ONDIRI WETLAND MANAGEMENT PLAN 2022-2027

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PREFACE

Ondiri wetland is Kenya's largest peat bog that forms the headwaters of Nairobi River within the Athi drainage basin. It plays a significant role as sources of domestic, agricultural and industrial water not only for Kiambu County but also the city of Nairobi. Ondiri wetland is well known for its very rich and diverse biodiversity that include birds' species e.g. Grey crowned cranes that are endangered and Marabou storks that are rare visitors to the wetland. It also supports both aquatic and semi-aquatic plants that include indigenous and exotic trees as well as grasses such as *Leersia hexandra, Eragrostis exasperate* and *Eriochloa meyerana*. These plants grow on accumulated semi decomposed organic matter that forms a thick layer of peat (approximately 0.5 m thick) on top of the water creating a quaking bog, the largest one in the country.

Like many wetlands around the country and world, Ondiri wetland has been heavily exploited as a water source, invaded by planted eucalyptus tree species, and treated as a convenient dumping ground for solid waste, industrial effluent, sewage and agricultural runoff. This has highly threatened the wetland ecosystem that provides habitat to very important biodiversity and support to the economic livelihood of the local community. Further, unsustainable agricultural practices and uncoordinated conservation activities in the wetland ecosystem has also led to over-lap and ineffective conservation efforts.

In order to ensure Ondiri wetland is sustainably conserved for its rich and diverse biodiversity and productivity there is an urgent need to conserve it through a well-focused management plan. In this regard, CGK, NEMA, Local community representatives, wetlands experts, UON, NGOs, CBOs and other stakeholders have developed Ondiri wetland management plan that will ensure Ondiri wetland is sustainably conserved and managed for its ecological, social and economic importance. To achieve this, political good will and stakeholders support and commitment in the implementation of the management plan are paramount in order to achieve the mission and objectives of the management plan.

To this end, the County Government of Kiambu fully supports the management plan and highly encourages all stakeholders including the national government, NGOs, private sector, researchers, experts, CBO and the local communities to support its implementation as it will provide a means to ensuring ecological integrity of the wetland.

Finally, I would like to thank CGK, NEMA, experts, the local community and all other stakeholders who provided technical and financial support in the development of this Management plan.

His Excellency James K. Nyoro
Governor, Kiambu County

FOREWORD

Wetlands are important ecosystems as they provide water, moderate climate by acting as a carbon sink and release in some cases, support certain food chains and habitat for wildlife. They also provide goods such as wetland clay for brick making, sedges and reeds for basketry, medicinal herbs and vegetables. Further, they also provide water for agriculture, food production for human and livestock and play a critical role in tourism.

Ondiri wetland contributes significantly to ground water recharge and hydrological systems within its surrounding. It is rich in biodiversity with a number of bird's species both resident and migrant, macro invertebrates as well as mammals some of which are endangered. Ondiri wetland, located in Kikuyu town provide great opportunities for tourism activities given its proximity to Nairobi City.

Wetland encroachment for agriculture, excessive water abstraction and other related governance challenges are among the threats faced by Ondiri wetland. This wetland management plan seeks to address and to provide a platform for management of such challenges and address the threat to its degradation.

The National and County Governments have responsibility in protecting and developing the natural resources as provided for in the National and County policies and legislations. County Government Act, 2012, provides for protection and development of natural resources within their jurisdictions. Kiambu County Government has proposed the enactment of legislations for the management of natural resources including wetlands largely for their protection, preservation and restoration.

Finally, I would like to acknowledge the contributions of various stakeholders from both the County and the National governments levels, the non-state actors and the communities. Special acknowledgement goes to the Ministry of Environment and Forestry, Post Covid Economic Stimulus Programme for providing financial and technical support towards the development of this plan.

Dr. Lul Abdiwahid
Ag. Chair, NEMA Board of Management

ACKNOWLEDGEMENT

The National Environment Management Authority wishes to acknowledge the financial support from the Ministry of Environment and Forestry, under the Post-Covid Economic Stimulus programme, which facilitated drafting and finalization of this integrated management plan.

I also wish to acknowledge the significant role played by various stakeholders including national government institutions, the County Government of Kiambu, NGOs, Private sector, Research scientists including Mr. Laban Njoroge (NMK), and local communities who participated during the development of this Plan under the leadership and guidance of NEMA officers.

I further pass my appreciations to the following members of the Technical Working Group who gave technical inputs in the plan preparation process.

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1. Dr. Thuita Thenya	University of Nairobi
2. Dr. Mary Gathara	Kenya Forestry Research Institute
3. Mr. Wakangu Kiarie	County Government of Kiambu
4. Mr. Gilbert Kosgei	National Museums of Kenya
5. Mr. Simon Gatuhi	National Environment Complains Committee
6. Mr. Dennis Wafula	Kenya Water Towers Agency
7. Mr. Peter Njeru	Nature Kenya
8. Mr. David Wakogy	Friends of Ondiri Wetland Kenya
9. Mr. Stephen Katua	National Environment Management Authority
10. Mr. Dan Ashitiva	National Environment Management Authority
11. Ms. Caroline Muriuki	National Environment Management Authority
12. Mr. Stephen W.Kitunga	National Environment Management Authority
13. Mr. Wilson Busienei	National Environment Management Authority
14. Mr. Mwangi Wainaina	University Of Nairobi

Their effective coordination, hard work and dedication demonstrated throughout the planning process is well noted.

Mamo B. Mamo, EBS
Director General

EXECUTIVE SUMMARY

Ondiri wetland is located 200m South of Kikuyu town in Kikuyu Sub-County in Kiambu County surrounded by 6 administrative locations namely: Kikuyu, Muguga, Sigona, Karai, Kinoo and Kabete, The size of the wetland is 34.5 ha with a perimeter of 3.3km making it Kenya's largest peat bog. The wetland forms the headwaters of Nairobi River and is part of the Lari-Ondiri fault drainage system recharging the Kikuyu springs through a subterranean passage.

The wetland supports an estimated population of 94 species of resident and migratory birds such as Cattle Egret, Sacred Ibis, Hadada Ibis, King fisher's, Hammer kop, Jackson's widow, Grey crown cranes (endangered) and African marsh harrier as well as approximately 68 plant species and 26 species of macro invertebrates. It provides a range of critical ecosystem services and products that are indispensable to human survival, health and welfare.

The area around the wetland has a fast growing population as a result of urban influence of nearby Kikuyu town that is characterized by high in-migration thus pausing numerous threats and challenges to the wetland. This necessitated development of this management plan through numerous multi-stakeholder consultative processes.

The plan is anchored on a number of international, regional and national legal frameworks such as the Ramsar Convention on wetlands, the Constitution among others. It identifies unregulated water abstraction, pollution and uncoordinated stakeholder efforts as some of the issues and threats facing the wetland causing loss of biodiversity and habitat degradation.

To address the challenges, the plan has proposed management programmes as outlined below:

1. Water management
2. Governance and coordination management
3. Biodiversity management
4. Socio-Economic and cultural management
5. Climate change management
6. Land-use management

Each of the programmes has operational objectives and activities that will be implemented to address the challenges impacting on the ecological integrity of the wetland. A monitoring and evaluation framework has also been put in place to assess the implementation progress during the 5 year period.

LIST OF ACRONYMS

AEWA	African Eurasian Water bird Agreement
AM	Afrotropical Migrant
CBOs	Community Based Organizations
CEC	County Environment Committee
CFAs	Community Forest Associations
CFAs	Community Forest Associations
CGK	County Government of Kiambu
CIDP	County Integrated Development Programme
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CR	Critically Endangered
DG	Director General
EAWS	East Africa Wildlife Society
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EN	Endangered
ESIA	Environmental and Social Impact Assessment
FAO	Food and Agricultural Organization
FBOs	Faith Based Organizations
FOWK	Friends of Ondiri Wetland Kenya
GIS	Geographical Information Systems
GOK	Government of Kenya
IGPs	Income Generating Groups
IK	Indigenous Knowledge
KALRO	Kenya Agriculture and Livestock Research Organization
KEFRI	Kenya Forestry Research Institute
KFA	Kenya Farmers Association
KFS	Kenya Forest Service
KMD	Kenya Meteorological Department
KWS	Kenya Wildlife Service
KWTA	Kenya Water Towers Agency
LCLU	Land Cover and Land Use
M&E	Monitoring and Evaluation
MEAs	Multilateral Environmental Agreements
MoALF&BE	Ministry of Agriculture, Livestock, Fisheries and Blue Economy
MoALF&C	Ministry of Agriculture, Livestock, Fisheries and Cooperatives
MoLPP	Ministry of Lands and Physical Planning

NCCRS	National Climate Change Response Strategy
NECC	National Environment Complaints Committee
NEMA	National Environment Management Authority
NGAO	National Government Administration Officer
NGOs	Non-Governmental Organizations
NLC	National Land Commission
NMK	National Museums of Kenya
ONKARU	Ondiri, Nyongara, Kabuthi, and Rungiri
PFM	Participatory Forest Management
PFMP	Participatory Forest Management Plan
PM	Palearctic Migrant
RLOA	Riparian Land Owners Association
SDO	Social Development Officer
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WI	Wetland International
WRA	Water Resources Authority
WRUA	Water Resource Users Association
WRUAs	Water Resource Users Associations
WWF	World Wildlife Fund for Nature

CHAPTER 1:

INTRODUCTION/BACKGROUND INFORMATION

1.1 Location and size of Ondiri wetland

Ondiri wetland is located 200m South of Kikuyu town in Kikuyu ward, Kikuyu Sub-County in Kiambu County and 20km West of Nairobi City. The wetland ecosystem is surrounded by 6 administrative locations namely: Kikuyu, Muguga, Sigona, Karai, Kinoo and Kabete, (Figure 1). It lies at longitude 36.657186 and latitude -1.248375. Ondiri wetland lies at an altitude of 2000m above sea level. The size of the wetland is 34.5 ha with a perimeter of 3.3km and estimated depth of 2 to 3 meters. This makes it Kenya's largest peat bog (Macharia. *et al,* 2010).

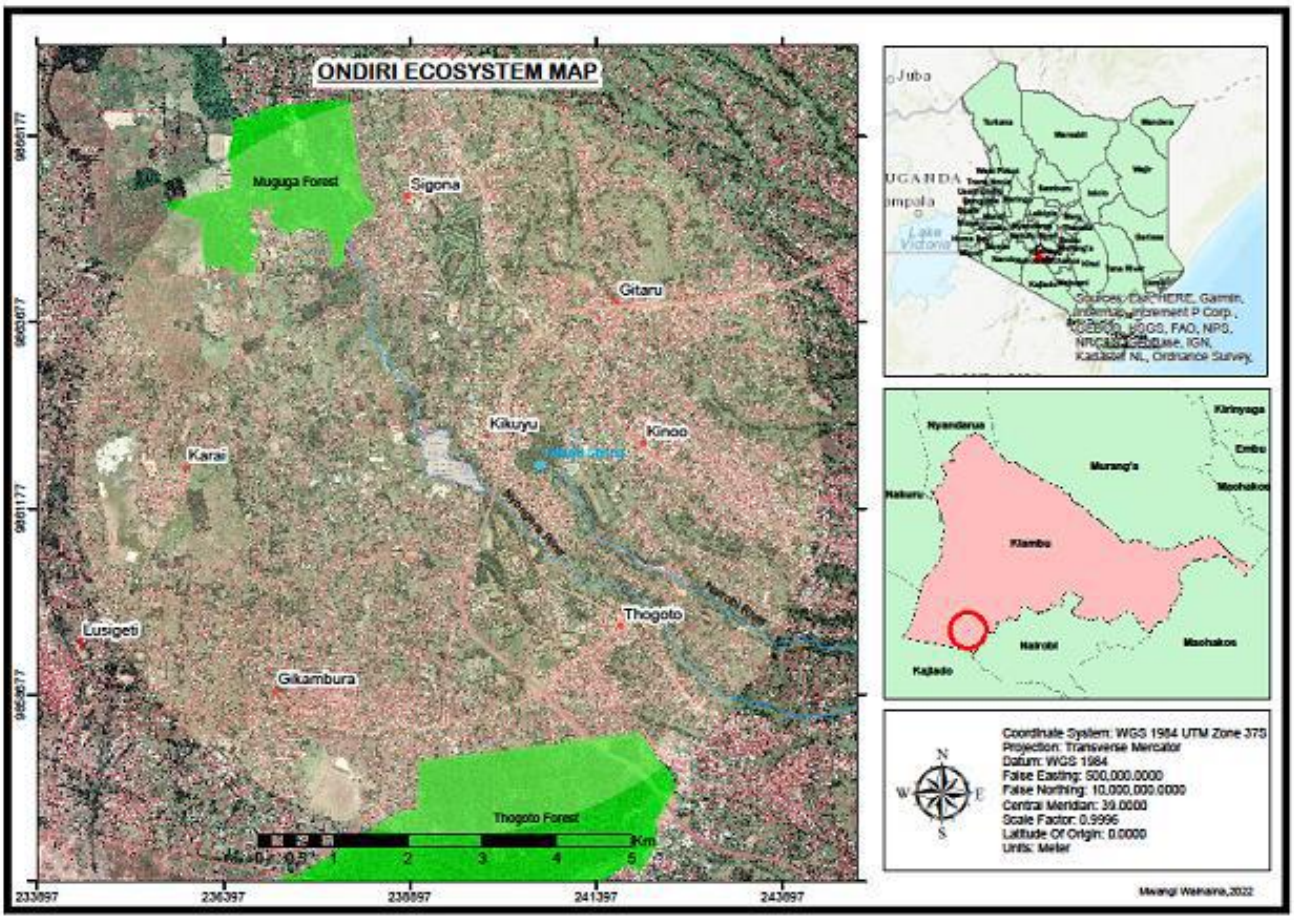


Figure 1: The Geographical location of Ondiri Swamp

Nyongara River has its direct source from Ondiri wetland and forms the main tributary of Nairobi River and joins other minor streams within Kikuyu escarpment. The wetland recharges the Kikuyu springs through a subterranean passage. The springs is the oldest source of piped water for the city of Nairobi.

1.2 Demography

The area around the swamp has a fast growing population as a result of urban influence of nearby Kikuyu town that is characterized by high in-migration. The population density in Kikuyu location stands at 1,186 persons/km2 while in Karai Location, which borders the swamp to the South, at 1,068 persons/km2, (Kenya National Bureau of Statistics, 2019)(Figure 2).

Although the surrounding area is cosmopolitan, it is dominated by Kikuyu ethnic groups. The swamp has attracted various user groups, which include Friends of Ondiri Wetland Kenya (FOWK) and Water resource user association (WRUA) who help in conservation and management of the swamp. Other groups are farmers who abstract water for irrigation; Institutions like schools that abstract water for domestic use among others.

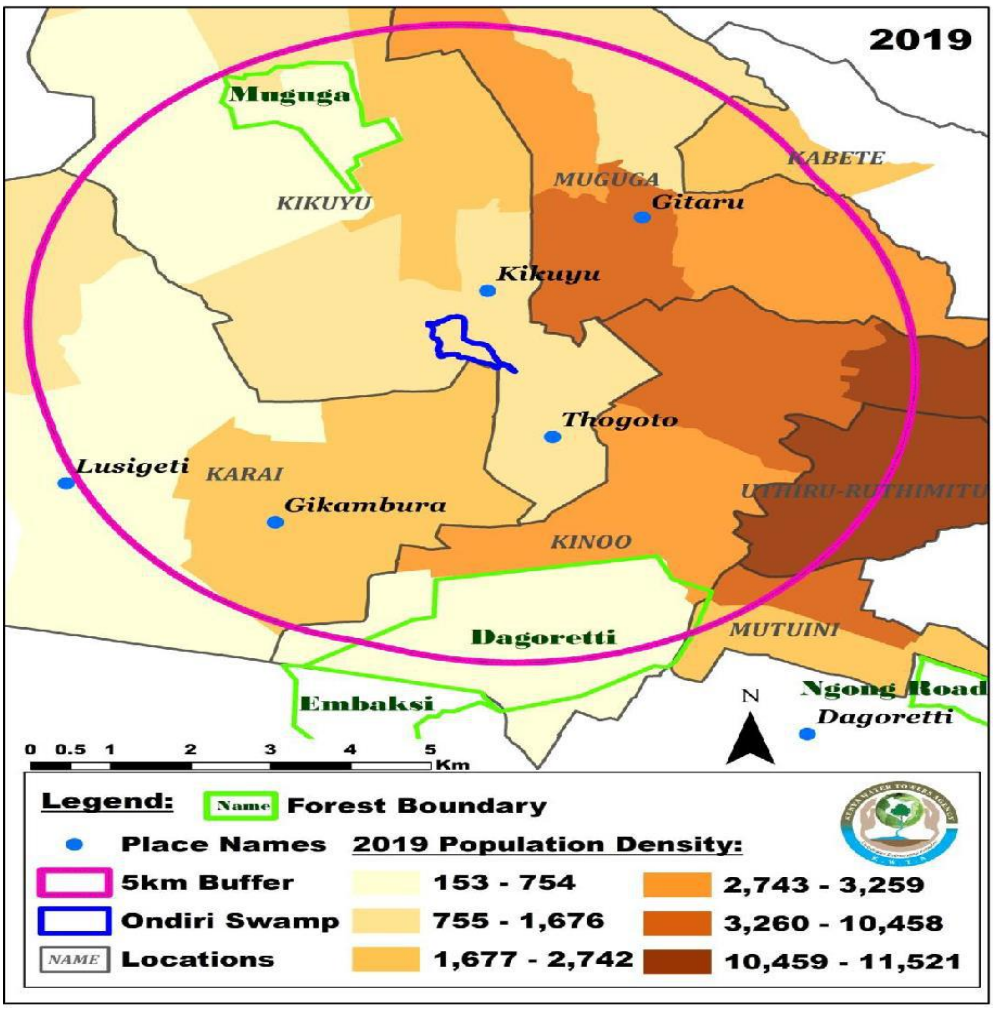


Figure 2: Population density around Ondiri Swamp as at 2019

1.3 Physical Characteristics

1.3.1 Climate

Ondiri wetland and surrounding areas experience bi-modal type of rainfall. The long rains fall between Mid-March to May followed by a cold season usually with drizzles and frost from June to August. Short rains occur between mid-October to November. The average annual rainfall is 1500 mm. The mean annual temperature is 26^{0}C, which ranges between 20.4^{0}C in the upper highlands to 34^{0}C in the midlands of Karai in Kikuyu Sub-County. Low temperatures are experienced in July and August while January and February are the hottest months, (Macharia *et al*., 2010; CGK, 2018).

1.3.2 Topography

Ondiri wetland is located at the foot of Kikuyu escarpment surrounded by hilly landscape at an altitude of 2000m above sea level. Kikuyu town lies on the raised northern side of the swamp. The area around Ondiri slopes gently eastwards from 2000 m ASL to around 1600m above sea level in Nairobi city (Figure 3).

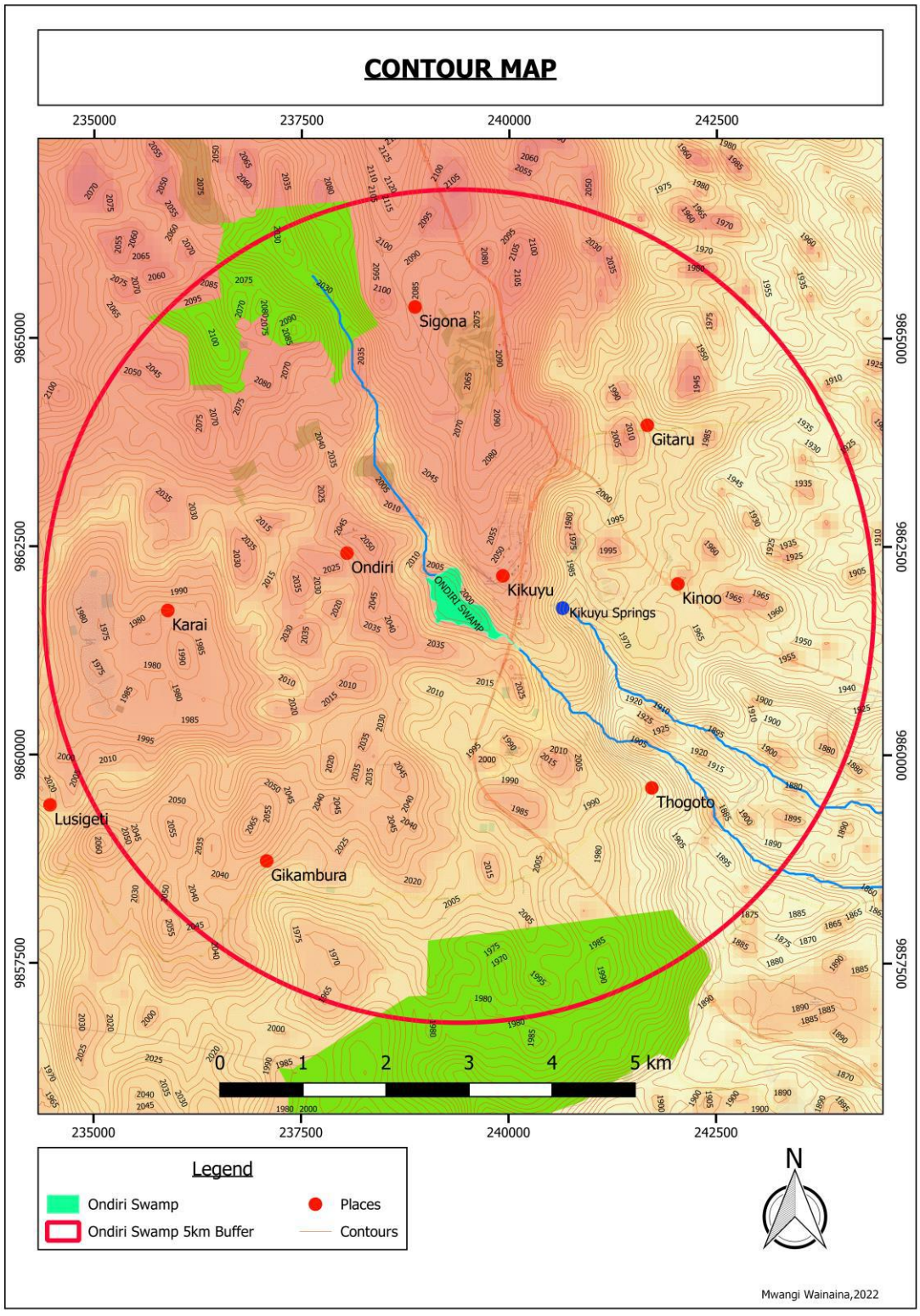


Figure 3: A contour Map showing topography of Ondiri Wetland and surrounding area

1.3.3 Geology and Soils

Geology determines the soil types developed and soil texture consequently impacting on the recharge rate. The geology of the area comprises faulted north – south oriented late quaternary lava flows and pyroclastic of trachytic composition, which were extruded during the formation of the Kenyan Rift Valley. The area around Ondiri is composed of the youngest of the trachyte sequence, the Limuru trachytes have been dated at 1.72-1.55+/- 0.09 Ma (Barker *et al.,* 1971). The geology of the area is part of the Eastern Border Zone of the Rift Valley, filled with kainozonic volcanic and sediments underlying the upper Athi generating good aquifers.

The soils consist of well –drained podsols and andesols soils (GoK, 2002). The soils are developed on undifferentiated tertiary volcanic and basic igneous rocks. The soils are extremely deep, grey/red in color to dark brown friable clays. In some places they are imperfectly drained and are characterized by dark to black soils especially in valley bottoms. Soil nutrients in the area are of moderate fertility support growing of a wide range of crops such as cabbages, tomatoes, spinach, kales and carrots (Kinyanjui, 2003).

1.3.4 Hydrology

The Ondiri wetland is part of the Lari-Ondiri fault drainage system. The wetland forms the headwaters of Nairobi River that drains into Athi River and finally flows into the Indian Ocean, (Onkaru WRUA, 2013). Kikuyu Springs lies to the East of Ondiri Swamp, and both are connected through a subterranean passage. The swamp is recharged by three small streams in the northern side originating from Muguga Forest block. It also receives water from rainfall, several springs located at the edges of the swamp and run-off from the adjacent areas (Gichuki *et al*., 1998) and is believed to have underground source, the reason why it's perennial.

The main direction of outflow from the swamp is to the South- East by river Nyongara and thereafter several streams join Nyongara river; the main tributary of the Nairobi River, (Figure. 3). This river passes through highly populated areas such as Thogoto, Dagoretti market, Uthiru and Kawangware, before draining into the Nairobi River at Waithaka. These areas are inhabited by low-income people and if the wetland is well conserved, they will greatly benefit from steady supply of water. Ondiri wetland is also the source of three

underground streams namely: Mbagathi, Kabuthi and Rungiri. The water passes underground through Thogoto forest and resurfaces at Karinde near Karen Estate where it is referred as Mbagathi River (Miriti, 2014).

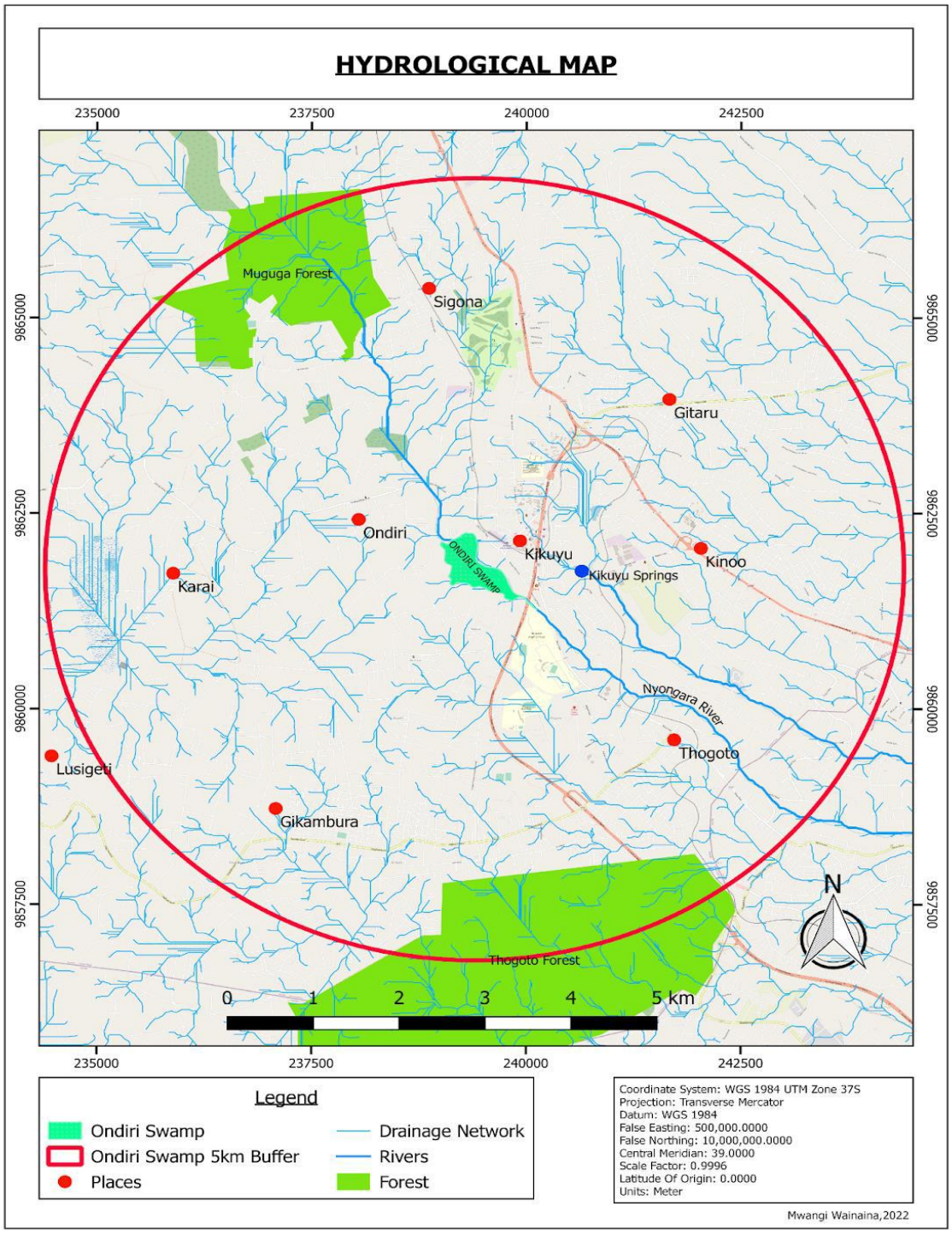


Figure 4: Hydrological Map of Ondiri Wetland

1.4 Biodiversity

1.4.1 Flora

A total of 68 plant species (aquatic and semi-aquatic) have been recorded in the swamp. The common species include *Typha domingensis, Vossia cuspidate, Cyperus brevifolius*, and grasses such as *Leersia hexandra, Eragrostis exasperate* and *Eriochloa meyerana*. These plants grow on accumulated semi decomposed organic matter that forms a thick layer of peat (approximately 0.5 m thick) on top of the water.

The swamp catchment is covered by open trees (40-65% cover) with few species of indigenous trees. These include *Warburgia ugandensis*, *Prunus africana*, *Podocarpus milanjianus*, *Acacia melanoxylon, Acacia mearnsii, Ocotea usambarensis, Croton megalocarpus, Brachylaena huillensis, Calodendrum capense, Teclea nobilis, Strychnos henningsii* and *Diospyros abyssinica* among others, (Macharia *et al*., 2010). The common exotic tree species include *Grevillea robusta*, *Eucalyptus spp*., *Jacaranda mimosifolia* and *Cupressus lusitanica* among others (Macharia and Thenya, 2007b). Several diatom species have also been recorded. These are algae species known to respond rapidly to eutrophication. Therefore, they can be used as indicators of nutrient concentration such as phosphate and nitrogen (Ogondo *et al*., 2010).

1.4.2 Fauna

An estimated 94 species of resident and migratory birds have been recorded in the swamp. Some of these species are Cattle Egret, Sacred Ibis, Hadada Ibis, King fisher's, Hammer kop, Jackson's widow, Grey crowned cranes (endangered) and African marsh harrier, (Muhati, 2002; Wathiru and Ng'weno, 2019). The Marabou stork is also a rare visitor to the swamp. Ondiri swamp provides crucial breeding sites for these birds. The swamp is also a habitat for insects, crustaceans and amphibians, which provide adequate food for birds including during breeding and migration. The tall grass harbors small carnivores such as mongooses and wildcats, (Gichuki *et al.,* 1998). In a recent rapid baseline survey conducted by NMK (Mr. L.Njoroge), the results indicate domination of pollution insensitive beetle families such as Dytiscidae (diving beetles) and Hydrophilidae (water scavenger beetles).

1.5 The historical perspective/context

Ondiri swamp is a unique Palustrine wetland (meaning "marshy" - marshes, swamps and peat bogs), (Ramsar Convention, 1996). The origin of the name itself is alleged to be 'Gikuyu corruption of the term old lake' (Undiri). It is possible to walk on it, and when one jumps up and down the whole bog quakes just like a bouncing castle. The swamp is oval in shape and is alleged that it used to be an open lake in the early 19th century. Over the years, as deforestation and subsequent erosion accelerated, the 'lake' was covered with floating reeds on peat forming an extensive reed-mat that enshrouded more than 95 percent of the wetland. Thus, creating a quaking bog, the largest one in the country.

However, according to a study on the groundwater recharge of Kikuyu springs by WRA in 2011, this allegation has been disputed. The report indicates that as long as the recharge- discharge relationship remains unchanged the water level at Ondiri does not change. Hence, the alleged drying up of the lake, is likely to be more because of eutrophication and not reduced ground water.

Just like other wetlands in the country, there were no restrictions in the exploitation of resources at Ondiri swamp and mostly regarded as a common resource hence threatening its existence as a wetland ecosystem. Consequently, ecosystem destruction at Ondiri wetland dates back to the colonial era, which was marked by extensive deforestation around the swamp and its catchment areas mostly for settlement and development projects.

To date, Ondiri swamp is not under any form of legal protection as is the case with most small wetland ecosystems in the country, (NECC, 2018). It has also received minimal attention from both National and County Governments even though Kenya is party to the Ramsar Convention since 1990. The Convention obligates Governments to sustainably manage their wetland resources.

1.6 Why The Need For A Management Plan?

Ondiri wetland is the biggest quacking bog in Kenya and it is very rich in biodiversity. The wetland plays a major role is providing ecosystem services and It is the main source of water for the community living around Kikuyu town for both domestic and commercial uses. Despite the benefits derived

from this wetland, it has received scant attention from researchers, writers, natural resource/ environmental managers and the large conservation driven organizations. Equally the governments both national and county have done little to conserve the wetland for posterity. In addition, the ecosystem continues to be destroyed by the ever increasing anthropogenic activities such as improper waste disposal, encroachment, unregulated abstraction of water among others. The increase in human population in the adjacent Kikuyu town and other adjacent towns has led to intensive agricultural activities, settlements and urbanization which accelerates ecosystem loses and fragmentation hence the disappearance of the plants, birds and other species associated with wetlands.

In order to maintain the biological diversity and productivity, and to permit the wise use of its resources, there is an urgent need to conserve it through well-focused management actions. To achieve these aims effectively, a common understanding, and sometimes an agreement, is needed between the various stakeholders whose activities are linked to, or are affected by the wetland. Therefore, the management planning process provides the mechanism to achieve this understanding and an agreement in a collaborative manner.

1.7 Scope of The Plan

The geographical coverage of this plan comprises the area surrounding Ondiri wetland including riparian area. The plan also considers areas around Kikuyu town which is a fast growing urban center as well as the stretch to Muguga and Thogoto forests.

Management actions will be broadened to include the entire Ondiri catchment area which extends to Aberdare forest, in order to effectively respond to issues facing the wetland. The wetland is experiencing several challenges which require multi stakeholder approach to respond to issues within the scope of this management plan

1.8 Planning Approach

The development of Ondiri management plan process was spearheaded by a technical working group appointed by NEMA from government, non-government agencies. Government agencies presents were UON, KEFRI, NECC, KWTA, NMK and Kiambu County Government. Non state actors

included Nature Kenya and Community representatives (FOWK). The technical team held several consultation meetings as well as drafting workshops to put together all the inputs and views of the various stakeholders (Figure 5). Development of Ondiri management plan process adopted a multipronged approach through stakeholder engagement processes. This included community level consultations, expert based field assessments and observations. In addition, the process relied on literature from organizations and wetlands experts as well as tacit knowledge based on community experiences and knowledge.

FIG 5. L –photo showing the technical team during a drafting session; R community members following the management plan presentation

The experts provided expertise skills and knowledge on the hydrology, biodiversity, social economic, cultural and sustainable livelihood options. Laban Njoroge, NMK led a team of scientists in conducting a baseline survey of macro invertebrates present in the swamp to guide on the appropriate management interventions. The Information /data gathered was compiled into a report and a full checklist of macro invertebrate recorded is attached (Annex 2).

A validation meeting was held on 5th May 2022 at Leilani Gardens, Kikuyu, Kiambu which was attended by over 30 participants (Figure 6). The participants were mainly representatives of different interest groups within the areas adjacent to the swamp such as riparian land owners, farmers, among others (See annex 3 full list of participants). During the meeting, members of the public were briefed on the contents of the management plan aby representatives of the technical working group (Figure 7). The feedback from the participant was recorded and incorporated in the final document.

Figure 6: Members of the technical group together with community members during the validation meeting

Figure 7. Members of the technical working group making presentations during the validation meeting (L- Dr. Thenya, UON; R- Mr. Wambua, NEMA)

CHAPTER 2:

ECOLOGICAL AND SOCIO-ECONOMIC FEATURES OF ONDIRI SWAMP

2.0 Introduction

Ecologically, wetlands provide several key ecosystem services: provisioning, cultural, supporting and regulating services. Wetlands act as a sponge during heavy rains helping to recharge groundwater aquifers. They act as carbon sinks and help regulate the negative effects of climate change. They provide habitat to flora and fauna. Wetlands act as filters for biocides, excess nutrients and sediments among other chemicals helping to protect downstream ecosystems. Wetlands are essential spawning grounds for fish, amphibians and invertebrates.

Wetlands provide plenty of green forage throughout the year hence acting as source of fodder for domestic animals. Wetlands also provide water for domestic, industrial as well as agricultural activities. Wetlands support several livelihoods such as weaving, macrophytes harvesting and pottery, which enhances resiliency of local communities.

2.1 Biological features

2.1.1 Flora

A total of 68 plant species within and around Ondiri wetland have been recorded. The common ones include *Typha domingensis* (Figure 8) *Vossia cuspidata*, *Cyperus brevifolius,* and grasses such as *Leersia hexandra, Eragrostis exasperata* and *Eriochloa meyeriana*. These species are mainly found growing on the floating accumulated large amount of semi-decomposed organic matter that forms a thick layer of peat (approximately 0.5 m thick) in Ondiri Swamp. The edge of the swamp is dominated by *Polygonum pulchrum*, *Bidens pilosa*, *Oxygonum sinuatum*, *Sphaeranthus gomphrenoides* and *Melanthera scandens*. Several diatom species have been recorded. These are algae species known to respond rapidly to eutrophication. They can therefore be used as indicators of nutrient concentration such as phosphate and nitrogen (Ogondo *et al*., 2010).

The swamp water catchment and riparian areas are vegetated with exotic tree species of *Grevillea robusta*, *Lantana camara*, *Eucalyptus species*, *Cupressus lusitanica, Acacia mearnsii* and *Jacaranda mimosifolia* among others. These

trees are however exploited for construction and timber. In addition, there are some remnants of indigenous species such as *Croton megalocarpus*, *Ficus* species, *Acacia melanoxylon, Warburgia ugandensis, Prunus africana, Ocotea usambarensis, Brachylaena huillensis*, *Calodendrum capense, Teclea nobilis, Strychnos henningsii, Diospyros abyssinica* and *Podocarpus* species (Macharia *et al*., 2010). These trees provide habitat for animals as well as protect the swamp from agents of erosion and degradation.

Figure 8: A photo showing *Typha domingensis* species at Ondiri Swamp

2.1.2 Fauna

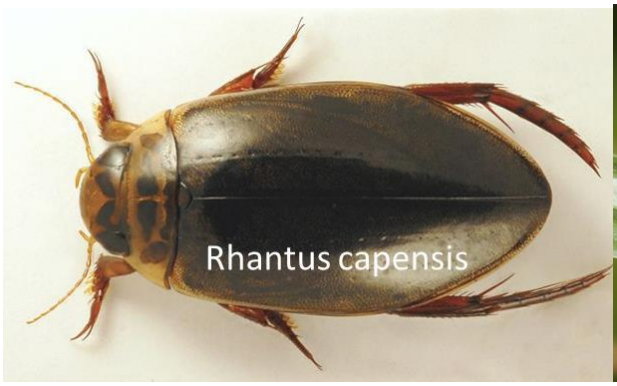
2.1.2.1 Avifauna

An estimated 94 species of resident and migratory birds have been recorded in the wetland. Among these birds are insectivores, frugivores, grannivores, carnivores, omnivores, molluscivores among other feeding guilds. Some of these species are Cattle Egret, Sacred Ibis, Hadada Ibis, kingfishers, Hammerkorp, Jackson's Widow, Grey Crowned Crane and African Marsh Harrier among others (Muhati, 2002; Wathiru and Ng'weno, 2019). The

Marabou Stork is also a rare visitor to the wetland. (See Annex 1 for complete bird list). The wetland provides crucial breeding sites for various bird species.

2.1.2.2 Macroinverterbrates

Available records indicate the presence of twenty seven macroinvertebrate taxa in Ondiri Swamp all of which are tolerant to pollution indicating environmental degradation. These taxa are mainly beetles, true flies and dragonflies with fourteen, six and four taxa respectively. Spiders, crayfish and mayflies each had one representative. During the development of this management plan, Mr. Njroge, NMK conducted a rapid assessment of the macro inverterbrates at Ondiri swamp. Sampling was done at 5 different points that were open and accessible along the shoreline. In each point, an area of approximately 1 m^2 was sampled by vigorously moving an aquatic net in the water. All collected specimens were then emptied into a sorting tray. Representatives of all present species were picked and transferred into well labelled preservation vials containing 90% ethanol. Identification was carried out at the Invertebrates Zoology Section at the National Museums of Kenya. Results indicate a dominance of pollution insensitive beetle families such as Dytiscidae (diving beetles) and Hydrophilidae (water scavenger beetles) and the near absence of other keys groups such as dragonflies (Odonata), True bugs (Hemiptera) and True flies (Diptera) points to some level of ecological disturbance (Figure 9 ,See full list Annex 2). According to Miller & Miller, 2003; swamps are for instance some of the most productive habitats for dragonflies. Only 4 dragonfly species have been recorded in Ondiri swamp over a long period of time.



Diving Bettle

Narrow-winged damselflies

Small Minnow Mayflies Skimmers

Figure 9: Photos of some macro invertebrates found at Ondiri swamp (Images by L. Njoroge 2022)

2.1.2.3 Other fauna

There is limited information on other fauna of Ondiri wetlands. According to past literature, four amphibian species have been recorded in Ondiri Swamp and two of them are endemic; Kinangop river frog (*Phrynobatrachus kinangopensis)* and Bladder reed frog *(Hyperolius cystocandicans)* that are listed as vulnerable and near threatened by IUCN respectively. Two fish species; Sabaki tilapia (*Oreochromis spilurus)* and Dwarf Lake Victoria mouth brooder *(Pseudocrenilabrus multicolor victoriae)* have been recorded while the downstream rivers such as Kirichwa River have records of Sharp tooth catfish (*Clarias gariepinus). Pseudocrenilabrus multicolor victoriae* is an introduced species. Several mammal species have been recorded in the swamp including Mongooses and Wildcats (Gichuki, *et al.,* 1998; NMK Zoology database as at 9/5/2022).

2.2 Ecological Functions

2.2.2 Habitat for biodiversity

The swamp is covered by a floating bog with macrophyte vegetation, open water pools and areas inundated by water. These provide habitat for

biodiversity including birds, herpetofauna, mammals, fish and invertebrates among others. Among these is the endangered Grey Crowned Crane.

2.2.3 Carbon Sequestration

Ondiri swamp, like other wetlands, plays a major role in the global carbon cycle because it is an important carbon sink. The floating bog in Ondiri is composed of 40% carbon showing its importance as a carbon sink. Like other peatlands, when disturbed the carbon can be easily released to the atmosphere contributing to global warming (Ogondo *et al*., 2010).

2.2.4 Water Quality Regulation And Underground Water Recharge.

Ondiri swamp is covered by macrophytes and other vegetation that acts as filters for biosites. The swamp is important for holding nitrogen and phosphorus at about 1.6ppm and 7ppm respectively. It is also characterized by high exchangeable bases; sodium 5.8 me/100g; potassium 2.4 me/100g, calcium 34.8 me/100g and magnesium 4.06 me/100g. The pH of the water in Ondiri ranges from about 6.1 on the western side at the wetland entrance, gradually increasing to alkalinity of 8.2 in the middle and finally stabilizing at 6.9 at the outlet of R. Nyongara (Macharia and Thenya*,* 2007). Ondiri Swamp therefore has a positive impact on downstream water quality. The swamp acts as a sponge to reduce water flow and evaporation thus increasing infiltration rates. This forms an important catchment of Nairobi River by recharging springs that feed into the river.

2.3 Socio-Economic And Cultural Values

It provides a range of critical ecosystem services and products that are indispensable to human survival, health and welfare. The swamp is located in a high potential agricultural zone and within an urban set up near the capital and also highly accessible.

2.3.1 Agriculture

Ondiri swamp is a productive ecosystem that directly supports a large population outside its borders. The swamp area supports agricultural practices in the surrounding area through provisioning of fertile soils and

water for irrigation (Macharia *et al*., 2010). Seventy percent (70%) of the households practice intensive agriculture supported by water extracted from Ondiri Swamp (Macharia and Thenya, 2007b). Farming is done through a combination of overhead irrigation and use of greenhouses, which take the form of both large and small scale. Crops grown include cabbages, tomatoes, spinach, kales and carrots (Figure 10).

Figure 10. Photo showing farming activities adjacent to Ondiri Wetland, both irrigation and green houses

The swamp's fertile soils make it high potential for agriculture. The agricultural activities around Ondiri wetland are highly intensive due to the high demand for food from the nearby Nairobi and Kikuyu urban areas. The swamp also provides fodder for livestock especially during the dry seasons. About 14% of local community members harvest grass and about 7% are involved in harvesting macrophytes to supplement their livestock fodder (Macharia and Thenya, 2007b).

2.3.2 Industries

Various industries such as steel rolling, milk processing and garment making factories are located in Kikuyu Municipality, where Ondiri Swamp is located. In addition, industries that produce a range of products such as soap, matchboxes, plastic bottles as well as slaughterhouses, business premises and floriculture industries depend on the swamp for their water requirements.

2.3.3 Ecotourism

Ondiri swamp is a unique ecosystem with macrophytes growing on a floating peat, making it Kenya's only quaking bog. It is home to a number of bird species. Currently various tourism activities such as bird watching, site seeing and recreational walks along the nature trails (Figure 11). Nature trails have been constructed making it suitable for other recreational activities such as nature walks. Local and international tourists visit the area (Macharia *et al*., 2010). As an important green space in Kikuyu Municipality, the aesthetic value of the swamp is enormous and the swamp's tourism potential is yet to be fully harnessed to create more employment opportunities for the surrounding community (FOWK, 2020 pers comm.)

Figure 11: Members of the public bird watching led by Nature Kenya, at Ondiri Wetland

2.3.4 Cultural And Religious Practices

Ondiri Swamp is an important cultural and religious site amongst the local community. The mythology of its origin has been passed from generation to generation. The kikuyu elders normally perform their rituals within the swamp. The swamp is also utilized by Christians as their baptism grounds and the Indian community residents in Kenya are known to visit the swamp to perform cultural rituals especially when they lose their loved ones (FOWK, 2020 pers. comm.). Due to this cultural importance, Ondiri swamp is ideal for protection for prosperity.

2.3.5 Aquaculture

The economic stimulus package in 2008/2009 promoted construction of fish ponds around the swamp, which operated for some time but due to mismanagement they collapsed. However, some commercial farmers are still practicing greenhouse aquaculture within the Kikuyu Municipality.

2.3.6 Timber

Other uses include timber based industries and quarrying. Timber based industry is dependent on exotic trees that often regenerate quickly. Quarrying is done in nearby Rungiri and supply quarrying materials to numerous construction sites within and around Kikuyu Sub County.

CHAPTER 3:

REVIEW OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORKS

3.1 Introduction

Wetland ecosystems are managed under different policy and legal frameworks. The aim is to enhance the conservation and management of wetlands resources. Ondiri wetland is managed under different legal provision at local, national and international levels. This chapter provides a review of the policies and legal frameworks for the management of Ondiri wetland. Ondiri wetland is not gazzetted as a protected wetland. 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 1: International legal frameworks

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,

Convention/Agreement	Relevance to wetland ecosystems
	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
African Convention on the Conservation of Nature and Natural Resources, 1968 (as revised in 2003).	Natural Resource Conservation
Convention on Migratory Species	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

3.3 National Policy and Legal Framework

The preparation, planning and implementation process of the Ondiri IMP recognizes existence of the current wetland legal framework including the Constitution of Kenya, National Wetlands Conservation and Management Policy 2015, EMCA 1999 and Wetland Regulations among other legal frameworks, which have direct impact to sustainable conservation, management and utilization of the wetland. A highlight of some of the relevant national policies and legal framework is provided in Table 2

Table 2: National policies and legislations

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

Policy/Legal framework	Relevance to wetland ecosystems
Land Policy 2009	Section 3.4.2.3 (124) Restore the environmental integrity of land and facilitate sustainable management of land-based resources Section 3.4.2.3: 124 (d) Establish institutional mechanisms for conservation of quality of land for environmental conservation purposes. Section 3.4.3.1 Conservation and Sustainable Management of Land Based Natural Resources
Forest Policy 2016	Chapter 3- Sustainable development management, utilization and conservation of forest resources Chapter 8- Equitable sharing of the resources Stakeholders involvement
The Constitution of Kenya (2010)	Article 42- The right to clean and healthy environment 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
Land Act 2012	Part II: 19 (1) - Make rules and regulations for the sustainable conservation of land based natural resources. 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.
National Land Commission Act 2012	Part II 5 (c), Registration of title in land throughout Kenya. Part II 5 (d) Research related to land and the use of natural resources, and make recommendations to appropriate authorities Part II 5 (c) registration of title in land throughout Kenya
Environmental Management and Coordination Act of 1999 (revised 2015)	Overarching law on environmental management in Kenya. Sections 3- Entitlement to a clean and Healthy environment Section 42- Measures for the Protection of rivers lakes seas and wetlands Measures for the protection of environmentally

Policy/Legal framework	Relevance to wetland ecosystems
	significant areas. Sections 54 and 58- Requirement for Environment and social impact assessment (ESIA) and Environmental Audits
Forest Act 2016	Sections 4 and 42-Provides for PFM and PFMP preparation Research and development programmes to provide information for sustainable natural resources Conduct training on natural resources Public participation and community involvement in management of forests Provides for preparation and gazettement of rules and regulations such as Participation in Sustainable Forest Management
Wildlife Conservation and Management Act, 2013	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 Section 31 (1)- Publish management plan for wetland under KWS management Section 33- Through the Cabinet secretary declare a wetland that is an important habitat or ecosystem for wildlife conservation a protected wetland.
Water Act 2016	Provides the use management, control and conservation of water resources Stipulates matters on use, ownership and control of water resources and safeguards water catchment areas
Agriculture Act cap 318	Addresses maintenance and advancement of good agricultural practices Provides for soil conservation, fertility and encourages Agricultural land developments through principles and practices of good land management
National Climate Change Response Strategy (NCCRS)	Chapter 4- Protection of natural resource base (soil and water conservation techniques) Protection of Water towers, river banks and water bodies

Policy/Legal framework	Relevance to wetland ecosystems
	Building capacity for water quality improvement and awareness campaign to promote water efficiency measures
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)

3.4 County policy and legal provision

The County has a mandate to formulate policies on soil and water conservation. In this regard the County has developed the Water and Sanitation Act 2015 that governs how the water resources shall be provided and managed. The wetland being an important water catchment area part IV of the Act guides how this wetland should be conserved and managed. Below are specific sections.

Table 3: Relevant sections guiding wetland management in the County law

Policy/Legal framework	Relevance to wetland ecosystems
Kiambu County Water and Sanitation Services Act, 2015	**Section 32 (1 and 2):** Conservation and protection of water sources and catchments areas. **Section 34. C**ollaboration with other entities, develop and implement policies and strategies for soil conservation and sustainable management of wetlands. **Section 36.** Demarcation and protection of riparian land. **Section 37.** Prohibited activities on riparian land.

CHAPTER 4:

STAKEHOLDER ANALYSIS

4.1 Introduction

A Stakeholders analysis was conducted with the aim of identifying the interests, roles/responsibilities, comparative advantages and contributions of stakeholders in the development and implementation of the projects and programmes at Ondiri Wetland. Stakeholders were defined as any group that benefits from or has an impact or influences the formulation and implementation of Ondiri Wetland management plan at basin, national and regional levels, and international levels. Stakeholder analysis involved an inventory of all parties that have a stake in the project, taking into consideration the various ways they may influence its implementation. Simply put, the stakeholders are those that play a complementary or synergistic role to the efforts in development and implementation of the project. Stakeholders within Ondiri wetland include local farmers, institutions like schools, hospitals, government departments and civil society organizations. Due to its close proximity to Kikuyu town and Nairobi city, it is an important source of horticultural products. Local people also use it intermittently as a recreation site. The peat within Ondiri wetland has also been used previously as a carrier material for rhizobium inoculation bacteria in research.

4.2 Methodology

The adopted methodology for the stakeholder analysis included desktop study and working group discussions to review the existing stakeholders involved in Ondiri wetland ecosystem to form a preliminary list. It was during this discussion that stakeholders' roles, interests in cooperation with the project, as well as identification of challenges and opportunities to the process of formulation of the management plan were identified. For this analysis, stakeholders identified were classified in broad seven categories (Table 4) and discussions were held to identify their roles, whether they are enabler or threat (Figure 12) to the project and their potential for partnership on implementation of the management plan.

Table 4: Categories of Stakeholders Identified

Category	Stakeholder	Roles/interests/mandate	Influence	Importance
Government Agencies	NEMA	Monitoring and advisory of Sustainable management of environment and natural resources Enforcement of laws	High	High
	CGK	Overall responsible for the governance of the county Implementation of the plan	High	High
	NECC	Enforcement of environmental laws and policies. Monitoring of pollution.	High	High
	WRA	Water resource management, regulation of Abstraction and enforcement	High	High
	KFS	Management of forest within the catchment	High	High
	KWTA	Management of water towers	Low	High
	KEFRI	Advisory and guidance on the tree species to grow.	High	High
	KWS	Protection and management of wildlife ecosystems	Low	High
	NMK	Biodiversity research and preservation of cultural heritage	Low	High
	NGAO	Public order and coordination of government	High	High
	KMD	Climate information services	High	High
	MoALF&C	Implementation of agriculture and livestock programs	Low	High
	MoLPP	Land administration	High	High
	NLC	Oversight and monitoring of public land	High	High
	Elected	Lobbying, legislating,	High	High

Category	Stakeholder	Roles/interests/mandate	Influence	Importance
	Leaders	budgeting and oversight		
Non-Governmental Organizations	Nature Kenya	Biodiversity monitoring	Low	High
	EAWS	Advocacy and lobbying	Low	High
	Rhodes Foundation	Advocacy and lobbying, Conservation and Livelihood support	High	High
Research Training institutions	Universities	Training, Research and innovations	Low	High
	Primary & High Schools	Advocacy and trainings	High	High
Community Based Institutions	CFAs	Sustainable use and Management of forests resources	High	High
	WRUAs	Sustainable use and Management of water resources	High	High
	FOWK	Advocacy and conservation	High	High
	RLOA	Sustainable use and Conservation	High	High
Community	FBOs	Religious and social activities.	High	High
	Farmers	Crop production for subsistence and commercial	High	High
	Fisherfolks	Fishing and fish farming	high	High
Private sector	Horticulturalists	Commercial farming	Low	High
	Business Community	Commercial water abstraction and commercial activities.		
Development partners	FAO-UN, UN Environment, WI,WWF, UNDP	Knowledge management and technical and financial support	Low	High
Media	Local & National Radio/TV and print	Information dissemination and public awareness	Low	High

Figure 12: Template for power/interest grid Analysis

The broad categories include stakeholders at Ondiri wetland and its catchment area, county, national, regional, and international levels as well as research institutions and media. At the local level; riparian users, associations of farmers, business community and water users are identified as primary project stakeholders in terms of implementation of planned management intervention. At county level, county leadership including members of the national assemblies and county assemblies as well as county departments responsible for agriculture, fisheries, environment and water resource management is identified as key partners to the process.

State authorities responsible for environment and water resource management and emergency response are identified as national stakeholders. Engagement of scientific and research organization was observed to be valuable in terms of development of the scientific information data acquisition and analysis. Finally, the media was regarded as a powerful influencer for creation of awareness on the values of the wetland and implementation of the wise use strategies.

CHAPTER 5:

THREATS AND CHALLENGES FACING ONDIRI WETLAND.

5.1 Introduction

These are various threats and challenges facing Ondiri wetland affecting its ecological integrity and its ability to supply ecosystem services. These threats include; Unregulated water abstraction, sewage pollution, heavy metals, siltation, alien and invasive species and climate change among others. These threats and challenges lead to biodiversity loss and degradation of habitats. The sustainability of Ondiri wetland is only guaranteed when the above threats are addressed.

5.2 Water Issues

Ondiri wetland is the source of River Nyongara, a tributary of Nairobi River. It is also a recharge of Kikuyu springs. It serves as the main source of water for Kikuyu town; serving industries, farms and institutions such as Alliance High School, Kikuyu Hospital and University of Nairobi, Kikuyu Campus. Kikuyu springs supplies 2% of its water to the City of Nairobi through the Nairobi Water and Sewerage Company. There are 8.5 acres (3.5 Ha) of cropland and twenty six (26) buildings covering 0.12 acres (0.05 ha) within Ondiri wetland's 30 meter buffer zone, (Ministry of Environment and Forestry Status report, May 2020).

5.2.1 Unregulated Water Abstraction

Ondiri swamp is perceived and treated as a pool resource. This has led to unregulated and unsustainable water abstraction via water pumps, most of which are located within the 30M buffer zone of the swamp (Figure 13). According to a baseline survey by Friends of Ondiri Wetlands Kenya (FOWK) in 2018, there are 44 permanent water pumps drawing water from the swamp and only 22 water pumps are metered. As such, the unmetered pumps lack permits making it difficult to monitor water abstracted from the swamp. This contravenes Section 36 of the Water Act, 2016 that stipulates that it is an offense to construct or use works to abstract water without a permit. Further,

there are 13 boreholes within the riparian area of Ondiri swamp (FOWK, 2021).

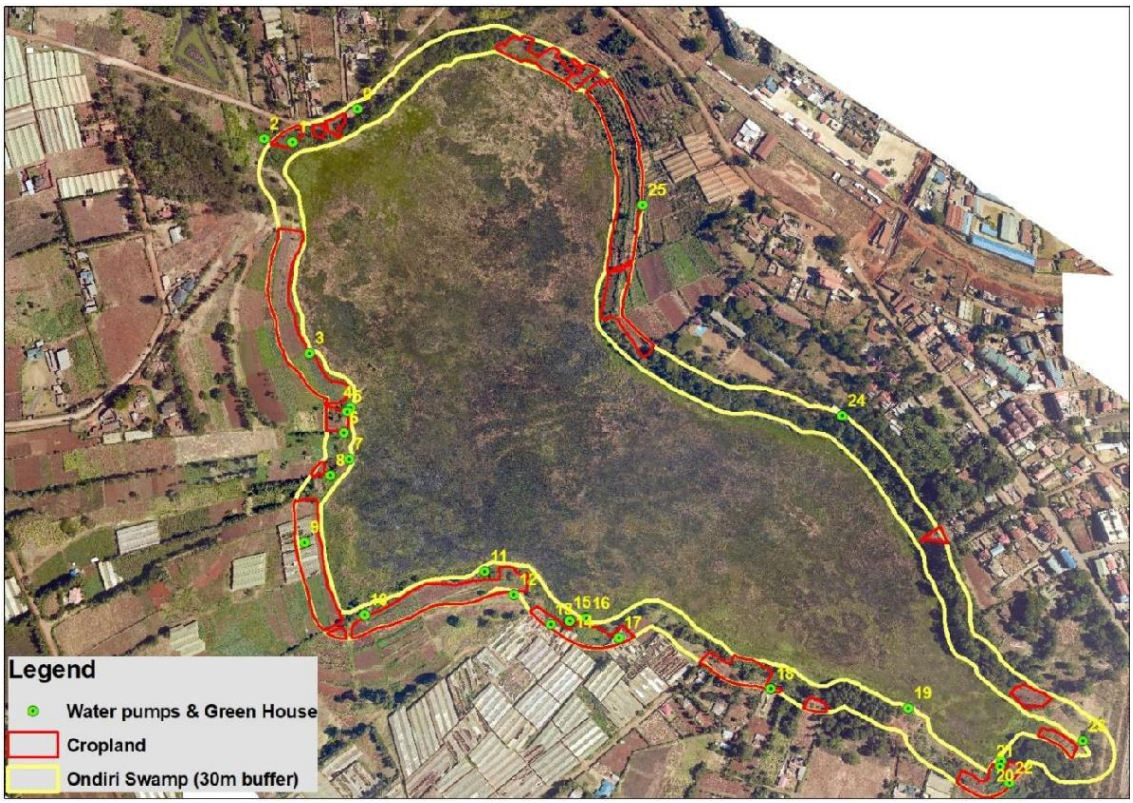


Figure 13: Farms and water pump houses mapped within the 30m buffer of Ondiri swamp

5.2.2 Pollution

The proximity of the swamp to Kikuyu town makes it vulnerable to pollution. The main sources of pollution include industrial effluents, raw sewage from settled areas and agro-chemicals used in farmlands. Kikuyu town does not have a sewer treatment plant forcing residential areas to use septic tanks for waste disposal. Some of the homeowners use storm-water spillways along the Southern by-pass road to release raw sewage into the swamp.

The surrounding greenhouses lack proper waste management practice, leading to release of chemical effluents into the Swamp. In addition, fertilizers and pesticides from farmlands are carried by surface run-off into the swamp. This is a common practice during the rainy season, (NECC 2018, KWTA 2020).

Studies on heavy metals undertaken in Ondiri swamp have recorded significant concentrations of Zinc, Copper, Lead and Chromium, (Kinyanjui, 2003; Gathara *et al*., 2020). This was as a result of horticultural farming, use of agro-chemicals and fertilizers along the riparian zone. These heavy metals are likely to have a prolonged effect on human health due to bioaccumulation. All these practices are in contravention EMCA, Water Quality Regulations, 2006 and Rule 81 of the Water Resources Management (Water) Rules, 2006, which both prohibits discharge or application of any poisonous, toxic, noxious or obstructing matter, radioactive waste or other pollutants into a water body. Additionally, section 18 of the Waste Management Regulations, 2006 prohibits any owner or operator of a trade or industry to undertake discharge or dispose of waste in any state into the environment, unless the waste has been treated in a treatment facility and in a manner prescribed by the National Environment Management Authority.

5.2.3 Siltation

Majority of the farmers around Ondiri swamp practice unsustainable land management practices. They do not terrace their land leading to increased erosion where the soil is deposited into the swamp. Over time, accumulation of silt reduces the wetland area as well as the depth.

5.2.4 Inadequate Monitoring Of Water Abstraction

The water abstracted from the swamp is poorly monitored. Out of 44 water pumps installed, only 22 are metered.

5.3 Land Management Issues

Ondiri swamp lack formal protection status. It has not been mapped hence no clear boundary exists. As a result, there is "free access" by every member of the community and over time this has led to its over-exploitation and degradation. This contravenes Section 12 (2) of the Lands Act, 2012, which directs the National Land Commission to ensure that any land identified for allocation does not fall within categories including wetlands, public water reservoirs and riparian areas.

5.4 Governance Issues

5.4.1 Uncoordinated Stakeholder Efforts

There are different stakeholders both state and non-state organizations working autonomously at Ondiri wetland. Sometimes activities by different agencies overlap due to lack of synergy. This has resulted in uncoordinated approaches and lack of a common vision to guide on implementation of conservation activities in this ecosystem.

5.4.2 Weak law enforcement

Several provisions of existing legislation have not been implemented to protect Ondiri swamp. This is due to weak institutional capacity and poor funding. Water abstractors do not have permits thus they do not pay water charges. In addition, many boreholes have also been sunk around Ondiri swamp. Some of the greenhouses operating around the swamp do not have EIA licenses and Environmental Audit Reports. Environmental Management and Coordination (Amendment) Act 2015 requires that EIA be conducted and a written approval obtained from NEMA before such establishments are constructed near a wetland.

There is also encroachment into the swamp for agricultural expansion through cultivation of horticultural crops beyond the buffer zone. Greenhouses are located less than 30 meters from the swamp, which is in contravention with the Environmental Management and Coordination, (Water Quality) Regulations, 2006. The regulation stipulates that no person shall cultivate or undertake any development activity within a minimum of six meters and a maximum thirty meters from the highest ever recorded flood level of either side of a river, stream or water body.

5.4.3 Inadequate Community Participation

The negative perception of wetlands as „wastelands" coupled with increasing human populations and changing lifestyles has led to degradation of this swamp. Majority of the community members are passive towards conservation of Ondiri swamp. For instance, some of the trees planted by KEFRI were uprooted by community members. Similarly, the beacons put by WRA to delineate the swamp riparian area were also removed by riparian land owners. Public participation/consultation is now a constitutional right and is an important consideration in conserving Ondiri swamp.

5.5 Loss Of Biodiversity And Degradation Of Habitats

5.5.1 Growing Of Exotic Trees

Landowners around the swamp have adopted growing of exotic trees especially Eucalyptus sp. over indigenous ones. This is because these trees are fast growing and with a ready market hence, they have quick returns within a short period of time. However, Eucalyptus spp. have negative impact on water catchment areas due to their high water uptake and rate of transpiration. These impacts include reduced water volume and drying up of springs and rivers. They also have an allelopathic effect thus harboring survival of undergrowth vegetation leading to increased soil erosion. Planting of Eucalyptus *spp* along wetlands and riparian land violates the Water Rules, 2007 and the Agriculture (Farm Forestry) Rules, 2009.

Over-exploitation of the wetland resources as the swamp lacks any form of legal protection. It is therefore perceived as a free-for-all resource. In this regard, everybody wants to derive maximum gain from it yet nobody is willing to have any input in its conservation and management. For instance, there is over-harvesting of swamp vegetation for fodder especially during the dry season. This depletes essential food sources and habitat for animal species found in this swamp.

5.6 Climate Change

Many parts of the country have been experiencing climatic changes evident through flooding and droughts. Given its proximity to Nairobi City, the Ondiri Wetland is bound to experience flooding in addition to the global climate changes, a unique urban climate changes. This unique change is brought about by land cover patterns and the interaction between urban surfaces and weather elements (Abuje *et al.,* 2020). Among the recorded effects of the unique changes include the increased surface runoff and altered wind flow patterns. Nairobi city has continued to experience these effects and it is projected that they may worsen under the changing climate.

CHAPTER 6:

VISION, MISSION AND MANAGEMENT OBJECTIVES

Vision

A well-conserved and managed Ondiri wetland and its catchment area

Mission

To sustainably manage Ondiri wetland ecosystem towards ecological integrity and socio economic development for the present and future generation

6.1 Management Objectives

1. To improve water access, quantity and quality at Ondiri wetland
2. To promote sustainable economic development and local livelihoods
3. To promote protection of the wetland as an ecologically sensitive area
4. To promote sustainable land use and management around Ondiri wetland
5. To improve governance in conservation and management of Ondiri wetland
6. To promote climate change mitigation, adaptive capacity and resilience at Ondiri wetland

6.2 Guiding Principles

Implementation of Ondiri management plan to achieve the above set vision and management objectives will be guided by the following principles:

- ***Wise use principle:*** Due to the significant contribution of the Ondiri wetland to local livelihoods and the national economy the wise use principle will be applied to ensure sustainable use of the wetlands resources
- ***Public participation and inclusive approach:*** An integrated approach that entails involvement of relevant stakeholders and consensus building on matters of planning and decision making.
- ***Adaptive management:*** The best available knowledge, scientific information and data will be applied to manage Ondiri ecosystem.
- ***Precautionary principle:*** Where information is inadequate for decision making the precautionary principle will apply. Lack of full scientific

information should not prevent implementation of measures to mitigate wetland resources degradation

- ***Polluter pays principle:*** Persons who pollute the wetland should meet the cost of cleaning up, restoring, rehabilitating and also meet the cost of the pollution to resource users
- ***Ecosystem approach in management:*** Management activities will recognize the relationship and inter-linkage between ecological and socio-economic components of Ondiri wetland
- ***Principle of collaboration and partnership:*** Collaboration by stakeholders including governments, local community, civil society, private sector and development partners is crucial to achieve the objectives of this management plan
- ***Equity and access:*** Fairness and equity will be embraced to ensure access to resources by different gender and user groups

In order to achieve the management objectives outline above, the following management programmes have been identified.

1) Water management programme
2) Governance and Coordination management programme
3) Biodiversity management programme
4) Socio-economic and cultural management programme
5) Climate change programme
6) Land use management programme

CHAPTER 7:

MANAGEMENT PROGRAMMES

7.1 Water Management Programme

Introduction

Ondiri swamp is the largest water tower in Kikuyu sub-county. However, information on the water budget is not readily available hindering the regulatory agencies to support in implementing the existing laws. WRA existence is not significantly felt by the locals due to limited capacity in their regional office to monitor and implement the water abstraction law requirement. This creates a challenge in ensuring only legal abstraction is permitted and limits community involvement through the policing provided by the existing WRUA. Water from the wetland is heavily utilized for irrigation, institutional and domestic uses. This if not checked can result in ecosystem imbalance and pronounced conflicts from water utilization. Several threats have been identified around the Ondiri that affect water quantity and quality. These include unregulated water abstraction, pollution and siltation among others. This management programme aims at putting in place interventions that will result in equitable and sustainable water access to support the socio-economic as well as the ecological processes of Ondiri wetland.

Key water issues

- Unregulated water abstraction by community members living around the wetland
- Water Pollution from both point and non-point pollution sources
- Siltation from storm water and farmland as agricultural practices are on the increase on adjacent land.

Operational Objectives

1) To promote compliance with water abstraction regulations
2) Enhance water quality and quantity within the wetland
3) To promote catchment conservation and Management

A summary of management actions to improve water management

Management Objective: To improve water access, quantity and quality at Ondiri wetland		
Operational objectives	**Management actions**	**Outputs**

To promote compliance with water abstraction regulations **Outcome**: Regulated water abstraction	Undertake an inventory of all abstraction plans	An inventory of all abstraction plans will be developed
	Stop all illegal abstractions	Illegal water abstraction stopped
	Create awareness on water abstraction regulations	Community are empowered on water abstraction regulations and requirements
Enhance water quality and quantity within the wetland **Outcome**: improved water quality and quantity	Collect and proper disposal of all solid waste in and around Ondiri wetland	Solid waste well managed
	Identify and stop all effluent discharge points	Enhanced water quality
	Define a buffer zone within the wetland	Buffer zone well demarcated
	Construct and maintain a sewer plant within Kikuyu Municipality	Enhanced water quality
To promote Ondiri swamp catchment conservation and Management	Create awareness on eco-agriculture practices	Eco-agriculture practices are promoted
Outcome: Ondiri wetland is well managed	Growing of water-friendly plants	Purification and infiltration of water promoted

7.2 Governance And Coordination Management Programme

Introduction

Ondiri Wetland is an important resource for a diverse group of people and stakeholders attracting a number of socio-economic and agricultural activities. The conservation and management of Ondiri wetland remains unclear despite the involvement of many government and non-government agencies such as County Government of Kiambu, NEMA, WRA, KFS, KWTA, KEFRI, Friends of Ondiri Wetland Kenya (FOWK), Ondiri Riparian Land Owners Association, ONKARU Water Resources Users Association, Kikuyu Water and Sanitation Company, and other private water companies and users.

Owing to the diverse number of stakeholders in Ondiri wetland with divergent interests, there is generally inadequate mechanism to ensure effectiveness in coordinating activities towards sustainable management of the Ondiri wetland resources. As such, a number of governance issues have been identified that constrain the important role of these players.

Key Governance issues

- Inadequate institutional capacity at the local level to manage the swamp
- Weak and uncoordinated enforcement of the existing laws
- Uncoordinated approach for the management of ondiri swamp
- Inadequate resources to support conservation and management initiatives

Operational Objectives

1) To enhance institutional capacity at the local level for sustainable management of Ondiri swamp
2) To enhance coordinated enforcement actions by the relevant agencies
3) To enhance a coordinated Management approach for Ondiri swamp
4) To Enhance capacity of Ondiri wetland players in resource mobilization

A summary of management actions to improve governance and coordination

Management objective: To improve governance in conservation and management of Ondiri wetland		
Operational objectives	**Management actions**	**Outputs**
To enhance institutional capacity at the local level for sustainable management of Ondiri wetland **Outcome:** Effective management and conservation of Ondiri swamp	Establish Ondiri wetland Coordination committee	Local coordination committee established
	Build Governance capacity of relevant community institutions	Local leadership empowered
To enhance coordinated enforcement actions by the relevant agencies **Outcome**: improved	Build capacity of the relevant structures on regulatory frameworks for the management of the wetland	Synergy and coordination among relevant players in enforcement actions
	Undertake regular	Reduced incidences of

coordination on enforcement	Multi agency enforcement actions for the management of Ondiri wetland	non-compliance
To enhance a coordinated Management approach for ondiri swamp **Outcome**: Improved coordinated management	Undertake sensitizations on the Ondiri swamp integrated Management plan	Enhanced synergy
	Establish a site implementation committee	Site implementation committee
To Enhance capacity of Ondiri wetland players in resource mobilization **Outcome:** Enhanced resources for management of ondiri wetland	Train and capacity build on resource mobilization	Empowered resource mobilizers

7.3 Biodiversity Management Programme

Introduction

Ondiri wetland is rich in biodiversity among them 68 floral, 94 avifaunal, 4 amphibian, 2 fish and 27 macroinvertebrate species/taxa documented within the wetland and its neighboring areas. Unsustainable ecosystem uses such as encroachment of the riparian land for agricultural purposes, planting of alien and invasive species and disposal of solid and liquid waste into the wetland are the main issues. These activities have resulted in reduced vegetation cover, degradation and habitat loss, emigration and mortality of faunal species and eutrophication due to nutrient accumulation. The land use around the wetland is characterized by cropland, green houses, and on the southern side are several and upcoming high-rise buildings. Because of the unsustainable development, there is a need to undertake a comprehensive biodiversity survey to ascertain the status of various species.

Key ecosystem issues

- Inadequate biodiversity data on composition and status

- Unsustainable land use

Operational objectives

1) To undertake biodiversity survey and monitoring within and around Ondiri wetland.
2) To promote biodiversity conservation within and around the wetland
3) To promote landscape restoration within and around the wetland
4) To enhance protection of Ondiri wetland resources and its catchment

A summary of management actions to improve biodiversity management

Management Objective: To promote protection of the wetland as an ecologically sensitive area		
Operational objectives	**Management actions**	**Outputs/Outcomes**
To undertake biodiversity survey and monitoring within and around the wetland. **Outcome**: Biodiversity status in known	Biodiversity survey	Species inventory report.
	Monitoring	State of habitat reports.
	Capacity building	Enhanced participation of locals (citizen science) in biodiversity conservation
To promote biodiversity conservation within and around Ondiri wetland. **Outcome**: Enhanced biodiversity conservation	Map degraded areas	Map(s) of degraded sites
	Rehabilitate degraded areas	Rehabilitated and restored habitats
	Raise awareness on the importance of biodiversity in the wetland.	Increased awareness on the importance of biodiversity.
	Empower youth and women to actively get involved in environmental conservation.	Youth and women actively involved in conservation activities
	Implement sustainable land management practices	Sustainable land management

Zoning and securing core biodiversity habitats **Outcome**: Core biodiversity areas zoned and protected	Mapping and zoning the core biodiversity areas	Core biodiversity areas mapped and zoned
	Enforce relevant biodiversity conservation laws and regulations.	Improved compliance.
	Undertake regular patrols	Zoned areas protected

7.4 Socio-Economic And Cultural Management Programmes

Introduction

The socio-economic activities undertaken by communities living adjacent to the swamp include horticultural farming, which is characterized by use of overhead irrigation and green houses and subsistence farming. This forms an important source of employment and raises income when the produce is sold to nearby markets as well as Nairobi city. Other socio-economic activities include transport, housing construction for rental income, industrial, water vending, grass harvesting among others. The socio- economic activities have had negative impacts on the swamp mainly through encroachment and pollution. Therefore, the social-economic and cultural programme seeks to promote sustainable use and exploitation of ondiri wetland resources while preserving its ecological integrity.

Key issues

- Unexploited livelihood opportunities
- Low adaptation of alternative livelihoods
- Lack of Benefit sharing structures
- Unsustainable livelihood practices

Operational Objectives

1) To promote alternative sources of livelihood for the local community
2) To promote research, training and awareness creation of livelihood programmes.
3) To formulate a benefits sharing mechanism.

4) To Integrate modern and traditional knowledge in the management of Ondiri wetland

A summary of management actions to improve the social economic and cultural management

Management objective: To promote sustainable economic development and local livelihoods		
Operational objectives	**Management actions**	**Outputs/Outcomes**
To promote alternative sources of livelihood for the local community. **Outcome**: Enhanced lternative livelihood	Identify and support alternative sources of livelihoods	Increased adoption of alternative sources of livelihoods by local community
To promote research, training and awareness creation on livelihood options **Outcome**: Research based awareness in place	Develop and implement research findings on sustainable livelihood options *Ca*pacity building of community members on alternative sources of livelihoods	An informed community on the livelihood options that promote sustainable utilization of the wetland
	Equip the information resource center within materials on alternative forms of livelihoods	Fully equipped resource center A repository of the wetland information.
	Fundraising for different livelihood options	Availability of funds to support livelihood options
To formulate a benefits sharing mechanism **Outcome**: Benefit sharing framework in place	Develop revenue sharing formula.	Equitable sharing of Revenue

To integrate modern and indigenous knowledge in the management of Ondiri wetland **Outcome**: Modern and indigenous knowledge integrated	Document indigenous knowledge (IK) to assist in the environmental planning and management process.	IK documented.

7.5 Climate Change Programme

Introduction

The Ondiri wetland and surrounding areas experience bi-modal type of rainfall. The long rains fall between Mid-March to May followed by a cold season usually with drizzles and frost between June to August and then short rains from mid-October to November. The average annual rainfall is 1500 mm (Macharia et al., 2010 and CGK-CIDP, 2018). Climate change has disrupted this rainfall as well as weather patterns and the area is now marked by unpredictability in timing and intensity. The wetland helps to regulate climate change by capturing and storing carbon. To address this County government has developed Climate change Act 2020.

Climate change has impacted land productivity especially farming negatively. This combined with poorly managed landscape has had a negative impact on farm productivity. Kikuyu Municipality where the wetland is located is highly dependent on agriculture with horticulture being the dominant economic activity across the landscape. The farming practice is characterized by overhead irrigation as well as greenhouses. This practice is also common in the riparian land around Ondiri wetland. Overhead irrigation is often employed during the dry months and due to climate change occasioning prolonged dry months; demand for water abstraction from Ondiri wetland has increased overtime. The high temperatures experienced during the dry months lead to significant amounts of water being lost to the atmosphere through evapotranspiration. This increased demand calls for more abstraction from both surface and underground sources that are interlinked.

Key issues

- Low farm productivity due to prolonged dry months
- Increased reliance on wetland water abstraction
- Unsustainable human activities around Ondiri wetland

Operational Objectives

1) To promote climate smart agriculture
2) To enhance collaborative land management actions among stakeholders to address climate change related issues in Ondiri wetland ecosystem
3) To enhance capacity of local CBO's and other stakeholders to actively engage in policy and advocacy

A summary of actions to address climate change mitigation and adaptation

Management objective: To promote climate change mitigation, adaptive capacity and resilience at Ondiri wetland		
Operational objectives	**Management actions**	**Outputs**
To promote climate smart agriculture **Outcome**: smart agriculture innovations in place	To promote crop diversification and rotation.	Diverse crops on farm.
	To promote water conservation farming techniques like drip irrigation	water conservation adopted in farming
	To improve livestock management systems. such as fodder growing and banking	Improved livestock management systems.
	To promote soil conservation and management.	Soil conservation and management promoted.
	To promote water harvesting and use techniques.	Water harvesting techniques promoted.
	To promote aquaculture.	Aquaculture promoted.
To enhance collaborative land management actions among stakeholders to	To form a multi-stakeholder committee for climate change.	A multi-stakeholder committee for climate change formed.

address climate change related issues in Ondiri wetland ecosystem **Outcome**: collaborative stakeholders action on climate change enhanced	To formulate land management actions corresponding to County climate change action plan	climate change land management action plan around the wetland
	Create awareness of County climate change Act among stakeholders including schools	Awareness created
	To domestic climate change action plan activities at County level	County climate change action plan domesticated
	To develop a proposal for funding climate change, adaptation and mitigation issues, target County climate fund and other sources	Climate change proposal developed.
To enhance capacity of local CBO's and other stakeholders to actively engage in policy and advocacy. **Outcome**: stakeholders actively involved in policy and advocacy issues	To enhance capacity for local stakeholders to participate in policy activities, targeting FOWK	Skills and knowledge on policy and advocacy imparted.
	To training stakeholders like FOWK on lobbying and advocacy techniques	Stakeholders trained on lobbying and advocacy
	To create awareness on advocacy and lobbying of County climate change Act 2021	Awareness created on advocacy and lobbying climate change Act

7.6 Land Use Management programme

Introduction

There are 29 riparian land owners whose land borders Ondiri wetland along its 3.3 kilometers circumference. The number of the riparian landowners has been increasing due to subdivisions of existing land. The wetland is not formally registered with the Survey of Kenya and the Ministry of Lands. This affects sustainable utilization, conservation and management of the wetland. With the increase in population, the wetland is faced with the problem of change of land use from agricultural to individual residential or commercial use. These changes have contributed to generation of more liquid and solid

waste that negatively affect the wetland due to lack of effective and efficient waste management systems.

Key land management issues

- Unclear land ownership documentation
- Unsustainable land use changes

Operational Objectives

1) To process and formalize the land ownership of the wetland
2) To promote sustainable land use planning and practices

A summary of management actions to improve land management

Management objective: To promote sustainable land use and management around Ondiri wetland		
Operational objectives	**Management actions**	**Outputs**
To process and formalize the land ownership of the wetland **Outcome**: Wetland gazetted	Register Ondiri wetland with the Survey of Kenya and Ministry of Lands	Ondiri wetland registered and boundaries well established
	Mapping and Pegging of Ondiri wetland	Riparian boundaries are well-demarcated
	Gazettement of Ondiri wetland	Well-coordinated conservation and management initiatives
To promote sustainable land use planning and practices **Outcome**: Properly planned and sustainable land use	Creation of awareness on sustainable land use	Local community trained on sustainable land use practices
	Develop and implement a County spatial plan	County spatial plan developed

CHAPTER 8:

PLAN IMPLEMENTATION MATRIX

Table 5: Plan Implementation Matrix

WATER MANAGEMENT PROGRAMME										
Activity	**Sub-activity**	**Expected Outcome**	**Performance/ M&E Indicators**	**Actors**	**Budget (KSh) M**	**Timeframe**				
						Y 1	**Y 2**	**Y 3**	**Y 4**	**Y 5**
Operational Objective 1: To promote compliance with water abstraction regulations										
Establish and maintain an inventory of abstractors	Undertake an inventory of all abstractions	Regulated water abstraction	No. of abstraction points	**WRA,CGK**, NEMA CBOs, WRUAs, development partners	2.5M	X	X	X		
	Identify and prosecute illegal abstractors	Increased water volumes	No. of prosecutions	**WRA, CGK**, NEMA WRUAs, Development partners	4M	X	X	X	X	X
	Establish and strengthen WRUAs	Effective involvement in water management	No. of WRUAs established or strengthened	**WRA,** CGK, CBOs, Private sector	3.0 M	X		X		

Operational Objective 2: Enhance water quality and quantity within the wetland										
Manage solid and effluent discharge	Map and designate solid waste transfer stations within the municipality	reduced dumping	Designated solid waste transfer stations	**CGK,** Kikuyu Municipality, NEMA	100 M	X				
	Install solid waste receptors within the municipality	well managed solid waste	No. of waste bins installed	**CGK,** Kikuyu Municipality, NEMA, Private sector	5 M		X			
	Undertake regular clean-up events	Improved waste management	No. of clean-up events organized	**CGK,** Kikuyu Municipality; FOWK, NEMA	10M	X	X	X	X	X
	Expand and maintain a sewer line within Kikuyu Municipality	Reduced pollution to the wetland	Installed functional sewer plant	**CGK,** Kikuyu Municipality, NEMA, development partners	300M		X	X	X	
	Facilitate connection of facilities to the sewer line	improved water quality	No. of facilities connected to the sewer line	**CGK,** Kikuyu Municipality, NEMA,	50M		X	X	X	
	Undertake regular monitoring and analysis of water quantity & quality	Increased awareness on the quality of water	Monitoring report	**WRA,** WRUA NEMA, Community	10M	X	X	X	X	X

	Identify and stop illegal discharge points	Improved water quality	No. of illegal points identified and stopped	**NEMA**, WRA, NGAO, Community	5M	X	X	X	X	X
	Enforce EMCA Solid waste and water Quality Regulations	Increased compliance	No. of enforcement actions undertaken	**NEMA,** WRA, Kikuyu Municipality, Community	20M	X	X	X	X	X
	Create awareness on the impact of pollution	Reduced pollution impacts	Awareness reports	**NEMA,** WRA, KFS, Kikuyu Municipality, Community	10M	X		X		
Operational Objective 3: To promote catchment conservation and Management										
Promote good agricultural practices around swamp and catchment areas	undertake trainings and capacity building on good agricultural practices	Reduced siltation	% uptake of good practices	**CGK,** MoALF&BE, KALRO, Development partners	30.0 M	X	X	X	X	X
Rehabilitate degraded catchment areas	Identify degraded areas and initiate conservation measures	Well conserved catchment	Total area rehabilitated, monitoring report	**KFS,** KEFRI, KFA, WRA, NEMA, CGK, FOWK, CBOs, Development partners	50.0 M	X		X		X

	Promote agro-forestry/ farm forestry and other best practices	Improved vegetation cover	Monitoring reports	**CGK,** KFS, KEFRI, KWTA,, NGOs, CBOs, private sector	20.0 M	X	X	X	X	X
GOVERNANCE AND COORDINATION MANAGEMENT PROGRAMME										
Activity	**Sub- activity**	**Expected Outcome**	**Performance/ M&E Indicators**	**Actors**	**Budget (KSh) M**	**Time frame**				
						Y 1	**Y 2**	**Y 3**	**Y 4**	**Y 5**
Operational Objective 1: To enhance institutional capacity at the local level for sustainable management of Ondiri Wetland										
Establish Ondiri Wetland Management and Coordination committee	Undertake sensitization around Ondiri Wetland Identify and map all stakeholders in Ondiri area Conduct elections & train officials on governance and Wetland mgt	Enhanced capacity in wetland management	No of sensitization meetings Inventory of all players Minutes and Training reports	**NEMA,** WRA, KWTA, **CGK**, Community Groups, WRUAs, development partners	4.5M	X				
Build governance capacity of relevant community	Map all relevant community institutions in	Enhanced capacity of community groups	No of community groups mapped	**WRA, CGK** NEMA, KWTA, , SDO Community	3.5M	X	X	X		

institutions	Ondiri Undertake Capacity needs assessment and identify capacity gaps Develop capacity development plans Undertake training based on the capacity development plans		Capacity needs assessment report/ Plans developed No of trainings done No. of people trained	Groups, WRUAs, Development partners						
Operational objective 2: Enhance Coordinated enforcement actions by the lead agencies										
Build capacity of the relevant structures on regulatory frameworks for the management of the wetland	Train the County Environment Committee Train Ondiri wetland Management and coordination committee Recruit and train Voluntary scouts for monitoring and surveillance	Empowered structures	No. of trainings/ No. of people trained No. of trainings/ No. of people trained No. of scouts recruited and trained	**NEMA,** WRA, KWTA, KWS, Development partners, NGOs, Private sector, Local community	4.5M	X	X	X		

	Undertake public awareness among the stakeholders		No.of trainings No. of awareness							
Undertake regular Multi agency enforcement actions for the management of Ondiri swamp	Undertake inspections around the swamp Identify non compliances Issue Warnings/ Notices/orders Prosecute offenders	Improved health status of the swamp	No. of inspections done No.of non-compliances identified No. of warnings/notices/orders issued No. of prosecution cases	**NEMA**, KWS, KEFRI, KFS, CGK	5.0		X	X	X	X
Build capacity on the Ondiri swamp integrated Management plan for a coordinated management approach	Sensitize CEC Sensitize Ondiri Wetland management and coordination committee Undertake public awareness	Enhanced capacity	No of trainings No of campaigns	**NEMA,** WRA, KWTA, NGOs, CGK, , KFS, CBOs,	3M	X	X	X	X	X

Establish a site implementation committee	Organize workshops to establish and train the committee Monitor implementation Progress	Improved management of the swamp	No. of workshops No. of Monitoring	**NEMA,** CGK, KWTA, KFS,	2.5M	X	X	X	X	X
Operational objective 3: To Enhance capacity of Ondiri wetland players in resource mobilization										
Train and capacity build on resource mobilization	Identify relevant players in Ondiri Train on resource mobilization and proposal writing Establish a donor networks and database Hold donor round table meetings and scout for relevant donors Prepare and submit fundable proposals	Enhanced resource mobilization capacity Increased resources Improved wetland management	No. of players identified No. of players trained/ No. of trainings Networks established No. of donor meetings No of fundable proposals submitted	**NGOs,** CGK, NEMA, KWS,KEFRI	5M	X	X	X	X	X
BIODIVERSITY MANAGEMENT PROGRAMME										

Activity	Sub - activity	Expected Outcome	Performance/ M&E Indicators	Actors	Budget (KSh) M	Time frame				
						Y 1	Y 2	Y 3	Y 4	Y 5
Operational Objective 1: To undertake biodiversity survey and monitoring in Ondiri wetland										
Undertake biodiversity survey and monitoring	Conduct biodiversity survey	Species of Ondiri wetland identified	Species inventory	**NMK,** KWS, KFS, KEFRI, academia, NEMA, NGOs, CBOs, Communities	2M	X	X			
	Undertake biodiversity monitoring	Status of biodiversity monitored	Species monitoring reports		2M		X	X	X	X
Raise awareness on the importance of biodiversity.	Community/stake holder mobilization	More local community members undertaking conservation initiatives	Number of people attending conservation meetings		4M	X	X	X	X	X
	Awareness creation through site meetings, workshops, village *barazas* and local radios/TV stations	Enhanced awareness on importance of biodiversity within the swamp	Number of TV/Radio programmes aired Awareness meetings/forums reports	**CGK**, KWS, KFS, NMK, NEMA, NGOs, CBOs, Communities, media	3M	X	X	X	X	X
Operational Objective 2: To Promote sustainable conservation and management of biodiversity Ondiri wetland										

Map and restore degraded habitats	Map degraded areas	Degraded areas mapped	Map of degraded sites	**CGK**, ,- KWS, KFS, WRA NEMA, NGOs, CFAs, CBOs, KEFRI, KALRO, Academia,	2M	X				
	Rehabilitate degraded areas	Degraded catchment areas rehabilitated	Acreage rehabilitated.	**CGK**, KWS, KFS, WRA NEMA, NGOs, CBOs, private sector actors, KEFRI	10M		X	X	X	X
	Establishment of /expanding the capacity of tree nurseries	Tree nurseries established and the capacity of existing ones expanded	Number of tree nurseries established and or expanded	**CGK**, KWS, KFS, WRA NEMA, NGOs, CBOs, private sector actors, KEFRI, NECC	2M	X	X	X	X	X
Remove and replace exotic and invasive species	Remove and replace exotic and invasive species in core conservation areas	Exotic and invasive species removed and replaced	Number of exotic and invasive species replaced	**CGK**, KWS, KFS, WRA NEMA, NGOs, CBOs, private sector actors, KEFRI	5M	X	X	X	X	X
Operational Objective 3: Enhance protection of Ondiri wetland										

Zoning and securing core wildlife habitats	Mapping and zoning the core wildlife areas	Core wildlife areas mapped and zoned	Information sheets/database collected by youths	**KWS**, CGK, NGAO, KFS, communities	1M	X	X			
	Recruit community scouts to undertake monitoring to identify illegal activities	Community scouts enlisted	List of scouts enlisted	**KWS**, CGK, NGAO, KFS, communities	1M	X	X			
	Procurement of equipment (vehicles, uniform, boots, motorbikes etc), running and maintenance cost	Patrol equipment procured and maintained	Inventory of equipment procured And maintained	**CGK, KWS,** NEMA, Min of Interior, NGOs, local CBOs development partners	5M		X	X	X	X
	Undertaking regular joint patrols to secure zoned habitats	Enhanced surveillance of zoned habitats	List of officers deployed No. of patrols conducted Compliance reports	**KWS**, CGK, NGAO, KFS, communities	2M		X	X	X	X
SOCIO-ECONOMIC AND CULTURAL MANAGEMENT PROGRAMME										
Activity	**Sub- activity**	**Expected Outcome**	**Performance/ M&E Indicators**	**Actors**	**Budget (KSh) M**	**Time frame**				
						Y	**Y**	**Y**	**Y**	**Y**

						1	2	3	4	5
Operational Objective 1: To promote alternative sources of livelihood for the local community										
Diversify livelihood activities	undertake studies/ survey on sustainable alternative livelihoods Implement studies/survey findings	Diverse livelihood options adopted by local communities	Documentation on alternative livelihoods adopted	**CGK**, KALRO, Academia, CBOs, NGOs	100M	X	X	X	X	X
Create awareness on alternative sources of livelihoods	catalyze information dissemination through print, audio and social media Organize demonstration sessions	Increased awareness on the alternative sources of livelihood options	Awareness materials produced	**CBOs**, FOWK,CGK Residents associations Farmers, NEMA NECC	10M	X	X	X	X	X
Operational objective 2. To promote research and training on livelihood programmes										
Capacity building of local community groups	Develop training Manuals Identify groups to be trained within Ondiri wetland catchment (i.e	Sustainable livelihoods options adopted by community members	Training manual Number of trainings held and conservation	**CBOs,** CSOs, FOWK CGK	5 M	X	X	X		

	income generating groups)		groups trained							
Develop and implement a benefit sharing mechanism	Constitute a committee to develop a benefit sharing framework Implement the benefit sharing framework	A benefit sharing framework developed and implemented	No. of beneficiaries	**NEMA**, CGK, CSOs	5 M		X	X	X	X
Operational Objective 3. To integrate modern and traditional knowledge in the management of Ondiri Wetland										
Document indigenous knowledge (IK) to assist in environmental planning and management	Conduct survey to document IK Disseminate survey findings	IK documented and disseminated	IK study reports;	**CGK**, NMK,	5M					
CLIMATE CHANGE MANAGEMENT PROGRAMME										
Activity	**Sub- Activity**	**Expected Outcome**	**Performance/ M&E Indicators**	**Actors**	**Budget (KSh) M**	**Time frame**				
						Y 1	**Y 2**	**Y 3**	**Y 4**	**Y 5**
Operational Objective 1: To promote climate change mitigations and adaptations										

	To promote water conservation farming techniques like drip irrigation	Water conservation adopted in farming	No farmers who have adopted water conservation techniques Records of water abstraction Technologies being used for irrigation	**CGK**, MoALF&C, Community groups, WRA	1.5M	X	X	X		
	Promotion of fodder production and banking to reduce over-reliance of posture from swamp	Improved fodder production Improved livestock management systems.	No of farmers in fodder production No of farmers in fodder preservation No of training on fodder	**MoALF&BE**, CGK,	3m	X	X	X		

	To promote soil conservation and management.	Soil conservation and management promoted.	No of farmers in soil conservation No of trainings on soil conservation Techniques adopted by farmers	**MoALF&BE**, Community groups, WRA, MEF, FOWK,						
	To promote water harvesting and use techniques.	Water harvesting techniques promoted	Techniques adopted by farmers No of farmers using water harvesting techniques No of trainings on water harvesting and use techniques	**WRA**, Community groups, WRUAS, MEF	4M	X	X	X		

	To promote aquaculture.	Aquaculture promoted.	No of meetings on community sensitization No of trainings in aquaculture No of farmers who have adopted aquaculture Type of fish promoted	Community groups, CGK, MOAL	4M	X	X	X		
To enhance collaborative land management actions among stakeholders to address climate change related issues in Ondiri wetland ecosystem	To form a multi-stakeholder committee for climate change. which is site implementation committee		Minutes of stakeholders meeting Images from meetings Members of the committee Strategies/actions formulated	**RLO**, NEMA, CGK, Community Groups, MEF, MOAL	2M	X	X	X	X	X

	To create awareness on County climate change action	Awareness created among stakeholders including schools	Invitation memos Minutes of training Images of meetings	**CGK**, CSOs,	3M	X				
	To domesticate climate change action plan activities at County level	County climate change action plan domesticated	Minutes of meetings Strategies on domestication Records of domestication	**CGK**, Community Groups, RLO	6M	X	X	X		
	To formulate land management actions corresponding to County climate change action plan	climate change land management action plan around the wetland	Management action plan Planning meetings minutes Record of formulation Records of implementation	**RLO**, NEMA, CGK, Community Groups, MEF, MOAL	4.5M	X	X	X		
	To develop a proposal for	Climate change proposal	Proposal developed	**RLO,** CGK CBOs, NEMA		X	X	X	X	X

	funding climate change, adaptation and mitigation measures, target County climate fund and other sources	developed.	Meeting minutes Strategies on proposal development							
To enhance capacity of local CBO's and other stakeholders to actively engage in policy and advocacy.	To enhance capacity for local stakeholders to participate in policy activities	Skills and knowledge on policy imparted.	No of Stakeholders involved in capacity enhancement No of meetings in policy activities Policy formulation meetings Policy awareness material produced	**CGK**, Community groups, RLO, MEF, MOAL, CSOs	4.5M		x	x	x	X

	To train stakeholders like FOWK on lobbying and advocacy techniques	Stakeholders trained on lobbying and advocacy	No of stakeholders trained No of training forums No of advocacy meetings held Advocacy forums formed	**CBOs,** RLO, CSOs NECC	3M	X	X	X	X	X
	To create awareness of County climate change Act 2021	Awareness created on climate change Act	Minutes of awareness meeting No of people trained Awareness material produced	**CGK**, Community groups, NEMA, RLO, CSOs	4M	X	X	X		
LAND USE MANAGEMENT PROGRAMME										
Activity	**Sub-activity**	**Expected Output/outcome**	**Performance/ M&E Indicators**	**Actors**	**Budget (KSh) M**	**Time frame**				
						Y 1	**Y 2**	**Y 3**	**Y 4**	**Y 5**
Operational Objective 1: To process and formalize the land ownership of the wetland										

Register Ondiri swamp with the Survey of Kenya and Ministry of Lands	Conduct Survey and register the wetland	Ondiri wetland registered and boundaries well established	Survey map and L.R. Number	**SOK, NLC**, NEMA, CGK, WRA, RLO	10M	X	X			
Mapping and pegging of Ondiri swamp	Hold sensitization meetings with the riparian land owners. Mark the riparian boundaries	Riparian boundaries are well-demarcated	Minutes of the sensitization meetings; Riparian area pegs; GIS Map.	**WRA**, NEMA, NLC, CGK, RLO	5M	X	X			
Gazettement of Ondiri as a protected wetland	Conduct stakeholders sensitization meetings; Publishing the gazette notice	Gazetted wetland	Copy of gazettement notice	**NEMA,** CGK, WRA, WRUA, RLO, NGOs, media, NLC	3M	X	X			
Operational Objective 2: To promote sustainable land use planning and practices										
Creation of awareness on sustainable land use	Build the Capacity of the community and stakeholders on sustainable land management practices	Local community trained on sustainable land use practices	Training report and photos of the participants.	**CGK,** NEMA, WRA, WRUA CBOs	10M	X	X	X	X	X
	Promote Eco friendly	Best agricultural	Field reports on sustainable	**CGK** NEMA	15M	X	X	X	X	X

	agricultural practices around the wetland e.g. Organic Farming, Agroforestry, and Conservation Agriculture.	practices widely adopted in the wetland	agriculture practices	CBOs, Partners/donors						
Develop and implement a County spatial plan	Preparation and implementation of County Spatial Plan	Spatial plan developed and implemented	Copy of approved County spatial plan	**CGK,** NEMA, SOK, NLC, WRA,CBOs	20M	X	X	X		

CHAPTER 9:

MONITORING AND EVALUATION

The Monitoring and Evaluation (M&E) framework will be used in tracking progress performance and impact of Ondiri Wetland Management Plan. M&E would be utilized to collect information and data for effective implementation of the Management Plan and the related programmes and projects' activities. The performance indicators encompass environmental and socio-economic conditions that reflect achievement of the expected outputs and outcomes as well as consequential effects and impacts of the Management Plan.

The Monitoring and Evaluation framework, among other things, will be utilized to build an information base and identify critical information gaps. It will assist to identify attributes of the resources, threats, mitigation measures, as well as identify the baseline conditions and emerging issues.

The effectiveness and sustainability of this Monitoring and Evaluation plan is dependent on the following conditions;

- Participatory approach in the planning and implementation of this management plan involving and including all stakeholders
- Evidence a strong reliance among partners in implementing and monitoring field activities.
- Timely reporting of feedback to all stakeholders that aid in decision making and adaptive management.
- Thorough analysis of performance as required for decision making and development of lessons learnt so as to skew up performance.

Table 6: Monitoring and Evaluation Plan

Result level Management objectives	Performance indicator	Means of verification	Risks and assumptions
Water Management Programme			
Operational Objective 1: To promote compliance with water abstraction regulations	• inventory of all abstraction plans • All abstraction permitted • WRUAs coordinating water abstraction	Permits issues Data on water abstraction returns	Failure by WRA to enforce permit abstraction levels
Operational Objective 2: Enhance water quality and quantity within the wetland	• Improved water quality • River gauging level at R. Nyongera	Water quality reports monitoring reports River gauging report	Failure to install
Operational Objective 3: To promote catchment conservation and Management	• Catchment conservation measures in place • Sub-catchment management plan developed • A appropriate trees planted in catchment	Sub-catchment management	stakeholders conflict inadequate funds to undertake activities
Governance and Coordination Management Programme			

Operational Objective 3: To enhance a coordinated Management approach for Ondiri swamp	• Plan implementation committee on sites • Annual Management plan work • Participation of the various stakeholders	Committee reports Annual plans Minutes of meetings	Failure to form sites implementation committee
Operational objective 2: Enhance Coordinated enforcement actions by the lead agencies	• Enforcement team in place • Government lead agencies involved in wetland management plan • Cooperation between lead agencies and community	Enforcement report Reports on enforcements	Lack of cooperation among lead agencies
Operational Objective 3: To enhance a coordinated Management approach for ondiri swamp	• Site implementation committee formed and operation • Composition of committee made of state and non-state actors • Annual work plan	Reports of site committee Membership of committee Annual reports	Delay in formation of committee Dysfunctional site committee
Biodiversity Management Programme			
Operational Objective 1: To undertake biodiversity survey and monitoring in Ondiri wetland	• Updated Biodiversity report for the wetland and adjacent area • Monitoring plan in place	Biodiversity report Monitoring report	Lack or inadequate funds for the survey
Operational Objective 2: To Promote sustainable conservation and management of biodiversity in Ondiri wetland	Initiative towards sustainability such as nature walks, birding	Reports on nature walk activities List of visitors	Poor management of the site discourage visitation Insecurity increasing in the area

Operational Objective 3: Enhance protection of Ondiri wetland	• Security arrangement in place in Ondiri area • Citizens participating in wetland protection including reporting incidences of crime	Protection reports	Inadequate corporation by local residents Low funds for protection agencies
Socio-economic and Cultural Management Programme			
Operational Objective 1: To promote alternative sources of livelihood for the local community	• Alternative livelihood implementation in place • Diversification of income sources including nature based enterprises	Reports on livelihood Reports in income sources	Lack of resources to support for diversification
Operational objective 2. To promote research, training on livelihood programmes	• Types of research ongoing in the ecosystem • Livelihood awareness programmes implementation plan	Field reports in awareness meetings Research reports	Inadequate funds to support training
Operational Objective 3. To formulate a benefit sharing mechanism	Benefit sharing formulated and approved	Benefit sharing document	Lack of consensus on benefit sharing approach
Operational Objective 4. To integrate modern and traditional knowledge in the management of Ondiri Wetland	• Both modern and traditional practices supporting wetland management	Field reports	Conflict between traditions impacting management negatively
Climate Change Management Programme			

Operational Objective 1: To promote climate change mitigations and adaptations	• Climate change mitigation and adaptations measures in place around Ondiri • Lead agencies contributing to support mitigation and adaptations	Field reports	Inadequate funds to implement mitigation and adaptations
To enhance collaborative land management actions among stakeholders to address climate change related issues in Ondiri wetland ecosystem	Stakeholders collaborating in land management approaches Climate change management committee	Field reports	Conflict among stakeholders Low corporation
To enhance capacity of local CBO's and other stakeholders to actively engage in policy and advocacy.	• Citizens around Ondiri involved in policy debate • Local advocacy group active on conservation and management	Policy reports Advocacy reports	Low interest in policy and advocacy
Land use Changes Management			
Operational Objective 1: To process and formalize the land ownership of the wetland	• Wetland gazette process completed • Citizen awareness of gazettement process and well received	Gazettement notice in Kenya gazette	Conflict with stakeholders delaying or derailing the process
Operational Objective 2: To promote sustainable land use planning and practices	• Ecologically friendly activities in place such as birding • Controlled water abstraction • Restoration activities in place	Field reports Visitors numbers	Business as usual continues

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ANNEXES

Annex 1: Checklist of birds of Ondiri wetland

(AM = Afrotropical migrant; PM = Palearctic migrant (Lower case am or pm = part of population is resident); EN = Endangered; CR = Critically Endangered; R = Resident).

Group	Common Name	Scientific Name	Status
Anatidae: ducks and geese	Yellow-billed Duck	*Anas undulata*	am
Podicipedidae: grebes	Little Grebe	*Tachybaptus ruficollis*	R
Threskiornithidae: ibises & spoonbills	Hadada Ibis	*Bostrychia hagedash*	R
	Sacred Ibis	*Threskiornis aethiopicus*	R
	African Spoonbill	*Platalea alba*	R
Ardeidae: herons, egrets and bitterns	Grey Heron	*Ardea cinerea*	am, pm
	Black Headed Heron	*Ardea melanocephala*	R
Falconidae: falcons	Lanner Falcon	*Falco biarmicus*	R
Accipitridae: hawks, vultures, buzzards,	Black Kite (Yellow-Billed Kite)	*Milvus migrans*	am, pm
	Ruppell's Vulture	*Gyps rueppellii*	CR
	African Harrier Hawk	*Polyboroides typus*	R
	Common (Steppe) Buzzard	*Buteo buteo*	PM
	Augur Buzzard	*Buteo augur*	R
	Booted Eagle	*Hieraaetus pennatus*	PM
	Ayre's Hawk Eagle	*Hieraaetus ayresii*	R
	African Marsh Harrier	*Circus ranivorus*	R
	Black (Great) Sparrowhawk	*Accipiter melanoleucus*	R

Group	Common Name	Scientific Name	Status
	Long-crested Eagle	*Lophaetus occipitalis*	R
Columbidae: pigeons & doves	Speckled pigeon	*Columba guinea*	R
	Red -eyed Dove	*Streptopelia semitorquata*	R
	Feral (Rock) Pigeon	*Columba livia*	R
Cuculidae: cuckoos & coucals	Red-chested Cuckoo	*Cuculus solitarius*	am
	White-browed Coucal	*Centropus superciliosus*	R
	Klaas's Cuckoo	*Chrysococcyx klaas*	R
Caprimulgidae: nightjars	Montane Nightjar	*Caprimulgus poliocephalus*	R
Apodidae: swifts	Little swift	*Apus affinis*	R
Gruidae: cranes	Grey Crowned Crane	*Balearica regulorum*	EN
Ciconiidae: storks	Marabou Stork	*Leptoptilos crumeniferus*	R
Coliidae: mousebirds	Speckled Mousebird	*Colius striatus*	R
Picidae: wrynecks & woodpeckers	Red-throated Wryneck	*Jynx ruficollis*	R
Alcedinidae: kingfishers	Malachite Kingfisher	*Corythornis cristatus*	R
Meropidae: bee-eaters	Cinnamon-chested Bee-eater	*Merops oreobates*	R
	Eurasian Bee-eater PM	*Merops apiaster*	PM
Malaconotidae: bush-shrikes, chagras & puff backs	Black-backed Puffback	*Dryoscopus cubla*	R
Ramphastidae (Lybiinae): barbets and tinker birds	Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	R
Platysteiridae: batises, wattle-eyes and allies	Chin-spot Batis	*Batis molitor*	R
Laniidae: shrikes	Northern (Common) Fiscal	*Lanius collaris*	R
Monarchidae: monarchs (paradiseflycatchers)	African Paradise Flycatcher	*Terpsiphone viridis*	am

Group	Common Name	Scientific Name	Status
Corvidae: crows and Allies	Pied Crow	*Corvus albus*	R
Paridae: tits	White-bellied Tit	*Melaniparus albiventris*	R
Hirundinidae: swallows and martins	Black Saw-wing	*Psalidoprocne pristoptera*	R
	Plain Martin	*Riparia paludicola*	R
	Rock Martin	*Ptyonoprogne fuligula*	R
	Common (Northern) House Martin	*Delichon urbicum*	PM
	Red-rumped Swallow	*Cecropis daurica*	R
Cisticolidae: cisticolas and allies	Red-faced Cisticola	*Cisticola erythrops*	R
	Singing Cisticola	*Cisticola cantans*	R
	Hunter's Cisticola	*Cisticola hunteri*	R
	Winding Cisticola	*Cisticola marginatus*	R
	Stout Cisticola	*Cisticola robustus*	R
	Grey-Backed Camaroptera	*Camaroptera brevicaudata*	R
	Tawny-flanked Prinia	*Prinia subflava*	R
Pycnonotidae: bulbuls	Common Bulbul	*Pycnonotus barbatus*	R
Zosteropidae: white-eyes	Montane (Kikuyu) white-eye	*Zosterops poliogastrus*	R
Locustellidae: grassbirds	Little (Southern)Rush Warbler	*Bradypterus baboecala*	R
	Cinnamon Bracken Warbler	*Bradypterus cinnamomeus*	R
Acrocephalidae: reed warblers and allies	Lesser Swamp Warbler	*Acrocephalus gracilirostris*	R
	Dark-capped (African) Yellow Warbler	*Iduna natalensis*	R
Phyllosopidae: old world leaf warblers	Willow Warbler	*Phylloscopus trochilus*	PM
Sylviidae: sylviid warblers and hill babblers	Blackcap	*Sylvia atricapilla*	PM
	Garden Warbler	*Sylvia borin*	PM
Turdidae: true thrushes	Abyssinian (Olive) Thrush	*Turdus olivaceus*	R

Group	Common Name	Scientific Name	Status
Muscicapidae: scrub robins, African robins,chats and flycatchers	Cape Robin Chat	*Cossypha caffra*	R
	Ruppell's Robin Chat	*Cossypha semirufa*	R
	Common (African) Stonechat	*Saxicola torquatus*	R
	White-eyed Slaty Flycatcher	*Melaenornis fischeri*	R
	African Dusky Flycatcher	*Muscicapa adusta*	R
Nectariniidae: sunbirds	Collared Sunbird	*Hedydipna collaris*	R
	Green-headed Sunbird	*Cyanomitra verticalis*	R
	Amethyst Sunbird	*Chalcomitra amethystina*	R
	Bronze Sunbird	*Nectarinia kilimensis*	R
	Northern Double-collared Sunbird	*Cinnyris reichenowi*	R
	Variable Sunbird	*Cinnyris venustus*	R
Passeridae: old world sparrows and	House Sparrow	*Passer domesticus*	R
Petronias	Kenya (Rufous) Sparrow	*Passer rufocinctus*	R
Ploceidae: weavers, bishops and widowbirds	Grosbeak Weaver	*Amblyospiza albifrons*	R
	Baglafecht Weaver	*Ploceus baglafecht*	R
	Spectacled Weaver	*Ploceus ocularis*	R
	Holub's Golden Weaver	*Ploceus xanthops*	R
	Yellow Bishop	*Euplectes capensis*	R
	White-winged Widowbird	*Euplectes albonotatus*	R
	Red-collared Widowbird	*Euplectes ardens*	R
	Speke’s Weaver	*Ploceus spekei*	R
Estrildidae: waxbills	Common Waxbill	*Estrilda astrild*	R
	Red-billed Firefinch	*Lagonosticta senegala*	R

Group	Common Name	Scientific Name	Status
	Orange-breasted (Zebra) Waxbill	*Amandava subflava*	R
	Bronze Mannikin	*Spermestes cucculatus*	R
Motacillidae: wagtails, longclaws and pipits	Yellow Wagtail	*Motacilla flava*	PM
	Cape Wagtail	*Motacilla capensis*	R
	African Pied Wagtail	*Motacilla aguimp*	R
Fringillidae: canaries, seedeaters and allies	Yellow-crowned Canary	*Serinus flavivertex*	R
	African Citril	*Crithagra citrinelloides*	R
	Brimstone Canary	*Crithagra sulphurata*	R
	Streaky Seedeater	*Crithagra striolata*	R

Annex 2. List of Macroinvertebrates, Fish and Amphibians

MACRO INVERTERBRATES				
Common names	**Family**	**Common names**	**Genus**	**species**
Spiders	Tetragnathidae	Long-jawed water spiders	*Tetragnatha*	*sp*
Beetles	Dytiscidae	Diving beetles	*Copelatus*	*assimilis*
	Dytiscidae	Diving beetles	*Copelatus*	*erichsoni*
	Dytiscidae	Diving beetles	*Rhantus*	*capensis*
	Dytiscidae	Diving beetles	*Yola*	*sp*
	Gyrinidae	Whirlgig beetles	*Aulonogyrus*	*caffer*
	Hydrophilidae	Water scavanger beetles	*Coelostoma*	*sp*
	Hydrophilidae	Water scavanger beetles	*Enochrus*	*sp1*
	Hydrophilidae	Water scavanger beetles	*Enochrus*	*sp2*
	Hydrophilidae	Water scavanger beetles	*Helochares*	*depactus*
	Hydrophilidae	Water scavanger beetles	*Helochares*	*pallens*
	Hydrophilidae	Water scavanger beetles	*Helochares*	*sp3*
	Hydrophilidae	Water scavanger beetles	*Helochares*	*sp4*
	Hydrophilidae	Water scavanger beetles	*Sternolophus*	*angolensis*
	Scirtidae	Marsh beetles		
Crayfish, crabs, shrimps	Cambaridae	Fresh water crayfish	*Procambarus*	*clarkii*
True flies	Chironomidae	Lake flies	*Chironomus*	*sp*
	Culicidae	Mosquitoes	*Culex*	*duttoni*
Mayflies	Baetidae	Small Minnow Mayflies	*Cloeon*	*sp*
True bugs	Belastomatidae	Giant water bugs	*Appasus*	*nephoides*
	Gerridae	Pond striders/Water skaters	*Eurymetra*	*natalensis*

	Mesoveliidae	Water treaders	*Mesovelia*	*sp*
	Notonectidae	Back swimmers	*Anisops*	*debilis*
Dragonflies & Damselflies	Aeshnidae	Hawkers	*Pinheyschna*	*sp*
	Coenagrionidae	Narrow-winged damselflies	*Proischnura*	*subfurcata*
	Coenagrionidae	Narrow-winged damselflies	*Pseudagrion*	*spernatum*
	Libellulidae	Skimmers	*Orthetrum*	*julia*
AMPHIBIANS				
Common names	**Family**	**Common names**	**Genus**	**species**
Frogs	Phrynobatrachidae	Kinangop river frog	*Phrynobatrachus*	*kinangopensis*
	Pipidae	African clawed frog	*Xenopus*	*borealis*
	Ptychadenidae	Hot springs grass frog	*Ptychadena*	*nilotica*
	Hyperoliidae	Bladder reed frog	*Hyperolius*	*cystocandicans*
FISH				
Common names	**Family**	**Common names**	**Genus**	**species**
Tilapia	Cichlidae	Sabaki tilapia	*Oreochromis*	*spilurus*
	Cichlidae	Dwarf Victoria mouthbrooder	*Pseudocrenilabrus*	*multicolor victoriae*

Appendix 3: Full list of participants during the validation meeting

VALIDATION MEETING OF ONDIRI WETLAND MANAGEMENT PLAN TO BE HELD ON 5TH MAY, 2022 IN KIAMBU COUNTY

List of Attendance

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VALIDATION MEETING OF ONDIRI WETLAND MANAGEMENT PLAN TO BE HELD ON 5TH MAY, 2022 IN KIAMBU COUNTY

List of Attendance

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List of Attendance

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VALIDATION MEETING OF ONDIRI WETLAND MANAGEMENT PLAN TO BE HELD ON 5TH MAY, 2022 IN KIAMBU COUNTY

List of Attendance

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List of Attendance

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VALIDATION MEETING OF ONDIRI WETLAND MANAGEMENT PLAN TO BE HELD ON 5TH MAY, 2022 IN KIAMBU COUNTY

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