT	Ear Nose and Throat infections
KBA	Key Biodiversity Area

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## **INTRODUCTION/ BACKGROUND INFORMATION**

### **1.1 Description of the Area**

Sabaki River Estuary is located in Mambrui sub-location to the north and Sabaki Sub-location to the south in Magarini Sub County. It covers an area approximately 2,470ha with the estuary proper being 483Ha with central coordinates 40° 8.00' East 3° 9.00' South. This area comprises the sandbanks, mudflats, sand dunes and freshwater pools and marshes at the mouth of the Sabaki, Kenya's second-longest river, about 5 km north of Malindi town, between the Malindi–Mambrui road bridge and the sea. The state and size of the estuary vary seasonally, depending on river flows. Just north and south of the river mouth are grassy dunes that conceal permanent or temporary pools of fresh water.

The estuary receives freshwater and terrigenous sediment load from the Athi-Sabaki river basin. The estuary is unique in that it is not permanent, but is more or less completely flushed out after every tidal cycle exposing parts of the main tidal channel and inter-tidal mud-flat area. It is relatively shallow during high water (HW) with mean depth of about 3m and is also ebb dominant, thus favoring net export of sediment out of the estuary. The boundary of the estuary is defined by the flooding of saline water from the Indian Ocean which is 4 km long inwards from the river mouth. The width of the estuary decreases at an exponential rate, from roughly 1 km at the entrance to 200 to 300 m at the tidal limit. The main channel is however, narrow ranging from 50 to 100m in width.

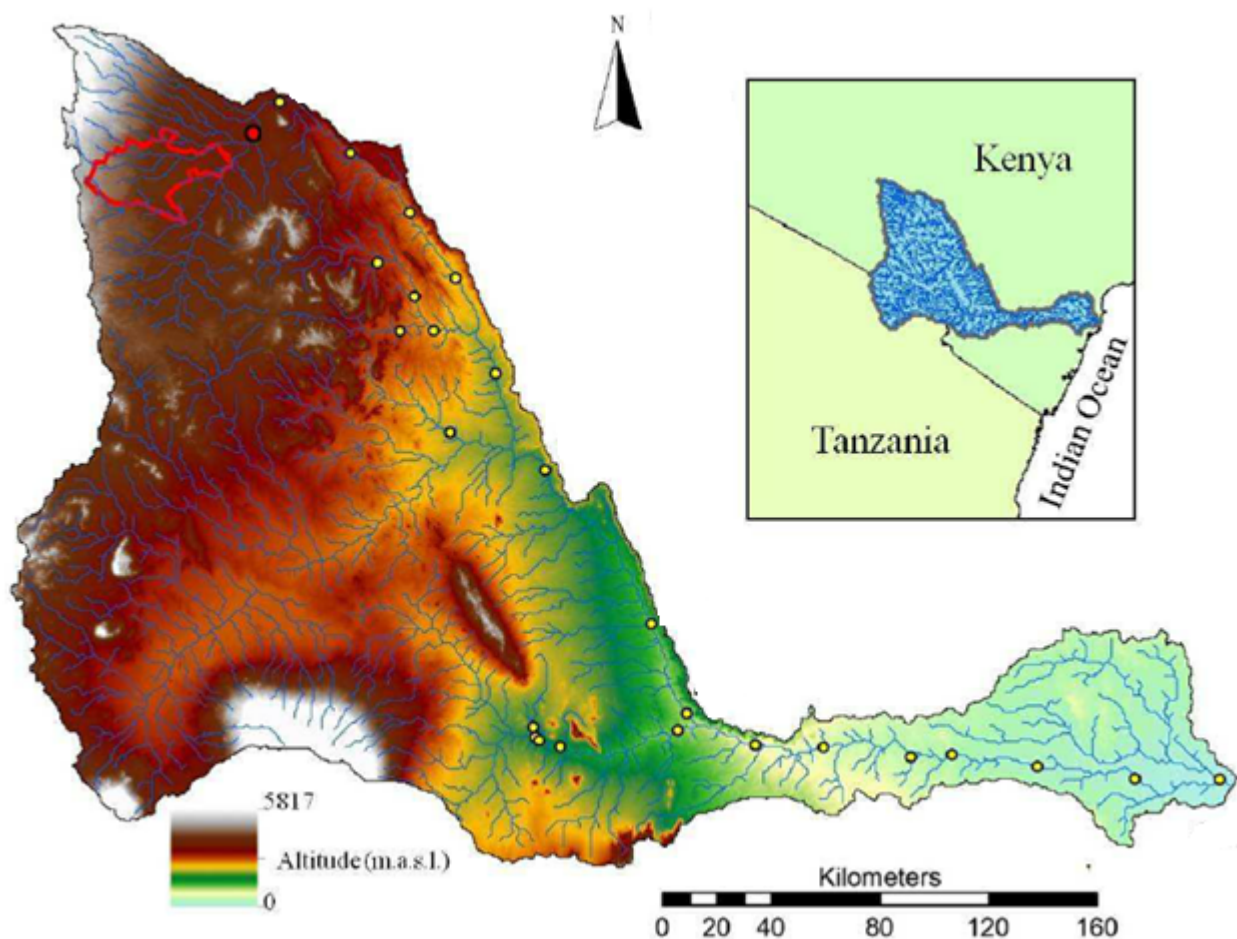


Figure 1.1 Athi-Galana-Sabaki River Basin

Ecologically, the estuary is one of Kenya's 67 Important Bird Areas (Fish pool and Evans 2001) with a total of 186 bird species, including 91 species of water birds. It hosts more than 1% of the biogeographic population of Sooty Gull; Saunders Tern; and Lesser Crested Tern (Nasirwa et. al. 1995). The estuary and the nearby turbid coastal waters are also an important nursery ground for prawns and numerous species of fish and crustaceans of which are of commercial importance. The sandy shores flanking both sides of the mouth of the estuary extending into Malindi Bay are important breeding grounds of turtles. There are mangrove forest stands on the periphery of the mudflats and the southern bank of the estuary dominated by seven species including *Avicennia marina*, *Brugiera gymnorhiza*, *Ceriops tagal*, *Xylocapus granatum*, *Sonoretia alba*, *Lumnitzera racemosa* and *Rhizophora mucronata*. Species of wildlife include crocodiles and hippopotamus in the mangrove areas while small antelopes such as the Suni and Duikers still exist in small numbers in the scrub vegetation in the adjacent areas. Beyond the intertidal area is a scrubland dominated by *Azardchta indica*, *Acacia spp* and *Prosopis juliflora*, which is a highly invasive alien plant common throughout the agricultural, residential, and scrubland areas. The native bush is severely degraded by charcoal burning and firewood collection.

The estuary is a source of livelihood for the local community which depends on it for domestic water collection, livestock watering, fishing, crustacean/gastropod collection, mangrove harvesting, charcoal burning, bee keeping, small scale agriculture and collection of medicinal plants. Resource extraction, fisheries, and farming activities are unregulated, possibly illegal and their contribution to local livelihoods at Sabaki has not previously been quantified.

The main types of land uses are agriculture, fisheries and sand harvesting. Agriculture remains the main economic activity of the people. Arable agricultural land is under small-scale crop production with the main food crops grown being maize, beans and cassava. In addition, small -holder horticultural irrigation for vegetables is practiced in some of the places. Commercial and subsistence fishing is common among the communities living around the estuary. Sand harvesting is undertaken by licensed and unlicensed traders as a source of livelihood.

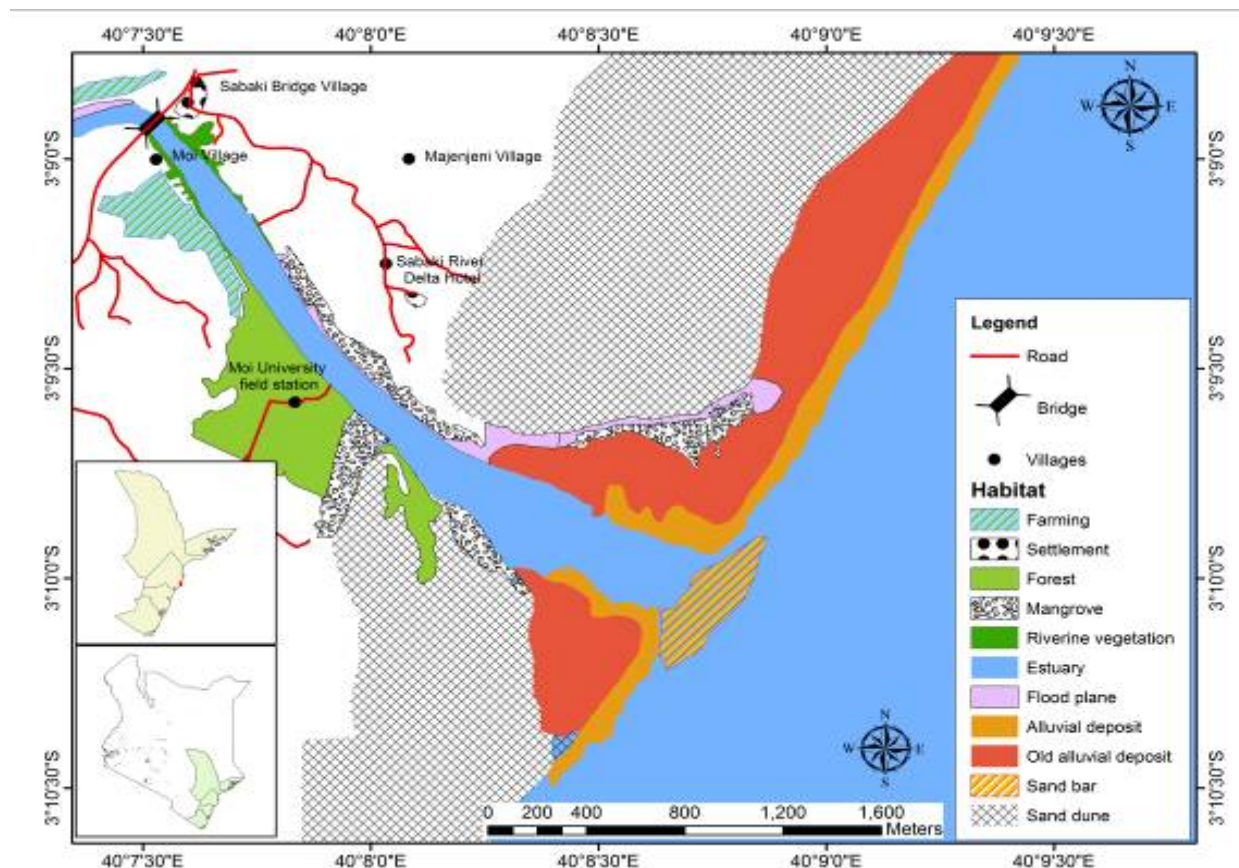


Figure 1.2 The Sabaki River Estuary

The estuary is a tourist attraction due to its bird life, striking landscape, and a small resident population of Hippopotamuses (*Hippopotamus amphibious*) (about 50-100 individuals estimated in 2021). Birdwatchers



have visited the Sabaki for decades to view the large congregations of water birds and local school groups also visit the estuary. Researchers frequently visit the estuary for studies. There is however no tourism infrastructure and tourism activities are unregulated.

## 1.2 Demography – Population Size, Tribes and User Groups

From 2019 population and housing census, the Kilifi County recorded a population of **1,453,787** persons, **298,472** households, and density of 116 persons per square kilometer area (KNBS, 2019). The area around Sabaki River Estuary is a sub-urban with a growing human population estimated to be 48,171 in the two neighboring sub locations namely Sabaki and Mambrui. The dominant community is the Miji Kenda, Giriyaama (majority) and Kauma subtribes who engage in small scale agriculture, fishing, businesses and tourism.

*Table 1.1 Sabaki sub-location Population by Gender, Number of Households, Area and Density*

Sub-Location	Male	Female	Total	Households	Area (Km <sup>2</sup> )	Density (person km <sup>-2</sup> )
Sabaki sub-location	12301	11918	24219	4958	33.8	718
Mambrui sub-location	11,641	12,311	23,952	4,270	43.4	552

*Source: KNBS (2019) Vol. II*

## 1.3 Physical Setting – Climate, Topography, Geology, Hydrology, Soils; Infrastructure

### 1.3.1 Topography

Kilifi County has 4 major topographical features: the Coastal Plain, the Foot plateau, the Coastal Range, and the Nyika plateau. The Sabaki estuary is all within the Coastal Plain but the rest of the river crosses through the Foot and Nyika plateaus.

#### 1.3.1.1 The Coastal Plain

This runs along the County's coastline with its width varying from 3km to 20km. The average altitude is 30m above sea level with several creeks running across the coastal plain that has mangrove forests and the estuary of River Sabaki.

#### 1.3.1.2 The Foot Plateau

This is characterized by a slightly undulating terrain that slopes gently towards the sea with altitude ranging from 60m to 136m above sea level. The plateau has grassland and stunted vegetation. It is also traversed by inland water sources and is densely populated. Areas in the County falling under this feature include Gede, Watamu, Malindi and parts of Gongoni and Magarini locations.

#### 1.3.1.3 The Coastal Range

This is characterized by low range sand stone hills of altitudes ranging from 130m to 420m above sea level. It has a high potential of rain-fed agriculture with high and moderately fertile soils. The area constitutes the

cassava/cashew nut zone and has the largest area of County's Forest cover. Areas falling under the Coastal range include Magarini, Goshi, Gongoni and parts of Jilore location.

#### **1.3.1.4 The Nyika plateau**

This is the hinterland and covers the largest part of the County characterized by poor soils, little rainfall, thin vegetation, shallow depressions and a gently undulating terrain. This is an arid region with potential for rain-fed crop farming and is sparsely populated. It covers the lowland ranching zone and livestock/millet agro-ecological zones. The main economic activities are livestock keeping and growing of drought resistant crops such as maize and cassava. It also has potential for irrigation in places like Chakama, Langobaya, Garashi and Dagamra that lie along River Sabaki. Small -holder horticultural irrigation for vegetables is already being practiced in some of these places.

#### **1.3.2 Physical Features**

There are two major physical features in the County. These are the Indian Ocean and the Galana/Sabaki River. Sabaki River is the tail end of what is nationally called for the Athi River.

##### **1.3.2.1 The Indian Ocean**

This is a major feature in the County, lying on the entire east of the County. The Coastline is 185km, extending from Mida Creek in the South to Ungwana in the North. The Ocean supports Fisheries, Tourism activities and the Salt manufacturing industry. The Ocean also has a coral ecosystem that has rich marine biodiversity with a fringing reef that is broken by the Sabaki River estuary due to silt deposition. The ocean also supports a rich mangrove forest ecosystem found mainly in creeks. There are also two near shore islands: Kinyaole (Robinson Island) and Kirepwe.

##### **1.3.2.2 River Sabaki and the Estuary**

The Athi-Galana-Sabaki River has its origin in the central highlands around Nairobi. When joined by River Tsavo in its lower basin it is known as Galana River. The river enters the ocean north of Malindi Town. The Athi-Galana-Sabaki system extends 390 km and drains a catchment area of 70,000 km<sup>2</sup> (NEMA, 2017). The sediment load of the Athi-Sabaki has increased tremendously from 50,000 tons/year in the 1950s to the current rates, which range from 5 to 13 million tons/year (NEMA, 2017). This increase has been attributed to catchment degradation as well as an increase in the capacity of the river to transport sediments to the coast. Current data indicate that the annual freshwater discharge of the Athi-Sabaki River is 6 million m<sup>3</sup>/year, (NEMA, 2017). The high sediment load is caused largely by poor land-use practices up-stream; threaten the sustainability of coastal habitats (mangroves, sea grass beds and corals) and the aesthetic quality of beaches, which are a major tourist attraction. An integrated river basin management approach would probably provide panacea for these issues.

The river flows through the Kilifi County in an easterly direction and is the source of water for Malindi town, Watamu, Kilifi and Mombasa. It enters the County at Chakama location and flows for a distance of 150km up to its river mouth (River Sabaki Estuary). The river influences human settlement as it provides water for both humans and livestock and also supports fresh water fishery. The estuary is where Kenya's second largest river empties into the ocean. The estuary covers an area of 11km<sup>2</sup> and is 5km north of Malindi town. It consists of sandbanks, mudflats, sand dunes and seasonal and permanent freshwater pools, mangroves and scrub. The state and size of the estuary vary seasonally depending on river flows. Just North and South of the River Mouth are grassy sand dunes that conceal permanent or temporary pools of fresh water.

### **1.3.5 Soil, Climate & Hydrology**

#### **1.3.5.1 Climate**

The Sabaki Location is in the Coastal Lowland 3 (CL3) zone that is a Coconut-Cassava agro-ecological zone. The climate of Malindi is usually hot and humid all the year round. Mean daily temperature ranges from a minimum of 22°C to a maximum of 29.5°C. The County experiences a bimodal rainfall pattern with the short rains occurring between October to December and the long rains occurring between April to June. The average rainfall ranges from 400mm in the hinterland to over 1,200mm along the coastal belt. The coastal belt receives more rainfall, compared to the hinterland, ranging between 900mm to 1,110mm due to the effect of the monsoon winds. Average relative humidity along the Coastal belt is 65% but decreases towards the hinterland.

The temperature data presented in Tables 1 and 2 were recorded at the Msabaha Meteorological Station believed to be influenced by the Arabuko Sokoke Forest microclimate. This might not be representative of Sabaki areas situated at least 10 km and 15 km from Msabaha and Arabuko respectively.

**Table 1.2 Weather Summary for 2009**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year 2009
<b>Mean Max °C</b>	31.8	32	33.1	32.5	30.2	28.8	28.0	28.4	29.6	29.6	31.3	32.8	<b>30.7</b>
<b>Mean Min °C</b>	23.1	23.9	24.4	25.7	24.6	23.8	22.8	22.6	23.1	23.3	22.7	24.0	<b>23.7</b>
<b>Mean (0600Z)</b> <b>RH %</b>	77	78	73	75	82	83	80	80	75	81	78	74	<b>78</b>
<b>Mean (1200Z)</b> <b>RH%</b>	59	59	59	67	72	75	70	69	66	74	69	63	<b>67</b>
<b>Mean Soil</b> <b>Temp (10cm) °C</b>	34.0	34.5	36.3	34.2	30.8	28.4	27.2	28.4	31.5	30.1	32.4	35.2	<b>31.9</b>
<b>Rain (Total) mm</b>	13.4	16.9	3.5	46.1	163.4	238.9	59.4	22.5	10.6	346.2	43.6	24.2	<b>988.7</b>

**Table 1.3 Weather Summary for 2008**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year 2008
<b>Mean Max °C</b>	31.9	31.9	32.8	31.3	28.7	28.0	27.5	27.8	29.0	31.1	31.6	32.0	<b>30.3</b>
<b>Mean Min °C</b>	23.5	22.9	24.3	24.6	23.5	23.1	23.3	21.7	22.3	23.4	23.5	23.7	<b>23.3</b>
<b>Mean (0600Z)</b> <b>RH%</b>	78	78	78	82	87	81	81	82	79	74	78	74	<b>79.3</b>
<b>Mean (1200Z)</b> <b>RH%</b>	61	59	62	68	79	76	75	73	69	65	68	62	<b>68.1</b>
<b>Rain (Total) mm</b>	47.8	0.6	69.9	69.8	66.7	225.0	99.3	122.5	13.9	54.3	44.1	20.5	<b>1134.4</b>

Source: Kenya Meteorological Department, Msabaha Met Station, Malindi, 2010.

**Notes:**

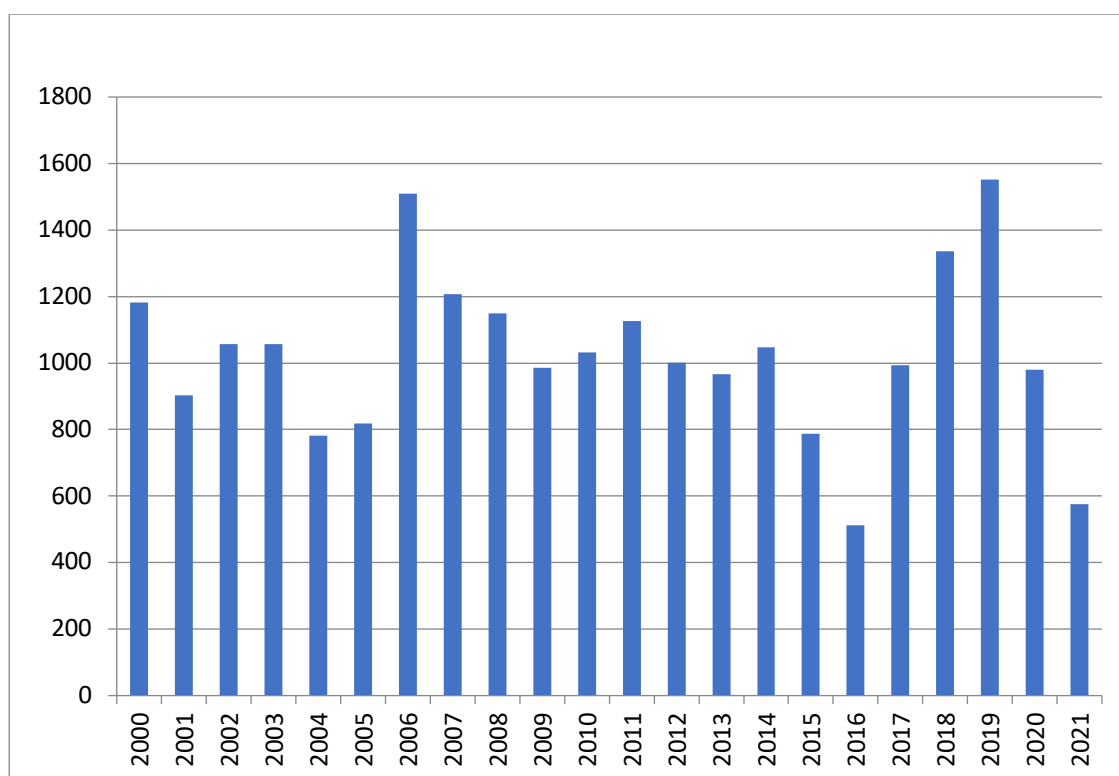
Mean = Average

Max =Maximum Temperature

Min = Minimum Temperature

RH = Relative Humidity mm = Millimeter

Z = Universal Time (U.T.) or Greenwich Mean Time (G.M.T.) 0600Z = 09.00am 1200Z = 03.00pm



*Figure 1.3 Total Annual Rainfall (mm) (Msabaha Met Station)*

#### 1.3.5.1 Soils

Land surrounding the Sabaki River Estuary is characterized by poor soils, shallow depressions and a gently undulating terrain characterized by sandy, sandy loam soils with very high infiltration rates. In some areas, the soils are dry with drainage and salinity. In some places, the soils are covered with thick top soils, which are loamy sand to sandy loam.

#### 1.3.5.2 Geology of the Area

The earliest geological work in the Malindi area involved geological mapping by Thompson, 1956 and thereafter many studies were undertaken such as the one to investigate causes of increased siltation from the Sabaki River in Malindi and on the beaches of Malindi (Delft Hydraulics, 1970) and on sedimentation in the modern depositional environments of Malindi which included beaches and the Sabaki estuary (Hove, 1980a). The Sabaki has a considerable discharge of  $3.0 \times 10^8 \text{ m}^3$  /year according to Brakel, (1984). It has been suggested the influx of sediment from Sabaki River has been on the increase and the sediment is spreading southward leading to active accumulation according to Bird, 1985.

The source of the deposits composing the Malindi shores is the Sabaki River. The mineral assemblage characterizes the sediments as residues of disintegration of the Mozambican belt metamorphic rocks drained

by upper courses of the river. The sandy shores near Malindi have their major part of the deposits derived from the Sabaki River resulting from weathering of rocks inland according to Aboudha *et al.*, (1989).

In a nutshell, the shoreline here is fringed landward by sand dune systems, though their occurrence and physical appearance depend on a combination of suitable factors. These are sand supply, wind regime, beach geometry, tidal range, precipitation, vegetation and human activities. Sand dunes can be thought of as migrating bed forms resulting from wind action and they can be stabilized by vegetation which traps the moving sand and tends to bind it. This area of Sabaki has experienced high rates of shoreline propagation and large dune fields have developed according to Bird, 1985, Aboudha, 1989 and Arthurton, 1992. The fundamental cause of this occurrence is considered to be an increase in sediment transport volume by the Sabaki River. As a result, the agricultural lands, recreational facilities and settlements next to the mobile sand dunes are threatened with incursion. The predicament is augmented further by anthropogenic influences such as the vegetation of stabilized dunes through overgrazing and clearing. Thus, the management of this area would require knowledge of morphologically dynamic processes operating, so that effective mitigating procedures could be implemented.

### **1.3.6 Access to Other Infrastructure**

#### **1.3.6.1 Water**

The main sources of water for Sabaki communities are the Sabaki River, shallow wells within the sand dunes, the community use the river to water their livestock and for irrigation. The quantity of water from the Sabaki River is sufficiently high thus a source of piped water to Malindi town, Mombasa, Kilifi and Watamu.

#### **1.3.1.2 Health**

There is a health center in both sub locations (Mambrui and Sabaki) staffed by the Ministry of Public Health. The community receives services such as: anti- and post-natal services, family planning, periodic visits by ENT and eye doctors.

#### **1.3.1.4 Schools**

There are four public secondary schools and four public primary school government schools and 18 private schools both primary and secondary with enrollment of about 5,084 students. Those who graduate to secondary school go to village polytechnics, colleges and universities.

#### **1.3.1.5 Roads**

The local roads though not paved are passable all year round apart from the narrowness within the trading centers area where shops and houses have been constructed without consideration for road reserves. Matatus, tuk tuks and motorcycle boda boda serve the Sabaki and Mambrui residents in and out of their area.

#### **1.3.1.6 Religious Centers: Mosques and Churches**

The main religions are Islamic and Christianity.

#### **1.3.1.7 Other Public Services**

The Chief and Assistant Chief provide the community with administrative and security support. However, extension services for livestock and fisheries are provided regularly in the village by visiting officers from the respective departments.

### **1.4 Biodiversity**

#### **1.4.1 Flora and Fauna**

The vegetation of the area is varied and is dependent on both proximity to fresh and marine water as well as the soil that range from sand dunes to river bed sediments. On the sand dunes scrub vegetation exists consisting of 103 plant species of 43 families. In the northern bank an expansive mangrove forest has been formed covering an estimated 132 Acres. Sabaki river mouth is one of the Important Bird Areas (IBAs) in Kenya (Bennun and Njoroge, 1999). It hosts large visiting flocks of the Madagascar Pratincole (*Glareola ocularis*), resident population of Malindi Pipit (*Anthus melindae*) and is also an important nesting, roosting and feeding ground for gulls and terns. A total of 186 species have been recorded and a maximum count of Over 50,000 birds in 2012. The Collard Pratincole has a limited breeding distribution within Kenya and this is the only known breeding location for this species on the Kenyan coast. Numbers of Palearctic waders and broad billed sand pipers also occur. The Malindi Pipit also occurs in and around the dune grasses. Some of the species which have recorded sufficient numbers in Sabaki estuary include; pelicans, cormorants, herons, flamingoes, ducks, geese, waders, gulls, terns and kingfishers. It is the most important wintering site for the Broad -billed Sand Piper (*Limicola falcinellus*) (Crafter *et al.*, 1992).

The estuarine is rich in fisheries and crustaceans that have in turn supported fishing which is the main livelihood for the people of the area. The beaches are good nesting places for sea turtles. The insect collection for the estuary area totals 339 taxa and this great diversity is an indicator of the ecological wellbeing of the Sabaki River Estuary. This is mainly in reference to the big role played by these insects in the ecosystem: insects are a source of food to a variety of birds and other small animals. Other species of wildlife include crocodiles and hippopotamus in the mangrove areas while small antelopes such as the Suni and Duikers still exist in small numbers in the scrub vegetation in the adjacent areas.



### 1.5 The Context/Link to Existing Policy Frameworks

The development of this management plan has been aligned to legal, institutional and policy frameworks that are relevant and applicable to the context of the Sabaki River Estuary. These frameworks include international treaties and convention, regional, national and county policy and legal tools that enable and empower the planning process, assign responsibilities to institutions for implementation and fit outcomes to the targets set in the frameworks.

### 1.6. The Historical Perspective/Context

The initial human settlement in the Sabaki area was in 1918 mainly by farmers who also kept goats, cattle and chicken. The major crops grown then were maize, simsim and cowpeas and later they started to plant cotton, coconuts and mangoes. They provided wage employment to Arabs and Indians, when the Europeans settled at the coast, they also sourced labor from the community. During this period fish was plentiful in the area.

There have been a series of famines; the first between 1941 and 1945 at which most families did not have food the famine was called "Njaa ya foleni". There was famine again in 1960 called "Njaa ya Msolo" and the President of United States of America JF Kennedy supplied yellow corn flour because of prolonged famine. Lastly between 1990 and 1992 there was severe drought and famine called "Njaa ya Changilo".

By 1950 Missionaries started coming to Sabaki with the arrival and establishment of the Seventh Day Adventist Church by Mr. Willard and later followed by the Baptist and Catholic missionaries who established churches too.

The exotic tree species "Neem" *Adzaderachta indica* was introduced in Sabaki in 1957 and the other invasive species "Mathenge" (*Prosopis juliflora*) was introduced in 1979.

In the years 1958-1970 there was a big population of a diversity of wild animals such as baboons, monkeys and antelopes but at present now only the hare is frequently seen.

It was only in 1989 following settlements between 1918 -1977 that land adjudication was conducted and individuals given titles while the vast unsettled areas were declared Trust Land.

The landmark Sabaki Bridge was constructed in 1997 by Japanese engineers and the road connection to the areas further north by the construction of the Sabaki-Garsen Road at the same time by the Chinese.

And it was in 1998 that the village started to experience weather changes whereby the village experienced intense sun and excess rain. At the same time El Nino rains and impacts as increase in mosquito population (Gichuki, 2007)

## **1.7 Justification for the Management Plan**

The Sabaki estuary has not been accorded any formal protection under the Kenyan legislations. There are plans underway to have the estuary designated a Ramsar site. Internationally, Birdlife International has designated the site an Important Bird Area (IBA) and a Key Biodiversity Area (KBA) (Bennun and Njoroge, 1999). The local Site Support Group identified as Sabaki River Conservation and Development Organization has spearheaded stakeholders in the identification of an 11Km<sup>2</sup> area of the Sabaki Estuary and its adjacent area and are working towards its recognition as a Marine Conservation Area under the Forest Act 2016 which recognizes all mangrove forest as gazette forest. However, there are a myriad of other legislative frameworks that are support of sustainable management of the estuarine and adjacent resources including the Water Act, Fisheries Act, Forest Act, EMCA, and Wildlife Act in the protection of the fragile ecosystem.

There is a general recognition that natural resources can be better managed through involvement of the local communities and other stakeholders. It is hoped that under such arrangements, all stakeholders, especially the estuary adjacent community, will better manage the Sabaki Estuary. Participatory management aims at minimizing resource use conflicts, and creating an opportunity for them to contribute towards a sustainable estuary management and supporting sustainable estuary-based livelihood activities by then adjacent community. It is hoped that the sustainable estuary-based livelihood activities will reduce poverty levels among the adjacent community.

The management plan provides a framework for the stakeholders to ensure the sound management and the flow of sustainable benefits to the local communities who depend on the natural resources for their livelihoods.

The main source of pressure on the Sabaki estuary is from the depletion and degradation of the area's natural resources as population growth and settlements expand in the area. This pressure is attributed to poverty, population growth, unemployment, poor management skills, weak management structures and systems. The Sabaki Estuary planning process involved holding stakeholder consultative brainstorming sessions to identify environmental problems, potential solutions and strategies. The following were identified as the threats to the Sabaki Estuary sustainable management:

## **1.8 Scope of the Plan**

### **1.8.1 Geographical Scope**

The planning area will include the core zone and the intervention zone. The core zone covers the estuary itself and the riparian land going upstream up to the Sabaki Bridge (Figure 1.3). The intervention zone to the

southern banks include part of Kibokoni village down to the shore and the northern banks covers all the sand dunes up to Majenjeni Village to the ocean.

### **1.8.2 Temporal**

This will be a five-year management plan that will be broken down into phases based on resource availability, technical ability and concerned institutional capacities. The phasing of the implementation will be dynamic and will respond to the changing opportunities and challenges of the implementation process and the environment where the implementation will take place. Legal and policy changes will also be incorporated into the implementation plan.

### **1.8.3 Operational Scope**

This management plan is intended for the Sabaki Estuarine ecosystem and the adjoining intervention areas all together covering approximately 2,953 ha. The areas include two villages namely Majenjeni and Moi. Other areas of concern include sand dunes, wetlands and scrubland. Specific action will be selected on the basis of the micro-area of implementation.

## **1.9 The Methodology/Approach used to Develop the Management Plan**

Consultative planning meetings have been used in the development of this Management Plan (MP). A participatory approach involving communities and all stakeholders was used. Prior to the consultations there was extensive sensitization of the community since 2007 but the process stalled due to financial insufficiencies. The planning team has been representative of key interests/resources and special interest groups identified by the community. The planning team has been actively involved in household surveys, resource mapping, collating information and data from key sectors and consultation with the regulatory agencies. Due consideration has been taken of the existing national policies and legislation with regard to natural resource management. This planning process was initiated in December 2008 and redone in 2021. It involved consultations where consensus was obtained on various issues. A GIS map of the Sabaki Estuary area to be managed using this plan developed using existing GIS data, field GPS data collection, data from satellite imagery and remote sensing all of which together condensed into negotiated and fairly accurate maps.

## **ECOLOGICAL AND SOCIO-ECONOMIC FEATURES**

### **2.1 Ecological and Biological Features of the Estuary**

Sabaki Estuary has ecological, economical and aesthetic values. Ecologically the estuary provides feeding and roosting ground for marine waders, it's also a breeding ground for fisheries, birdlife, and carbon sequestration especially in the mangrove forest. The economic value of the estuary includes fishing, tourism, fuel wood, water for domestic uses, beekeeping, sand harvesting, and harvesting of mangrove poles. The estuary serves as a tourist attraction site due to its aesthetic value.

Sabaki estuary is a dynamic ecosystem. The river course has been shifting southwards for the last six decades together with the mudflats and sand dunes (Abuodha, 2003)

The mangrove forest used to be expansive in the 1950s and almost vanished by the year 2000 (Gichuki 2007). Since the mid-1970s a high levels of silt deposition has taken place that has extended the river mouth into the ocean and created the wide, open mud and sand flats which are the key attraction for large numbers of waders. Until 2000, there were only some degraded patches of mangrove forest slightly upstream. With the siltation, however, conditions have become ideal for mangroves.

#### **2.1.1 Changes in Mangrove Cover in Sabaki River**

In the year 2000, the total mangrove cover was estimated to be 14.7 ha and mostly found on the southern bank of the estuary (Figure 4). A mudflat characterized the northern bank, but the deposition in this area has since led to the development of a mangrove forest whose coverage has increased over time. By the year 2022, the mangrove cover around the estuary was estimated to be about 71.9 ha. Figure 2.1 shows the distribution of the mangrove cover where the northern bank seems to have significantly gained in coverage. Figure 4c) and 4d) shows high resolution Maxar images of the Sabaki river estuary mudflat in year 2000 and the mangrove cover on the same area in the year 2022, respectively. The deposition area has resulted in the development of a mangrove forest.

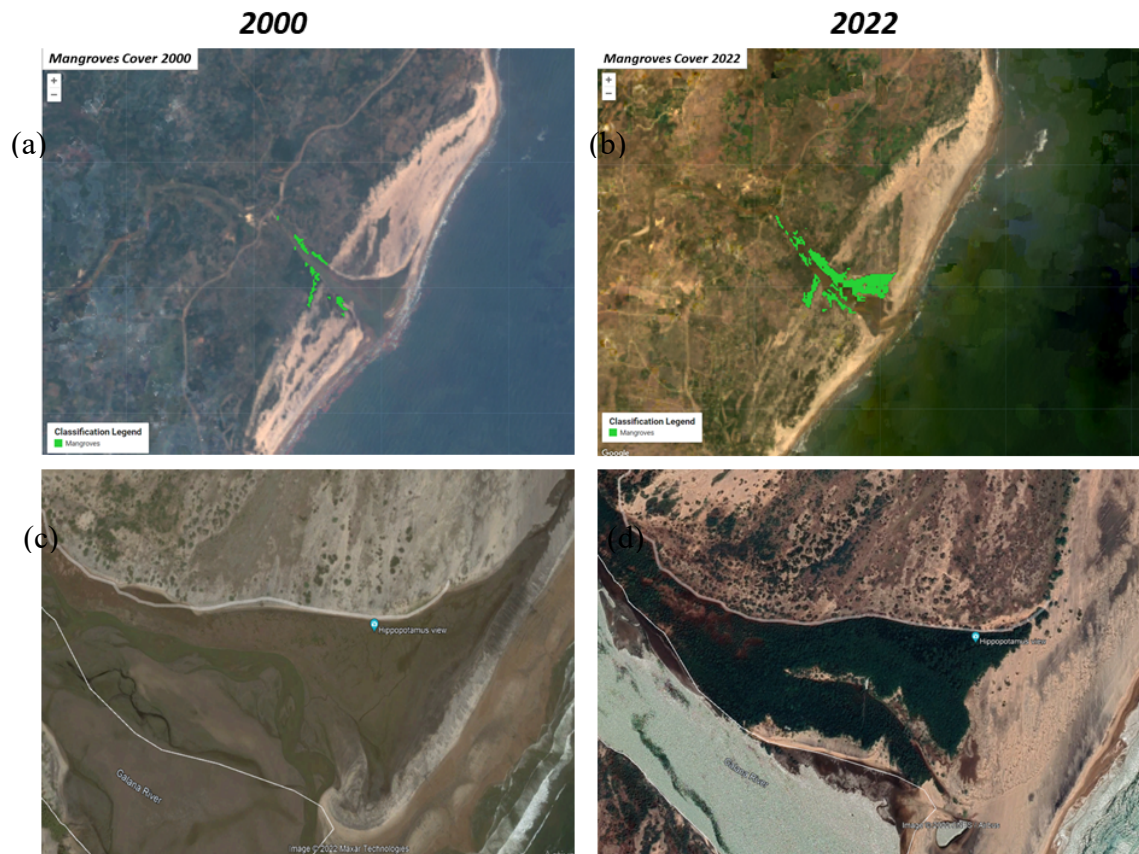


Figure 2.1 2000 and 2020 Images Showing the Mangrove Covered Areas  
The upper images (4a, b) are Landsat images while the lower images (4c, d) are Maxar high resolution images.

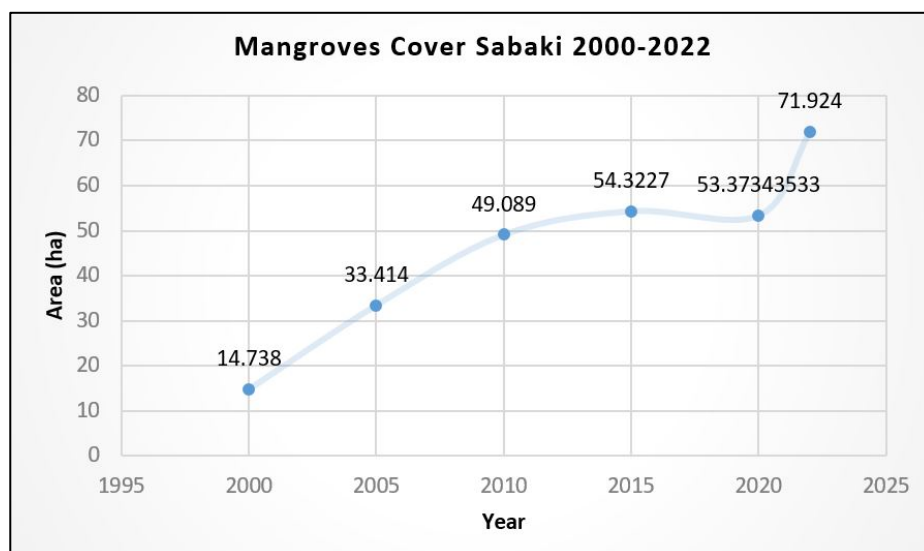


Figure 2.0.2 Time Series Trend for Mangrove Cover in Sabaki Estuary Year 2000 to 2022

### 2.1.3 Variation in the Shoreline at the Sabaki River Mouth

Historically sand dunes existed throughout in the area. However, it has been observed that new sand dunes have been developing continuously in the new accreted land as the ocean recedes. The accreted land formed by the recession of the ocean is suspected to be as a result of siltation from the river due to massive erosion in the catchment. Presently there is an expanse of about 2km of the accreted land formed since 1960. The position of the river mouth has been shifting seawards.

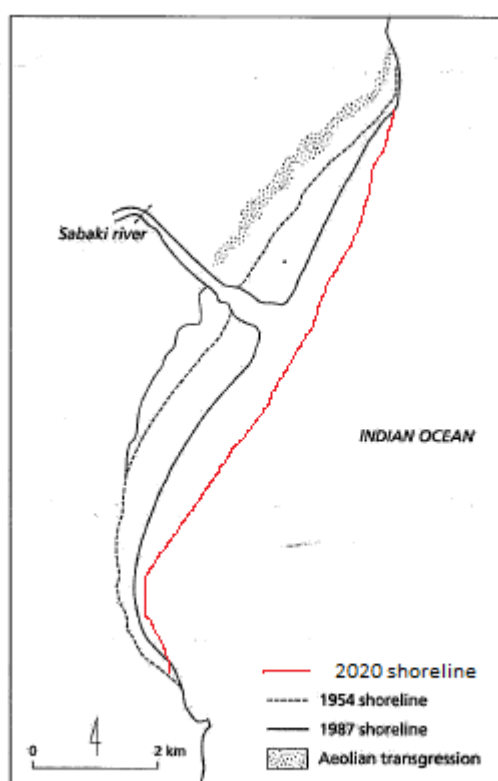


Figure 2.3 Changing Shoreline at Sabaki River Estuary

### 2.1.4 Biodiversity

The vegetation of the area is varied and is dependent on both proximity to fresh and marine water as well as the soil that range from sand dunes to river bed sediments. On the sand dunes scrub vegetation exists consisting of 103 plant species of 43 families. In the northern bank an expansive mangrove forest has been formed covering an estimated 117 Acres. Sabaki river mouth is one of the Important Bird Areas (IBAs) in Kenya (Bennun and Njoroge, 1999). It hosts large visiting flocks of the Madagascar Pratincole and is also an important nesting, roosting and feeding ground for gulls, plovers and terns. A total of 186 species (Appendix 1) have been recorded and a maximum count of 11,753 birds. The Madagascar Pratincole has a limited breeding distribution within Kenya and this is the only known breeding location for this species on the Kenyan coast. Numbers of palearctic waders and broad billed sand pipers also occur. The globally threatened and range restricted Malindi Pipit is also resident in and around the dune grasses. Some of the species which have

recorded sufficient numbers in Sabaki estuary include; pelicans, cormorants, herons, flamingoes, ducks, geese, waders, gulls, terns and kingfishers.

The estuarine is rich in fisheries and crustaceans that have in turn supported fishing which is the main livelihood for the people of the area. The beaches are good nesting places for sea turtles. The insect collection for the estuary area totals 339 taxa and this great diversity is an indicator of the ecological wellbeing of the Sabaki River Estuary. This is mainly in reference to the big role played by these insects in the ecosystem; insects are a source of food to a variety of birds and other small animals. Other species of wildlife include crocodiles and hippopotamus in the mangrove areas while small antelopes such as the Suni and Duikers still exist in small numbers in the scrub vegetation in the adjacent areas.

### **2.1.2 Water**

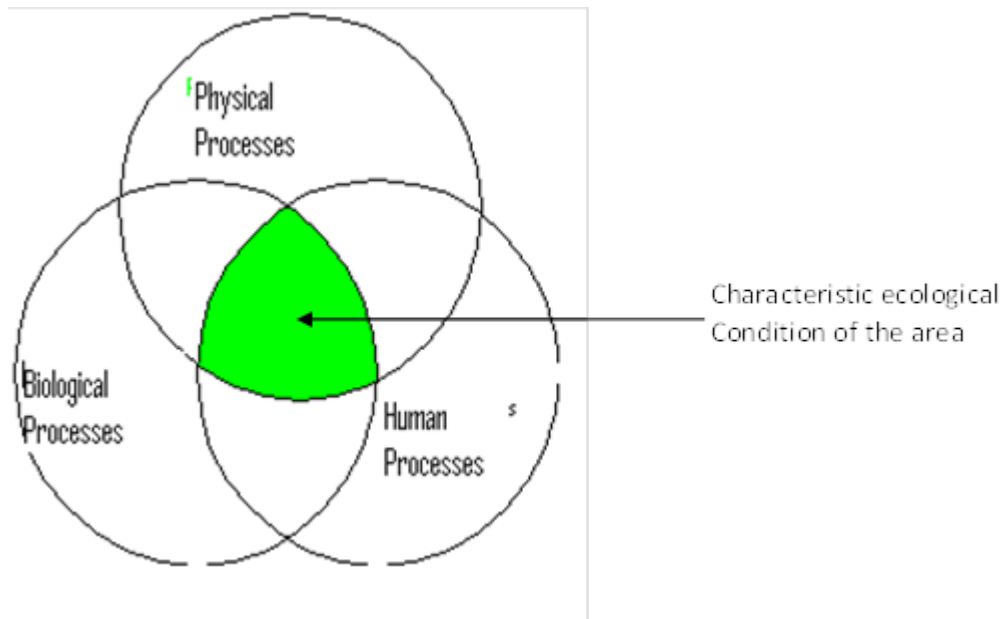
The main sources of water for Sabaki community are from the tap water, Sabaki River, shallow wells within the sand dunes. The Sabaki River is Kenya's second longest river with its waters originating from the Ngong hills and Ondiri swamp in the Nairobi and Central provinces of Kenya. At the estuary the fresh waters of Sabaki River converge with the salty waters of the Indian Ocean. The quantity of water from this river is sufficiently high thus a source of water to Malindi town, Mombasa, Kilifi and Watamu. In addition, it provides water for livestock and irrigation.

### **2.1.3 Ecology Perspective**

The ecology of the area demonstrates interrelationship of 3 interfaces namely:

- Physical processes – waves, river discharge, sediment transport, tides, wind action
  - Biological processes – marsh establishment, mangrove & other vegetation growth, fish life, birdlife.
- Human processes – economics, politics





*Figure 2.4 An Ecological Perspective of the Area*

## **2.2 Socio-Economic and Cultural Values**

These are community aspects that demonstrate how the community lives and may have a bearing on how they are connected to the estuarine natural resources either way; negatively or positively.

### **2.2.1 Community Education levels**

The population levels of education include both those who are currently studying in a certain level and those who have finished that level as depicted in Figure 4. Majority of the Sabaki village residents have attained the primary education, 41%. The share of under-school aged children is large (19%) and together with the share of nursery going children (7%) constitutes a quarter of Sabaki's population, which is less than 7 years old. It is also noticeable that the number of those in secondary school and those pursuing higher education is just about 5%. A sizeable part of the population (14%) in Sabaki does not have any formal education. The education status at Sabaki is better than that for the wider rural Malindi population with 29% never attended school and 53% primary level (KNBS, 2010).

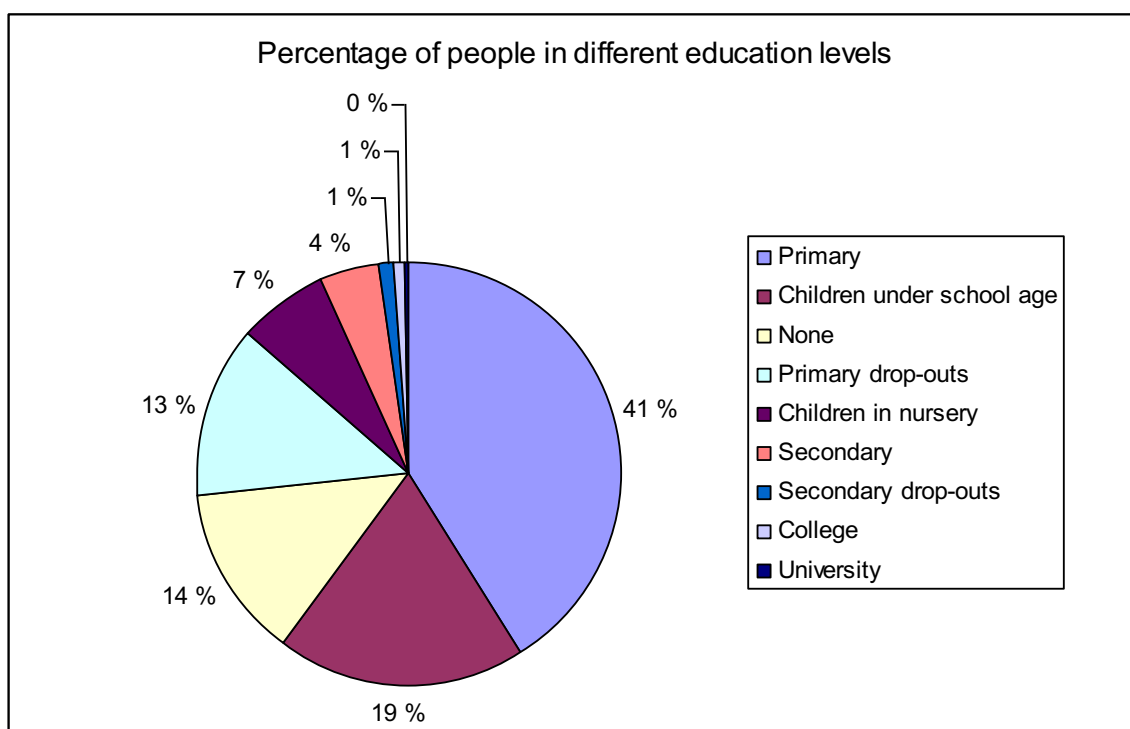


Figure 2.5 Sabaki Socio-economic Report, 2009

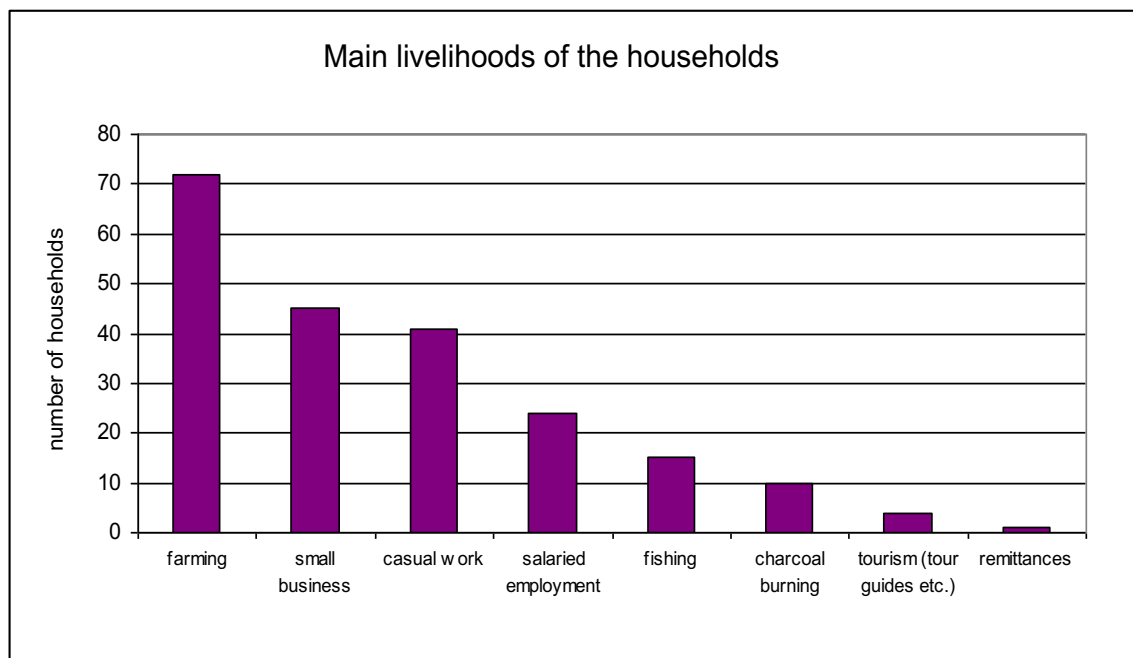
### 2.2.2 Livelihood Sources

There are six main livelihood sources whose predominance is dictated by location within Sabaki estuary. These are casual waged labor, fisheries, forest/tourism formal employment, business/trade, livestock farming and mixed farming. Mixed farming is the main livelihood of the community in the coastline although more than half of the County's area is semi-arid under ranching. Casual waged labor and fishing are predominantly practiced along the coastal strip. The farming in the area is long rains dependent and produce can meet only 20% of its grains, vegetables and pulses requirements. The deficit is met from imports from other neighboring Counties' mainly Taita-Taveta, Tana River Delta and upcountry.

The Rapid Social Economic Appraisals conducted at Sabaki Estuary in 2007 (Gichuki,2007) established the various sources of livelihoods for the Sabaki community as: fishing; fruit farming; subsistence farming; tapping palm wine; business (shops); seafood supply; charcoal production and selling palm wine; tour guiding; salaried employment; livestock keeping; and bee keeping.

The number of households engaging in farming is highest with remittances contributing the least. Farming, small business and casual labor are the major livelihood activities.

Figure 5 depicts the current household livelihood sources and their importance in income contribution to the Sabaki Estuary community as established by Ayiimba and Mbuvi (2011).



*Figure 2.6 Source of Livelihoods*

The main types of land uses are livestock keeping, growing of drought resistant crops, fisheries and sand harvesting. Small -holder horticultural irrigation for vegetables is already being practiced in some of the places. Arable agricultural land is under small-scale crop production with the main food crops grown being maize, beans and cassava.

### **2.2.3 Tourism/Ecotourism**

Both Malindi town and Sabaki estuary are important tourism destinations for both local and international visitors. Tourism is the major industry in Malindi town. There are 20 hotel establishments providing direct and indirect employment opportunities to 60% of the workforce in the town. There are nine main hotel establishments within Sabaki. The Malindi tourist circuit comprises of the Malindi Marine Park and Reserve, Malindi Tourist Market, the sandy beaches, historical and cultural sites such as Vasco da Gama Pillar, Portuguese chapel, Gede Ruins, Arabuko-Sokoke Forest, bird watching, sport fishing, jet skiing and snorkeling.

Accurate data on the number of tourists visiting Malindi over the years is lacking. There is consensus among stakeholders that the number of tourists has been declining over the years due to global economic recession, recent insecurity issues and Covid 19 pandemic.

Tourism activities in Sabaki Estuary are as a result of the rich avifauna and scenery. The IBA attracts an average of 300 visitors per month depending on the seasonality of tourism activities along the Kenyan Coast. Visitor numbers are dominated by students from schools within Kenya on educational field trips. The students tend to come in groups and frequency of visits is more sporadic than for tourist visitation, with the peak visits recorded during school holidays. Other visitors include domestic and foreign tourists. Tourists do not pay entry fees into the Estuary but they contribute 6% of the local income through local business, tour guiding and indirect employment. The focus is on low impact tourism and eco-tourism. Organized community groups such as the Sabaki River conservation and development organization (SARICODO) provide tour guiding services and conservation activities.

#### **2.2.4 Fishing**

In respect to artisanal fisheries, there are several fishermen from different villages who operate within the Sabaki river estuary. The fishermen are members of Kichwa cha Kati Beach Management Unit (BMU). The fishing gear employed by the fishermen include gillnets, hooks and line, traps and baskets, marine seine nets and scoop nets. Gillnets are deployed from artisanal fishing crafts that include dhows and canoes. Since the fishery is a common open access resource, fishing effort has increased with increase in the number of artisanal fishermen over the years. Lack of an alternative livelihoods, has resulted in artisanal fishing to become the only source of livelihood resulting to depleted fisheries resource. Over fishing has become a major challenge within the Sabaki River Estuary.

The exploitation of Marine resources within Malindi-Ungwana Bay prawn fishery is shared between the trawlers and the local fishermen. Prawn trawling in the area is restricted to the Malindi-Ungwana bay in north coast owing to the influence of the Tana and Sabaki rivers discharging at the North and South most ends of the bay respectively. The fishery employs semi-commercial trawlers. The prawn fishery in the Malindi-Ugwana bay is managed through a prawn fishery management plan. The plan introduced closed season from November to March whereby trawler fishing closes. The prawn management plan limits the number of trawlers that can be licensed to four and also introduced by-catch sharing among BMU, s within the bay. The total landings for prawns fluctuate between 300-650 tones for all trawlers annually with retained by-catch to prawn catches showing an inverse relationship. The prawn to by-catch ratio has been estimated at a 1 tonne to seven tones respectively. The main species of prawns recorded by the fishery include *Panaeus monodon*,

*P. indicus*, *P. monoceros* and *P. semisulcatus*. Other catch compositions obtained from the trawl hauls include retained by-catch, discards and large marine fauna such as sharks, turtles and rays.

Freshwater prawns are also abundant in the lower Sabaki and make a valuable contribution to the local fishery. The main species are *Macrobrachium lepidac tylus*, which reaches 40 g in weight, *M. rude* and *M. scabrinsculum*. Originally from Lake Victoria, *Caridina nilotica* and *C. africana* are found in the Sabaki River floodplains.

### 2.2.7 Sand harvesting

Sand harvesting occurs in the dune areas both to the North and South of the estuary. The sand is harvested by means of scooping with shovels and loading into Lorries (Figure 6). Besides the use of the sand for construction activities in Malindi, Kilifi and Mombasa, sand harvesting and selling is a source of employment within Mambrui and Sabaki sub location. Prior to the introduction of a weigh bridge by Kilifi County Government in Malindi in late 2013, the turnover was an average of 40 Trucks per day carrying between 280 and 1,200 Tonnes of Sand worth a maximum of Ksh 1.2 million at the market but a paltry Ksh 0.2 million at the source (Kilifi County cess collection records). This explains in part the poverty prevalence among local communities where sand harvesting occurs. Following the introduction of the weigh bridge and cess station by the County Government, the turnover has declined to an average of 10 trucks per day and this has also contributed to reduced earnings on the part of the youth involved in the sand harvesting business.



Figure 2.7 Sand harvesting at Kibokoni area within the Sabaki Area

### 2.2.8 Households Well-being

Since 2007 the living conditions of the residents of Sabaki Estuary area were described and the indicators of for the identified four wellbeing categories described in Table 4 generated (Gichuki, 2007; 2010). The current household well-being has improved with proportion of households in Category 4 reduced by about 10% within one year and an average increase of 5% in the Categories 1 to 3 (Ayiemba and Mbuvi, 2011; Figure 6).

The most common housing type in Sabaki village is the mud walled and palm (makuti) roofed houses (61%), while semi-permanent houses built of mud walls supported by permanent blocks or permanent blocks with iron (mabati) roof are 25%. Only 4% of households were living in houses in extremely poor conditions.

*Table 2.1 Wellbeing Categories and Indicators as Perceived by Sabaki Residents*

Category	Indicators
Category 1: High well being	<ul style="list-style-type: none"> <li>▪ People who own four or more hectares of land</li> <li>▪ Own at least 10 local breed cattle</li> <li>▪ Own rental houses</li> <li>▪ Have permanent house with iron sheet roof</li> <li>▪ Parents take their children to private schools</li> <li>▪ Can hire self-driven vehicles</li> <li>▪ Some own motor bikes</li> <li>▪ Use casual labor for their farms</li> <li>▪ Have a good standard gear for fishing.</li> <li>▪ Have enough food for the family</li> </ul>
Category 2: Medium well being	<ul style="list-style-type: none"> <li>▪ Own mud walled houses with iron sheet roof</li> <li>▪ Most of them have salaried employment</li> <li>▪ Have enough food for the family</li> <li>▪ Own land between half a hectare to 2 hectares</li> <li>▪ Some are casual laborers</li> <li>▪ Fishermen and farmers</li> <li>▪ Have modified fishing equipments</li> <li>▪ Have one or two cattle</li> <li>▪ About 10 goats</li> <li>▪ Own a radio or and a bicycle</li> <li>▪ Can educate their children to primary school level</li> </ul>
Category 3: Low well being	<ul style="list-style-type: none"> <li>▪ Run vegetable and fruit business</li> <li>▪ Casual laborers</li> <li>▪ Does not use oil or coconut sauce for cooking</li> <li>▪ Some own only two chickens</li> <li>▪ Cannot afford buying school uniform</li> <li>▪ Their poorly constructed houses have to be repaired every year.</li> <li>▪ Their businesses collapse or do not expand.</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Do not own livestock</li> <li>▪ Are squatters</li> <li>▪ Own mud walled houses with <i>makuti</i> roof</li> </ul>
<b>Category 4: Lowest wellbeing</b>	<ul style="list-style-type: none"> <li>▪ Children do not go to school</li> <li>▪ Beggars for food and clothing's</li> <li>▪ Have only one wife</li> <li>▪ Most are drunkards</li> <li>▪ Do not wear shoes</li> <li>▪ Squatters on other people farms</li> <li>▪ Makuti, paper, gunny bags walled houses</li> </ul>

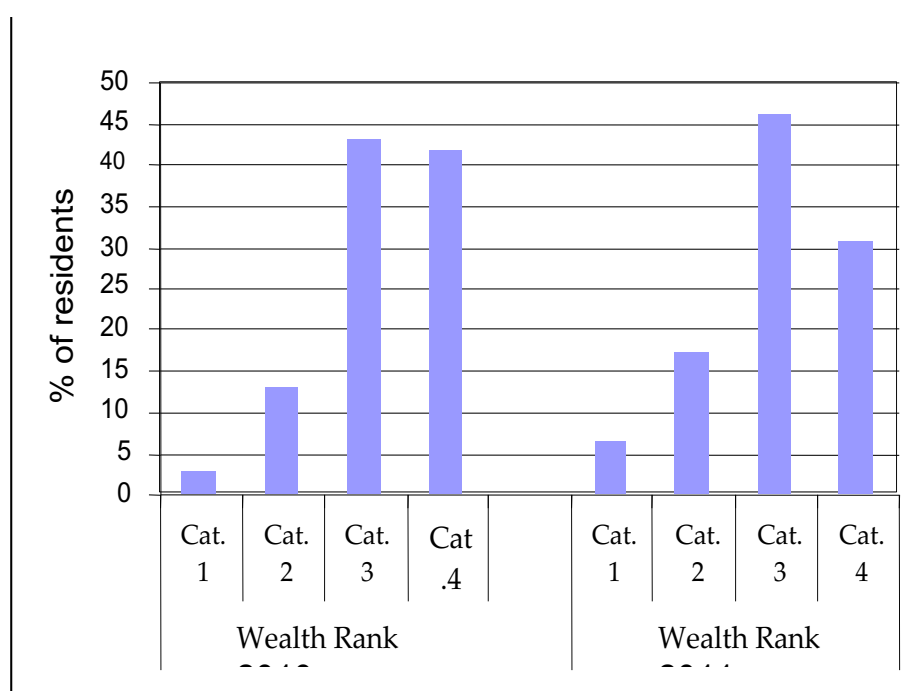


Figure 2.8 Comparison of 2010–2011 Well-being Status (Source: Field data, 2011)

## 2.3 Socio-Ecological Management Units

### 2.3.1 Ecological perspective

The ecology of the area demonstrates an interrelationship of 3 interfaces namely the:

1. Physical processes – waves, river discharge, sediment transport, tides, wind action;
2. Biological processes – marsh establishment, mangrove and other vegetation growth, fish life, birdlife; and mammals
3. Human processes – economic activities, social events and politics political processes

The fragile ecosystem balance is threatened by local population and settlement patterns as the Malindi Urban center grows and the locals engage in supply for the increasing demand of products and their livelihoods. Similar pressure upstream results in imbalances in agricultural practice, soil and water conservation, and the destruction of the river catchment. Without a holistic plan for the entire Athi-Galana-Sabaki River system the biodiversity supported by the fragile ecosystem balance stands threatened.



## POLICY, LEGAL AND INSTITUTIONAL FRAMEWORKS

### 3.1 Introduction

Wetland ecosystems are managed under different policy legal and institutional frameworks. The aim is to enhance the conservation and management of wetlands resources. Sabaki Estuary is not gazetted, however, it is managed under different legal provisions at the national and international levels. Below is a summary of relevant legislative provisions.

### 3.2 International Legal Frameworks

Kenya has ratified a number of international agreements, protocols and Conventions that impact on wetlands conservation. They form part of Kenyan laws under article 2 (5) (6) of Constitution of 2010. The key international agreements and conventions that are considered most important for conservation of Ondiri wetland are summarized in below.

*Table 3.1 International Legislation, Conventions and Agreements*

Convention/Agreement	Relevance to Wetland Ecosystems
African Eurasian water bird agreement (AEWA) (1995)	Conservation of Migratory water birds
Nairobi convention for the protection, management and development of Marine and Coastal environment of western Indian ocean region (1990)	Conservation of coastal and marine Ecosystems including river basin i.e. Nairobi-Athi- Galana-Sabaki
East African community Protocol on environment and natural resources Management	Conservation of natural resources wetlands included
The Ramsar Convention	Framework for international cooperation for the conservation and wise use of wetlands and their resources
Convention on Biological Diversity	Conservation of biological diversity, sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources
United Nations Framework Convention on Climate Change (UNFCCC 1992)	Climate Change mitigation and adaptation

Convention/Agreement	Relevance to Wetland Ecosystems
African Convention on the Conservation of Nature and Natural Resources, 1968 (as revised in 2003).	Natural Resource Conservation
Convention on Migratory Species (Bonn Convention, CMS) 1979	Conservation of terrestrial, marine and avian migratory species
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Regulation of trade in species which are endangered, or which may become endangered if their exploitation is not controlled
Man and Biosphere Programme UNESCO (1971)	Improving relationships between people and environment
Sustainable Development Goals (SDGs)	A strategy in tackling the world's greatest challenges related to global sustainable developments so as to achieve better and more sustainable future for all

### 3.3 National Policy and Legal Framework

The preparation, planning and implementation process of the Sabaki Estuary management plan recognizes existence of the current wetland legal framework including the Constitution of Kenya, Wetland Policy, EMCA 1999 and Wetland Regulations among other legal frameworks which have direct impact to sustainable conservation, management and utilization of the Estuary. A highlight of some of the relevant national legal framework is provided in Table 6 below:

*Table 3.2 National Policy and Legal Frameworks*

Policy/Legal Framework	Relevance to Wetland Ecosystems
National Wetlands Conservation and Management Policy 2014	Chapter 3- Secure and ensure the benefits of wetlands for posterity Providing a framework for mitigating diverse challenges that affect wetlands conservation and wise use in Kenya Chapter 4- Fulfilling Kenya's obligation under the Ramsar convention, the East Africa Community and other MEA's
Land Policy 2009	Section 3.4.2.3 (124) Restore the environmental integrity of land and facilitate sustainable management of land-based resources

Policy/Legal Framework	Relevance to Wetland Ecosystems
	<p>Section 3.4.2.3: 124 (d) Establish institutional mechanisms for conservation of quality of land for environmental conservation purposes.</p> <p>Section 3.4.3.1 Conservation and Sustainable Management of Land Based Natural Resources</p>
Forest Policy 2016	<p>Chapter 3- Sustainable development management, utilization and conservation of forest resources</p> <p>Chapter 8- Equitable sharing of the resources Stakeholders involvement</p>
The Constitution of Kenya (2010)	<p>Article 42- The right to clean and healthy environment</p> <p>Article 69- Ensure sustainable exploitation, utilization and management of the environment and natural resources, public participation in the management, protection and utilization of the environment</p>
Land Act 2012	<p>Part II: 19 (1)- Make rules and regulations for the sustainable conservation of land based natural resources</p> <p>Part II: 19 (2 e and f)-Involvement of stakeholders in the management and utilization of land-based natural resources; and ensure benefit sharing to the affected communities.</p>
National Land Commission Act 2012	<p>Part II 5 (c), Registration of title in land throughout Kenya.</p> <p>Part II 5 (d) Research related to land and the use of natural resources, and make recommendations to appropriate authorities</p> <p>Part II 5 (c) registration of title in land throughout Kenya</p>
Environmental Management and Coordination Act of 1999 (revised 2015)	<p>Overarching law on environmental management in Kenya.</p> <p>Sections 3- Entitlement to a clean and Healthy environment</p> <p>Section 42- Measures for the Protection of rivers lakes seas and wetlands</p> <p>Measures for the protection of environmentally significant areas</p> <p>Sections 54 and 58- Requirement for Environment and social impact assessment (ESIA) and Environmental Audits</p>
Forest Act 2016	<p>Sections 4 and 42-Provides for PFM and PFMP preparation</p> <p>Research and development programmes to provide information for sustainable natural resources</p> <p>Conduct training on natural resources</p>

Policy/Legal Framework	Relevance to Wetland Ecosystems
	<p>Public participation and community involvement in management of forests</p> <p>Provides for preparation and gazettment of rules and regulations such as Participation in Sustainable Forest Management</p>
Wildlife Conservation and Management Act, 2013	<p>Section 30- Prohibition of activities that may have adverse effects to the environment. Control of pollution from toxic waste seepage to streams, lakes and wetlands</p> <p>Section 31 (1)- Publish management plan for wetland under KWS management</p> <p>Section 33- Through the Cabinet secretary declares a wetland that is an important habitat or ecosystem for wildlife conservation a protected wetland.</p>
Water Act 2016	<p>Provides the use management, control and conservation of water resources</p> <p>Stipulates matters on use, ownership and control of water resources and safeguards water catchment areas</p>
Agriculture Act cap 318	<p>Addresses maintenance and advancement of good agricultural practices</p> <p>Provides for soil conservation, fertility and encourages Agricultural land developments through principles and practices of good land management</p>
National Climate Change Response Strategy (NCCRS) 2010	<p>Chapter 4- Protection of natural resource base (soil and water conservation techniques)</p> <p>Protection of Water towers, river banks and water bodies</p> <p>Building capacity for water quality improvement and awareness campaign to promote water efficiency measures</p>
Kenya tourist development corporation Act, Cap 382	<p>This regulates tourism development corporation includes provision of travel, expedition tours, whether hunting, fishing, photography or otherwise</p>

Policy/Legal Framework	Relevance to Wetland Ecosystems
	Useful in regulating tourism development through Kenya tourist development corporation
The Physical and Land use Planning (development permission and control) (general) Regulations, 2021	Regulation 13 provides guidelines on utilization of riparian reserves Regulation 14 outlines measurements of riparian reserves for rivers (not less than 100 meters) and oceans (300 meters from the highest water mark)
Wetlands, River Banks, Lake Shores and Sea Shore Management Regulation	The Regulations provide for procedures for declaring a wetland as a protected area; regulation of activities to be undertaken in a wetland through permits; protection and management of traditional interests; and protection of riparian reserves including demarcation of a protected zone of fifty (50) meters measured inland from the high-water mark.
Fisheries Act (Cap. 378)	It purposes to set up the basic principles for the development, management, exploitation, utilization and conservation of fisheries and for connected purposes
Physical and land use planning act (2019)	The tenets of the act include the principles, procedures and standards for the preparation and implementation of physical and land use development plans at the national, county, urban, rural and cities level; The administration and management of physical and land use planning in Kenya; The procedures and standards for development control and the regulation of physical planning and land use; The framework for the co-ordination of physical and land use planning by county governments;

### 3.4 County Legal Frameworks

The overall responsibility for county planning lies with the County department of finance and planning and state and non-state institutions working in the County. The relevant departments and agencies were involved in the planning process, and therefore understand their roles in its implementation.

*Table 3.3 County Legal and Policy Framework*

Legal Framework	Relevance to the Wetland
Kilifi County Planning Act 2016	<p>It integrates economic, physical, social, environmental and spatial planning.</p> <p>The act also provides for the preparation of environmental management plans;</p>
Kilifi County Forest Conservation and Management Act 2019	<p>It ensures biological diversity, enhanced productivity, regeneration and resilience capacities; vitality and posterity of forests.</p> <p>Sustainable management allows for the possibility of multiple uses of forest in a way that satisfies ecological, economic, social, and cultural needs for today and future.</p> <p>Preparation of management plans that captures forest conservation that are critical in wetland conservation</p>
Kilifi County Climate Change Act 2021	<p>Useful in handling climate change aspects such as weather information release and providing advice to resource managers and community</p> <p>It endeavors to facilitate public participation in climate change response through capacity development, awareness creation, consultation, representation and access to information.</p>

## STAKEHOLDER ANALYSIS

### 4.1 Stakeholder Identification and Mapping

There are various stakeholders with interest in the Sabaki River Estuary. Their contribution in activities related to the conservation and management has not had noticeable impact to date. This is partly due to inadequate stakeholder consultation and participation in the conservation and management of the Estuary. During the world wetlands Day 2021 sensitization/planning meetings various stakeholders were identified and informed on the need of a management plan for Sabaki Estuary.

#### 4.1.1 Range of Stakeholders

The stakeholders of Sabaki River Estuary are defined as those individuals, groups and institutions who are directly affected by decisions made on the utilization, management and conservation of the Estuary and whose aspirations and activities affect the objectives of conservation of the area. The stakeholders range from the managing institutions, non-governmental organization. The stakeholders, currently identified to be directly or indirectly involved in activities within the estuary are listed in Table 6.

### 4.2 Stakeholder Analysis Matrix

It is a tabular description of key stakeholders, their status roles and responsibilities in the implementation of Sabaki Estuary management plan. These stakeholders have the mandate, duty or interest in the implementation process.

*Table 4.1 Stakeholder Profiles and Responsibilities*

Category	Stakeholder	Possible Roles & Responsibilities	Influence	Importance
Government Agencies	KFS	Support governance and management of resources at the Estuary Undertaking education, awareness & extension services	High	High
	KEFRI	Coordinate estuary forest research activities and initiatives Encourage integration of research finding	high	High
	KWS	To provide technical advice on management of wildlife in the estuary Minimize human wildlife conflicts Ensure flourishing biodiversity	High	High
	WRA	Ensure protection of river banks -Formation of water resource users' association (WRUAs) -Undertake education & awareness on water conservation Develop water allocation plan for the estuary	High	High

Category	Stakeholder	Possible Roles & Responsibilities	Influence	Importance
	NEMA	Monitoring and advisory of Sustainable management of environment and natural resources Enforcement of laws	High	High
	NLC	Assign ownership and use of accreted land Address land tenure	High	High
	NGAO	Enforce environmental regulation on the ground Provide enabling environment for implementation of MP	Low	High
	KeFS	Fisheries development Control of overfishing and illegal fishing Boost the governance and management of resources of the Estuary	High	High
	MoT	Tourism regulation and offer certification	Low	High
	NECC	Enforcement of environmental laws and policies. Monitoring of pollution.	Low	High
	MOLPP	Land administration	Low	High
County Government	CGK	Overall responsible for the governance of the county Implementation of the plan	High	High
Non state Actors	Nature Kenya	-Development of proposals for funding -Capacity building -Publicity and Advocacy Provide capacity building Develop eco-tourism infrastructure to improve tourism	Low	High
	SARICODO	-Scouting of the estuary -Co-managers of the estuary Create awareness in the community and stakeholders on the value of the estuary Develop tourism circuit Tourism marketing	Low	High
	A Rocha Kenya	-Research activities on bird life -Environmental education Improve livelihoods of the community	Low	High
	BMUs	Control illegal fishing Conduct beach management	Low	High



## **ISSUES AND THREATS FACING SABAKI ESTUARY**

The section below provides a summary of the issues and threats facing Sabaki estuary. These issues justify the need for a management plan in an attempt to address them.

### **5.1 Poor Governance of Sabaki River Estuary**

Sabaki Estuary does not have a formal protection status despite its importance in terms of biodiversity and support for local livelihoods. The estuary is part of the Malindi-Watamu biosphere reserve designated in 1979. There have been previous attempts to have the estuary declared a Ramsar site alongside local advocacy for protection which have not been successful. Other governance issues facing the estuary include weak enforcement of relevant laws; low level of awareness and poor attitude amongst the local community on importance of the estuary and weak capacity among community members on environmental conservation. This is contributing to over-exploitation and unsustainable use of the natural resources in and around the estuary. Key gaps are manifested by the following

- a. Poor and undefined land tenure system
- b. Low levels of stakeholder awareness about the value and the potential of the estuary for conservation and development.
- c. Low-capacity levels among the stakeholders to undertake tasks assigned to them
- d. Poor or nonexistent governance and management of resources of the area-
- e. Lack of formal protection of the estuary
- f. Lack of coordination and synergy among stakeholders working at the estuary

### **5.2 Natural Resources Management and Biodiversity Related Issues**

These are issues that relate to the way resource users extract the materials and services for their livelihoods and ecosystem services. These include effects that result from indirect use of the resources or space at the estuary or the adjoining landscapes. These include

- a) Illegal fishing and potential overexploitation of the fisheries resources. The number of fishermen in the estuarine area has been increasing steadily from 5 in year 2000 to 100 in the year 2021. Competition for access to the dwindling fisheries stock has led to increasing use of illegal fishing gear (including mosquito nets) in a desperate effort to improve the catch. Key drivers to this include
  - i. Low awareness among the fishermen about the long-term negative consequences of applying wrong fishing methods.
  - ii. Incapacity of the fishermen to access the correct fishing gear due to the cost and access to the same

- iii. Lack of alternative engagement for subsistence and income leading to opportunistic fishermen who practice when other activities fail e.g., farming and tourism. Fishing is free for all fallback resource
  - iv. Increased number of fishermen, some from far places (Masheheni, Kibikoni, Mabui, Sabaki Village)
  - v. Destruction of fish breeding sites that ultimately reduce the available fish stocks.
  - vi. Abonnement of traditional knowledge about fish seasonality that controlled fishing in certain seasons
- b) Overgrazing in the estuary is a common practice. Herders leave their animals to graze freely often destroying the habitat including mangrove seedlings. Some of the reason for this include
- i. Most of the estuarine land is government land without known ownership. It is treated as a common property and one can graze when and where they like
  - ii. Most livestock keepers lack awareness about the value of the estuary and therefore does not care about the consequences of random grazing.
  - iii. Overstocking is a common practice in which a livestock keeper owns more animals than his private land can support, hoping to use the free estuarine land for grazing.
  - iv. Population growth has led to increased demand for land for farming and settlement leaving little space for grazing.
  - v. Migrant pastoralist communities with large herds, some for sale in Malindi slaughter house keep animals around the estuary awaiting slaughter. These animals graze in the estuary exacerbating the already bad situation in terms of overgrazing
  - vi. Livestock watering along the river provide the only available water source. Animals travel from other areas to water in the estuary making bad situation worse
- c) Over-exploitation of natural resources in the estuary is a growing concern. Previously, there was little mangrove forest in the estuary that attracted no attention from the resource hungry community. The growing settlement, coupled with limited access to alternative building technologies has led to dependence of the estuarine adjacent community on the resource leading to
- i. Over harvesting of mangroves. Mangroves are a key material for building traditional houses. Mangrove poles are termite and rot resistant making the preferred taxa for poles
  - ii. Unsustainable traditional livelihoods such as farming in the advent of climate change have become more unreliable. Households whose livelihoods have failed often turn to natural resources to fill the void thus created.

- d) Change of habitat composition in the estuary and adjacent landscape has been driven by invasion by *Prosopis juliflora* and *Cactus spp.* *Prosopis* suppresses other vegetation. These invasive species have been
- i. Deliberately introduced by human being to enrich the habitat or make fences
  - ii. Dispersed by cattle in dug especially from Tana River
- e) Unsustainable sand harvesting has been common in the south banks in Kibokoni area for more than 20 years. The problem is spreading to the north risking the mature dunes and water aquifers they contain. Drivers of sand harvesting include the following
- i. Lack of alternative livelihood leading to young men adopting sand harvesting to bridge an existing income gap
  - ii. Collapse of tourism has increased the unemployment rates in the estuary to unprecedented levels. Copying from Kibokoni was expected as the opportunities dwindled for sustainable income especially to the young men.
  - iii. Illiteracy is a common shortcoming in a majority of the community members. Only slightly above 5% of the community go beyond primary level education. These high levels of illiteracy are commensurate to high unemployment rates and low skills and technologies for employability.
  - iv. Land ownership unclear and resources therein belong to nobody in particular. Such resources are almost always over-exploited to suffer the tragedy of the commons.
  - v. High demand for the sand in development of building in the urban areas of Malindi, Watamu, Kilifi and Mombasa have been driving the flow of sand from uncontrolled quarries.
- f) Human-wildlife conflict-hippos has been on the rise at the estuary particularly involving hippos. The reported number of hippo attacks is at an average of 1 every three months. The conflict is driven by
- i. Increased number of hippos in the estuary from 9 in 2006 to over 100 in 2021. These hippos shelter in the river during the day and fishermen are the most likely victims. At night they roam in the village as they forage with opportunistic encounters with humans increasing by the day.
  - ii. Increase human population in the village has taken over former hippo foraging land. The settlements are taking over every open space displacing the hippos
  - iii. Extensive farming/encroachment-including in riparian areas Hippos have to forage in the farms
- g) Threats to estuarine biodiversity from human and natural processes. The estuary is most of all and important biodiversity conservation area. Threats to biodiversity include

- i. Conversion and destruction of feeding areas for birds especially the mud flats that are important for marine waders. Natural and anthropogenic driven expansion of mangrove and habitat alterations have reduced the span of foraging areas threatening the existence of thousands of Palearctic migrant species of avifauna
- ii. Roosting areas for birds have been lost by changing habitat composition
- iii. Loss of dune vegetation to charcoal burning and other human driven wood material demand. Habitat for smaller mammals is lost in the process eg Suni, duiker, Bushbuck
- iv. Human settlement and development on the sand dunes
- v. Loss of freshwater invertebrate habitats – dragonflies, butterflies, pollinators
- vi. Loss of seasonal freshwater pools that appear in the wet season and hold breeding populations of birds, insects, amphibians etc.
- vii. Disturbance on reptiles – including sea turtles – breeding along the beach.
- h) Water management      Protect water reserves in sand dune aquifer
  - i. Lack of legal status of aquifer reserves
  - ii. Sand harvesting in the sand dunes destroying water aquifers
  - iii. Destruction of sand dune forest
  - iv. Charcoal burning in the sand dune vegetation
- i) Unsustainable development in the accreted land
  - i. Failure to implement recommendations of the Shoreline Management Strategy for gazettement accreted land as public land
  - ii. Lack of and failure to implement a spatial zoning plan for the accreted land
  - iii. Lack of a policy on the use of accreted land adjoining privately owned land
  - iv. Absence of a Resettlement Action Plan (RAP) for Mijikenda village
  - v. Enforce EIA/EA Regulations for development within and adjacent to the accreted land

### 5.3 Unregulated Tourism and Hospitality Practices

Tourism is a key income earner for the larger Malindi Municipality. Dependence on tourism as a key source of income is common to a vast majority of beach related ecosystems and habitats. Sustainable tourism is challenging venture but remains the only formula to ensure tourism does not degrade the resource base on which it is dependent. The existing practices not only do they lead to low customer experience, they also expose the people and the ecosystems to degradation and loss of attractiveness that led to low visitation and depressed income. Tourism activities in the estuary are characterized by

- a) Irresponsible driving of jeeps and quad bike on dunes and beaches for fun and adventure. There is no controlled entry point

- b) Poor access road to the most important sections of the estuary in terms attractiveness
- c) Low awareness about laws and regulations among the community and tourist themselves which allows for behavior that is illegal eg children involvement in begging
- d) Threats to biodiversity by tourists eg Birds disturbance
- e) Lack of a tourism development plan for the site that allows for disorderly and nonstrategic tourism development
- f) Poor or nonexistent marketing plan and strategy,
- g) Poor and insufficient of infrastructure,
- h) Little or no benefit to the community, including lack of benefit sharing mechanism
- i) Low capacity and skills to run and manage an of Eco-tourism venture,
- j) Lack of an establish tariff system to regulate charges and standardize fees and a mechanism for enforcing it
- k) Low competitiveness with other sites like Mida Creek, Hell's Kitchen which are established

### **5.3 Unsustainable Livelihood Practices**

These are livelihoods communities derive from extraction and use of natural resources of the estuarine ecosystem that may be detrimental to the sustainability of the ecosystem or a by themselves cannot provide a continuous flow of benefit for generations.

#### **5.3.1 Artisanal Fisheries**

Survey on fish catch done in 2015 revealed that majority of the fishermen in Sabaki estuary live in poverty earning as low as KES 200 during the low season and up to KES 2,000 during the peak fishing period (GOK, 2015). These earnings are from fishing activities in the estuary as well as the Indian Ocean. The underlying cause of poverty among the fishermen is the fact that those who fish in the Indian Ocean do not own the fishing gears that they use but are instead employed by dealers who pay them according to the proportion of catch per day. On the other hand, those who fish in the estuary have to do with an over-exploited fishery owing to too many fishermen and use of wrong fishing gear eg mosquito nets. As a result, the livelihood of the fishermen is characterized by: low incomes; poor saving culture; lack the knowhow of more productive fishing methods/technologies; lack of access to large modern fishing vessels and use of illegal gears as fishermen try to catch more fish.

Other issues facing artisanal fisheries in the estuary include: poor and inadequate infrastructure (e.g. lack of an ice plant); lack of skill among the BMU members on how to manage cold storage facility; weak BMU in terms of capacity and governance structures; and lack of alternative livelihoods for BMU members and community groups dependent on the estuary.

### **5.3.2 Unregulated Sand Harvesting**

Sand harvesting occurs in the dune areas in Kibokoni area in the south as well as in the sand dunes in the northern range of the estuary. The sand is used for construction activities in Malindi, Kilifi and Mombasa thus serving as a major source of employment and income for the sand sellers and loaders of trucks. Most of the sand sellers and loaders of trucks are unskilled and often lack an alternative livelihood activity which exposes them to over-exploitation by the sand buying companies. Prior to the introduction of a weigh bridge by the County Government of Kilifi in Malindi in 2014, the turnover used to be an average of 40 Trucks per day carrying between 280 and 1,200 Tons of Sand everyday worth a maximum of Kenya Shillings 1.2M once it reaches construction markets but a paltry Kenya Shillings 0.2M at the source, explaining in part the poverty prevalence among local communities where sand harvesting occurs (GOK, 2015). With the introduction of a weigh bridge and cess station by the County Government, the turnover declined to an average of 10 trucks per day and this has also contributed to reduced earnings on the part of the youth involved in the sand harvesting business.

Other issues that have continued to make sand harvesting unsustainable include high illiteracy levels amongst the youth which exposes them to over-exploitation by the sand buying companies and unclear land tenure in the sand harvesting areas.

## **5.5 Pollution**

Pollution of a river basin-wide problem that accumulate pollutants at the estuary being the lowest point of the basin. Some of the key issues include:

### **5.4.1 Effluent Discharge from Farms and Urban Areas**

Discharge of agrichemicals and effluent from farms and urban areas along Sabaki River has been reported to be a major cause of reported cases of eutrophication in Sabaki river. The eutrophication incidences have had major impacts on fisheries resources and the local community. For instance, a eutrophication phenomenon reported in 2011 (KMFRI, 2015) was associated with massive fish kill in the river. The local communities also suffered serious health effects, possibly attributable to consumption of water from the river experiencing eutrophication. These effects included cases of diarrhea, vomiting and Stomach ailments.

### **5.4.2 Solid Waste**

Solid waste disposal is an increasing issue especially near the bridge area where there is an upcoming trading center. The trading center has no waste management system in place (including designated waste collection points) and therefore solid waste is dumped haphazardly and sometimes directly into the estuary. The poor solid waste disposal coupled with marine litter is a challenge that needs to be addressed to ensure a clean and healthy Sabaki estuary.

#### 5.4.3 Noise and Light Pollution

Noise and light pollution from estuary and beach adjacent facilities has become a major issue in Sabaki estuary. Artificial beach lighting is known to affect many beach animals such as shoreline birds, frogs, insects etc. as the light disorients the animals away from the sea and the beach thus exposing them to dehydration, predators and other hazards. On the other hand, noise is a public nuisance to the community around the estuary.

#### 5.4.4 Siltation

Siltation at the Sabaki estuary emanates from degradation of upstream catchment areas. A survey done on sediment load in Sabaki River (GOK, 2012) it was established that the sediment load of the river had increased tremendously from 50,000 tons/year in 1950's to  $13.0 \times 10^6$  tons/year. The increase in sediment load has been attributed to poor land use systems, deforestation and agricultural intensification upstream and along the Athi-Sabaki river basin. Due to high wave and current action, the sediment is transported and deposited away from the river mouth hence formation of the vast sand dunes on the Northern side of the estuary and accreted land in front of Malindi town. The high sediment discharge threatens the sustainability of coastal habitats by smothering mangroves and corals reefs and the aesthetic quality of beaches.

Land accretion has been attributed to silt deposition from Sabaki River while the accreted land is also threatened by erosion through wave action on the shoreline. These processes threaten tourism establishments through loss of beach frontage, sand deposition and reduced recreational value of the developments. Due to the high value associated with the accreted land, it is also a major cause of conflicts and illegal activities including irregular allocations.

Besides upstream catchment degradation, destruction of riparian vegetation and unregulated socio-economic activities around the estuary are also causing contribution to siltation in the estuary. The economic activities include poor agricultural practices e.g overstocking and tilling land in sloppy areas; and unregulated sand harvesting. The livelihoods of local people are heavily dependent upon natural resources from the estuary and adjacent bush & sand dunes

## **VISION, GOAL AND STRATEGIC OBJECTIVES FOR THE PLAN**

### **6.1 Vision**

Be the best wetland in sustainable management and development in Kenya

### **6.2 Goal**

To sustainably manage Sabaki estuary for biodiversity conservation and socio-economic development of the local and global community

### **6.3 Management Objectives**

The management objectives of this plan are 5-fold and are in line with stipulated policies for conservation of wetlands. The management objectives are:

1. To enhance Governance of Sabaki River Estuary and associated resources
  - a. Improving land tenure system
  - b. Improve awareness in community and stakeholders of value of the estuary
  - c. Enhance the capacity of stakeholders to undertake tasks assigned to them
  - d. Boost the governance and management of resources of the area-
  - e. Lobby for a formal protection of the estuary
  - f. Enhance coordination and synergy in stakeholders working at the estuary
2. To improve management and use of Natural Resource by
  - a. Addressing overfishing.
  - b. Controlling over-exploitation of resources e.g., mangroves
  - c. Controlling overgrazing
  - d. Reduce changes of habitat composition
  - e. Minimize Human-wildlife conflict-hippos
  - f. Control unsustainable sand harvesting
  - g. Encourage integration of research
3. To promote sustainable local community Livelihoods
  - a. Charcoal burning
  - b. High poverty levels
  - c. Lack of alternative livelihoods
  - d. Low skills and technologies
4. To promote sustainable tourism development in Sabaki Estuary



- a. To Develop tourism circuits and infrastructure
  - b. Improve training of service providers
  - c. To market the tourism products and services
- 5. To mitigate Pollution in Sabaki River Estuary
  - a. Control upstream siltation
  - b. Mitigate influx of sewage from urban areas and runoff from farms upstream (Eutrophication)
  - c. Controlling Industrial chemical discharge into the river
  - d. Controlling Solid waste from upstream and from tides
  - e. Accelerated accretion of land

#### 6.4 Management Guiding Principles

- a) Use of ecosystem approach: This approach considers the estuary as one system with multifaceted aspects that are diverse and interrelated and interconnected. These include biotic and abiotic aspects, and anthropological effects.
- b) Public participation approach which ensures all interested parties are involved, participate and their input incorporated into the plan and the community have a role in the implementation, derive benefits and evaluate the process
- c) Wise use principle is based on the fact that resources are limited and delicate in wetlands. The wise use of wetlands is their sustainable utilization for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem. It includes maintenance of wetland "ecological character" as the central tenet of the concept.
- d) Adaptive management approach which entails a systematic approach for improving environmental management by learning from management outcomes.
- e) Precautionary principle as a new guideline in environmental decision making, has four central components: taking preventive action in the face of uncertainty; shifting the burden of proof to the proponents of an activity; exploring a wide range of alternatives to possibly harmful actions; and increasing public participation in decision making.
- f) Polluter pays principle is the commonly accepted practice that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment. For instance, a factory that produces a potentially poisonous substance as a by-product of its activities is usually held responsible for its safe disposal. The polluter pays principle is part of a set of broader principles to guide sustainable development worldwide (formally known as the 1992 Rio Declaration
- g) Collaboration and partnerships of stakeholders despite their legal, institutional and policy differences in mandates and interest for a common purpose and goal, working together, creating necessary

synergies, complementing each other and resolving conflicts that arise from all the possible sources of differences

## MANAGEMENT PROGRAMMES

### 7.1 Zonation

The overall area proposed to fall within the main Sabaki River Estuary Conservation Area can be divided into three broad areas – the Outer Buffer Zone, the Core Conservation Zone and the Intervention Zone. The first includes the main areas of the Sabaki village and environs extending inland to the first main bend of the

Sabaki River, the intervention zone for a range of human-use activities and the core conservation zone of the nature reserve. The area of key interest and international importance for biodiversity as well as sustainable use for the benefit of local communities is titled the Core Conservation Zone and is shown in red (fig 1.).

#### 7.1.1 The Core Zone

This is the area where biodiversity of the estuary is found. It is the heart of the management area that contains biodiversity rich part of the estuarine ecosystem. The Core Conservation Zone encompasses the main sand dune aquifer (fresh water reserve) with its associated remnant sand dune forest and scrub – which form an important breeding site for pollinators. It also includes some further areas of economic importance and interest for activities including livestock grazing, fishing and agriculture. It also includes the area of direct importance for wetland birds and other wildlife.

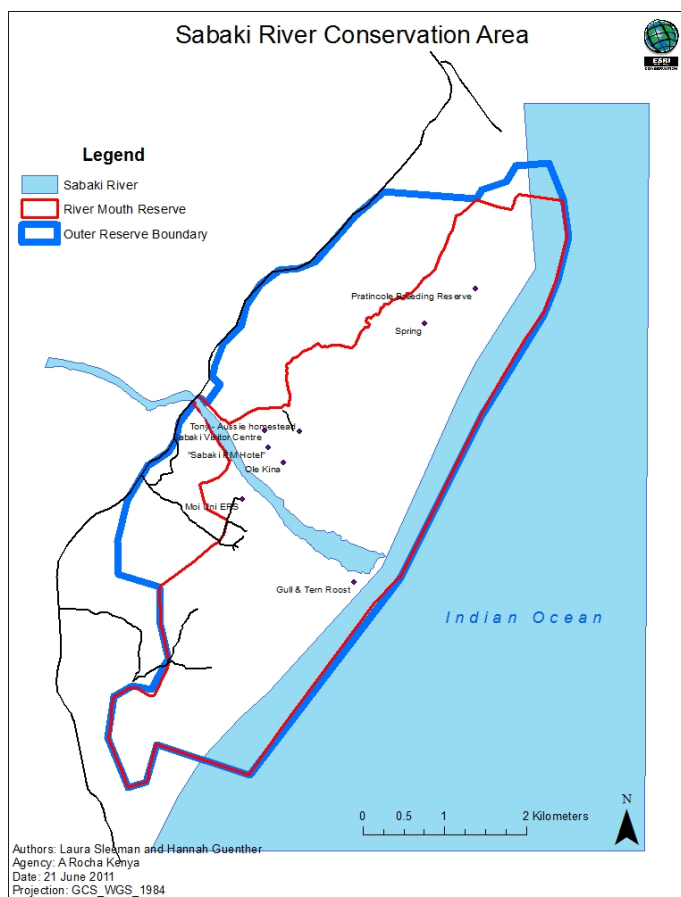
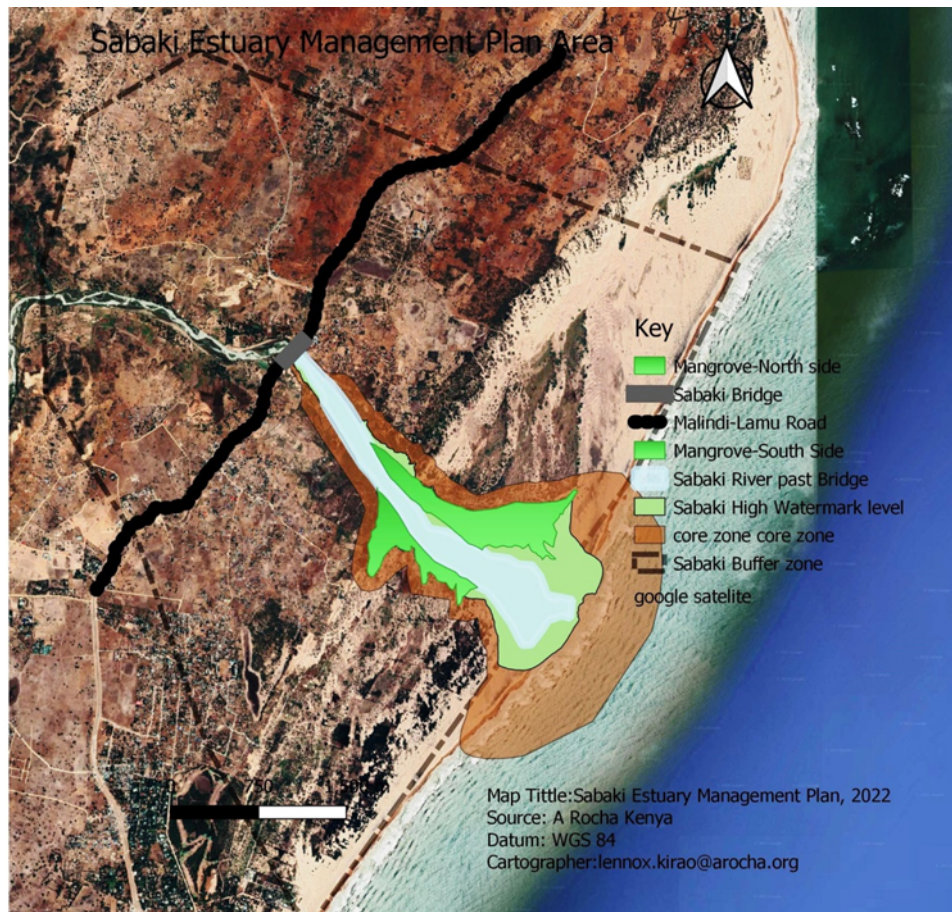


Figure 7.1 Sabaki River Estuary Conservation Area



*Figure 7.2 Sabaki River Estuary: The Core Zone*

The zonation for the Conservation Area has been based on the Google Earth image and from an intimate knowledge of the river mouth area and dunes from personal experience of many hours of observing and walking the area by contributors to this document. The image in Fig.13 shows how the map and zones were drawn on Google Earth. The core zone is 483 ha.

### 7.1.2 The Intervention Zone

This is the area adjacent to the core zone where there are human settlements; agricultural activities, sand harvesting and livestock keeping are taking place. It includes the neighbouring settlements, villages, Sand dunes, temporary wetlands and thickets. The activities in this zone are limited so that they do not affect the core zone. The intervention zone is 2,470 ha.

The Intervention Zone includes areas that are designated for economic use including recreation, livestock grazing, sand mining and agriculture.





*Figure 7.3 Image from Google Earth showing the outline of entire Conservation Area and the zones within it (see below for details of each zone)*

#### DESCRIPTION OF ZONES

##### **[A] AQUIFER & POLLINATOR RESERVE ZONE**

##### **Rationale for Zone**

In a survey of 190 households in the Sabaki community, 100% of people rely on fresh water from within the proposed conservation area, 99% from within the old IBA boundary and 81% relying on water drawn from the sand dune aquifer. Sand dunes are well known to be a significant aquifer and capable of holding millions of litres of purified water that are a critical source of water for people living nearby. As such it is vital that the sand dunes are protected from destruction and instead are maintained with an overall integrity of the dune ecosystem. This is particularly so in that entomological studies have shown the dune vegetation – remnant

sand dune forest and scrub – to be important breeding grounds for key insect pollinators which pollinate the crops on adjacent shambas. Thus, by protecting the tall, vegetated sand dunes in their entirety the reserve would be both ensuring a long-term supply of fresh, pure water as well as ensuring a source of pollinators for community members' farms.

### Description of Zone

This is a long, narrow zone 3-600m wide that takes in the main high sand dunes of the Sabaki Estuary and that stretches from 4.0 kms north-east of the river near Mambrui to the river bank (the area marked in yellow in the map – fig.3). The dunes are the main topographical feature of the Reserve other than the river itself and can be seen from far off. Up to 20m high at the highest point, this zone consists of steeply undulating high banks of sand with deep valleys between ridges and peaks with a mosaic of open wind-blown sand and dense cover of coastal dune bush and thicket. At the base there are some watering points where very pure, sand-filtered water is collected by community members. A spring exists towards the northern end of the zone in a deep hollow with dense casuarinas trees around it.

20-25 years ago, the dunes would have had quite a good cover of relatively young dune forest including *Azelia quanzensis* and coastal scrub. However most, if not all of the trees of any size have been cut down for either timber or, over the past 15 years, for charcoal. There is still quite a diversity of remnant plants present and these create a habitat which is rich in other biodiversity such as insects, small mammals and birds including some restricted range species such as the Scaly Babbler *Turdoides squamulatus*. There has been some heavy invasion of the habitat, however, by alien invasive species in particular Neem, prickly pear and *Prosopis* which are threatening the integrity of the habitat and in time will cause a reduction in biodiversity.

The area includes a long narrow strip of indigenous coastal bush and thicket lying to the immediate west of the main dunes some 1km north of the river in a small valley in the wind shadow of the dunes. This sheltering from the wind has meant that the coastal bush has grown quite dense and provides a safe haven for a number of wildlife including birds such as Spotted Morning Thrush *Cichladusa guttata*, Rufous Chatterer *Turdoides rubiginosa*, and the Regionally Threatened Scaly Babbler *Turdoides squamulata*.

### Suggested Management Strategy for Zone

The dynamic, moving nature of the sand means it is not possible to construct easily on it and similarly the sand is of no use for agriculture nor grazing given the lack of grass. To this end, it is recommended that this area be managed in the following way:

- a) No sand mining
- b) No cutting of trees for charcoal burning – except strict limitation to *Prosopis*, Neem and Casuarina where they occur.
- c) No removal of indigenous dune vegetation
- d) Active removal of alien plant species – notably Neem, Prickly Pear, *Prosopis*, Casuarina, Eucalyptus, Lantana sp.
- e) No planting of any of these species.
- f) No grazing by livestock
- g) No development unless strictly related to limited construction for improving high quality ecotourism facilities – no 'kiosk' development.

- h) All ecotourism facilities put up in this zone must be done in a style which minimises the visual impact on the surroundings and carried out to a high standard
- i) Open access for tourists but tourism encouraged on a limited network of access routes and paths through the dunes for tourists to use for viewing the dune environment. Such paths should be either low-level board walks for visitors on foot or open paths for potential camel back visits as an option. The board walks will prevent erosion of the dunes from visitors walking directly on the sand.

## **[B] SEASONAL WETLAND SUB-ZONE**

### **Rationale for Zone**

Worldwide wetlands are depended upon by countless animal and plant species as well as humans. They serve as breeding grounds for resident and migrating birds, amphibians and fish, social interaction amongst mammals who congregate there for water, and an escape from the heat of the sun for countless reptiles, amphibians and mammals. Wetlands are seen as the cornerstone of wildlife populations. They also are a source of water and food for humans and the greatest density of human population is invariably found near wetlands. Seasonal wetlands are a habitat that is important for a unique set of taxa that similarly rely on them for breeding and feeding. Such wetlands are often ignored, however, due to their transient nature where in much of the year they are dry and apparently lifeless. However, in normal rains, they soon fill up and provide a habitat rich in insect and plant life which in turn support an important diversity of other taxa including birds, mammals, fish, amphibians and reptiles. Sabaki River Mouth has several such wetlands which are only apparent during the rains but which when full provide breeding & foraging habitat for frogs, insects and birds such as Greater Painted-snipe *Rostratula benghalensis* Black-winged Stilts *Himantopus himantopus* and Spur-winged Plover *Vanellus spinosus*. They also provide fresh drinking water for livestock which otherwise have to drink the often-saline water of the Sabaki River.



*Figure 7.4 Areas Important for Water and Wetlands*

### Description of Zone

The main area of seasonal wetlands is found on the northern bank of the river set back a little way from the mangrove forest and stretching north and west to the base of the main sand dunes. It is part of the Core Conservation Zone and serves a function alongside the Wetland Bird Reserve Sub-Zone (see below). Several smaller but still important seasonal wetlands are found on the western, inland side of the main dunes and which are used even more by local community members as a water source and in the period when the wetland is drying up, as an area for cultivation.



The wetlands are characterised by shallow pools up to a metre or so in depth that form in good rains with an area of inundated grassland adjacent to the open water that can be rich in insect life, in particular dragonflies. These provide good foraging grounds for pipits and wagtails. Some of the wetlands have small patches of reedbed adjacent to the open water as well which provide breeding and roosting habitat for birds such as weavers and widowbirds.

A separate 'island' of short grass set in among open sand dunes is included in this zone 1km to the north of the main seasonal pools at the northern end of the proposed reserve. This is the only known breeding site on the coast for Collared Pratincole *Glareola pratincola* and also holds a breeding population of Grassland Pipits *Anthus cinnamomeus* and should therefore be afforded a high level of protection within the Core Conservation Area.

### **Suggested Management Strategy for Zone**

- Active removal of alien plant species – notably Neem, Prickly Pear, Prosopis, Casuarina, Eucalyptus, Lantana sp.. No planting of any of these species.
- Controlled grazing by livestock during breeding season of bird populations – to prevent undue disturbance to breeding birds
- No trapping of birds or wildlife in these wetlands; any fishing must be only done using truly traditional methods or controlled line fishing – no gill nets.
- No development or construction of any sort within the wetland; a bird hide could be constructed adjacent to the main wetlands to allow visitors to watch birds at close quarters (a feasibility study is first needed to assess the actual potential of such a facility)
- Open access for tourists but tourism encouraged on a limited network of access routes and paths through the wetlands for tourists to use for viewing the wetland environment.

### **[C] WETLAND BIRD RESERVE SUB-ZONE**

#### **Rationale for Zone**

Sabaki River Estuary is world famous as a safe haven for many migrant birds from the Palaearctic and elsewhere in Africa. It has been classified as an 'Important Bird Area' (IBA) under BirdLife International's global IBA programme for sites that are recognised as being important for the survival of birds using set criteria. Sabaki has large congregations of birds present at many times of the year, in particular waders, terns and gulls and is an important non-breeding site and passage stop-over site for these migrants.

Given this status and with Kenya being a Contracting Party to the African-Eurasian Waterbird Agreement it is one of the main driving forces for having the area protected. Birds are furthermore becoming increasingly important in ecotourism with more tourists wanting to see birds and ready to pay to enter a conservation area to watch them or for a guide to show them the birds.

To ensure optimum conditions for the wetland birds, both feeding and roosting (resting) areas must be taken into account and for the few breeding species, the areas where they build nests. It is easy for an area to be protected for the first reason – a feeding area – but studies have shown that roosting sites are equally important for birds.

## Description of Zone

This zone stretches from the road bridge 3.5 kms inland to the beach front of the river mouth, encompassing a long section of beach stretching 2.6 kms to the south. This latter area is a key roosting area for sometimes over 1,000 Madagascar Pratincole *Glareola ocularis* – possibly 10% of the global population of this ‘Globally Vulnerable’ (IUCN Red List) species. Many of the other waders, terns and gulls also roost on the southern bank and in behind the beach along this area making it important to protect from disturbance and land use change.

The main section of the river includes the open water but also mud and sand banks which are exposed at low tide and are important feeding sites for birds including often several thousand flamingoes. Reed beds, mangroves and riverine scrub along the edge of the river are within this zone and are used by many birds including kingfishers, thick-knees, herons, storks, bee-eaters, sunbirds and the colourful Zanzibar Red Bishop, a coastal speciality. Towards the mouth of the river a significant ‘forest’ of mangroves has appeared on the north bank over the past 30 years. It measures up to 1,000 m long and 400 m wide and is expanding at a fast rate with new mangroves growing in an area that was once deep, soft mud and water but which has been filled in with wind-blown sand from the beach. There are still areas of soft mud which form key areas for feeding waders but these are also constantly changing – something that must be accounted for in the management plan. The open areas of firmer mud and sand are used daily by terns and gulls for roosting where numbers at night in 2004 reached an estimated 80,000-100,000 birds. Numbers have reduced since then, but the area is still important for flocks of terns, gulls and waders.

## Management Issues

Key issues include:

- Cultivation of the river banks down to the water’s edge. Strictly speaking, this is illegal to do as by law a margin of 30m should be left of natural vegetation along any watercourse or drainage channel. By cultivating to the very edge of the river it causes erosion and significantly increases sediment loading of the river. It also removes important riverine vegetation habitat that is critical for the survival of a lot of wildlife and at Sabaki in particular is a refuge for hippos and roosting waterbirds.
- Siltation. This is a very large-scale issue that involves the whole catchment of the river rather than the local use of the proposed reserve and needs to be dealt with at probably a national level.
- Mangrove expansion. The impact and effect of the mangroves taking root and establishing themselves over the mud flats should be studied and understood for the modelling of how the estuary will respond in the future to a mangrove forest. Mangrove *planting* should be avoided except where the old growth mangroves have been cut – though, in reality, simply protecting the site from further disturbance will allow the mangrove forest to regenerate naturally.
- Disturbance of and subsequent effect on biodiversity by:
  - Fishermen
  - Tourists
  - Livestock

## Suggested Management Strategy for Zone:

This zone is the core area for conservation and yet it is also a key area for use by community members – for fishing. It is therefore important to design a strategy that maintains the habitat necessary for the survival of the wildlife and minimises disturbance of the same wildlife together with enforcing a management system

that maximises sustainable fishing use of the estuary. Fishermen quickly agree that the fish catches have declined over the years and so to implement fishing methods which reduce negative impacts on the fish populations. The following management options are suggested:

- 11 Encourage animal keepers to manage livestock to minimize damage to riparian and wetland vegetation – designate a fixed watering point for all livestock to come to for watering so that only a small area is disturbed by the animals.
- 12 Strictly protect known areas of importance for the feeding, breeding and roosting of birds by:
  - a) Restrict access to the sites by users: e.g. no vehicular access; fishermen sensitised to walk *around* roosting flocks of birds, not through them
  - b) Control activities within these sites: e.g. no proactive disturbance of birds, particularly flamingos, to make them fly for tourists to photograph; change design of fishing nets such that at low tide they are not standing and therefore catching birds; restrict access of livestock to Pratincole breeding site during the breeding season.
- 13 Institute entrance management systems that will minimize manipulations to mimic a more natural regime
- 14 Design a management strategy for sustainable fishing methods for the estuary including:
  - a) No fishing nets of undersized mesh (as per law)
  - b) Discourage leaving of nets standing erect over low tide which therefore trap birds – design method of floaters on slack net that raises the net when the tide comes in and allows it to lie harmlessly on the ground at low tide
  - c) Identify fish breeding areas and seasons – ban fishing in these areas / at these times to allow fish populations to expand
  - d) Limit the number of fishermen licensed to fish in the area
  - e) For a long-term plan, gill netting should be banned as it is known to be unsustainable and damaging to fish populations. Line fishing and traditional fish trapping should be encouraged – and even subsidised.

#### **[D] FOREST & WILDLIFE RESERVE SUB-ZONE**

##### **Rationale for Zone:**

Coastal bush and forest is a habitat that is fast disappearing along the coastline of Kenya – and with it the associated biodiversity and ecosystem services. The proposed Conservation Area at the Sabaki River Mouth includes a number of significant patches of natural coastal sand dune associated habitats including some mature forest (south and west of the main sand dunes on the south bank) and the area that has been preserved by the Moi University Environmental Research Centre.

In terms of potential for tourism, an area like Sabaki River Mouth has an attraction to visitors partly for its ‘wild-ness’, something that needs to be exploited properly in the eco-tourism plans for the area. By including and, better still, highlighting these areas, they can become an attraction in themselves for tourism.

The forest and coastal bush zones are important for breeding sites for pollinators of local community crops and help to maintain a good vegetation cover which reduces the drying out of soil.

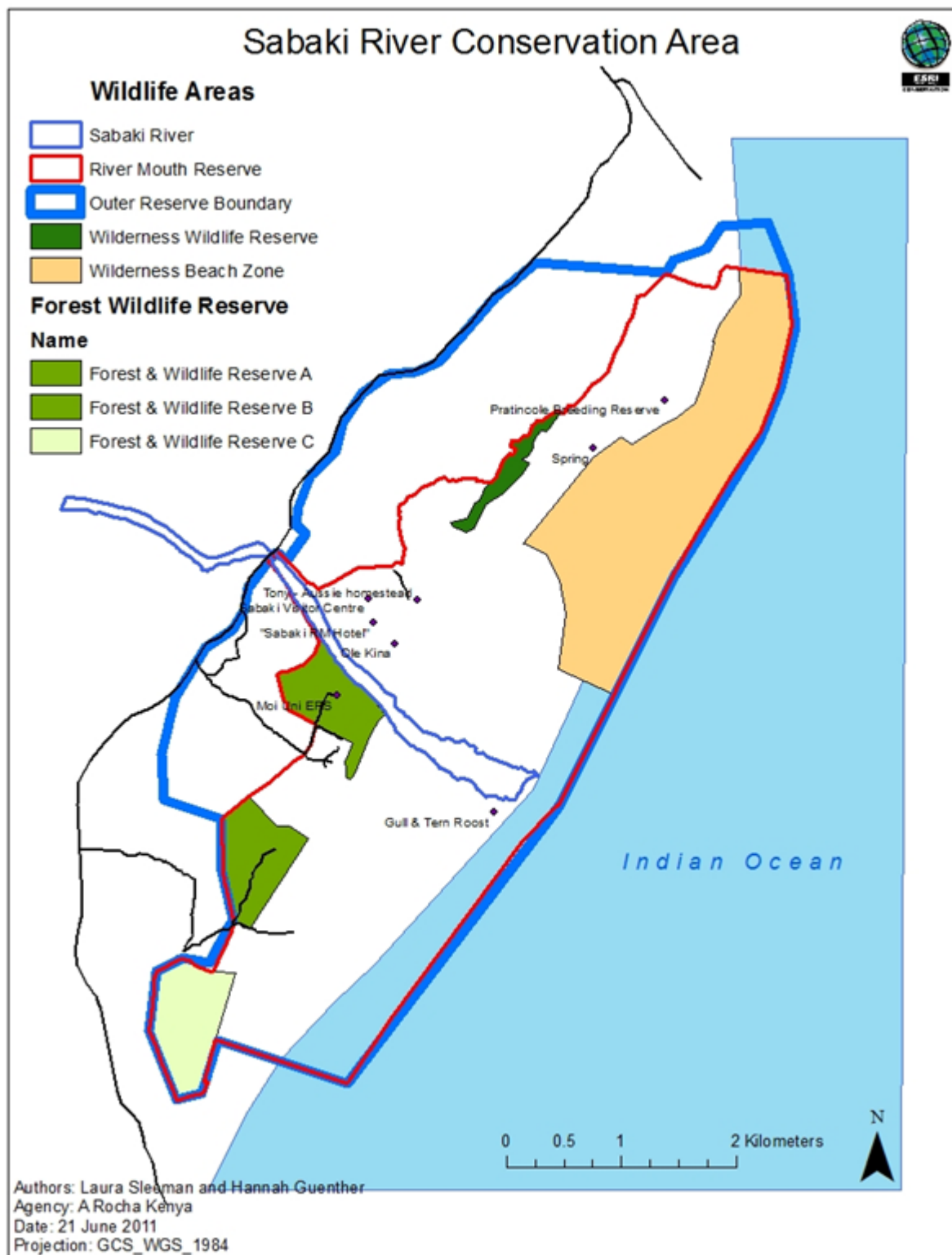


Figure 7.5 Terrestrial Forest and Wildlife Areas

## Description of Zone:

*Forest & Wildlife Reserve Zones Di and Dii:* These zones are important zones for biodiversity conservation in that they are all privately owned by people or institutions which have a commitment to conservation. As such, while they may be quite degraded currently, there is much potential for restoration of the unique coastal forest which once thrived here.

*Forest & Wildlife Reserve Zone Di:* This area mostly comprises of the Moi University land for the research centre. As it is privately owned, it has been protected from the total clearance much of the rest of the area has experienced south of the river and is therefore an island of relatively good habitat and thus a haven for a lot of biodiversity including duiker, Suni, hippopotamus, mongoose and a diversity of birds and insects. Due to its location along the river bank, it includes the riverine habitat of salt-resistant plants and thicket which are used as roosting sites and foraging cover for Striated Herons *Butorides striata* and Water Thick-knees *Burhinus vermiculatus*.

*Forest & Wildlife Reserve Zone Dii:* This zone is mostly privately owned by one land owner who bought the land many decades ago and maintained it in its natural state. As a result, it still retained some good habitat including some forest of taller trees until 2016 when the owner passed away and the land was invaded by squatters, the forest cleared and burnt. If the land has not been completely taken over by squatters, there is great potential for restoration of the forest through natural regeneration and enrichment planting.

## Suggested Management Strategy for Zone:

- 1 Identify gaps in the flora & fauna surveys/assessments that have been done already and identify further species of conservation significance in terms of biodiversity and threatened species
- 2 Identify and strictly protect known areas for feeding, breeding and nesting of important biodiversity within these zones
- 3 Develop an alien invasive species control and indigenous bush regeneration programme
- 4 Negotiate formal & voluntary conservation agreements with landowners for private land of high conservation value. These should include:
  - a) No cutting of [indigenous] trees
  - b) No trapping of wildlife
  - c) No livestock grazing – or very limited under strict management
  - d) No sand mining
  - e) Limited development or construction – no more than 5% of the area to be developed with buildings
  - f) any development to be done in such a way as to 'blend' with the environment and minimise impact on it
  - g) land not to be sub-divided
- 15 Encourage landowners to participate in land care to improve / regenerate forest and coastal bush for wildlife – design an award system for those land owners who take active participation to maintain or improve habitat for biodiversity in order to fully recognise the critical importance of their action.
- 16 Institute entrance management systems that will minimize unwanted impacts so as to mimic a more natural regime
- 17 Design & implement an ecological monitoring programme to capture data on land cover trends, bird and other taxa populations, vegetation status, etc.

#### **[E] RIPARIAN WOODLAND AND MANGROVE SUB-ZONE**

Immediately east of the Moi University site on the south bank is a narrow but significant stretch of mature mangroves and there are remnants of older mangroves on the north bank upstream of where the main dunes come down to the river bank. Where the estuary opens out downstream of the main dunes since 1999 there has been a significant growth of new mangrove forest now measuring c.90 acres in size. Prior to this it was just open mud and sand flats. Further upstream from the mangroves riparian scrub occurs along the river banks.

1. Encourage animal keepers to manage livestock to minimize damage to riparian and wetland vegetation – designate a fixed watering point for all livestock to come to for watering so that only a small area is disturbed by the animals.
2. In the old growth mangrove habitat there should be zero offtake of trees and the habitat should be maintained as is
3. For the new growth mangroves, it could be possible to have managed off-take of mangrove poles. This would require calculation of densities of trees, an understanding of tree regrowth rates and thus a calculation of at what time interval trees can be harvested such that they can regenerate and regrow.

#### **[F] LIVESTOCK GRAZING AND AGROFORESTRY SUB-ZONE**

This is an area of sand dune which has been deposited over the past 40 years to the seaward side of the main old dune system south of the river mouth. It has become extensively grown with casuarina trees, some specifically planted but many self-seeded and invading the area. As such it has lower biodiversity value and is ideal for use for agroforestry and grazing of livestock.

##### **Suggested Management:**

1. Encourage animal keepers to manage livestock to minimize damage to riparian and wetland vegetation – designate a fixed watering point for all livestock to come to for watering so that only a small area of wetland is disturbed by the animals.
2. Manage numbers of livestock to be limited to within the holding capacity of the land to avoid over-grazing and degradation of habitat

#### **[G] SAND MINING SUB-ZONE**

##### **Rationale for Sub-zone:**

There is a large market for building sand and the wind-blown sand found in these ancient dunes is excellent for this purpose. While strictly speaking it is an important aquifer, sand mining has been happening along this section of the dunes since the late '90s and the aquifer and habitat has already been significantly impacted and degraded. Thus, as there is still a need for building sand, it is agreed that this area be maintained as a sand mining zone.

##### **Suggested management:**

Sand miners should not be allowed to remove the sand below the water table as this then exposes the water table to pollution.

#### **[H] RECREATION SUB-ZONE**

*Wilderness Beach Space:* This is the large area covering the north-eastern section of the proposed overall conservation area including c.3 kms of beach front stretching down from near Mambrui. It is mostly very exposed, un-vegetated open sand but with many small sand dunes with tussock grass growing on them. It is a very windswept area which may sometimes be used for roosting waders and otherwise is a buffer area for the main dunes and pratincole breeding site to the west of it. On the western edge of it there is a deep depression with a spring of fresh water around which a dense copse of mostly casuarina trees have grown. It is an area of quite distinctive 'wild beauty' within the Sabaki Conservation Area.

#### **7.1.2.1 Outer Buffer Zone**

In the wider Outer Buffer Zone habitats have largely been entirely adapted by human use. This is where the villages, roads and agricultural land are. They have been highlighted as the area which is adjacent to the Conservation Area and thus activities happening within this likely to impact it.

In this area, there will be

- a) less direct engagement with residents.
- b) Encourage good farming practices such as Regenerative Agriculture which conserve soil structure and quality as well as increase productivity.
- c) Discourage use of chemical fertilisers and pesticides – give incentives for those farming organically.

### **7.2 Management Programmes**

The plan is comprised of the following five (5) management programmes: Governance of Sabaki River estuary; Management and use of natural resources; Sustainable local community livelihoods; Sustainable tourism development in Sabaki estuary; and Mitigation of pollution in Sabaki River estuary.

Each management programmes is comprised of brief information on its current status; Objectives; Challenges; and Management interventions. The management interventions are outlined in Tables that describe Strategy, Activities and Responsibilities.

#### **7.2.1 Governance of Sabaki River Estuary**

##### **7.2.1.1 Current Status**

Sabaki Estuary does not have a formal protection status despite its importance in terms of biodiversity and support for local livelihoods. There have been previous attempts to have the estuary declared a Ramsar site alongside local advocacy for protection which have not been successful. Measures will therefore be implemented with a view to improving governance and management of the estuary and associated resources.

##### **7.2.1.2 Challenges**

The governance challenges facing the estuary are:

1. Land tenure system issues;
2. Low awareness among community members and stakeholders on value of the estuary;

3. unclear governance and management system in the estuary;
4. Lack of protection status; and
5. Lack of synergy and coordination of stakeholders' efforts in the estuary.

Lack of clear tenure system in the accreted land and the continued increase in accretion are major hindrance to sustainable development of the accreted land together with lack of a zoning plan to guide development proposals. In addition, the informal settlements within the accreted land are a major source of pollution, threat to security and reduced aesthetic appeal of the shoreline. Unregulated establishment of casuarina plantations has also negatively impacted on the ecological and landscape value of accreted land. The overall goal for this thematic area therefore is to ensure that accreted land tenure system is defined and proper systems for the estuary put in place.

#### **7.2.1.3 Objective**

The objectives of the governance program are:

- a) To enhance compliance and enforcement by the regulatory agencies in and around the estuary
- b) To improve knowledge and understanding of the estuary through research and monitoring
- c) To enhance communication, education and public participation and awareness
- d) To promote conflict management and resolution in the Sabaki estuary

#### **7.2.1.4 Interventions**

The interventions to address governance related issues will include:

1. Mapping and registering land to individual and group ownership;
2. Enhance awareness among stakeholders and community about the value of the estuary for people and biodiversity;
3. Improve the capacity of local conservation and resource user groups to manage themselves and the natural resources;
4. Enhance the governance of the area;
5. Gazettement of Sabaki River Estuary as a conservation area.



*Table 7.1 Management Interventions for Governance of Sabaki Estuary*

Strategy	Activities	Output	Appropriate zone
Map and register land to individual and group ownership	<ul style="list-style-type: none"> <li>• Survey and Map all the unregistered land</li> <li>• Create a register of lands</li> <li>• Issue title deeds to individuals and groups/Institutions</li> <li>• Create a conservation area with utility sections</li> </ul>	<ul style="list-style-type: none"> <li>• Survey map developed</li> <li>• Land owners well known</li> <li>• Existing land conflicts solved</li> <li>• Recognizes the genuine land owners</li> <li>• Conservation area with utilities developed</li> </ul>	Maps developed for all zones in the management area. Conservation area be mapped as an exclusive area devoid of development except recreation
Enhance awareness among stakeholders and community about the value of the estuary for people and biodiversity	<ul style="list-style-type: none"> <li>• Hold public barazas and community events for sensitization</li> <li>• Hold radio talk shows for awareness creation</li> <li>• Make media articles for print and electronic media</li> <li>• Develop brochures and posters with specific information about the estuary and its interconnection to the river basin and the ocean systems</li> </ul>	<ul style="list-style-type: none"> <li>• Acquired and increase knowledge for conservation and value of the estuary</li> <li>• Reduced pressure on the natural resources</li> <li>• Enhanced integration and participatory management of the estuary</li> <li>• Media articles about conservation developed</li> <li>• Increased tourism</li> <li>• Improved marketing at the estuary.</li> </ul>	<ul style="list-style-type: none"> <li>• All adjacent communities in the intervention area and beyond</li> </ul>
Improve the capacity of local conservation and resource user groups to manage themselves and the natural resources	<ul style="list-style-type: none"> <li>• Carry out capacity assessment of the local groups</li> <li>• Training on gaps identified for leadership, governance, conflict management and Natural resource management</li> </ul>	<ul style="list-style-type: none"> <li>• Identified strength and weakness</li> <li>• Identified capacity gaps amongst resource users</li> <li>• Improved governance</li> <li>• Increased capacity on conservation</li> </ul>	<ul style="list-style-type: none"> <li>• Key target to be local community and conservation groups</li> <li>• Resource user groups within intervention area and beyond</li> </ul>
Enhance governance structure of the area	<ul style="list-style-type: none"> <li>• Develop natural resource use guidelines for access and control</li> <li>• Form a resource management committee</li> </ul>	<ul style="list-style-type: none"> <li>• Guidelines developed</li> <li>• Reduced pressure on resources</li> <li>• Reduced conflicts</li> </ul>	<ul style="list-style-type: none"> <li>• Target residents on the intervention area</li> </ul>

	consisting of all stakeholders <ul style="list-style-type: none"> <li>Stakeholders share and implement responsibilities as provided in the management plan</li> </ul>	<ul style="list-style-type: none"> <li>Resource management committee formed</li> <li>Reduced conflicts</li> <li>Division of responsibilities</li> <li>Implementation of the plan</li> </ul>	
Management of resource-use conflicts	<ul style="list-style-type: none"> <li>Set up conflict resolution mechanism.</li> <li>Establish resource use guidelines and users rights</li> <li>Develop and implement benefit sharing mechanisms</li> <li>Enforce existing laws and regulations</li> </ul>	<ul style="list-style-type: none"> <li>Conflict Resolution mechanism developed</li> <li>Reduced conflicts</li> <li>Resource use and user rights guidelines developed</li> <li>Resources and user groups identified</li> <li>Compliance with existing laws</li> <li>Reduced pressure on resources</li> </ul>	<ul style="list-style-type: none"> <li>Target resource user-groups in the intervention area</li> </ul>

## 7.2.2 Management and Use of Natural Resources

### 7.2.2.1 Current Status

Natural resources within the Sabaki estuary are threatened by over-exploitation and unsustainable use. The overall goal of this management programme is therefore to improve the management of the estuary resources and consequently ensure that their exploitation is sustainable. *Prosopis juliflora* is a highly invasive species that is threatening biodiversity, pasture and water resources within the estuary. Although it is difficult to eradicate, appropriate actions are needed for its control and prevent it from spreading to non-infested areas of the estuary.

Sand harvesting takes place mainly in the Kibokoni area of the estuary. In addition to the much-needed supply of construction sand to Malindi, Kilifi and Mombasa, sand harvesting has also generated employment for the youth of Kibokoni, who engage in scooping, sale, and loading activities at the site. However, the unregulated sand harvesting business has continued to degrade the environment and yet the gains accruing to the community in the area are minimal. The goal of this management programme is therefore to ensure that sand harvesting is carried out in a sustainable manner that continues to provide a source of livelihood to the local community and retains the ecological functions of sand dunes. Sand harvesting in the area is conducted in an unregulated manner leading to degradation of the dunes and a reduction of their capacity to hold and replenish fresh water aquifers. Many of the areas from where sand has been harvested are left derelict and

hence remain prone to erosion and colonization by invasive species such as the *Prosopis juliflora*. There is need to develop a dune area management plan that will guide activities allowed to be undertaken in the area. Dune vegetation should be protected for biodiversity and dune stabilization function. Rehabilitation of the mined areas is also required to reduce further environmental degradation and convert derelict land areas into sources of income to the local community. Sand harvested from the area mainly benefits the transporters and construction industry and has minimal returns to the local community. It is therefore important that strategies are formulated to enhance the benefits that accrue to the local community from sand harvesting. Increased benefits are likely to have a positive influence on the acceptability of programmes to protect and conserve sand dune areas.

Besides tourism, fishing is an important socio-economic activity within the area. Both commercial prawn fishing and artisanal fishing are practiced. There are however environmental and livelihood challenges that are a threat to the sustainable exploitation of the fisheries resources and local livelihoods. The challenges range from habitat destruction to low-income levels among the artisanal fisher folk. The prawn fishery causes environmental degradation and threatens the local artisanal fishery through destruction of fishing gear. The latter has been a leading cause of resource use conflicts between local fishermen and trawler operators. On the other hand, the artisanal fishers are known to use illegal fishing gear and methods such as mosquito nets.

#### **7.2.2.2 Challenges**

The challenges are: over-exploitation of natural resources, especially illegal logging of mangrove trees; over-fishing, use of illegal fishing gears, overgrazing; human-wildlife conflicts, especially conflict with hippos and unsustainable and uncontrolled sand harvesting. Invasive species *Prosopis juliflora*.

#### **7.2.2.3 Objective**

The general objective of the programme is to improve management and use of natural resource

- a) To promote restoration of degraded biodiversity sites within and around the estuary
- b) To promote biodiversity conservation measures within and around the estuary
- c) To promote measures that prevent and control introduction and spread of invasive species
- d) To promote protection of the estuary as an ecologically sensitive area.
- e) To promote sustainable use of natural resources within and around the estuary.

#### **7.2.2.4 Interventions**

The interventions will include: Addressing overfishing; Controlling over-exploitation of resources e.g. mangroves; Controlling overgrazing; Reduce changes of habitat composition; Minimize Human-wildlife conflict-hippos; Control unsustainable sand harvesting; and Encouragement of integration of research (Table).

*Table 7.2 Management Interventions for Biodiversity and Natural Resource*

Strategy	Activities	Outputs	Appropriate zone
Promotion of sustainable fisheries	<ul style="list-style-type: none"> <li>• Eliminate use of illegal and destructive fishing gear such as Mosquito net</li> <li>• Create awareness on effect of use of right gear</li> <li>• Training on sustainable fisheries management</li> <li>• Equipping BMU with the right fishing gear</li> <li>• Enforcement of fisheries laws and regulations</li> <li>• Control the number of fishermen, that fish in the estuary</li> <li>• strengthening BMU capacity to manage fisheries</li> <li>• Promote alternative livelihoods besides fishing</li> <li>• introduce fishing control measures such seasonal fishing</li> <li>• promote traditional knowledge on fisheries management</li> </ul>	<ul style="list-style-type: none"> <li>• Standard gears acquired</li> <li>• People reached in awareness</li> <li>• Number of training sessions</li> <li>• Standard gears usage</li> <li>• Size and catch increase</li> <li>• Improved compliance</li> <li>• Improved fishing practices</li> <li>• Regulated fishing</li> <li>• Reduce pressure on fisheries</li> </ul>	<ul style="list-style-type: none"> <li>• Fisheries to be controlled in the core zone and only in the ocean not the river</li> </ul>
Mitigate over harvesting of mangroves	<ul style="list-style-type: none"> <li>• Awareness creation of ecological value of Mangroves</li> <li>• Enforcement of relevant laws</li> <li>• Engaging community in rehabilitation of mangroves degraded areas</li> <li>• Introduce and promote use of alternative building materials</li> <li>• Promote alternative livelihoods</li> <li>• Establishment of a CFA for the river mouth</li> </ul>	<ul style="list-style-type: none"> <li>• Number of awareness meetings</li> <li>• Number of people sensitized</li> <li>• Number of people arrested</li> <li>• Number of people stopped from harvesting</li> <li>• number of acreages rehabilitated</li> <li>• number of seedlings planted</li> <li>• acreage of woodlots established</li> </ul>	<ul style="list-style-type: none"> <li>• Mangrove harvesting should not happen at all in all zones</li> <li>• Alternative livelihoods and building technologies to target adjacent community and beyond</li> </ul>

Strategy	Activities	Outputs	Appropriate zone
		<ul style="list-style-type: none"> <li>• number of tree nurseries established</li> <li>• Number of alternative user group formed</li> <li>• CFA established</li> <li>○ Number of members</li> </ul>	
Control overgrazing in the estuary and accreted land	<ul style="list-style-type: none"> <li>• Controlling number of livestock through awareness creation</li> <li>• Improvement of breeds of animals</li> <li>• Controlled access to the river through marked watering points</li> </ul>	<ul style="list-style-type: none"> <li>• % decreased in number of livestock</li> <li>• Number of people reached through awareness sessions</li> <li>• Number of improved animals</li> <li>• Number of marked access point</li> </ul>	<ul style="list-style-type: none"> <li>• Grazing to be allowed in the north bank seasonal wetlands but restricted in number of livestock</li> </ul>
Control of change of habitat composition by invasive species	<ul style="list-style-type: none"> <li>• Create awareness against use of cactus as a live fence by the community</li> <li>• Encourage multiple uses of <i>Prosopis juliflora</i> such as charcoal production, bee forage and chapati flour</li> </ul>	<ul style="list-style-type: none"> <li>• Number of cactus fences uprooted</li> <li>• Number of people reached through awareness</li> <li>• Area occupied by <i>Prosopis juliflora</i> reduced</li> <li>• Number of alternative uses of <i>prosopis juliflora</i> introduced</li> </ul>	<ul style="list-style-type: none"> <li>• All invasive species to be removed from both core and intervention zones</li> </ul>
Reduce Human-wildlife conflict-hippos	<ul style="list-style-type: none"> <li>• Awareness creation about the value of wildlife</li> <li>• Active management of wildlife (KWS should recommend how)</li> <li>• Develop a Land use plan for the estuary</li> </ul>	<ul style="list-style-type: none"> <li>• % reduction in reported human wildlife cases</li> <li>• Number of hippos/wild animals removed</li> </ul>	<ul style="list-style-type: none"> <li>• Both core and intervention zones</li> </ul>
Control illegal and unsustainable sand harvesting	<ul style="list-style-type: none"> <li>• Promote alternatives sources of income eg tourism</li> <li>• Support education systems to improve literacy level</li> <li>• Improve skills levels by enrolling youths in polytechnics</li> </ul>	<ul style="list-style-type: none"> <li>• Number of children supported</li> <li>• Number of youths enrolled in village polytechnics</li> </ul>	<ul style="list-style-type: none"> <li>• Sand harvesting to be disallowed in all areas</li> <li>• Land ownership to be restricted to the intervention zone.</li> </ul>

Strategy	Activities	Outputs	Appropriate zone
	<ul style="list-style-type: none"> <li>• Support the adjudication process to acquire title deeds for legal land ownership</li> <li>• Develop County and adopt National Environmental laws and regulations for sand mining</li> <li>• Awareness creation about effects of sand harvesting to the environment</li> <li>• Promote alternative livelihoods</li> <li>• Restoration of quarried areas and use the same for productive purposes like tree growing (eg Casaurina)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of title deeds issued</li> <li>• Number of laws and regulations developed</li> <li>• Number of people reached through awareness</li> <li>• Number of alternative user group formed</li> <li>• Number and acres of quarries restored</li> </ul>	All core areas to be gazette as conservation area
Improve integration of research finding into natural resource management	<ul style="list-style-type: none"> <li>• Develop systems of dissemination of research findings</li> <li>• Involvement of local community as citizen scientists in research work at the estuary</li> <li>• Streamline access of the estuary to researchers</li> <li>• taken care by the first bullet point</li> </ul>	<ul style="list-style-type: none"> <li>• Number of research findings disseminated</li> <li>• Number of new technologies adopted</li> <li>• Number of local people trained in data collection</li> <li>• Number of research studies local people are involved in</li> <li>• Research guideline developed</li> <li>• Number of Agreement signed</li> </ul>	<ul style="list-style-type: none"> <li>• Research information dissemination to target all people in the estuary and beyond</li> </ul>
Ensure long-term flourishing of estuarine biodiversity	<ul style="list-style-type: none"> <li>• Protecting feeding areas for birds</li> <li>• Protecting Roosting areas for birds</li> <li>• Re-establish the forest habitat on the main dunes</li> <li>• Protect the main dunes from being cleared and developed – create a no-take reserve for the main dunes</li> </ul>	<ul style="list-style-type: none"> <li>• acreage of feeding areas</li> <li>• Acreage of roosting area</li> <li>• Acreage of re-established forest</li> <li>• Acreage of protected dunes</li> <li>• %increased habitat for smaller animals</li> </ul>	<ul style="list-style-type: none"> <li>• Target core zone and other natural areas in the intervention zone</li> </ul>

Strategy	Activities	Outputs	Appropriate zone
	<ul style="list-style-type: none"> <li>• Restore habitat for smaller mammals – Suni, duiker, Bushbuck</li> <li>• Protecting Freshwater invertebrate habitats – dragonflies, butterflies, pollinators</li> <li>• Protect and enhance the seasonal freshwater pools that appear in the wet season and hold breeding populations of birds, insects, amphibians etc.</li> <li>• Protecting nesting sites for Reptiles – including sea turtles – breeding along the beach.</li> </ul>		
Promote sustainable development in the accreted land	<ul style="list-style-type: none"> <li>• Advocating for gazettment of accreted land as public and Implement recommendations of the Shoreline Management Strategy</li> <li>• Prepare and implement a spatial zoning plan for the accreted land</li> <li>• Formulate and implement a policy on the use of accreted land</li> <li>• Advocate and support preparation and implementation of a Resettlement Action Plan (RAP) for Mijikenda village</li> <li>• Enforce EIA/EA Regulations for development within and adjacent to the accreted land</li> </ul>	<ul style="list-style-type: none"> <li>• Number of people trained with skills</li> <li>• Number of people trained on natural resource management</li> <li>• Number of enterprises established by the trained people</li> </ul>	<ul style="list-style-type: none"> <li>• Accreted land to be gazetted as public space and used for recreation purposes</li> </ul>
Marking land use points eg fish landing site, Watering point for livestock	<ul style="list-style-type: none"> <li>• Designate a fish landing site</li> <li>• Develop a development plan and strategy for use of the landing site</li> <li>• Designate livestock watering point along the river</li> </ul>	<ul style="list-style-type: none"> <li>• Acreage of fish landing points established</li> <li>• Development plan established</li> <li>• Number of watering points established</li> </ul>	<ul style="list-style-type: none"> <li>• Land use points to be in the intervention zone unless unavoidable</li> </ul>
Map and protect riparian land	<ul style="list-style-type: none"> <li>• Stabilization of river banks by planting the right vegetation</li> </ul>	<ul style="list-style-type: none"> <li>• % acreage of vegetation planted</li> </ul>	<ul style="list-style-type: none"> <li>• In the core zone</li> </ul>

Strategy	Activities	Outputs	Appropriate zone
	<ul style="list-style-type: none"> <li>• Create awareness of value and use of riparian land</li> <li>• Enforce and support existing regulations governing riparian land use</li> </ul>	<p>along the river banks</p> <ul style="list-style-type: none"> <li>• Number of people reached through awareness</li> </ul>	

### 7.2.3 Socio-economic Development Programme

#### 7.2.3.1 Current Status

Socio- economic activities that occur within the estuary such as fuel wood collection, artisanal fishing, farming, livestock grazing, mangrove and sand harvesting impose considerable pressure on its ecological functioning and its ability to sustain livelihoods. Over-exploitation of resources within the estuary is directly linked to poverty, low literacy levels, population growth, unemployment, poor management skills and weak management structures and systems.

Besides tourism, fishing is an important socio-economic activity within the area. Both commercial prawn fishing and artisanal fishing are practiced. There are however environmental and livelihood challenges that are a threat to the sustainable exploitation of the fisheries resources and local livelihoods. The challenges range from habitat destruction to low-income levels among the artisanal fisherfolk. The prawn fishery causes environmental degradation and threatens the local artisanal fishery through the destruction of fishing gear. On the other hand, artisanal fishers are known to use illegal fishing gear and methods.

#### 7.2.3.2 Challenges

The challenges are: Unsustainable charcoal production; High poverty levels among estuary adjacent local community members; inadequate alternative livelihoods; Low livelihoods skills and technologies.

#### 7.2.3.3 Objective

The objective of the Programme is to promote sustainable local community livelihoods.

- a) Identifying new/potential and enhance existing livelihoods sources
- b) Promote development of livelihoods skills

#### 7.2.3.4 Interventions

The interventions will include: Curbing unsustainable charcoal production; Introduction of alternative livelihoods; promotion of sustainable fisheries; sustainable sand harvesting practices. Training of the community members on the options available as alternative sources of livelihood.



Table 7.3 Management Interventions for Sustainable Community Livelihoods

Strategy	Activities	Output	
Curbing unsustainable charcoal production	Introduce sustainable charcoal production practices Empower the local community to make their own briquettes instead of charcoal Promote establishment of woodlots; Establishing an association of briquette making groups	<ul style="list-style-type: none"> <li>• Number of groups adopting new working technologies</li> <li>• Number of woodlots established</li> <li>• Briquette making groups established</li> </ul>	<ul style="list-style-type: none"> <li>• Charcoal production to target invasive plans (<i>Prosopis juliflora</i>)</li> </ul>
Introduction of alternative livelihoods	Initiate bee keeping Establishment of Agro forestry/Woodlots Establishment, training and give startup capital for micro-enterprises construct a board walk for eco-tourism enhancement Training and empowerment to enhance aquaculture Promote production of drought resistant and early maturing crops. Promote carbon trade in the area.	<ul style="list-style-type: none"> <li>• Alternative livelihoods introduced</li> <li>• New capital micro-enterprises established</li> </ul>	<ul style="list-style-type: none"> <li>• Except for tourism, all other livelihoods to be implemented in intervention zone</li> </ul>
Capacity development of alternative means of livelihoods	Training locals in relevant skills eg. Artisans courses, (catering, tailoring, masonry, IT), and tour guiding. Training in NR management eg improved farming practices and storage of farm produce; small stock rearing; fish processing and storage; etc Providing financial support to actualize the skills gained through the training	<ul style="list-style-type: none"> <li>• Number of people trained with skills</li> <li>• Number of people trained on natural resource management</li> <li>• Number of enterprises established by the trained people</li> </ul>	<ul style="list-style-type: none"> <li>• Target community adjacent and beyond</li> </ul>

## **7.2.4 Sustainable Tourism Development in Sabaki Estuary**

### **7.2.4.1 Current Status**

Tourism is expected to become the main socio-economic activity within the estuary in the near future. However, some tourism activities have a negative impact on the environment. These include illegal activities, environmental pollution and visitor pressure on natural resources. In addition, the number of visitors to the area has been declining as a result of insecurity, poor infrastructure and emerging markets among others. There are reported illegal activities on the beach within the area like collection and sale of marine curio items, sex tourism and nudity; and wildlife disturbance. Cases of drug abuse and child prostitution, beach parties and driving on the beach and other delicate areas have also been reported.

Dilapidated infrastructure including roads, security systems, sanitation systems and water and energy supply among others are a threat to the growth of tourism in the area. It is therefore important that actions are taken to provide improved infrastructural facilities with a focus to service the tourism industry.

### **7.2.4.2 Challenges**

The challenges are: Inadequate tourism infrastructure; Lack of tourism circuit; Low capacity on tourism development and management; Unmapped and poorly marketed tourism products and services.

### **7.2.4.3 Objective**

The objectives of the Programme are

- To promote sustainable tourism development in Sabaki estuary.
- To develop and install infrastructural support facilities to spur growth of Ecotourism activities around the estuary.
- To promote conservation, address issues of human-wildlife conflict
- To support and capacity build the community conservation groups

### **7.2.4.4 Interventions**

The interventions will include: Developing tourism infrastructure; improving training of service providers; developing tourism circuits; and marketing the tourism products and services (Table 10).

*Table 7.4 Management Interventions for Sustainable Tourism Development in Sabaki Estuary*

Strategy	Activities	Output	Appropriate zone
Develop tourism infrastructure necessary for the estuary to attract tourism flow	<ul style="list-style-type: none"> <li>• Make access road to the resource center and parking</li> <li>• Construct a boardwalk and bird hide for birds viewing at the edge of mangroves</li> <li>• Repair and equip the resource center with interpretation materials</li> <li>• Develop and equip a picnic site near the mangrove area</li> <li>• Construct a restaurant/ eatery for tourists</li> <li>• Develop a bush camping site</li> </ul>	<ul style="list-style-type: none"> <li>• Access road established</li> <li>• Number of parking lots established</li> <li>• Number of bird hides established</li> <li>• Boardwalk established</li> <li>• Resource center established</li> <li>• Number of resource materials established for interpretation</li> <li>• Number of picnic site developed</li> <li>• Number of restaurants established</li> <li>• Number of bush camping site developed</li> </ul>	<ul style="list-style-type: none"> <li>• Mainly in core zone</li> </ul>
To restrict use of vehicles in the estuary to restrict/ control use of the estuary and facilitate smooth running of the attraction site	<ul style="list-style-type: none"> <li>• Enforce laws and policies to restrict driving along the beach</li> <li>• empower and sustain community scouts to patrols</li> </ul>	<ul style="list-style-type: none"> <li>• Number of people arrested</li> <li>• Number of scout groups established</li> </ul>	<ul style="list-style-type: none"> <li>• In core zone</li> </ul>
	<ul style="list-style-type: none"> <li>• Develop benefit sharing mechanism between site support group (SARICODO) and larger community</li> <li>• Establish agreed charges and enforce them</li> <li>• Avail first aid Kits within the attraction site</li> </ul>	<ul style="list-style-type: none"> <li>• Benefit sharing mechanism developed</li> <li>• Number of first aid kit available in the attraction site</li> </ul>	<ul style="list-style-type: none"> <li>• In community and other beneficiaries</li> </ul>
Establish two manned entry points for the estuarine conservation area	<ul style="list-style-type: none"> <li>• Erect barriers at entry points</li> <li>• Establish conservation fee payment system</li> </ul>	<ul style="list-style-type: none"> <li>• Number of barriers at entry points established</li> <li>• Fee payment systems established</li> </ul>	<ul style="list-style-type: none"> <li>• In the intervention zone</li> </ul>
Identify and document all potential tourism activities and include	<ul style="list-style-type: none"> <li>• Develop estuarine information sheets and guide books/ profiling of all tourism activities</li> </ul>	<ul style="list-style-type: none"> <li>• Number of estuarine information guide developed</li> </ul>	<ul style="list-style-type: none"> <li>• Information to include the core and intervention zone</li> </ul>

Strategy	Activities	Output	Appropriate zone
them in the tourism regulations for the estuary	<ul style="list-style-type: none"> <li>• Conduct Tourism products diversification i.e. camel riding, canoe / Boat riding, code bikes, beach volleyball, football, water sports among others</li> <li>• Identify and establish tourism income generating activities for the community</li> </ul>	<ul style="list-style-type: none"> <li>• Number of tourism products diversified</li> <li>• Number of tourism income generating activities established</li> </ul>	
Create awareness and enforce national and county laws and regulations	<ul style="list-style-type: none"> <li>• Hold sensitization forums</li> <li>• Make booklets of the regulations and laws</li> <li>• Obtain the necessary licenses and certification for the tourism products and services</li> </ul>	<ul style="list-style-type: none"> <li>• Number of people sensitized</li> <li>• Number of booklets developed</li> <li>• Number of licenses obtained</li> <li>• Number of certifications obtained</li> </ul>	<ul style="list-style-type: none"> <li>• Adjacent community and beyond</li> </ul>
Establish a tourism marketing system for the area	<ul style="list-style-type: none"> <li>• Develop practical marketing strategy</li> <li>• Hold tourism stakeholder forums for promotion</li> <li>• Erecting Sign boards</li> <li>• Develop social media pages (website, Facebook, Instagram, twitter handle) etc.</li> <li>• Identify uniform &amp; badges for the tour guides</li> <li>• Have an official telephone no. to assist in communication</li> </ul>	<p>Number of marketing strategy developed</p> <p>Number of tourism stakeholder forum held</p> <p>Tourism guidelines developed</p> <p>Number of sign boards erected</p> <p>Number of social media pages developed</p> <p>Number of Uniforms and badges designated</p> <p>Number of people assisted through the telephone number</p>	Beyond the estuarine

## **7.2.5 Pollution prevention and control Programme**

### **7.2.5.1 Current Status**

Pollution in Malindi-Sabaki area is generally from inflows from farms and urban areas in the basin as well as on-site sanitation systems of coastal developments, municipal wastewater discharges, storm-water, leachate from solid waste and oil spills. Malindi town has no sewage treatment infrastructure and thus developments rely mostly on septic tank and soak pit systems. Soak pits are dug to water table level and are therefore major sources of bacterial contamination of the shallow wells that the local population depends on for domestic water supply. The wastes generated from the town and adjacent areas include household wastes, industrial wastes and biomedical wastes. All the solid wastes irrespective of their composition and character are disposed of collectively at the Towns open dumping site at Casuarina. There is also pollution from upstream of the river in form of effluent discharge from river adjacent facilities, solid wastes and siltation from unsustainable land use practices. This is degrading the estuary, marine area and the Malindi Marine Park which is key for tourism.

### **7.2.5.2 Challenges**

The challenges are improper management and disposal of both solid waste and sewage from Malindi town, surrounding villages and from upstream. The estuary has inadequate and ineffective infrastructure to manage solid waste generated by the rapidly growing population. Solid waste dumping is not regulated leading to littering and hence loss of aesthetic value of the physical environment, besides other impacts on ecosystem and public health. Siltation affects the fish breeding habitats at Sabaki River Estuary and Malindi Marine Park and affects the growth of corals which fish use as breeding areas and hiding from predators.

### **7.2.5.3 Objective**

The objective of the programmes is to mitigate pollution in Sabaki River Estuary. This includes identifying the sources and causes of pollution and siltation.

### **7.2.5.4 Interventions**

The interventions will include: promoting good land use practices; controlling upstream urban and industrial discharges into the river; and addressing solid waste disposal from upstream and around the estuary (Table 14).

*Table 7.5 Management Interventions for Mitigation of Siltation and Pollution in Sabaki River Estuary*

Strategy	Activities	Outputs	
Promote sustainable land use practices upstream	<ul style="list-style-type: none"> <li>• Developing a catchment management plan</li> <li>• Awareness creation and training of communities on good land management and agricultural practices conservation of riverine vegetation</li> <li>• Enforcement of existing legislation</li> </ul>	<ul style="list-style-type: none"> <li>• Catchment management plan developed</li> <li>• Number of communities sensitized and trained on good land management and agricultural practices</li> <li>• Number of people prosecuted for non-compliance with relevant laws</li> </ul>	<ul style="list-style-type: none"> <li>• Beyond the estuary</li> </ul>
Control upstream urban and industrial chemical discharges into the river	<ul style="list-style-type: none"> <li>• Create awareness on safe use of agro chemicals to resource users and stakeholders upstream</li> <li>• Encourage use of biodegradable farm inputs</li> <li>• Promote natural crop pest management system in the river basin</li> <li>• Promote conservation agriculture in the river basin</li> <li>• Enforcement of water Quality Regulations and other relevant laws to control industrial inflows</li> </ul>	<ul style="list-style-type: none"> <li>• Number of people sensitized</li> <li>• Number of farmers using biodegradable farm inputs</li> <li>• Acreage of land under natural crop pest management system</li> <li>• Acreage of farms under conservation agriculture</li> <li>• Number of cases reported and prosecuted</li> </ul>	<ul style="list-style-type: none"> <li>• Beyond the estuary</li> </ul>
Manage solid waste disposal from upstream and around the estuary	<ul style="list-style-type: none"> <li>• Enforce existing solid waste legislation in the catchment and around the estuary</li> <li>• Equip urban areas in the basin with improved solid waste management equipment</li> <li>• Raise awareness about solid waste pollution through mainstream and social media and public barazas</li> </ul>	<ul style="list-style-type: none"> <li>• Number of cases reported and prosecuted</li> <li>• Solid waste management equipment in place in urban areas</li> <li>• Number of people sensitized</li> </ul>	<ul style="list-style-type: none"> <li>• Beyond the estuary</li> </ul>

Strategy	Activities	Outputs	
To prevent further accretion of land in Malindi-Sabaki area	<ul style="list-style-type: none"> <li>• Implement the Athi-Galana-Sabaki Pollution Prevention and Control Strategy</li> <li>• Formulate and implement a catchment management plan for Sabaki River Basin</li> <li>• Stabilize the accreted land and rehabilitate sand dunes in collaboration with private land owners adjoining these areas</li> <li>• Enforce Wetlands Regulations 2009 and other relevant legislation to prevent soil erosion, siltation and water pollution in the area</li> </ul>	<ul style="list-style-type: none"> <li>• Pollution Prevention and control strategy implemented</li> <li>• Catchment management plans developed and implemented</li> <li>• Rehabilitated sand dunes</li> <li>• Number of cases reported and prosecuted</li> </ul>	<ul style="list-style-type: none"> <li>• Beyond the estuary</li> </ul>

## PLAN IMPLEMENTATION MATRIX

Table 8.1 Plan Implementation Matrix

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
<b>Thematic Area 1: Governance of Sabaki River Estuary</b>						
Map and register land to individual and group ownership	Survey and Map all the unregistered land	Survey map developed	NLC, CGK, Min of Lands	1.5 million	1 year	Survey maps, minutes
	Create a register of lands	Land owners well known	NLC, CGK, Min of Lands	0.5 million	1 year	Land register
	Issue title deeds to individuals and groups/institutions	Existing land conflicts solved	NLC, KSG, Min of Lands	1million	1 year	Title deeds
	Create a conservation area with utility sections	Conservation area with utilities developed	KWS, KFS, NEMA CGK, SARICODO, CBOs NGOs	2.5 million	1 year	Reports, maps
Enhance awareness among stakeholders and community about the value of the estuary for people and biodiversity	Hold public barazas and community events for sensitization	Acquired and increase knowledge for conservation and value of the estuary Reduce pressure on the natural resources at the estuary Enhance integration and participatory management of the estuary	KWS, KFS, NEMA NGAO, CGK, SARICODO, CBOs, BMUs Nature Kenya Arocha Kenya	1 million	1 year	Reports



Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Hold radio talk shows for awareness creation	-Media articles about conservation developed -Increase tourism -Improve marketing at the estuary.	KWS, KFS, County, SARICODO Nature Kenya	1.5 million	1 year	Media articles
	Make media articles for print and electronic media Develop brochures and posters with specific information about the estuary and its interconnection to the river basin and the ocean systems	-Media articles about conservation developed -Increase tourism -Improve marketing at the estuary	KWS, KFS, County, SARICODO Nature Kenya Arocha Kenya	2 million	1 year	Attendance list, brochures, pictures recorded media sessions, media articles
Improve the capacity of local conservation and resource user groups to manage themselves and the natural resources	Carry out capacity assessment of the local groups	-Identified strength and weakness -Identified capacity gaps amongst resource users -Improved governance -Increased capacity on conservation	KWS, KFS, NEMA CGK, SARICODO, CBOs NGOs	3 million	2 years	Capacity needs assessment report
	Training on gaps identified for leadership, governance, conflict management and Natural resource management	-Reduced conflicts -Improved governance -Increased knowledge on conservation -Minimal supervision needed	NEMA, KWS, KFS, CGK, SARICODO, NGOs, CBOs	2 million	1 year	Training Programme report Pictures attendance list
Enhance governance system of the area	Develop natural resource use guidelines for access and control	Guidelines Developed Reduced pressure on resources Reduced conflicts	CGK, NEMA, KWS, KFS, NGOs, CBOs	1 million	1 year	Meeting report Guidelines

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Form a resource management committee consisting of all stakeholders	-Resource management committee formed -Reduced conflicts	CGK, NGAO, NEMA, KWS, KFS, SARICODO, BMUs, CBOs, NGOs, Nature Kenya Arocha Kenya	0.5 million	6 months	Attendance list, reports Meeting reports,
Gazette and designate Sabaki River Estuary	Initiate gazettment of the estuary as a conservation area	Gazettment process initiated	NEMA, KFS, KWS, CGK, MoE and F, NGAO	2 million	3 months	Meeting minutes, reports, gazette notice
	Prepare the necessary gazettment notice	Gazette notice developed	NEMA, CGK, KFS, KWS, MoE&F	3 million	2 years	Meeting Reports Gazette notice
	Designate the Estuary as to part of the Watamu- Malindi Man and Biosphere reserve	Estuary designated	KWS, CGK, NMK	3 million	2 years	Meeting reports
	Designate Sabaki Estuary as wetland of international importance (Ramsar site)	Wetland listed as a Ramsar site	KWS, NEMA, NMK, CGK, NGAO, NGOs, CBOs,	3 million	2 years	Meeting reports, Field reports,
Management of Resource-use Conflicts	Set up conflict resolution mechanism.	Conflict Resolution mechanism developed Reduced conflicts	NGAO, CGK KWS, KFS, NEMA, CBOs NGOs	1 million	1 year	Resolution mechanism document Minutes
	Establish resource use guidelines and users rights	Resource use and user rights guidelines developed Resources and user groups identified	KWS, KFS, WRA, KeFS, CGK NGOs, CBOs	1 million	6 months	User rights guidelines document List of user group

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
						List of resources
	Develop and implement a benefit sharing mechanism	Benefit sharing mechanisms developed and implemented	NGAO, CGK, SARICODO, Nature Kenya and County Government	200,000	6 months	Benefit sharing document
	Enforce existing laws and regulations	Compliance with existing laws	NEMA, KWS, KFS, KeFS CGK, SARICODO BMU Min of fisheries	10 million	10 years	No. of cases reported and prosecuted
<b>Thematic Area 2: Management and Use of Natural Resources</b>						
Promotion of sustainable fisheries	Eliminate use of illegal and destructive fishing gear (Mosquito net)	Standard gears acquired	CGK, KeFS, BMU, KCGS, KWS, SARICODO	4 million	10 years	Increased fisheries
	Create awareness on effect of use of right gear	People reached in awareness	CGK, KeFS, BMU, KCGS, KWS, SARICODO	2 million	2 years	Enhance awareness on fishing regulations
	Training on sustainable fisheries management	Number of training sessions	CGK, KeFS, NGOs	10 million	10 years	Number of trainees Number of training sessions Training reports
	Equipping BMU with the right fishing gear	Standard gears Size and catch increase	CGK, KeFS, NGOs	3 million	1 year	Increased fisheries Number of catch increase

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Enforcement of fisheries laws and regulations	Law and order maintained Improved fishing practices	KWS, CGK, KeFS, BMU, KCGS, KFS	10 million	10 years	Improved compliance
	Control the number of fishermen,	Regulated fishing Reduce pressure on fisheries	KWS, CGK, KeFS, BMU	2 million	10 years	Increased fisheries Number of fishermen controlled
	Access to strengthening BMU to manage fisheries	Regulated fishing Reduce pressure on fisheries	KWS, CGK, KeFS, BMU,	10 million	10 years	Increased catch Number of registered BMU
	Promote Alternative livelihoods besides fishing	Reduce pressure on fisheries	CGK, KeFS, BMU, NGOs SARICODO, NEMA, KFS	20 million	10 years	Increased in catch
	Introduce fishing control measures such as seasonal fishing	Increased fisheries Reduce pressure on fisheries Traditional knowledge about fish seasonality applied	CGK, KeFS, BMU, NGOs SARICODO, NEMA, KFS	10 million	10 years	Number of fishermen report Type of fish report Report on different seasons
	Promote traditional knowledge in fisheries management	Reduce pressure in fisheries	KeFS, KWS, BMU, Site support groups, NGOs, CGK	2 million	2 Years	Traditional knowledge incorporated in fisheries management
Mitigate over harvesting of mangroves	Awareness creation of ecological value of Mangroves	Number of awareness meetings Number of people sensitized	CGK, BMU, NGOs SARICODO, NEMA, KFS	5 million	2 years	List of participants Report on sensitization

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Enforcement of relevant laws	Number of people arrested Number of people stopped from harvesting	CGK, KeFS SARICODO, NEMA, KFS NGAO	6 million	10 years	Enforcement report
	Engaging community in rehabilitation of mangroves degraded areas	number of acreage rehabilitated number of seedlings planted	CGK, NGOs CBOs, NEMA, KFS CFA, BMU, KeFS	6 million	10 years	Report Pictures
	Introduce and promote use of alternative building materials	acreage of woodlots established number of tree nurseries established	CGK, NGOs CBOs, KFS CFA	8 million	10 years	Survey Report Increased mangrove cover
	Promote alternative livelihoods	Number of alternative user group formed	CGK, KeFS, NGOs, CBOs, NEMA, KFS, SARICODO	8 million	10 years	Amount of income earned
	Establish and operationalize a CFA for the river mouth	CFA established Number of members	CGK, KFS	2 million	1 year	CFA established
Control overgrazing in the estuary and accreted land	Controlling number of livestock through awareness creation	% decreased in number of livestock Number of people reached through awareness sessions	CGK. Livestock department, community NGOs, NGAO	1 million	1 year	%improvement in habitat quality %reduction in disturbance of birds List of participants
	Improvement of breeds of animals	Number of improved animals	CGK. Livestock department, local community	3 million	3 years	Number of improved breeds

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
			NGOs			
	Controlled access to the river through marked watering points	Number of marked access point	CGK.NLC, WRMA SARICODO	0.5 million	1years	Number of marked access point
Control of invasive species	Create awareness against use of invasive species as a live fence	Number of cactus fences uprooted Number of people reached through awareness	CGK, KFS, NGAO, SARICODO, KEFRI,	1 million	1 years	Number of cactus fences uprooted Number of people reached through awareness
	Encourage multiple uses of <i>Prosopis juliflora</i> such as charcoal production, bee forage and chapati flour	Number of acreage occupied by invasive species reduced	NEMA, CGK, SARICODO, KFS,	1 million	2 years	Number of alternative uses of invasive species introduced
Reduce Human-wildlife conflict-	Awareness creation about the value of wildlife	% reduction in reported human wildlife cases	KWS, NGAO, CGK, SARICODO	6 million	10 years	% reduction in reported human wildlife cases
	Control of wildlife population (hippos)	Number of hippos/wild animals removed	KWS, NEMA	4 million	1 year	Number of hippos/wild animals removed
Control unsustainable sand harvesting	Promote alternatives sources of income e.g. tourism	Number of alternatives livelihoods	CGK, NGOs, NEMA, NGAO	3 million	3 years	
	Support education systems to improve literacy level	Number of children supported	Department of education, ICT, NGOs,	20 million	10 years	Number of children supported
	Improve skills levels by enrolling youths in polytechnics	Number of youths enrolled in village polytechnics	CGK, TVET NGOs	10 million	10 years	Number of youths enrolled in village polytechnics

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Support the adjudication process to acquire title deeds for legal land ownership	Number of title deeds issued	NLC, CGK, NGAO	20 million	1 years	Number of title deeds issued
	Develop County and adopt National environmental laws and regulations for sand mining	Number of laws and regulations developed	CGK, Min of Mining, NEMA, SARICODO	5 million	2 years	Number of laws and regulations developed
	Awareness creation about on sustainable sand harvesting	Number of people reached through awareness	CGK, Min of Mining, NEMA, SARICODO NGAO, NGOs	4 million	4 years	Number of people reached through awareness
	Promote alternative livelihoods	Number of alternative user group formed	CGK, Min of Mining, NEMA, SARICODO NGAO, NGOs	20 million	10 years	Amount of income earned
	Restoration of quarried areas and use the same for productive purposes like tree growing (eg - Casaurina)	Number and acres of quarries restored	CGK, Min of Mining, NEMA, SARICODO NGAO, NGOs KFS	10 million	10 years	Number and acres of quarries restored
Improve integration of research finding into natural resource management	Develop systems of dissemination of research findings	Number of research findings disseminated Number of new technologies adopted	NEMA, SARICODO, NGOs, KFS, KEFRI, KEMFRI	10 million	10 years	Number of research findings disseminated Number of new technologies adopted

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Involvement of local community as citizen scientists in research work at the estuary	Number of local people trained in data collection Number of research studies local people are involved in	Research Organizations	2 million	10 years	Number of local people trained in data collection Number of research studies local people are involved in
	Sensitize the local community on area access regulatory requirements by researchers	Community aware of regulatory requirements by researchers	KFS, KWS, KeFS, NGOs WRMA	0.5 million	1 year	Research guideline developed
Map and designate fish landing sites and livestock watering points	Identifying and survey the fish landing points	Fish landing sites identified	CGK, KeFS, BMU, SARICODO, LANDS DEPT	2 million	1 Year	Acreage of fish landing points established
	Development plan and strategy for use of the landing point	Development plan established	CGK, KeFS, BMU, SARICODO, LANDS DEPT	2 million	1 Year	Development plan established
	Designate livestock watering point along the river	Number of watering points established	CGK, KeFS, BMU, SARICODO, LANDS DEPT	2 million	1 Year	Number of watering points established
Stabilization of river banks by planting the right vegetation	Plant bank stabilization vegetation		NEMA, CGK, SARICODO	10 million	2 years	%acreage of vegetation planted along the river banks
	Great awareness of value and use of riparian land	Number of people reached through awareness	NEMA, CGK, SARICODO, Nature Kenya	1 million	1 Year	Number of people reached through awareness



Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
Ensure long-term flourishing of estuarine biodiversity	Protecting feeding areas for birds	acreage of feeding areas protected	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI	4 million	10 years	Acreage of feeding areas identified and protected
	Protecting Roosting areas for birds	Acreage of roosting area	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI	10 million	10 years	Acreage of roosting area identified and protected
	Re-establish (reclaim) the forest habitat on the main dunes	Acreage of re-established forest	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI	20 million	10 years	Acreage of re-established (reclaimed) forest
	Protect the main dunes from being cleared and developed – create a no-take reserve for the main dunes	Acreage of protected dunes	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI	20 million	10 years	Acreage of protected dunes
	<ul style="list-style-type: none"> <li>Restore habitat for smaller mammals – Suni, duiker, Bushbuck</li> <li>Protecting Freshwater invertebrate habitats – dragonflies, butterflies, pollinators</li> </ul>	% increased habitat for smaller animals	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI, KWS, KeFS	4 million	10 years	% increased habitat for smaller animals
Thematic Area 3: Socio-economic Development Programme						

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
Curbing unsustainable charcoal production	Introduce sustainable charcoal production practices to make their own briquettes instead of charcoal	Number of new working technologies introduced	SARICODO, KFS, CGK	10 million	10 years	Number of charcoal producers applying the new technologies
	Promote establishment of woodlots; Establish an association of briquette making groups	<ul style="list-style-type: none"> <li>Woodlots and briquette making groups established</li> </ul>	NEMA, SARICODO, NGOs CGK, KFS, KEFRI	40 million	10 years	Number of farms under woodlots No, of briquette making groups
Promotion of alternative livelihoods	Establish of Agro forestry/Woodlots	% acreage of woodlots established	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI	10 million	10 years	% acreage of woodlots established
	Establishment, training and give startup capital for micro-enterprises establishment	Number of local people trained in micro enterprises Number of micro enterprises established	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI	20 million	10 years	Number of local people trained in micro enterprises Number of micro enterprises established
	Training and empowerment to enhance aquaculture	Number of local people trained in aquaculture activities	SARICODO, NGOs, KeFS, CGK, KFS,	20 million	10 years	Number of local people trained in aquaculture activities
	Initiate bee-keeping	Bee-keeping farming adopted and practiced	Livestock dep, CGK, NGO, SARICODO	3 million	2 years	Number of local people trained, equipped and

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
						practicing bee-keeping
	Promote production of drought resistant and early maturing crops.	Number of people trained in production of early maturing crops	CGK, AGRI DEPT, KARLO	20 million	10 years	Number of people trained in production of early maturing crops
	Promote carbon trade in the area.	KFS, KEFRI, NEMA,	KFS, KEFRI, NEMA, NGO			
Capacity development of alternative means of livelihood in the accreted land	Training local people in relevant skills eg. Artisans courses, catering, tailoring, masonry, IT, tour guiding.	Number of people trained with skills	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI, CGK	10 million	10 years	Number of people trained with skills
	Training in NR management eg. improved farming practices and storage of farm produce; small stock rearing; fish processing and storage; etc	Number of people trained on natural resource management	NEMA, SARICODO, NGOs KFS, KEFRI, KEMFRI, CGK, Agri Dep, Livestock Dpt	20 million	10 years	Number of people trained on natural resource management
<b>Thematic Area 4: Sustainable Tourism Development in Sabaki Estuary</b>						
Develop tourism infrastructure necessary for the estuary to attract tourism flow	Make access road to the resource center and parking	Access road established Number of parking lots established	CGK, TRA, SARICODO, Nature Kenya, NGOs	2 million	1 year	Access road established Number of parking lots established
	Construct a boardwalk and bird hide for birds viewing at the edge of mangroves	Number of bird hides established Boardwalk established	NEMA, KFS, CGK, TRA, SARICODO,	10 million	2 years	Boardwalk established

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
			Nature Kenya, NGOs			Number of bird hides established
	Repair and equip the resource center with interpretation materials	Resource center established Number of interpretation resource materials established for	CGK, Tourism Regulation Authority, SARICODO, Nature Kenya, NGOs	5 million	3 years	Resource center established Number of resource materials established for interpretation
	Develop and equip a picnic site near the mangrove area	Number of picnic site developed	CGK, TRA, SARICODO, Nature Kenya, NGOs	5 million	5 years	Number of picnic site developed
	Construct a restaurant/ eatery for tourists	Number of restaurants established	CGK, TRA, SARICODO, Nature Kenya, NGOs	5 million	3 years	Number of restaurants established
	Develop a bush camping site	Number of bush camping site developed	CGK, TRA, SARICODO, Nature Kenya, NGOs	1 million	2 years	Number of bush camping site developed
Map and protect riparian land	Stabilization of river banks by planting the right vegetation	%acreage of vegetation planted along the river banks	NEMA, CGK, SARICODO, NGOs	10 million	2 years	% acreage of vegetation planted along the river banks
	Great awareness of value and use of riparian land	Number of people reached through awareness	NEMA, CGK, SARICODO, Nature Kenya	1 million	1 Year	Number of people reached through awareness

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
Control use of vehicles in the estuary	Enforce laws and policies to restrict driving along the beach	Controlled driving along the beach	KFS, KWS, CGK, SARICODO	5 million	10 years	Number of cases prosecuted
	Empower and sustain community scouts to patrol	Scout groups established and sustained	KFS, KWS, CGK, SARICODO, NGOs	10 million	10 years	Number of scout groups established
To restrict/control use of the estuary and facilitate smooth running of the attraction site	Develop benefit sharing mechanism between site support group (SARICODO) and larger community	Benefit sharing mechanism developed	SARICODO, CGK, Nature Kenya	0.5 million	1 year	Benefit sharing mechanism developed
	Establish agreed fees and enforce them	Fees and charges developed	SARICODO, CGK, TRA, KWS, KFS	0.2 million	6 months	Fee charging mechanism developed
	Avail first aid Kits within the attraction site	Number of first aid kit available in the attraction site	SARICODO, NGOs, CGK, RED CROSS	0.01 million	1 month	Number of first aid kit available in the attraction site
Establish two manned entry points for the estuarine conservation area	Erect barriers at entry points	Number of barriers at entry points established	KWS, KFS, CGK, SARICODO			Number of barriers at entry points established
	Establish conservation fee payment system	Fee payment systems established	SARICODO, CGK, TRA, KWS, KFS	200,000	6 months	Conservation fee system developed
Promote documentation of potential tourism activities	Develop estuarine information sheets and guide books/profiling of all tourism activities	Number of estuarine information guide developed	SARICODO, CGK, TRA, KWS, KFS, NGOs	200,000	6 months	Number of estuarine information materials developed

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Conduct Tourism products diversification i.e. camel riding, canoe/boat riding, code bikes, beach volleyball, football, water sports among others	Number of tourism products diversified	SARICODO, CGK, TRA, KWS, KFS	20 million	2 years	Number of tourism products diversified
	Identify and establish tourism income generating activities for the community	Number of tourism income generating activities established	SARICODO, CGK, TRA, KWS, KFS, NGOs	20 million	2 years	Number of tourism income generating activities established
Enforcement of national and county laws and regulations	Hold sensitization forums	Number of people sensitized	SARICODO, CGK, TRA, KWS, KFS	4 million	10 years	Number of people sensitized
	Make booklets of the regulations and laws	Number of booklets developed	SARICODO, CGK, TRA, KWS, KFS	4 million	10 years	Number of booklets developed
	Obtain the necessary licenses and certification for the tourism products and services	Number of licenses obtained Number of certifications obtained	SARICODO, CGK, TRA, KWS, KFS	4 million	10 years	Number of licenses designated Number of certifications designated
Establish a tourism marketing system for the area	Develop practical marketing strategy	Number of marketing strategy developed	TRA, SARICODO, CGK, KWS, KFS, NGOs	1 million	1 years	Number of marketing strategy developed
	Hold tourism stakeholder participation and promotional forums	Number of tourism stakeholder forum held	SARICODO, CGK, TRA, KWS, KFS	4 million	10 years	Number of tourism stakeholder forum held
	Erecting Sign boards	Number of sign boards erected	SARICODO, CGK	200,000	6 months	Number of sign boards erected

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
	Develop social media pages (website, Facebook, Instagram, Twitter handle) etc.	Number of social media pages developed	SARICODO, NATURE KENYA, NGOs	100,000	6 months	Number of social media pages developed
	Provide uniform & badges for the tour guides	Number of uniforms and badges provided	SARICODO, NATURE KENYA, KFS, KWS	200,000	6 months	Number of Uniforms and badges designated
	Obtain and register an official telephone line to assist in communication	Number of people assisted through the telephone number	SARICODO, NATURE KENYA, NGOs		6 months	Official telephone line operationalized
<b>Thematic Area 5: Pollution Prevention and Control Programme</b>						
Promote good land-use practices upstream.	Develop and implement a catchment management plan	Catchment management plans developed	KFS, WRA, NEMA, CGK. Upstream Counties	20 million	1 Year	Catchment management plans
	Awareness creation and training of communities on good land management and agricultural practices	Number of communities sensitized and trained on good land management and agricultural practices	CGK, MoA, NEMA. RE, KFS, KEFRI, NGAO	5 million	2 Years	Number of farmers sensitized and trained
	Enforcement of Water Quality Regulations and other relevant laws to control industrial inflows	Enforced regulation and laws	NEMA, CGK. WRA, MoA, KFS, KEFRI, CBOs	10 million	10 Years	Number of cases reported and prosecuted
Control upstream urban and industrial chemical	Create awareness on safe use of agrochemicals to resource users and stakeholders	Awareness created to resource users	MoA, PCB, CGK, NGAO	5 million	2 Years	Number of people sensitized

Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
discharges into the river	Promote use of biodegradable farm inputs	Increased use of biodegradable inputs	MoA, CGK.	50 million	2 Years	Number of farmers using biodegradable farm inputs
	Promote natural crop pest management system in the river basin	natural crop pest management system adopted	MoA, PCB, CGK, KFeS	50 million	10 Years	-Acreage of natural crop pest management system -Acreage of farms under natural crop pest management system
	Promote conservation agriculture in the river basin	Conservation agriculture adopted	MoA, CGK, NEMA KFS, KEFRI,	50 million	10 Years	Acreage under conservation
	Enforcement of water quality regulations and other relevant laws to control industrial inflows	Enforced laws and regulations	NEMA CGK. WRA, MoA, KFS, KEFRI, CoG	10 million	10 Years	Number of cases reported and prosecuted
Manage solid waste disposal from upstream and around the estuary	Enforce relevant solid waste legislation in the catchment and around the estuary	Relevant legislations enforced	CGK, NEMA	2 million	10 years	Number of cases reported and prosecuted
	Equip urban areas in the basin with improved solid waste management equipment	Solid waste management equipment designated	CGK, NEMA, NGOs, Private Sector, Development Partners	20 million	3 years	Number of solid waste management equipment
	Raise awareness about solid waste pollution through mainstream, social media and public barazas	Awareness created	CGK, NEMA, SARICODO, CBOs, NGOs,	5 million	10 years	Number of people sensitized



Strategy	Activity	Output	Actors	Budget	Timeframe	Indicators
Prevent further accretion of land in Malindi-Sabaki area	Implement the Athi-Sabaki Pollution Prevention and Control Strategy	Pollution prevention and control strategy implemented	CGK, NEMA, WRA, NGAO, Private Sector, NGOs, Development partners	10 million	10 years	Pollution prevention and control measures in place
	Formulate and implement a catchment management plan for Sabaki River Basin	Catchment management plan developed and implemented	CGK, NEMA, WRA, KFS, KEFRI, KeFS, CoG, Private Sector, Development partners	50 million	10 years	Implementation reports
	Stabilize the accreted land and rehabilitate sand dunes	Accreted land stabilized Sand dunes rehabilitated	CGK, NEMA, WRA, KFS, NGO, CBO, Private sector, Development partners,	10 million	10 years	Acreage of stabilized accreted land and rehabilitated sand dunes
	Enforce Wetlands Regulations 2009 and other relevant legislation to prevent soil erosion, siltation and water pollution in the area	Improved levels of compliance	NEMA, CGK, KFS, KeFS, WRA, NGAO, MoA	2 million	10 years	Number of cases reported and prosecuted

## MONITORING AND EVALUATION

Monitoring and evaluation of the management plan is essential in that it provides the basis for corrections, adjustments, and improvements in relation to the milestones proposed, targeted activities and assessment of the achievements attained. It is proposed that this Management Plan be reviewed annually. It's against this background that challenges encountered during implementation of work plans activities are identified and strategies to address them set. Hence, a candid reflection of the past is required in a bid to make the future better.

### 9.1 Method

A ten-year Participatory Monitoring and Evaluation Plan will be formulated at the beginning of the plan period and will be reviewed regularly. A mid-term and end of plan evaluations will be carried out to assess progress in the implementation of planned activities, achievement of its objectives, and analyze and address constraints encountered in the process. It will also provide essential information that can be used in revision of the management plan. Continuous monitoring during the implementation period will be maintained through the monthly, quarterly, half year and annual progress reports from the CCA management team and other stakeholders.

#### 9.1.1 Responsibilities

It is important to note that for each action in the management plan, responsibilities have been assigned to particular institutions or stakeholders. This will also be used to measure the progress by the implementing agency/stakeholder. NEMA will conduct periodical evaluation of the implementation progress

#### 9.1.2 Indicators of Success

Indicators of success provide a measure of assessing whether set targets are being achieved. In the management activity schedule, indicators have been quantified or qualified for different categories of activities. The achievement of the targets for each activity in the programmes has been provided with means of verification, which are the indicators in the management plan. They will be used to assess the extent to which the targets have been attained.

#### 9.1.3 Proposed Management Actions:

- Develop monitoring guidelines (**monitoring team and stakeholders**)
- Monitor impact of the Sabaki Estuary use (**monitoring team and stakeholders**)
- Monitor the implementation of plan programmed (**monitoring team and stakeholders**)

#### 9.1.4 Institutional Arrangements

The systematic implementation of the management plan requires appropriate institutional structures that are integrated into existing institutions. The successful implementation of the management plan necessitates the use of appropriate and integrated institutional and organizational structures that exist in the relevant institutions. Field organization for the implementation of this plan at the ecosystem level was set to be inclusive

and consultative. The implementation of this estuarine management plan by stakeholders will be guided by this management plan. There will be need to undertake a prior strategic assessment of the management plan implementation matrix and institution involved in its implementation.

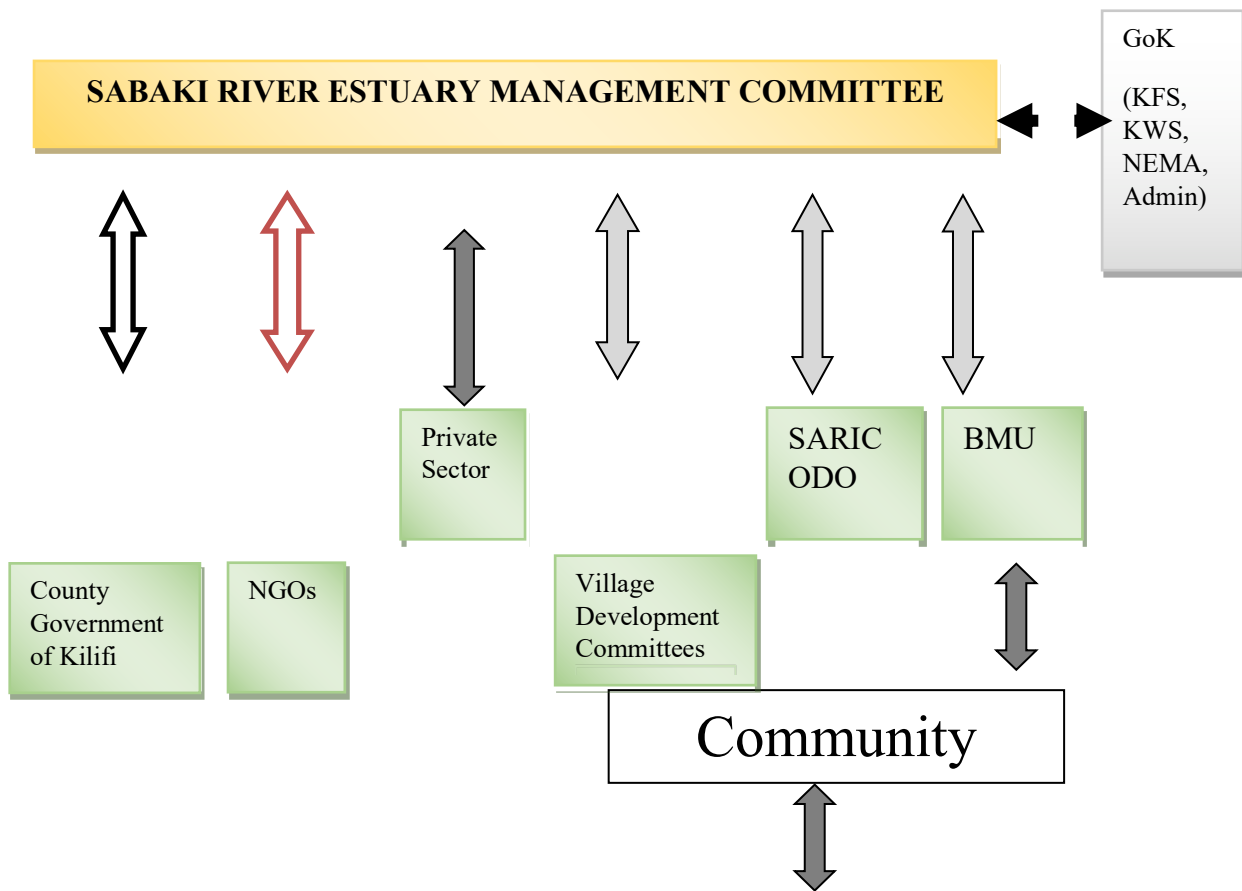


Figure 9.1 Management Plan Implementation Organogram

## 9.2 Guiding Principles for Implementation of the Plan

The management of the estuary shall be guided by the following principles:

**National heritage** - The estuary should be retained as a heritage, with public rights to access and benefit from its associated resources. Private ownership of the estuary should thus be avoided.

**User Pays Principle** – Prices charged for access to or use of resources should reflect all short term and long-term economic, environmental and social costs associated with the use of those resources.

**Social Equity** – management efforts should ensure that all people, including future generations are treated with dignity, fairness, justice and accountability.

**Holism** – the estuary should be treated as an indivisible system, recognizing the interrelationships between estuary users and ecosystems and between land and the sea.

**Risk-aversion and Precaution** – management efforts should adopt a risk-aversion and precautionary approach under conditions of uncertainty.

**Duty of Care** – the management of the estuary is a shared responsibility. All people should be responsible for the consequences of their actions, and have the duty to act with care to avoid damage to others and their environment.

**Voluntary and Negotiated Compliance** – estuary users should be willing to abide by the mutually agreed rules and regulations.

## **9.3 Plan Implementation and Development**

### **9.3.1 Financial Management**

Financial management will involve strict regulation of recurrent and development budgets. Expenditure will be strictly within budget and prescribed activities. Revenue collection will be strictly in accordance with the CCA regulations. Budget reviews will be done annually in order to prioritize the operations in accordance with the available funds, taking into account the inflation rates at the time of review. It is hoped that a policy on retaining part of the revenues generated will be followed. This policy will enable the CCA to plough back some of the revenues it generates to support conservation efforts within the Sabaki Estuary area.

Resources required for capital development may not be sufficiently met by the CCA Management, thus financial support would be sought from other sources. A fund-raising strategy will be developed as early as possible during the plan period.

Annual recurrent budgets will be prepared to cover the routine of management and administrative activities. It is expected that the partners will to a great extent provide the recurrent budgets to cater for their own running costs and for joint activities with communities and other stakeholders. Budgetary allocations will need to be increased substantially to accomplish the recommended activities during the plan period.

The CCA Management is encouraged to source for funding to undertake livelihood improvement activities. Members of the CCA such as self-help, women or youth groups can write proposals to establish the nature-based income generating activities identified in this plan. NGOs and development partners are identified as a source of fundraising in terms of capacity building and funding specific community activities

### **9.3.2 Environmental Impact Assessment**

A holistic approach will be adopted in planning of conservation and development activities within the estuary. Environmental Impact Assessments (EIA) will be carried out on all planned development activities before they are undertaken. Essentially, EIA is designed to ensure that negative impacts are recognized and mitigation measures included in the plan. Several activities that require environmental impact assessment before being undertaken have been identified and described in Second Schedule (Section 56 (1), (4)) of EMCA No.6 of 2012. These are:

- Establishment and expansion of recreational areas
- Road construction
- Change of land use
- Reforestation and afforestation activities
- Commercial exploitation of fauna and flora in indigenous forests and other conservation areas
- The establishment of wilderness areas.

At the very outset, it is recognized that the following planned activities may cause negative impacts, and they need to be taken into account:

- Vegetation degeneration or inhibition resulting from development activities

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## APPENDICES

### Birds of Sabaki Estuary Checklist (Jackson, 2009)

Common Name	Scientific Name	Notes
Great White Pelican	<i>Pelecanus onocrotalus</i>	
Pink-backed Pelican	<i>P. rufescens</i>	
Red-footed Booby	<i>Sula sula</i>	Single bird, 1998
Long-tailed Cormorant	<i>Phalacrocorax africanus</i>	One on 25 <sup>th</sup> Feb. 2005
Lesser Frigatebird	<i>Fregata ariel</i>	Two on 21 <sup>st</sup> Dec (yet to be accepted by EARC)
Cattle Egret	<i>Bubulcus ibis</i>	
Little Egret	<i>Egretta garzetta</i>	
Dimorphic Egret	<i>E. dimorpha</i>	
Black Heron	<i>E. ardesiaca</i>	
Common Squacco Heron	<i>Ardeola ralloides</i>	
Madagascar Squacco Heron	<i>A. idae</i>	
Green-backed Heron	<i>Butorides striata</i>	
Great Egret	<i>Casmerodius alba</i>	
Grey Heron	<i>Ardea cinerea</i>	
Black-headed Heron	<i>A. melanocephala</i>	
Woolly-necked Stork	<i>Ciconia episcopus</i>	One on 15 <sup>th</sup> Apr.2004
African Open-billed Stork	<i>Anastomus lamelligerus</i>	
Yellow-billed Stork	<i>Mycteria ibis</i>	
Sacred Ibis	<i>Threskiornis aethiopicus</i>	
Glossy Ibis	<i>Plegadis falcinellus</i>	
African Spoonbill	<i>Platalea alba</i>	
Greater Flamingo	<i>Phoenicopterus ruber</i>	
Lesser Flamingo	<i>Phoeniconaias minor</i>	
White-faced Whistling Duck	<i>Dendrocygna viduata</i>	27 on 14 <sup>th</sup> April 04 – 2 on 12 June 04
Spur-winged Goose	<i>Plectropterus gambensis</i>	One on 15 <sup>th</sup> Apr.2004
Egyptian Goose	<i>Alopochen aegyptiaca</i>	
Knob-billed Duck	<i>Sarkidiornis melanotos</i>	
Red-billed Teal	<i>Anas erythrorhyncha</i>	10 on 15 <sup>th</sup> April 04
Osprey	<i>Pandion haliaetus</i>	1 in April 2004
Black-shouldered Kite	<i>Elanus caeruleus</i>	
Black Kite	<i>Milvus migrans</i>	

Black-chested Snake Eagle	<i>Circaetus pectoralis</i>	One on 24 <sup>th</sup> Feb & 14 <sup>th</sup> Mar
Brown Snake Eagle	<i>C. cinereus</i>	
Pallid Harrier	<i>Circus macrourus</i>	
Montagu's Harrier	<i>C. pygargus</i>	One on 8 <sup>th</sup> Jan 05
Eurasian Marsh Harrier	<i>C. aeruginosus</i>	
African Goshawk	<i>Accipiter tachiro</i>	
Great Sparrowhawk	<i>A. melanoleucus</i>	
Lizard Buzzard	<i>Kaupifalco monogrammicus</i>	
African Fish Eagle	<i>Haliaeetus vocifer</i>	
Palm-nut Vulture	<i>Gypohierax angolensis</i>	One on 12 <sup>th</sup> November 04 over Kibokoni
Booted Eagle	<i>Hieraaetus pennatus</i>	One mobbing Black-chested Snake Eagle, Jan 07
Ayres' Hawk-Eagle	<i>Hieraaetus ayresii</i>	One on 19 <sup>th</sup> June 04
Long-crested Eagle	<i>Lophaetus occipitalis</i>	One on 15 <sup>th</sup> Sep 04
Martial Eagle	<i>Polemaetus bellicosus</i>	One on 19 <sup>th</sup> June 04
Saker Falcon	<i>Falco cherrug</i>	Jan-99
Peregrine Falcon	<i>F. peregrinus</i>	
Red-necked Falcon	<i>F. chicquera</i>	
Crested Francolin	<i>Francolinus sephaena</i>	
Black Crake	<i>Amauornis flavirostris</i>	
African Jacana	<i>Actophilornis africanus</i>	
Greater Painted-Snipe	<i>Rostratula benghalensis</i>	
Crab-plover	<i>Dromas ardeola</i>	Two in October and November 04
Eurasian Oystercatcher	<i>Haematopus ostralegus</i>	Uncommon but when present are normally found on the beach near the river mouth
Pied Avocet	<i>Recurvirostra avosetta</i>	
Black-winged Stilt	<i>Himantopus himantopus</i>	
Water Thick-knee	<i>Burhinus vermiculatus</i>	
Collared Pratincole	<i>Glareola pratincola</i>	
Madagascar Pratincole	<i>G. ocularis</i>	
Ringed Plover	<i>Charadrius hiaticula</i>	
Kittlitz's Plover	<i>C. pecuarius</i>	
Three-banded Plover	<i>C. tricollaris</i>	
White-fronted Plover	<i>C. marginatus</i>	
Lesser Sandplover	<i>C. mongolus</i>	

Greater Sandplover	<i>C. leschenaultii</i>	
Caspian Plover	<i>C. asiaticus</i>	Probably 1 or 2 most years - one on 26 <sup>th</sup> Sept '04
Pacific Golden Plover	<i>Pluvialis fulva</i>	Regular most years
Grey Plover	<i>P. squatarola</i>	
Northern Lapwing	<i>Vanellus vanellus</i>	First record for EA on 7-2-95; present for c.1 year
Spur-winged Plover	<i>V. spinosus</i>	
Black-headed Plover	<i>V. tectus</i>	
Senegal Plover	<i>V. lugubris</i>	Three on 12 <sup>th</sup> June 04
Little Stint	<i>Calidris minuta</i>	
Long-toed Stint	<i>C. subminuta</i>	Vagrant
Curlew Sandpiper	<i>C. ferruginea</i>	
Sanderling	<i>C. alba</i>	
Broad-billed Sandpiper	<i>Limicola falcinellus</i>	
Ruff	<i>Philomachus pugnax</i>	One on 17 <sup>th</sup> Apr & 23 <sup>rd</sup> Oct 04
Bar-tailed Godwit	<i>Limosa lapponica</i>	
Whimbrel	<i>Numenius phaeopus</i>	
Eurasian Curlew	<i>N. arquata</i>	
Marsh Sandpiper	<i>Tringa stagnatilis</i>	
Common Greenshank	<i>T. nebularia</i>	
Green Sandpiper	<i>T. ochropus</i>	One on 26 <sup>th</sup> Sep 04
Wood Sandpiper	<i>T. glareola</i>	
Common Sandpiper	<i>Actitis hypoleucos</i>	
Terek Sandpiper	<i>Xenus cinereus</i>	
Ruddy Turnstone	<i>Arenaria interpres</i>	
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Single bird, Jan 2009
Arctic Skua	<i>Stercorarius parasiticus</i>	One accepted record 7-2-95
Sooty Gull	<i>Larus hemprichii</i>	
Heuglin's Gull	<i>L. heuglini</i>	
Lesser Black-backed Gull	<i>L. fuscus</i>	At least three birds with Finnish colour-rings have been sighted at Sabaki.
Grey-headed Gull	<i>L. cirrocephalus</i>	
Black-headed Gull	<i>L. ridibundus</i>	
Gull-billed Tern	<i>Sterna nilotica</i>	
Caspian Tern	<i>S. caspia</i>	

Greater Crested Tern	<i>S. bergii</i>	
Lesser Crested Tern	<i>S. bengalensis</i>	
Roseate Tern	<i>S. dougallii</i>	
Common Tern	<i>S. hirundo</i>	
White-cheeked Tern	<i>S. repressa</i>	
Saunders' Tern	<i>S. saundersi</i>	Night-time roosts of 30,000-40,000
White-winged Black Tern	<i>Chlidonias leucopterus</i>	
Brown Noddy	<i>Anous stolidus</i>	
African Skimmer	<i>Rynchops flavirostris</i>	
African Green Pigeon	<i>Treron calvus</i>	
Emerald-spotted Wood-Dove	<i>Turtur chalcospilos</i>	
Namaqua Dove	<i>Oena capensis</i>	
Red-eyed Dove	<i>Streptopelia semitorquata</i>	
Ring-necked Dove	<i>S. capicola</i>	
Laughing Dove	<i>S. senegalensis</i>	
Levaillant's Cuckoo	<i>Clamator levaillantii</i>	
Diederik Cuckoo	<i>Chrysococcyx caprius</i>	
Yellowbill	<i>Ceuthmochares aereus</i>	
White-browed Coucal	<i>Centropus superciliosus</i>	
Barn Owl	<i>Tyto alba</i>	
Verreaux's Eagle-Owl	<i>Bubo lacteus</i>	
Slender-tailed Nightjar	<i>Caprimulgus clarus</i>	
African Palm Swift	<i>Cypsiurus parvus</i>	
Little Swift	<i>Apus affinis</i>	
Speckled Mousebird	<i>Colius striatus</i>	
Blue-naped Mousebird	<i>Urocolius macrourus</i>	
Narina Trogon	<i>Apaloderma narina</i>	
Grey-headed Kingfisher	<i>Halcyon leucocephala</i>	
Mangrove Kingfisher	<i>H. senegaloides</i>	
Malachite Kingfisher	<i>Alcedo cristata</i>	
Pied Kingfisher	<i>Ceryle rudis</i>	
Eurasian Bee-eater	<i>Merops apiaster</i>	
Carmine Bee-eater	<i>M. nubicus</i>	
White-throated Bee-eater	<i>M. albicollis</i>	
Lilac-breasted Roller	<i>Coracias caudatus</i>	

Red-fronted Tinkerbird	<i>Pogoniulus pusillus</i>	
Sand Martin	<i>Riparia riparia</i>	
Wire-tailed Swallow	<i>Hirundo smithii</i>	
Barn Swallow	<i>H. rustica</i>	
Ethiopian Swallow	<i>H. aethiopica</i>	
Lesser Striped Swallow	<i>H. abyssinica</i>	
Yellow Wagtail	<i>Motacilla flava</i>	
Golden Pipit	<i>Tmetothylacus tenellus</i>	
Grassland Pipit	<i>Anthus cinnamomeus</i>	
Red-throated Pipit	<i>A. cervinus</i>	
Pangani Longclaw	<i>Macronyx aurantiigula</i>	2 on 6 <sup>th</sup> of June 04
Zanzibar Sombre Greenbul	<i>Andropadus importunus</i>	
Northern Brownbul	<i>Phyllastrephus strepitans</i>	
Common Bulbul	<i>Pycnonotus barbatus</i>	
Scaly Babbler	<i>Turdoides squamulatus</i>	
Rufous Chatterer	<i>T. rubiginosus</i>	
Red-capped Robin-Chat	<i>Cossypha natalensis</i>	
White-browed Robin-Chat	<i>C. heuglini</i>	
Spotted Morning Thrush	<i>Cichladusa guttata</i>	
Rufous Bush Chat	<i>Cercotrichas galactotes</i>	
Northern Wheatear	<i>Oenanthe oenanthe</i>	
Isabelline Wheatear	<i>O. isabellina</i>	
Common Rock Thrush	<i>Monticola saxatilis</i>	
Bare-eyed Thrush	<i>Turdus tephronotus</i>	
Spotted Flycatcher	<i>Muscicapa striata</i>	One on 10 <sup>th</sup> May 04
Pale Flycatcher	<i>Bradornis pallidus</i>	One in September and November 04
African Reed Warbler	<i>Acrocephalus baeticatus</i>	One on 23 <sup>rd</sup> Oct 04
Willow Warbler	<i>Phylloscopus trochilus</i>	One on 16 <sup>th</sup> April 04
Winding Cisticola	<i>Cisticola galactotes</i>	
Tawny-flanked Prinia	<i>Prinia subflava</i>	
Grey-backed Camaroptera	<i>Camaroptera brachyura</i>	
Abyssinian White-eye	<i>Zosterops abyssinicus</i>	One on 1 <sup>st</sup> Jan 05
African Paradise Flycatcher	<i>Terpsiphone viridis</i>	
Black-headed Batis	<i>Batis minor</i>	
Red-backed Shrike	<i>Lanius collurio</i>	One on 6 <sup>th</sup> Apr 04
Lesser Grey Shrike	<i>L. minor</i>	One on 14 <sup>th</sup> Apr 04

Long-tailed Fiscal	<i>L. cabanisi</i>	
Black-crowned Tchagra	<i>Tchagra senegala</i>	
Tropical Boubou	<i>Laniarius aethiopicus</i>	
Black-backed Puffback	<i>Dryoscopus cubla</i>	
Eurasian Golden Oriole	<i>Oriolus oriolus</i>	
House Crow	<i>Corvus splendens</i>	
Pied Crow	<i>C. albus</i>	
Black-bellied Starling	<i>Lamprotornis corruscus</i>	110 on 12 <sup>th</sup> June 04
Rüppell's Long-tailed Starling	<i>L. purpuropterus</i>	
Superb Starling	<i>L. superbus</i>	Up to six in December 04 – January 05
Violet-backed Starling	<i>Cinnyricinclus leucogaster</i>	Six on 12 <sup>th</sup> June 04
Magpie Starling	<i>Speculipastor bicolor</i>	
Collared Sunbird	<i>Hedydipna collaris</i>	
Olive Sunbird	<i>Cyanomitra olivacea</i>	
Amethyst Sunbird	<i>Chalcomitra amethystina</i>	One on 6 <sup>th</sup> June 04
Purple-banded Sunbird	<i>Cinnyris bifasciata</i>	
Violet-breasted Sunbird	<i>C. chalomelas</i>	Rare
House Sparrow	<i>Passer domesticus</i>	Six on 9 <sup>th</sup> Jan 05
Red-billed Buffalo-Weaver	<i>Bubalornis niger</i>	Nine on 29 <sup>th</sup> May 04
Grosbeak Weaver	<i>Amblyospiza albifrons</i>	
Spectacled Weaver	<i>P. ocularis</i>	
African Golden Weaver	<i>P. subaureus</i>	Six in June
Golden Palm Weaver	<i>P. bojeri</i>	
Lesser Masked Weaver	<i>P. intermedius</i>	
Black-headed Weaver	<i>P. cucullatus</i>	
Red-billed Quelea	<i>Quelea quelea</i>	
Fire-fronted Bishop	<i>Euplectes diadematus</i>	
Zanzibar Red Bishop	<i>E. nigroventris</i>	
Parasitic Weaver	<i>Anomalospiza imberbis</i>	
Red-billed Firefinch	<i>Lagonosticta senegala</i>	
Common Waxbill	<i>Estrilda astrild</i>	
Red-cheeked Cordon-bleu	<i>Uraeginthus bengalus</i>	
Bronze Mannikin	<i>Lonchura cucullata</i>	
Cut-throat Finch	<i>Amadina fasciata</i>	One on 30 <sup>th</sup> Dec 04
Village Indigobird	<i>Vidua chalybeata</i>	

Pin-tailed Whydah	<i>V. macroura</i>	
Yellow-fronted Canary	<i>Serinus mozambicus</i>	
Grey-headed Sparrow	<i>Passer griseus</i> <i>gongonensis</i>	