

MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES

LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT PHASE TWO (LVEMP II) - KENYA

OMBEYI INTEGRATED WETLAND MANAGEMENT PLAN

“A sustainably Managed Ombeyi Wetland for Improved Community Livelihoods”





MINISTRY OF ENVIRONMENT, WATER
AND NATURAL RESOURCES

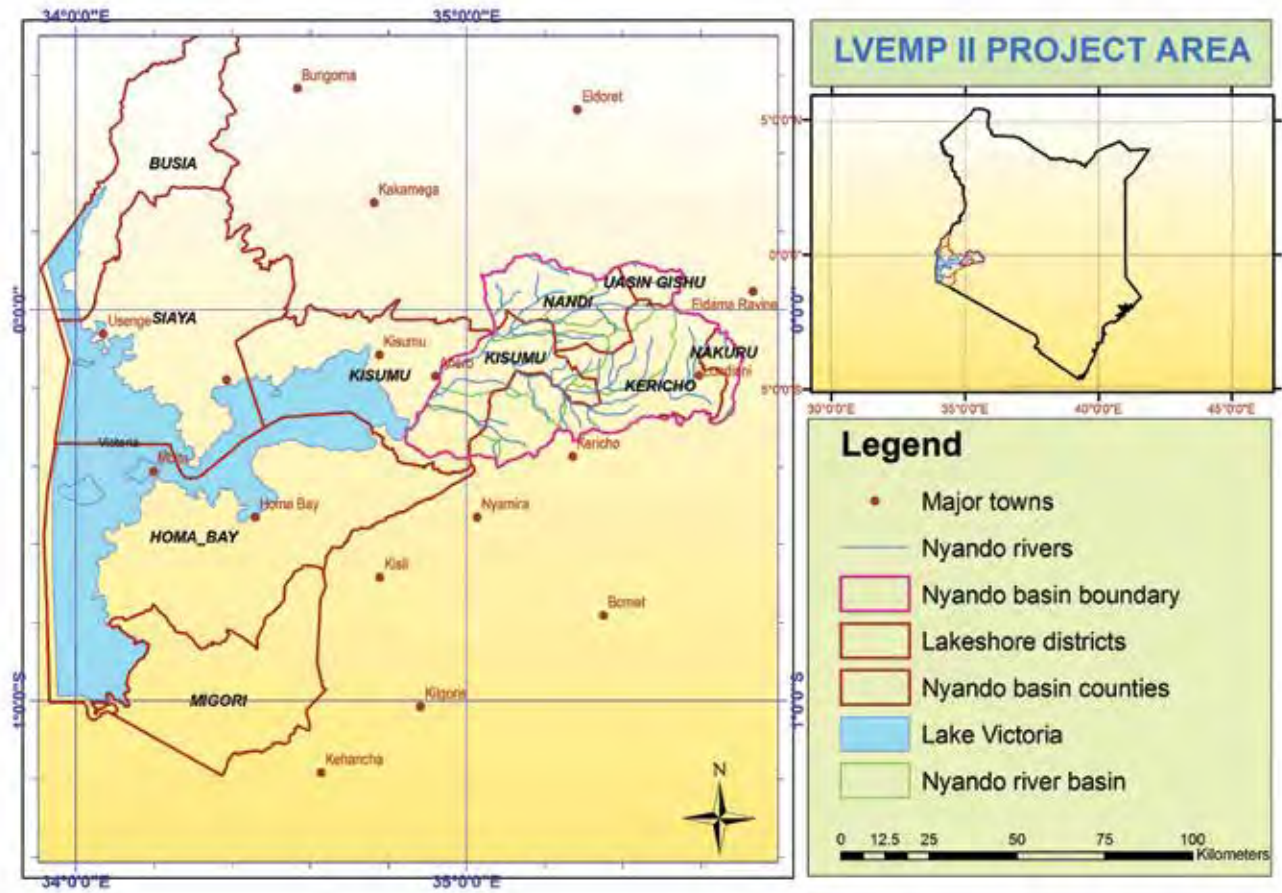
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PROJECT COVERAGE AREA



NYANDO RIVER BASIN



FOREWARD

Globally, wetlands are recognized as important ecosystems providing essential goods and services. They regulate water flow, recharge ground water, store and release water, filter nutrients and other pollutants, stabilize shoreline and microclimate and are of exceptional importance as habitats supporting biodiversity. Wetland habitats are also of high economic importance for provision of water and fisheries and thus supporting livelihoods to riparian and wetland-dependent communities.

In Kenya, wetlands cover approximately 14,000 km² (ca 3-4%) of the surface area of the country. They are rich in living and non-living natural resources, and are important sources of food, water, medicinal plants, fuel wood, materials for building and handcrafts.

Despite the myriad of benefits that they provide, wetlands continue to be drained at an alarming rate, to provide space for agriculture, human settlement and urban development among other competing developmental needs. These changes have had significant and deleterious effects to wetland ecosystems and the people depending on them due to pollution and the resultant loss of important ecosystem goods and services.

Given the fragility and vulnerability of many wetlands, there is an urgent need to strike a balance between the environmental functioning and wetland use for livelihood support. This requires management systems that take cognizance of the wetland ecosystems' natural characteristics while also allowing for their wise use. Such management regimes must be aligned to the Ramsar Convention's (1971) wise-use principle, which also requires development and implementation of Integrated Wetland Management Plans (IWMPs).

The Ministry of Environment, Water and Natural Resources (MWENR) continues to recognize the role wetlands play in the economy of this country and therefore has put in place the requisite legislations and policy frameworks to govern environmental and natural resource use in accordance with the Constitution of Kenya 2010 and the development blue print, Vision 2030. Further, the ministry shall enact appropriate legislation and review the old ones in order to align and make them current, responsive and relevant to address emerging environmental challenges including wetlands degradation and climate change.

The Ombeyi Integrated Wetland Management Plan (2014-2018) has set the stage for consolidating the efforts of various stakeholders in a bid towards effective and efficient wetland resource use for posterity. The implementation of the various programmes and actions set forth in this plan, envisions sustainable wetland management by halting the current degradation and loss of essential benefits that this wetland provides. The Ministry calls upon all stakeholders and actors to implement this plan. Importantly, is the recognition of environmental management mandate as a concurrent jurisdiction between the two levels of government, in which case, the County Government of Kisumu is urged to provide leadership and guidance towards realizing the plan's outcome.



Richard L. Lesiyampe, Phd, MBS,

Principal Secretary

Ministry of Environment, Water & Natural Resources

PREFACE

Wetland Management requires collaborative efforts among the various actors of the Government, Non-State Actors, Media, local communities and institutions working towards the achievement of sustainable development. While the role of wetlands in supporting community livelihoods and enhancing resilience cannot be over-emphasized, the degradation of many wetlands in Kenya is a cause to worry.

The Environmental Management and Coordination Act of 1999, has provided substantial provisions and opportunities for conservation and sustainable management of wetlands in Kenya. Sections 42, 54 and 55 particularly, have elucidated the need for sustainable wetlands, marine and coastal resources. In addition, the subsidiary legislations (regulations) such as the Environmental Management and Coordination (EIA/Audit) regulation of 2003 and the Environmental Management and Coordination (Wetlands, Riverbanks, Lakeshore and Seashores Management) Regulations of 2009 among others, have further stressed sustainable development within and around wetland areas through development control and gazettment of wetlands as protected and conservation areas.

As the environmental watchdog, the National Environment Management Authority (NEMA-Kenya) will continue to discharge its mandate on supervision and coordination of matters relating to sustainable environmental management, recognizing wetlands as Ecologically Sensitive Areas (ESAs) and instituting appropriate measures to reverse wetland degradation and loss. Additionally, as the principle government instrument charged with environmental management including coordinating of development of wetland management plans, I want to sincerely thank all the stakeholders for taking their time and resources to ensure the finalization of this plan. We shall therefore support the successful implementation of Ombeyi Integrated Wetland Management Plan for the benefit of both present and future generations.



Prof. Geoffrey Wahungu,

Director General

National Environment Management Authority

ACKNOWLEDGEMENTS

Ombeyi Integrated Wetland Management Plan has set the motion towards ensuring wise-use and sustainable management of the wetland resources. The plan which envisions a *sustainably managed Ombeyi wetland for improved community livelihoods* is a product of commitments and good will of many stakeholders. Therefore, my warm gratitude goes to the entire stakeholders who participated in the development and drafting of this important framework document.

The development and finalization of this plan involved considerable consultations with stakeholders both at the County and National Government levels as well as communities. In recognizing the value and role that wetlands play in providing ecological balance, this enabled privatization of wetlands and watershed management as critical components of LAVEMP II.

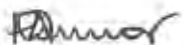
I recognize the financial support provided by the Government of Kenya and the World Bank without which this exercise could not have been achieved.

I want to thank members of the National Policy Steering Committee, National Technical Steering Committee and Project Coordinating Teams (NPCTs and DPCTs) for their valuable support and inputs during the wetland management plan preparation process. I wish to particularly thank the Principal Secretary, State Department of Environment and Natural Resources; as the Chairman of the National Policy Steering Committee and the Accounting Officer, for providing effective policy direction and decision making.

As this process was highly consultative, I am grateful for the patience, dedication, guidance, expertise and excellent facilitation accorded by the Lead Facilitators who steered the entire process right from community consultations, rapid ecological and hydrological assessments, drafting and finalization of this plan. In this regard, I owe much gratitude to Mr Benard Opa, Ms. Stella Wanjala, Mr. Palapala Muteshi, Mr. Valentine Lala (all of NEMA-Kenya), together with the LAVEMP II Environment specialists Mr. Stanley Ambasa and Mr. Solomon Kihui. I thank NEMA management for allowing these officers to participate and guide the process.

Also appreciated is the support accorded by the communities and the County Government of Kericho during consultations and fruitful inputs that have been essential in finalizing this plan. This has not only enabled ownership but also ensured that the plan's implementation is taken up by the County Government.

Last but not least, I am indebted to the Ministry of Environment, Water and Natural Resources, particularly to the Director Programmes, Projects and Strategic Initiatives / National Focal Point Officer, LAVEMP II Ms. Agnes Yobteric for her commitment and continued support during the entire plan development.



Francisca Owuor,

National Project Coordinator

Lake Victoria Environmental Management Project (LVEMP II)

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LIST OF ACRONYMS

LVEMP	Lake Victoria Environmental Management Project
ESAs	Ecologically Sensitive Areas
IWMPs	Integrated wetland Management Plans
Fig	Figure
URTI	Urinary Tract Infections
HIV/AIDS	Human-Immuno-Virus/Acquired Immuno-Deficiency Syndrome
IMR	Infant Mortality Rates
GoK	Government of Kenya
UNFCC	United Nations Framework Convention on Climate Change
CBD	Convention on Biological Diversity
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
MEMR	Ministry of Environment and Mineral Resources
DPTC	District Project Technical Committee
NPTC	National Project Technical Committee
BAPs	Best Available Practices
BATs	Best Available Technologies
KAP	Knowledge, Attitudes and Perceptions
CDM	Clean Development Mechanism
SLF	Sustainable Livelihood Framework
IWWM	Integrated Wetland-Watershed Management
IWRM	Integrated Water Resources Management
WRMA	Water Resources Management Authority
KFS	Kenya Forest Service
KWS	Kenya Wildlife Service
CBO	Community-Based Organization
NGO	Non-Governmental Organization
MP	Member of Parliament
US	United States

LIST OF ACRONYMS

KKV	Kazi Kwa Vijana
LVB	Lake Victoria Basin
LVBC	Lake Victoria Basin Commission
LUP	Land Use Plan
EMCA	Environmental Management and Coordination Act
NEMA	National Environment Management Authority
MoA	Ministry of Agriculture
LVB	Lake Victoria Basin
AU	Africa Union
CoP	Conference of the Parties
SEA	Strategic Environmental Assessment
EIA	Environmental Impact Assessment
LMO	Living Modified Organisms
EAC	East Africa Community
EMC	Environmental Management and Coordination

EXECUTIVE SUMMARY

The Ombeyi wetland Ecosystem is one of the important wetlands contributing to the natural capital in Kenya's side of the Lake Victoria Basin. It provides essential benefits to local communities who directly and indirectly depend on it for their livelihood support and income. Directly, the wetland is used for fishing, hunting, sand and clay extraction for construction and pottery respectively, water for household and industrial uses, small-scale agriculture for both subsistence and commercial purposes, papyrus and other reeds (wetland grasses) for roofing and livestock grazing among others. It acts as a home for many plants and wildlife, providing conducive breeding and feeding areas for diverse animals.

Indirectly, it recharges the underground water aquifers and enhances environmental flows in other wetlands connected with it, regulates flood flow regimes and act as important stabilizers for maintaining micro-climate. From a climate change perspective, this wetland acts as a blue carbon sink, sequestering atmospheric carbon dioxide – thus enhancing climate proofing- as well as improving scenic beautify within the landscape.

In spite of the many benefits and services that Ombeyi wetland provides, land use changes, poverty, coupled with rapid socio-economic dynamics of increasing population, HIV/AIDS, inequity and lack of an elaborate planning framework have impeded the sustainable management and development of the Ombeyi Ecosystem for both present and future generations. These have resulted in catchment degradation, water pollution, loss of biodiversity and other important socio-economic and cultural benefits.

The Ombeyi Integrated Wetland Management Plan (OIWMP), developed through a rigorous multi-stakeholder process aims to provide the coordination and inter-sectoral framework for action towards restoring the ecological integrity and improving the livelihoods of the wetland-dependent riparian communities. The plan teases out the objectives, issues, management options and responsible actors with budget towards marshaling the financial and human resource capacity for sustainable management of this vulnerable wetland in Kisumu County. It also establishes an institutional structure for local-level coordination and implementation of programmes and activities as well as reporting lines for conflict and grievance management.

The aim of the plan is to guide conservation and wise-use of Ombeyi wetland resources in the achievement of sustainability as demanded by both the national Blue print- Vision 2030 and the Constitution of Kenya 2010. Through capacity building and awareness creation, enhanced enforcement of environmental laws, livelihood diversification, promoting appropriate land management practices, catchment rehabilitation and adoption of Cleaner Energy efficient Technologies, the plan seeks to empower wetland dependent communities to ease the current pressure into the wetland ecosystem by creating an enabling environment of learn-by-doing and feed-back mechanisms.

Together with stakeholders, the County Government of Kisumu therefore commits to the full implementation of this plan in order to promote wise-use and improve community livelihoods. We will continue to provide an enabling environment for green investments and projects that mainstream and prioritize environmental management. We are therefore urging all stakeholders to support the implementation of this plan by initiating strategic development and investment options anticipated within this planning framework.



His Excellency,

JACKTON NYANUNGO RANGUMA

Governor,
Kisumu County

1.0 INTRODUCTION

Natural and artificial wetlands are important resources for the sustenance of livelihoods of riparian and wetland-dependent communities (Silvius et al., 2000). The Lake Victoria Basin (LVB) wetlands constitute a vital life support system for about 12 million people who extract freshwater, fish, medicinal plants and building materials. Naturally, wetlands are productive, and because of this, these ecosystems can support endemic wildlife and a considerable human population living around them. Natural wetlands provide a variety of natural products to rural communities living around Lake Victoria, Kenya, ranging from papyrus biomass which has multiple and gender-specific uses, to food products such as fish and seasonal crops. They are also important habitats of plant genetic diversity and support large numbers of bird, mammal, reptile, amphibian, fish and invertebrate species. However the increasing human population, coupled with unsustainable exploitation has led to a decline in wetland goods, particularly fisheries and loss of other vital ecosystem services (Balirwa, 1998).

The unsustainable exploitation and management of wetlands is manifested by encroachment into wetland ecosystems leading to continued drainage and conversion, pollution, over-exploitation or other unsustainable uses of their resources. For wetlands to continue supporting communities at the edge of the swamps, effective conservation and management techniques have to be put in place. More efforts should be directed to enhancing existing wetland uses rather than complete alteration of ecosystem functions or new uses (Symoens, 1995). Such measures require drastic mindset shifts infused with awareness creation as well as adequate legislations to safeguard the naturalness of these fragile ecosystems for posterity. Developing and implementing site-specific wetland management plans is a key step towards achieving sustainability of wetland management and a requirement of the Ramsar Convention (1971). The development of this management sought to fulfill Lake Victoria Environment Management Project phase II (LVEMP II) objectives which are:

- Protect and manage existing wetlands.
- Rehabilitate/Restore and enhance the ecological productivity and habitat values of wetlands.
- Expedite a significant increase in the quantity and quality of wetlands.
- Educate the public about the values of wetland resources

1.1 ADMINISTRATIVE AND POLITICAL UNITS

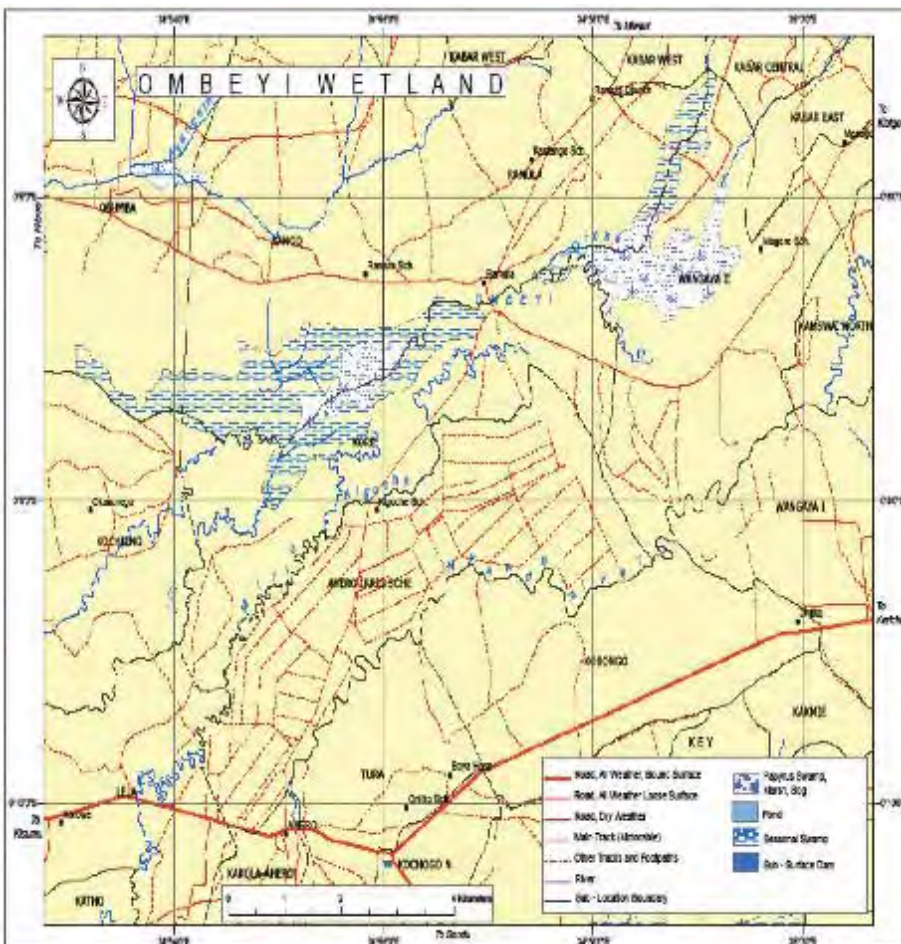
In regards to elective politics, The Kadibo Division falls under Nyando Constituency and Ahero Town Council both of which fall under Nyando District (sub-County). Muhoroni District was formerly under Nyando District but currently comprises of the Muhoroni Constituency which occupies an area of about 560.5 km².

The Kisumu East District (Sub-County) was hived from the larger Kisumu District, currently Kisumu County which is currently divided into three Sub Counties/districts namely Kisumu East, West and North. Kadibo was a division in the former Kisumu District and it had maintained its status and occupies an area of 162.7 km².

Ombeyi wetland ecosystem itself cuts across the Nyando and Kisumu East Sub Counties within the Kisumu County and forms a complex ecosystem comprising of several streams, rivers and swamps. There seems to be some close inter-linkage between this wetland and that within the Nandi escarpment, Kibirong/Koyo wetland. However, studies documenting such interdependence are not available. There are basically five sub-locations that make up the larger Ombeyi location namely; Obumba, Ramula, Kore, Ahero irrigation and Kang'o respectively.

The wetland ecosystem is situated within Ombeyi North and South- wards respectively and administratively operates in Nyando and Kisumu East Sub-Counties. In terms of size, the wetland ecosystem covers an area of about 1037ha consisting of small swamps, streams and rivers. The main river that provides the water for recharging the wetland ecotone is R. Ombeyi, (Fig. 1) while Oroba and Nyakoko streams feed this major river and derive its waters from the upper Nandi escarpment, around Bongwa area.

FIG 1: LOCATION AND DRAINAGE OF OMBEYI WETLAND ECOSYSTEM



1.2 THE OROBA

The Oroba river originates from the Nandi Escarpment as numerous streams namely, the Little Oroba and Oroba (latter becomes the Great Oroba) both of which drain the Miwani Sugar Complex and later merge to form the Oroba, which enters the Ombeyi Swamp at Ombeyi. The Oroba leaves Ombeyi Swamp as two distinct streams, the Miriu which forms the Western periphery of the Ahero Rice Irrigation Scheme and, the Ombeyi both of which drain through heavily settled plains in Bwanda and Kombura to later on diffuse into the Lakeshore Wetlands. Characteristically, none of the two streams enter the lake through a distinct channel.

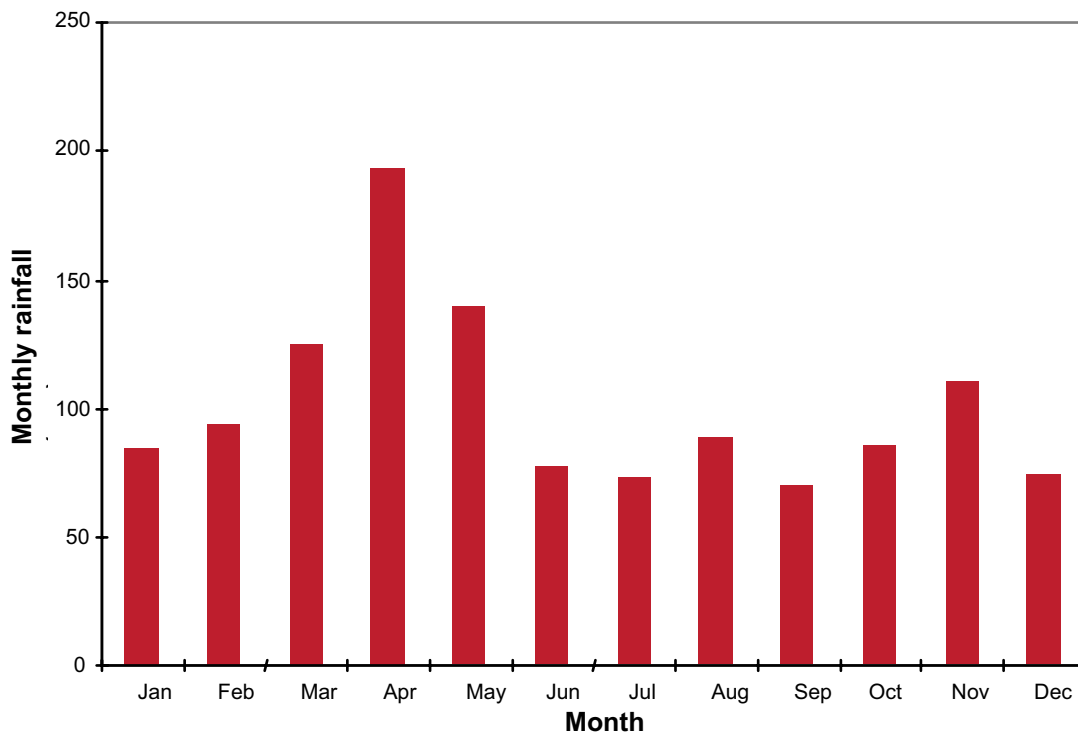
The Ombeyi Swamp complex also receives water from diverse rivulets such as the Nyangeto, Lielango which join to form the Mayenya which crosses the Kisumu Ahero road as the Luanda at Buoye and proceeds to enter the lake through a delta system. The Ombeyi wetland is easily accessible through the Kisumu-Kericho highway and accessed through the murrum-road passing in front of Ahero Girls High School. The local or indigenous people of Kano Plains largely communicate in Dholuo but at the catchment-level are Kalenjins/Nandi communities of Kenya thus national languages like English and Swahili are also used for communication.

1.3 TOPOGRAPHY AND CLIMATE

The area falls within the Lake Victoria Lowlands and Kano Floodplains which are frequently inundated by floods as it is surrounded by steep hills namely the Tinderet Hills to the East and Nandi Escarpment to the North. The Kano Plains which stretches from Miwani, Nyando and Lower Nyakach divisions stretches to Kisumu East district is a lowland flat area with a topography that gently changes as in the north-eastern and southern areas. The highest point is found in Muhoroni with an altitude of 1,801m above sea level (asl) with the lowest point being at the same altitude as the Lake (1,134m asl).

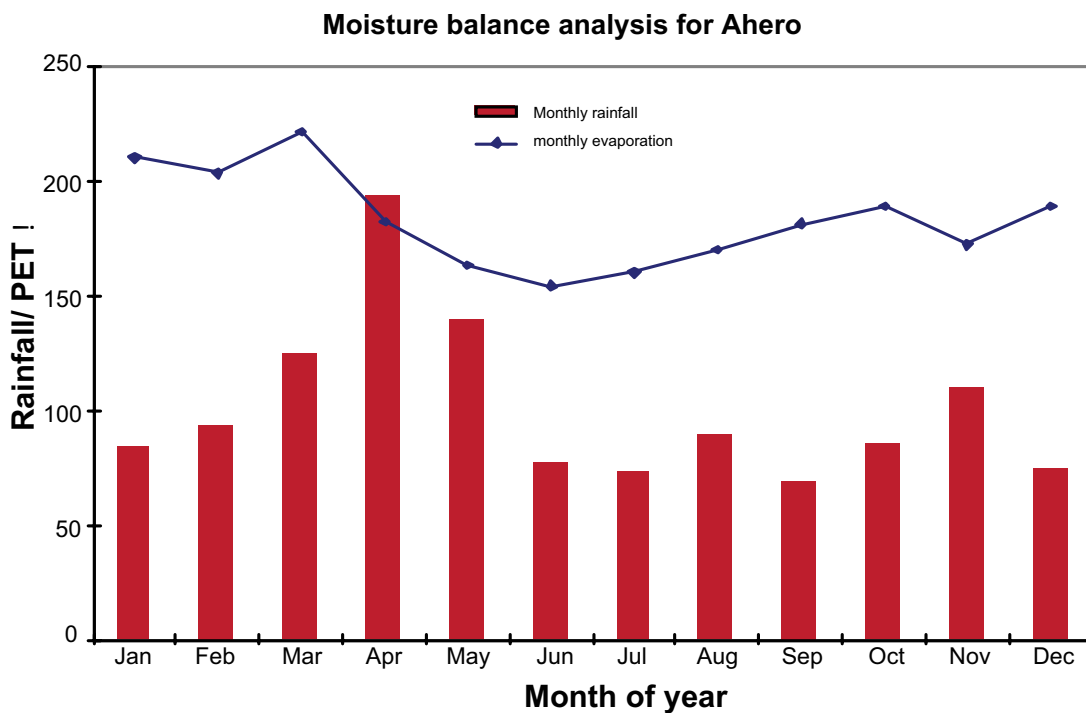
The climate of the Kano Plains where Ombeyi wetland sits is semi-humid characterized by an annual rainfall averaging 1204mm and distributed in three rainfall seasons (March - May, August and Nov-December; Fig 2). April and May comprise the wettest months accounting for 25% of annual rainfall.

FIGURE 2: MEAN MONTHLY RAINFALL FOR THE KANO PLAINS (AHERO STATION FOR 56 YRS.)



With regard to agro-climatology, rainfall in the Kano Plains is exceeded by evaporation demand (Fig 3) for most of the year, causing the area to be dominated by a negative moisture balance in all months with the exception of April, the wettest month. In spite of this, owing to impeded soil drainage on account of prevalence of vertic clays, water logging occurs extensively in the plains during and immediately after the rains.

FIGURE 3: MOISTURE BALANCE ANALYSIS FOR AHERO STATION



1.4 SOILS AND HYDROLOGY

On very flat terrain typical of the Kano Plains, Eutric Vertisols with a sodic phase are dominant with a coverage of 8,247 ha on flat to very gently undulating slopes of 0 – 1%. The soils are generally imperfectly drained to poorly drained, deep to very deep, dark grayish brown to black, firm to very firm, cracking, clay; in some places sodic deeper subsoil. This is the dominant soil unit in the Kano Plains. These are the same soils (though with an inudic phase and dominated by silty clay to clays in both horizons) that dominate the flood plains and river terraces covering about 5000 ha. Some sections of the West Kano area are dominated by sedimentary sandy loams which are too pervious for irrigation development.

The key hydrological feature pertinent to the study area is the location in the lower Kano Plains which is the flood plain for the Northern shoreline tributaries comprising of rivers originating in the surrounding highland masses of Tinderet, Nandi Escarpment and others. In this category are included the Oroba, Nyamasaria and Rabuor which, though outside the Nyando basin, pose severe flooding problems between Kisumu and Ahero (plate 1).

PLATE 1: FLOOD DRAINS WITHIN OMBEYI WETLAND AREA



1.5 SOCIO-ECONOMIC ENVIRONMENT

1.5.1 CROPS /AGRICULTURE

On the lowlands and on the Kano Plains, large scale sugarcane plantations, rain-fed food crops and rice production (irrigation and rain-fed), as well as cattle grazing are common. However, about 75% of the plains is unsuitable for economically viable small-scale farming (Jaetzold, & Schmidt, 1982). The extremely heavy soils combined with a warm climate, relatively low rainfall, and repeated flooding makes farming to be unattractive as an economic venture.

In the farmed land, various crops (maize, sorghum, Finger millet, rice, green grams, cowpeas, ground nuts, sweet potatoes, tomatoes, onions, kales, sugarcane, cassava and cotton; in addition are varieties of local vegetables, fruits such as mangoes, citrus, avocados, pawpaw and bananas.) are grown along or within Ombeyi wetland (plate 2). Some areas have bushes and in the unfarmed none bush areas, are pasture land. Most of these lands are likely to be converted to farm land. In all cases, the river basin will be preferred and no farming should be allowed within the official river bank streams.

PLATE 2: A MAKESHIFT BRIDGE AND BANANA CULTIVATED WITHIN THE WETLAND SYSTEM



1.5.2 INFRASTRUCTURE AND EXISTING WATER PROJECTS IN THE AREA

The area is mainly a rural setting with substandard and inadequate infrastructure apart from the Kisumu-Nairobi highway which divides the area into two. Other roads in the County are all-weather roads.

Homesteads within the area do not have water supply and depend on developed water supply projects for drinking water and rivers and rain for supply for other domestic uses. Some of the community members find the (Ombeyi) river water to be polluted and therefore depend on boreholes for their water supply.

The Kenya Power and Lighting Company electricity power lines pass through the area though only serves the trading centers and some community members living along the major roads and governmental institutions in the area.

Landline and mobile telephone network are available although these services are very unreliable due to lack of adequate booster stations and the somewhat hilly terrain.

1.5.3 HEALTH AND SANITATION

Water borne and water-related diseases are the most prevalent in the Nyando Sub-County and include malaria, Urinary Tract Infection (URTI), diarrhea, kin diseases and worms. While in Kisumu East Sub-County, the most common diseases are malaria, anaemia and HIV/AIDS. The prevalent diseases in the project/wetland area as mentioned by the community members are cholera, malaria, typhoid and dysentery. In terms of Health facilities, the area has a few clinics found mainly in the trading centres.

Nyando Sub-County exhibits exceptionally high mortality rates as compared to the National level with infant mortality rates (IMR) standing at 116 per 1000 live births. This is 50% higher than the national figure while under-five mortality rates is 212, about double the national average. The crude death rate for Nyando District / Sub-County is 44.1 (GoK, 2008).

Male expectancy at birth according to the 2009 census was 37.7 years while female parts was 42.9, much lower than the national average of 52.8 and 60.4 respectively. This reduction is mainly as a result of HIV/AIDS related ailments.

HIV/AIDS prevalence rate which was 29% at the beginning of the last plan period has been reduced to 15% through a number of strategies. This is still high considering that the National HIV/AIDS prevalence has dropped to about 5%.

1.5.4 POLLUTION

It is known that fertilizers, pesticides and fuels can become toxic through improper use which can lead to negative impact on the environment and people's health. Eutrophication of stagnant water bodies in canals and drains leads to invasion by aquatic weeds creating good breeding grounds for disease vectors such as snails and mosquitoes. Anaerobic conditions also develop at depth of stagnant waters leading to death of aquatic biodiversity.

Hydrocarbon fuels are likely source of pollution if they are not properly handled and some are highly flammable. Studies have shown that one liter of oil (hydrocarbons) can contaminate about one million liters of drinking water and therefore proper handling, transportation and storage of fuels is essential to avoid contamination of water bodies and fire incidences. Water pollution within the area is mainly from agricultural runoff (fertilizers from sugarcane farms and rice paddies), as well as domestic sources such as over-flowing toilets during flooding regimes.

1.6 OMBEYI WETLAND BIODIVERSITY

The wetland is home to many mammals, fish, reptiles, amphibians and plants (macrophytes). Despite a lack of a detailed biodiversity inventory for the Ombeyi wetland, the surrounding riverine Nyando wetland, which is closely associated with the Ombeyi, has shown huge potential for conservation particularly because of the diverse plants and animal life found in these ecosystems.

FISH:

LVB wetlands play a crucial role as habitats in the sustenance of lake fisheries since different fish species usually breed there or act as nursery grounds and feeding grounds; in addition, to supporting most of the surviving native tilapiine species that are virtually extinct in Lake Victoria (Balirwa, 1998). According to Chapman et al (2002) areas deep in the fringing swamp are less rich because the dense fringing swamps act much as a biological filter, limiting colonization and survival of species that can tolerate these extreme conditions.

Several fish species have been recorded to occur in the Nyando River and the associated wetlands (Raburu, 2003). These include Cichlidae (*Oreochromis niloticus*, *Oreochromis variabilis*, *Oreochromis leucostictus*, *Haplochromis multicolour* and other *Haplochromine* species), Cyprinidae are represented by several species (*Barbus alternialis*, *Barbus numayeri*, *Barbus nyanzae*, *Barbus cercops*, *Barbus kerstenii*, *Barbus jacksonii*, *Barbus amphigrama*, and *Barbus paludinosus*). Other Cyprinids include *Labeo victorianus*, *Labeo cylindicus* and *Gara johnstoni*. The Bagridae are represented by *Hipopotamyrus grahami*, Schilbidae by *Schilbe mystus*, Mochidae by *Synodontis victoriae* and *Synodontis afrofishcheri*. Other families include Protopteridae (*Protopterus aethiopicus*), Clariidae (*Clarias gariepinus*, *Clarias theodora*, and *Clarias alluadi*) Mastacembelidae (*Afromastacembelus frenatus*), Anabantidae (*Ctenopoma murerei*), Momyridae (*Marcusenias grahami*, *Gnethonemus longibarbis* *Petrocephalus castostoma*) and the introduced Centropomidae (*Lates niloticus*).

The distribution of fishes along the River Nyando and the associated wetlands found that several fish species occur in the wetlands (Raburu, 2003). There is a general decline in fish species upstream. Juveniles and riverine species are restricted to wetlands and the adults may develop a pelagic life but return to wetlands for breeding. However, recent studies in Nyando wetlands reveal that lake fisheries and the post-wetland fishery showed a marked decline

probably due to conversions and drying up of beaches as result of lake recession (Obiero et al., 2010). The shallow waters are the most fruitful in terms of fish catches, thus when water level is receding, fish catches also decreases. This threatens the food security and household economic gain of the rural communities.

THE BIRDS:

Nyando wetland is rich in avifauna. A total of 167 species belonging to 50 families have been recorded in the wetland area. Of these species, 111 and 123 species were encountered in the managed (rice irrigation schemes) and the natural wetlands respectively. Family Ploceidae and Sylviidae had the highest number of species, with 19 and 11 species respectively. This diversity is however very dynamic as it varies depending on whether the managed wetlands are under rice crop or not.

The dominant families in selected Lake Victoria wetlands include Sternidae 36.12% and Scolopacidae (18.23%) with diversity indices of 0.71 and 0.64 respectively and a total of 49 bird species. The highest diversities and densities are in irrigation schemes within Nyando Wetlands. These are the main feeding grounds for aquatic fowl most of which concentrate in the primary ponds. Gulls dominate in the main Lake and in the interface zone while Hamerkops, egrets and kingfishers are dominant in the inshore areas and the littoral fringes.

Bird distribution is influenced by human activities, availability of food and seasons. Bird species that are endemic to papyrus swamps include vulnerable Papyrus yellow warbler *Chloropeta gracilirostris*, the endangered Papyrus gonolek, *Laniarius mufumbiri* (Collar et al. 1994), the Papyrus canary *Serinus koliensis*, Carruthers's Cisticola *Cisticola carruthersi* and white-winged warbler *Bradypterus carpalis*. These birds are contained in the East African Red Data list of birds (Bennun and Njoroge, 1996).

AMPHIBIANS AND REPTILES:

Amphibians are a class of vertebrates, comprising of three living orders: Anura/Salientia (frogs and toads), Gymnophiona/Apoda (caecilians - worm-like amphibians), Caudata/Urodela (newts and salamanders); forms that are phylogenetically intermediate between fish and reptiles (Drewes, 1984). Only anurans (frogs and toads) have been recorded in the Lake Victoria Basin. In Nyando Wetlands the common amphibian species include *Chiromantis petersi* (great gray tree frog) and *Hyperolius viridiflavus* (common brown tree frog), *Cassina senegalensis* (running frog), *Zanopus laevis* (Clawed frog), etc.

Many amphibian species inhabit wetlands around water bodies. Any negative impact on an aquatic system emanating from inshore must first affect amphibians before affecting the organisms in the water, such as fish. Although largely overlooked, amphibians can therefore act as excellent indicators in assessing the biodiversity of an area (Heyer et. al., 1994). Amphibians are probably the least studied vertebrate group in East Africa. The only detailed studies done in a few places of the basin to-date have been those carried out by Kigoolo (1994) and Schiøtz (1999). In general, amphibians are not among the most threatened species in Kenya.

The dominant reptile species in Nyando Wetlands are *Naja melanolevia* (forest cobra) *Philothamnus hoplogaster* (green water snake) and *Python sabae* (Python).

MACRO-INVERTEBRATES:

The Nyando River and the floodplain wetlands are rich in macro-invertebrates. According to Raburu (2003), the orders found along the river and associated wetlands include Ephemeroptera, Plecoptera, Hemiptera, Trichoptera, Coleoptera, Diptera, and Odonata. Others which occur in lower numbers include Lepidoptera, Arachnida, Malacostraca, Gastropoda, Decapoda, Pelecypoda and Oligochaeta. A total of 97 genera were recorded in the entire basin with 33 genera being found within the river mouth Nyando Wetlands with the most abundant being *Syncaris* (Mysidaceae), and *Notonecta* (Notonectidae). A recent study (Orwa et al., 2012) on the abundance and distribution of macroinvertebrates in Nyando Wetlands reported a total of 45 genera belonging to 11 orders and 38 families in permanently and seasonally flooded areas. In this study the majority were from the order Hemiptera that accounted for 23.68% while Pulmonata and Isopoda with two families each accounted for only 5.3% of the total number of families. The families Gerridae, Baetidae, and Gyrinidae were widespread within the wetland

with Gerridae dominating at 14.7% and lowest abundance with 0.57% and 0.6% being recorded for the families Psychomyiidae and Hydroptilidae respectively.

Invertebrates constitute a significant part of the food chain and litter transformation as well as ecosystem engineering (Toyota et al., 2006). Apart from beneficial roles, some invertebrates have some harmful effects in the environment namely, transmission of disease-causing organisms such as *Leishmania* by sandflies, schistosomiasis by aquatic snails and release of toxic chemicals (such as cantharidin by blister beetles).

MACROPHYTES:

General accounts of the aquatic macrophyte communities in Lake Victoria have been provided by many authors, including Denny (1985a,b,c), Hughes and Hughes (1992); and Harper and Mavuti (1996). The widest zonation of wetland vegetation occurs along the shallow Lake edges, particularly in sheltered inlets, deltas and shores of rivers flowing into the Lake. The delta of Rivers Nyando and Sondu-Miriu provide good examples of sites with a wide zonation of wetland plants.

Natural vegetation in the area is largely comprised of grass, shrubs and indigenous trees including *Acacia* and other semi-arid species in the drier parts. The entire Nyando River Floodplain is generally plain grassland with *Acacia* spp., *Lantana* spp., and other shrubs in patches. *Cyperus papyrus* is the most common constituent plant of the littoral swamps in the area. Others include *Pennisetum* spp., *Panicum* spp., *Phragmites* spp., *Typha* spp., *Pistia* spp., *Nymphaea* spp., *Salvinia* spp., etc. The ground cover of the upper portion of Kano floodplain is rather poor with more than 75% of ground being bare due to cultivation and overgrazing. Along the Nyando River bank trees are scattered and dominated by *Cassia siamea* (Caesalpiniaceae) and *Ficus sycomorus* (Moraceae). Littoral aquatic macrophytes include *Plaraguite pluagmatoides* (Poaceae) accounting for over 50% of vegetation coverage. The others are *Centella asiatica* (Apiaceae), *Acasia polycartha* (Mimosaceae), *Aeschynomene schimperii* (Papilionaceae) and *Polygonum pudehrum* (Polygonaceae) (Raburu et. al., 2002).

The Ombeyi wetland is composed of several plants similar to those found by Raburu in the Nyando Wetland. The most abundant emergent Nyando wetland macrophyte are *Cyperus papyrus* (Cyperaceae), *Typha domingensis*, *Pycnopus nitidus*, *Pennisetum purpurium*, *Cyperus pectinatus*, *Phragmites australis*, *Phragmites phragmatoides*, *Aeschynomene mimosifolia*, *Kyllinga bulbosa*, *Centella, asiatica*, *Sphaeranthus suaveolens* and *Letonis laxa* (Raburu, 2003). The free-floating macrophytes are represented by *Pistia stratiotes*, *Echornia crassipes* (Pontedeliaceae), *Azolla pinnata* (Aspidiaceae) and *Nymphaea lotus* (Nymphaeaceae). Submerged macrophytes are on the other hand represented by an algae *Spyrogyra* sp (Chlorophyceae), *Ceratophyllum demnosum* (Raburu, 2003)

The wetland plants have a number of uses to the local people. *Kyllinga bulbosus*, *Sporobolus pyramidalis*, *Typha* sp *nitidus* and most of the *Cyperus* spp and *C. papyrus* are used for making mats and baskets as well as thatching houses. They are also harvested for commercial purposes. Some plants are also used as food: *Commelina africana* as a vegetable and *Maranta* sp tubers as a source of starch. The plant species in Nyando Wetland have been seriously disturbed due to increased anthropogenic activities in the area. The most important and threatened wetland plant is *Cyperus papyrus*. However, in some parts of river banks constituting this basin are patches of *C. papyrus*, *P. australis*, *P. nitidus*, while in some river banks eg in Okana wetland, there is expansion of invasive species such as *Mimosa pigra* and the herbaceous creeper (*Ipomea aquatica*) (Raburu et. al., 2002). Other plant species within this basin which are exploited by the riparian communities include *Typha domingensis*, *Aeschynomene elaphroxylon* while in open waters are aquatic weeds including water hyacinth (*Eichornia crassipes*) and *Azola nilotica*.

2.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORKS

The United Nations Conference on Environment and Development (Earth Summit) held in Rio de Janeiro, Brazil in June 1992 marked a high point in the development of international environmental law. Apart from adopting the Rio Declaration on Environment and Development as well as Agenda 21, the Heads of State and Governments launched the ratification process for the CBD and the United Nations Framework Convention on Climate Change (UNFCCC).

Kenya is a signatory as well as a party to various international conventions, treaties and protocols relating to the environment and aimed at achieving sustainable development. The agreements are both regional and international and became legally binding on Kenya upon ratification thereof by the rightfully designated Kenyan Authority.

In this case of wetland management planning, the global policy context is defined by the processes around the Ramsar Convention and other relevant environmental conservation treaties and conventions, notably the Rio Declaration and Agenda 21, the United Nations Convention to Combat Desertification (UNCCD), and the Convention on Biological Diversity (CBD). The regional policy context on the other hand is defined by the integration arrangement between Kenya and its four neighbouring countries within the framework of the East African Community (EAC). The Treaty Establishing the East African Community and the Protocol on Environment and Natural Resource Management are the key instruments in this regard. The national level context is defined by the Constitution, the National Land Policy, and the other policies and laws relating to natural resources management.

Currently, there are two important draft policies relating to the management of wetlands viz: the draft Wetlands Conservation and Management Policy 2013 and the draft Environment Policy 2013. These are important policy discourses that have set the motion towards sustainable wetland management in Kenya.

2.1 GLOBAL CONTEXT

2.1.1 RAMSAR CONVENTION ON WETLANDS

The Convention on Wetlands of International Importance (the Ramsar Convention on Wetlands, 1971) is the international Convention that has the greatest bearing on the sustainable management of Wetlands. The Convention, which is the only global environmental treaty that deals with wetland ecosystems, was negotiated outside the framework of the UN system, and its text agreed at an international conference in Ramsar, Iran on 2nd February 1971. The following day it was signed by representatives of 18 countries. It came into force in December 1975. Kenya ratified the Convention on 5th October 1990 and has 6 wetlands listed as Wetlands of International Importance, including Lakes Nakuru, Naivasha, Baringo, Bogoria, Elementaita and the Tana Delta.

The convention provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Parties commit themselves to the three pillars of the Convention, namely: to work towards the wise use of all their wetlands through national land use planning, appropriate policies and laws, management actions and public education; to designate suitable wetlands for the List of Wetlands of International Importance (“Ramsar List”) and ensure their effective management; and to cooperate internationally concerning transboundary wetlands, shared wetland systems, shared species and development projects that may affect wetlands.

Parties to the Convention also commit to specific actions regarding formulation and implementation of national plans so as to promote conservation of listed wetlands and the wise use of wetlands in their territory; research and exchange of data and publications regarding wetlands and their flora and fauna; and training of personnel in wetlands research, management and wardening.

In spite of this really comprehensive framework at the global level, the challenges to wetlands management and conservation have persisted. The global framework is useful for setting standards and creating mechanisms for collaboration especially with regards to transboundary dimensions of environmental conservation and management, but ultimately the gains for the environment can only be realized when the imperatives set in global agreements and commitments are translated into actions at the local/national level. It informs the requirement for national frameworks articulated by the Ramsar Convention.

The need for national wetland policy frameworks for conservation and management of wetlands is alluded to in Article 3 of the Convention which enjoins Contracting Parties to “formulate and implement their planning so as to promote the conservation” of listed and other wetlands in their territories, although the Article does not specifically mention ‘policy’. It is however in Recommendations and Resolutions made by Contracting Parties in periodic Conferences of the Contracting Parties (COP) that the requirement for national policies has been made more explicit.

By Recommendation 4.10 on Guidelines for the implementation of the wise use concept, the Parties agreed that “It is desirable in the long term that all Contracting Parties should have comprehensive national wetland policies, [which] should as far as possible address all problems and activities related to wetlands within a national context”. Resolution VII.6 passed by the 7th Conference of the Contracting Parties held at San José, Costa Rica in 1999 adopted guidelines for developing and implementing national wetland policies, which were issued as an annex to the Resolution, and urged those Parties that had not yet developed such policies to give the highest priority to the matter. A Handbook on National Wetland Policies has been published by the Ramsar Secretariat to provide guidance to national governments in developing appropriate policies.

In Kenya, the need for a stand-alone wetland policy is justified by the fact that wetlands are seldom explicitly covered at national level in other natural resource management policies such as for water, forest, land, and agriculture, which denies wetlands the recognition and targeted action to deal with problems and challenges associated with their sustainable conservation and management. A wetland policy thus provides an opportunity for giving recognition to wetlands as ecosystems requiring different approaches to their management and conservation and avoids the risk of wetlands conservation being marginalized by other sectoral management objectives. As such, a National Wetland Policy should reflect attitudes, desired principles, goals, objectives and aims, show what choices have been made about strategic directions, make commitments, provide a focus for consensus, express concerns and provide advice, and clarify roles and responsibilities.

The key challenge in thinking about a National Wetland Policy is how to reconcile the need for specific attention, which drives the quest for a stand-alone policy on wetlands with the fact that wetlands constitute components of ecological systems, so that their sustainable conservation and management is only possible within the overall framework of environment and natural resources management. The policy imperatives that inform the management of land, water, forests, and biodiversity, among others, have a direct bearing on the opportunities for proper management of wetlands. Ombeyi wetland is not yet listed as a Ramsar site but the development of this management plan sets the motion towards this process.

2.1.2 THE CONVENTION ON BIOLOGICAL DIVERSITY (CBD)

The Convention on Biological Diversity requires Parties to use EIA effectively to avoid or minimize significant adverse impacts on biodiversity; it introduces Strategic Environmental Assessment (SEA) to assess environmental implications of policies and program particularly for those with major implications for natural resource use, for example, agriculture/ irrigation. Wetlands biodiversity is heavily recognized by this Convention.

The CBD came into force in December 1993 upon receipt of the requisite number of ratifications. Kenya was among the countries that signed the Convention at Rio, and proceeded to fully ratify it on 26th July 1994. The country had been closely associated with the development of the Convention as its final negotiations were done in Nairobi.

The Convention seeks to promote the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of benefits arising from the use of genetic resources. It commits States Parties to

maintaining the integrity of biological diversity and its components out of appreciation of its critical and multiple values to life and its importance “for evolution and for maintaining life sustaining systems of the biosphere”.

Wetlands constitute an integral part of the concerns of the Convention, as is evident from the definition of biological diversity and ecosystem in Article 2. Biological diversity is defined as “the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems”, while ecosystem is defined as “a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit”.

The Convention obligates States Parties to develop national strategies, plans or programmes for conservation and sustainable use of biological diversity, and to integrate the conservation and sustainable use of biological diversity into sectoral or cross-sectoral plans, programmes and policies. Specific measures that Parties are enjoined to take in this regard include identifying components of biological diversity that need to be conserved and monitoring their conservation whether in-situ or ex-situ; integrating considerations of conservation and sustainable use into national decision-making processes; encouraging and protecting customary uses of biological resources that are compatible with conservation or sustainable use requirements; supporting local communities to rehabilitate degraded areas; and encouraging cooperation between government and private sector in developing methods for sustainable use of biological resources. Furthermore, Parties shall develop and implement social and economic incentives, promote research and training, public education and awareness creation, and environmental impact assessment to arrest and minimize adverse impacts on biological resources. Detailed provisions are also made for international cooperation in terms of technology transfer, information exchange and financing.

The Convention also led to formation of the Cartagena Protocol on Biosafety of 1999 namely “The Cartagena Protocol on Biosafety to the Convention on Biological Diversity”. This is an international treaty governing the movements of Living Modified Organisms (LMOs) resulting from modern biotechnology from one country to another. It was adopted on 29 January 2000 as a supplementary agreement to the Convention on Biological Diversity and entered into force on 29th January 2000. Kenya signed the protocol on 15th May 2000; ratified it on 24th January 2002 and became a party member on 11th September 2003.

2.1.3 THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC), 1992 requires parties to take climate change considerations into account, to the extent feasible. It emphasizes on the need of incorporating the consideration in relevant social, economic and environmental policies and actions, and encourage the employment of appropriate methods, for example impact assessments to be formulated and determined nationally, with a view of minimizing adverse effects on the economy, public health and the quality of the environment. Wetlands including Ombeyi play significant roles in micro-climate enhancements and act as strong water storage systems during dry-season, currently experienced by communities as a result of climate change and climate variability.

2.2 THE REGIONAL CONTEXT - THE EAST AFRICA COMMUNITY TREATY

The regional context for wetlands conservation and management is defined by the EAC, the regional integration framework that groups Kenya together with Burundi, Rwanda, Tanzania and Uganda. The Treaty Establishing the EAC recognizes the importance of natural resources to the economic development of the region. Article 5 of the Treaty thereof links the achievement of economic development to “the promotion of sustainable utilization of the natural resources of the Partner States and the taking of measures that would effectively protect the natural environment of the Partner States”. Furthermore, Chapter 19 of the Treaty provides for cooperation in environment and natural resource management to realize objectives that include ensuring “sustainable utilization of natural

resources like lakes, wetlands, forests and other aquatic and terrestrial ecosystems”. The Community has developed a Protocol on Environment and Natural Resource Management to further strengthen cooperation. In this regard Article 14 of the Protocol deals with sustainable management and wise use of wetland resources, and commits the Partner States to develop, harmonize and adopt common policies, laws and strategies for the purpose. It seeks to supplement the Ramsar Convention by providing for development and adoption of common guidelines and criteria for the declaration of any wetland other than a Ramsar site as a protected wetland. In addition, the Lake Victoria Basin Commission (LVBC) envisions working together to conserve Lake Victoria Basin and improve Livelihoods for the riparian communities. Ombeyi wetland is located within the Kenyan side of the Basin and therefore developing this plan is in tandem with the spirit of the LVBC principles and aspirations.

Kenya has also been part of processes within the framework of the African Union (AU) that led to the adoption of the Framework and Guidelines on Land Policy that articulates principles to inform the development and implementation of land policies in Africa. The Framework and Guidelines underscore the need to conserve and manage natural resources and ecosystems including wetlands. National land policies are thus expected to provide frameworks for conserving and managing such ecosystems to create foundations for sector specific policies and strategies.

2.3 THE NATIONAL CONTEXT

The national context is defined largely by the Constitution, Draft Environment and Wetland Policies 2013, the National Land Policy and legislation introduced to give effect thereto. Also of relevance are other sector specific policies and laws touching on wetland/water resources management.

2.3.1 THE CONSTITUTION OF KENYA 2010

The promulgation of a Constitution in August 2010 marked an important turning point for the country in many respects including with regard to the management of land and natural resources. Constitution informs policies and laws that are currently being developed as well as the need to align old laws and legislations and policies with it. In this connection, the most significant development is the introduction of constitutional principles for land, environment and natural resources management. This is significant because the lack of a constitutional foundation for sustainable management of natural resources has long been identified as one of the key constraints undermining efforts to put in place appropriate frameworks. The multiple policies, legal and institutional frameworks that exist in the country have had no overarching unifying principles to reconcile them, a situation that has engendered conflict and contradiction in governance and management of land and natural resources.

Article 60 of the Constitution entrenches principles of land policy that shall henceforth inform the manner in which land is held, used and managed in Kenya, with a view to ensuring equity, efficiency, productivity and sustainability. Two of these principles – sustainable and productive management of land resources, and sound conservation and protection of Ecologically Sensitive Areas – are of particular relevance to the design of an appropriate framework for conservation and management of wetlands.

The Constitution entrenches the three land tenure systems, namely: public, community and public. Water catchment and specially protected areas are vested in the national government to hold in trust for the people of Kenya. The use and disposition of public land is to be governed by an Act of Parliament. Existing land laws are to be revised, consolidated and rationalized, while sectoral land use laws are to be revised in accordance with the principles of land policy set out in Article 60.

Article 69 of the Constitution imposes obligations on the State with regards to the environment, which are of relevance to the draft Environment policy. The State shall, inter alia, ensure sustainable exploitation, utilization and management and conservation of the environment and natural resources, and ensure the equitable sharing of accruing benefits; encourage public participation in the management, protection and conservation of the environment; and eliminate processes and activities that are likely to endanger the environment. Individual citizens

have a duty to cooperate with State organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

Another major development introduced by the Constitution is devolved government, which has been inaugurated after the general elections of March 2013. Among the functions of the County Governments include the implementation of specific National Government policies on natural resources and environmental conservation, including soil and water conservation and forestry. Clearly, County Governments have an important role to play in implementation of the Wetlands Policy and Wetlands Management Plans.

2.3.2 THE NATIONAL LAND POLICY

The adoption of the National Land Policy in August 2009 marked the culmination of a long process and was a significant achievement in the search for a lasting solution to the challenge of land governance and management. Although it preceded the Constitution by a whole year, the two processes were closely linked as they both responded to the need for a comprehensive framework for reconciling competing interests over land and natural resources.

The National Land Policy highlights the need for policy responses to poor environmental management and inappropriate ecosystem protection and management. It recommends policy responses that include adoption and implementation of Land Use Plans (LUPs). It outlines principles to guide the protection of watersheds, lakes, drainage basins and wetlands. These include: prohibition of settlement and agricultural activities in water catchment areas; identification, delineation and gazettment of all water courses and wetlands in line with international Conventions; and integrated resource management based on ecosystem structure regardless of administrative or political boundaries. The Government also commits to ensure that all land use practices conform to land use plans and principles of biodiversity protection, conservation and sustainable development. Ombeyi wetland though cutting across two political boundaries (Muhoroni and Nyando Constituencies), it is within the jurisdiction of Kisumu County Government. In spite of the political setting, this comprehensive management plan which adopted ecosystem-based management (EBM) approaches requiring broader and holistic management regimes across boundaries, provides the necessary overarching frameworks towards managing the wetland resources for posterity.

2.3.3 LAND LAWS

Three new land laws have been enacted to give effect to the provisions of the Constitution and the National Land Policy, namely the Land Act, the Land Registration Act and the National Land Commission Act. Provisions of Land Act and the National Land Commission Act are of relevance to this wetland management plan.

The Land Act seeks, among other things, to provide for the sustainable administration and management of land and land based resources. It reinforces the principles of land policy set out in the Constitution. Section 11 of the Act empowers the National Land Commission to take appropriate action to maintain public land that endanger endemic species of flora and fauna, critical habitats or protected areas and to identify ecologically sensitive areas that are within public lands and demarcate or take any other justified action on those areas and act to prevent environmental degradation and climate change subject to consulting with existing conservation institutions. The Commission shall also make rules and regulations for the sustainable conservation of land based natural resources that include measures to protect critical ecosystems and habitats.

The National Land Commission Act provides for the functioning of the National Commission established by Article 67 of the Constitution. Among its functions is to monitor and have oversight responsibilities over land use planning throughout the country. In this connection, it shall be in a strategic position to ensure that the provisions of the National Land Policy regarding land use planning and ecosystems management are implemented, including those touching on wetlands such as Ombeyi.

2.3.4 DRAFT WETLAND CONSERVATION & MANAGEMENT POLICY (2012) AND THE DRAFT ENVIRONMENT MANAGEMENT POLICY (2012)

The development of the wetlands policy has been going on for over a decade, (started in 1998) during which time significant changes have occurred in the national context for governance as well as environment and natural

resource management, particularly as a result of the adoption of the National Land Policy and the promulgation of the Constitution of Kenya, 2010. The draft policy with eight objectives aims to achieve sustainable management and conservation of Kenya's wetlands through community participation and developing strategic programmes aimed at restoring the ecological integrity of these fragile and vulnerable resources. Currently, the draft policy has been undergoing review to align it to the Constitution of Kenya 2010 and also make it current and relevance as per the conditions prevailing both in terms of governance as well as challenges and opportunities thereunto. The updated draft policy has been adopted by the National Environment Council (NEC) and when enacted, the draft policy shall ensure Kenya's commitment to the Ramsar convention, which it is party to and therefore provide the resonance framework/direction on wise use and sustainable management of wetlands.

In addition, the draft Environment Management policy (2013) is the overarching environmental policy that provides direction on sustainable environmental management. Wetlands (coastal and marine-based and freshwaters) have clear provisions as key ecosystems in the natural environment land/seascape and recognized as critical natural capital by the draft environment policy.

2.4 OTHER SECTORAL POLICIES AND LAWS

The national context is defined largely by the Constitution, Draft Environment and Wetland Policies 2013, the National Land Policy and legislation introduced to give effect thereto. Also of relevance are other sector specific policies and laws touching on wetland/water resources management.

Apart from the Constitution, Land Policy and land laws, other policies of relevance to wetlands conservation and management include Vision 2030, EMCA, and sector specific laws policies and laws on water, forests, agriculture, Fisheries and wildlife conservation among others. Even where they do not specifically refer to wetlands, these policies and laws have a bearing on wetlands conservation and management by reason of the linkage between wetlands and the resources that they relate to within these sectors.

Vision 2030 is the national development blueprint that aims to deliver a globally competitive Kenya by the year 2030. Its Social Pillar integrates environmental management and privileges conservation and the building of institutional capacity for environmental planning and governance to improve overall management of the environment. Although it does not specify any strategies and interventions related to wetlands, Vision 2030 sets the stage for ecosystems approaches to environmental management, especially given its emphasis on water catchment management and land cover and land use mapping. Management of catchment and recognition of water-based tourism provides entry points into sustainable of water and wetlands in the country.

2.4.1 ENVIRONMENTAL MANAGEMENT AND COORDINATION ACT (EMCA) NO. 8 OF 1999

Part II of the said Act states that every person is entitled to a clean and healthy environment and has the duty to safeguard the same. In order to achieve the goal of a clean Environment for all, new projects listed under the Second Schedule of Section 58 of EMCA No. 8 of 1999 shall undergo an Environmental Impact Assessment. EMCA is a framework law on environment that establishes the institutional framework and makes elaborate provisions for management of the environment and its component parts including wetlands. It establishes the National Environment Management Authority (NEMA) to exercise general supervision and co-ordination over all matters relating to the environment and to be the principal instrument of Government in the implementation of all policies relating to the environment. Among the tools and mechanisms the Act establishes for environmental conservation and management include environmental planning from the local to the national level, environmental impact assessment, environmental audit and monitoring, and environmental restoration and conservation orders.

The Act makes elaborate provisions for protection and conservation of wetlands under Sections 42 and 43. It prohibits activities that compromise the integrity of wetlands, requiring prior written approval of the Director-General of NEMA, which can only be given after an environmental impact assessment (EIA). It also provides that

the Minister may, by notice in the Gazette declare a wetland to be a protected area and impose such restrictions as may be necessary. The Minister may also, by notice in the Gazette, issue general and specific orders, regulations, or standards for the management of wetlands, including measures for management, protection or conservation where there is risk of environmental degradation. Such measures may include management plans.

Main Sections of EMCA Relevant to the Sustainable Management of Ombeyi Wetland Include;

- Section 42- Conservation of Wetlands -This section guides on conservation of rivers, lakes and wetlands and requires any activity conducted within the wetland to be authorized by the Director General.
- EMC (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006 -The regulation aims at increasing the coverage of protected areas and establishing new special status sites. The regulation also intends to revitalize Agriculture by 2014 through comprehensive development of the agricultural sector at all levels for the benefit of the population
- EMC (Wetlands, River Banks, Lake Shores and Sea Shore Management)

Regulations, 2009 - The aim of this regulation is to ensure conservation and sustainable use of wetlands in Kenya whether occurring in private or public land.

- Section 4 of the regulation outlines the objective of the regulation which includes providing guidelines for the conservation and sustainable use of wetlands and their resources in Kenya;
- Section 5 (1) of the regulation outlines the General Principles to be observed in the management of all wetlands in Kenya
- Section 5 (2) of the regulation states that the obligations of the Regulations should be implemented while taking into account the provisions of other statues under different ministries.
- Section 11 of the regulation permits the use of wetlands for domestic use among other uses.
- Section 13 lists activities that may require temporary permits for the use of wetland including emergency cases and research activities requiring use of wetlands. The temporary permits will be valid for three (3) months only as stated under section 13(2).

Part III of the regulation gives guidelines on management of river banks, lake shores and sea shore in Kenya.

- Section 17 of the same part outlines the general principles to be observed in the management and conservation of river banks, lake shores and the seashore
- Section 18 of the regulation provides conservation measures for wetlands. Part (c) of the same regulation promotes soil conservation measures along river banks, lake shores, and the seashore which includes the following measures bunding, terracing, mulching, tree planting or agro forestry, grassing, soil engineering, compaction and placement of fills, zoning and planning; building of gabions, control of grazing, and recommending the promulgation of appropriate by-laws by the local authority.

The proponent would be required to follow the requirements of this regulation especially since the proposed project is located in a wetland inhabited with local communities and is prone to floods.

- EMC (Water Quality) Regulations, 2006

This regulation prohibits pollution of water bodies and encourages the engagement of the community in protection of water bodies both surface and underground. The regulation guides on several wetland management practices including:

- Restriction of water abstraction without conducting an Environmental Impact Assessment
- Observation of wetlands riparian zone of between 6-30m form the highest flood water mark of a water body
- Compliance with the water quality for irrigation and domestic use as stated under the first and eighth schedule of the regulation respectively.
- Provision of monitoring parameters for water bodies as listed under schedule two of the regulation

Other sectoral policies and laws, in particular Sessional Paper No. 1 of 1999 on National Policy on Water Resources Management and Development (Water Policy), the Water Act, 2002, Sessional Paper No. 1 of 2007 on Forest

Policy, the Forests Act 2005, the Agriculture Act, Cap 318, and the Wildlife (Conservation and Management) Act have implications for wetlands conservation and management because they relate to natural resources that are closely related to wetlands. Some of the policies and laws relate to land uses that are undertaken within wetlands. Ultimately, the implementation of these policies and laws has a direct bearing on the conservation and management of wetlands and vice versa.

2.4.2 THE WATER POLICY AND WATER ACT 2002

The Water Policy identifies lack of proper inter-linkages and poor coordination amongst the various sectors dealing with different aspects of water and water resources management as one of the major challenges to the sector. It recommends an Integrated Water Resources Management (IWRM) approach that ensures coordinated development and management of water, land and related resources in a sustainable manner. This approach is underpinned by a river basin or catchment as the smallest unit of planning and management of water resources. It seeks to promote social and economic benefits of the people in a catchment area in a manner that is equitable and does not compromise the sustainability of vital ecosystems. It thus addresses social, economic and environmental dimensions of water resources management from an ecosystem-wide perspective consideration.

The Water Act provides guidelines on use and management of the water resources in the country. It requires that a water user obtains a permit for various purposes including for discharge of pollutants into any water resource. The act further notes that, the issuance of the permit is subject to public consultation as well as an Environmental Impact Assessment. Water from Ombeyi wetland is abstracted for various uses, e.g. irrigated agriculture.

The Water Act establishes the implementation framework for the Water Policy. The Act does not define 'wetlands' nor does it make any direct reference to wetlands. However, its definition of "water resource" ("any lake, pond, swamp, marsh, stream, watercourse, estuary, aquifer, artesian basin or other body of flowing or standing water, whether above or below ground") clearly encompasses wetlands. Two outstanding features of the Water Act that are of relevance to the discussions about wetlands are, firstly, its streamlining of different functions related to the sustainable management of water resources; and secondly, its provisions of a framework for participation of different stakeholders in the management of water resources. The Act separates policy formulation, water resource management, regulation of water and sewerage services provision and financing and vests these mandates on different institutions. It also devolves decision-making processes to the regional and local levels, thereby promoting stakeholder participation, including that of communities and the private sector. Catchment Area Advisory Committees and WRUAs provide spaces for citizen participation in designing and implementing water resource management initiatives across the country.

2.4.3 FOREST ACT 2005

The Act guides on management and registration of forests. It is supported by the Forests Act of 2005 (No. 7 of 2005) and the Forests (Participation in Sustainable Forest Management) Rules, 2009 Kenya Gazette Supplement No. 754. The objective and purpose of these Rules is to guide on application of authorizations on sustainable use of forests.

Sessional Paper No. 1 of 2007 on Forest Policy introduced significant reforms in the management of forest resources including an ecosystems approach to the planning and management of forests and the involvement of forest adjacent communities and other stakeholders in forest management and conservation. Although it does not specifically address wetlands, the Policy and its objectives have a bearing on the management of wetlands resources. Among its objectives are to promote the participation of the private sector, communities and other stakeholders in forest management to conserve water catchment areas, create employment, reduce poverty and ensure the sustainability of the forest sector. Wetlands have important implications for water catchment. It expands forest management to embrace preservation of religious and cultural sites, traditional medicinal sources, water catchments, and habitats for endemic and threatened species of flora and fauna, categories that no doubt include wetlands.

The implementing legislation for the Forest Policy is the Forests Act, 2005. It too does not specifically deal with wetlands. It establishes the Kenya Forest Service (KFS), the functions of which include, "managing forests on water catchment areas primarily for purposes of water and soil conservation, carbon sequestration and other environmental

services”. It empowers the Minister, upon the recommendation of the forest conservation committee for the area within which a forest is situated, the local authority and the Board of the Kenya Forest Service to declare as a local authority forest any land under the jurisdiction of a local authority that is an important catchment area, a source of water springs, or is a fragile environment; or is rich in biodiversity or contains rare, threatened or endangered species”. These powers can be used to conserve and protect wetlands.

2.4.4 AGRICULTURE ACT CAP 318

This Act aims to promote and maintain stable agricultural production in the country through conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry.

The Agriculture Act (Cap 318) is an old piece of legislation, first enacted in July 1955. It has no direct relevance to wetlands except in so far as they may be affected by orders given to owners and occupiers of agricultural land by the Minister in charge of agriculture for purposes of conserving and managing soil, checking soil erosion and preventing other adverse impacts on land. The Minister may also make land development orders against an owner or occupier of agricultural land requiring the carrying out of specified development programmes within a specified period of time. Although such orders could effectively have a bearing on wetlands management, their objective would be the promotion of good farming methods.

2.4.5 THE WILDLIFE CONSERVATION ACT

The Wildlife (Conservation and Management) Act provides the framework for protection, conservation and management of wildlife in Kenya. It establishes the Kenya Wildlife Service (KWS) as a uniformed and disciplined force and vests it with oversight of conservation, management and utilization of all types of fauna (other than domestic animals) and flora. Because this Act focuses more fauna and flora, it has no direct relevance to wetlands management, except for the fact that wetlands are often habitat for fauna and flora. Unfortunately, the focus of wildlife conservation in Kenya has traditionally been on the large animals and protected areas and this is what KWS is known for, despite being the Administrative Focal point of Ramsar in Kenya.

2.4.6 PHYSICAL PLANNING ACT 1999

The Act gives provision for the development of local physical development plans and, it also guides and coordinates development of infrastructure within the county, municipal and town councils. The Act also guides on land use and development. This regulation is triggered as the area is currently mainly under agricultural use with a few institutional and commercial uses. It is therefore recommended that the land use status is reviewed.

2.4.7 PUBLIC HEALTH ACT CAP 242

The Act provides measures that safeguard and promote public health. The measures considered by the Act include those on prevention of discharge of pollutants into watercourses; prevention of mosquitoes breeding sites, sanitation management among others.

2.4.8 FISHERIES ACT

This Act guides on the development, management, exploitation, utilization and conservation of fisheries. Section 5 of the Act gives guidelines on fisheries management measures.

It is evident from the foregoing that there are a large number of policies and laws that have a bearing on the conservation and management of wetlands in Kenya, and that there are in existence policy and legal provisions that if enacted and properly used could facilitate the sustainable conservation of wetlands. Unfortunately, this multiplicity of policies and laws also translates into a multiplicity of institutional mandates that often trigger conflict and confusion. A key challenge with this framework, which has implications not just for wetlands but also

for other natural resources, is the issue of coordination. It is clear from the foregoing that apart from EMCA 1999, the policies and laws are sector specific. And although the rhetoric of holistic management is common especially to the more recent policies and laws, the reality of implementation is by reference to specific sectors.

This has remained the key challenge to wetlands management and is the main motivation for the push for policy, legal and institutional framework specific to wetlands resources. It is quite evident that only a framework that has a focus on wetlands can ensure sufficient attention to these resources. But it is also now acknowledged that wetlands and other natural resources have to be managed in a manner that takes into account the interconnectedness of ecosystems. It is for this reason that the design of a policy on wetlands must of necessity involve wide consultations and bring on board stakeholders from a wide spectrum of sectors. Ultimately, what a wetlands policy should seek to do is to articulate principles and values for sustainable conservation and management and to generate buy-in thereon so that different sectoral institutions and to apply the same in their sectors and thereby contribute to the integrity of wetlands.

PLATE 3: PARTS OF THE WETLAND



3.0 BENEFITS OF OMBEYI WETLAND TO THE COMMUNITY

Ombeyi wetland provides diverse resources and benefits to the local communities. Some of the benefits as listed by communities during consultations (Plate 3 & 4) include;

- Source of water for domestic, agriculture/small-scale irrigation and livestock watering
- Source of papyrus (*Cyperus papyrus*) used for making mats and other handicrafts as well as sedges used for thatching (Plate 5)
- Provides conducive environment for rice and arrow root farming etc
- Provides breeding ground for many fish species such as the African lung fish (*Protopterus aethiopicus*), Tilapia (*Oreochromis niloticus*) and catfish (*Clarias gariepinus*) among others.
- Provides good grazing ground for cattle especially during the dry season. The wetland is the only fall-back pasture land for grazing during dry season, occasioned by prolonged drought.
- Acts as ground water recharger
- Suitable ground for fish hunting
- Source of food e.g. bananas, rice, vegetables and fish

The Ombeyi wetland in Lake Victoria Basin (LVB) provides several benefits to the riparian communities and to the nation at large as some of the wetland products are sold to other consumers outside the wetland vicinity including Nairobi, the Capital City of Kenya. The benefits and services provided by the wetland from a gender perspective are summarized in table 1.

PLATE 4: COMMUNITY BARAZA AT MASOGO MARKET



PLATE 5: COMMUNITY CONSULTATIVE MEETING AT OMBEYI MARKET AND WANGAYA, NYANDO SUB-COUNTY



PLATE 6: OMBEYI WETLAND USES (LEFT- HARVESTED SEDGES/PLANTS FOR ROOFING; RIGHT ARROW ROOT AND BANANA FARMING)



TABLE 1: GENDERED IMPACTS OF THE LOSS AND BENEFITS OF WETLAND PRODUCTS/SERVICES

Ombeyi Wetland Benefit/Service	Who is more Affected by lack of the Resource (Male (M); Female (F); Boys (B); Girls (G))
Source of water for domestic/household use	F and G
Source of Papyrus reeds (<i>Cyperus papyrus</i>) for making mats and handicrafts;	F
sedges for house thatching	M
Conducive Land for rice and arrow-root farming	M
Breeding ground/habitat for various fishes (Tilapia- <i>Oreochromis niloticus</i> , catfish- <i>Clarias gariepinus</i> , and African lung fish- <i>Protopterus aethiopicus</i>) for both local consumption and sale/income	ALL
Fall-back grazing and livestock watering field during dry season	M
Ground water recharge	F who rely on borehole water when there is no water in the wetland or the quality is poor
Clay soil for pottery	F

3.1 COMMUNITY LIVELIHOOD SOURCES

Livelihood analysis is an important step towards wetland management plan development as it provides better understanding of the livelihood options and opportunities for livelihood improvement using a Sustainable Livelihood Approach (SLA). It also provides a means of understanding the vulnerability from a food security angle. During the community engagements and discussions, participants listed some of the livelihood sources as;

- Brick-making
- Casual jobs such as Kazi Kwa Vijana (KKV)
- Bicycle motor-bike taxi operators (Boda boda)
- Farming (both subsistence eg maize, beans, as well as commercial-sugarcane, arrow root, mangoes, rice)
- Livestock husbandry
- Fishing
- Sand harvesting
- Mat-making and sale of dried papyrus
- Self-employment
- Formal employment
- Funds from benefactors (well-placed sons and daughters etc.)

3.2 PROBLEM ANALYSIS AND THREATS

Community members listed some of the problems caused by the wetland and which have profound effects on their lives and well-being. These are;

- Flooding causing havoc to the surrounding farms as well as homesteads.
- Water borne and water-related diseases such as cholera, typhoid and malaria.
- Displacement of communities.
- Limited land space for dry-land farming and animal grazing grounds.

3.2.1 THREATS TO THE WETLAND AND OTHER SOCIO-ECONOMIC IMPERATIVES

The threats to the Ombeyi wetland include:

- Encroachment for wetland farming, grazing and settlement.
- Over-harvesting of wetland products such as fish, sedges and papyrus.
- Unsustainable sand harvesting/mining.
- Sedimentation and siltation.
- Catchment degradation and deforestation.
- Farming along river banks and destruction of buffer/riparian zones.
- Over-population hence need for more land for settlement and 'development'.
- Climate change scenarios e.g. long period of dry spell and intensive flooding regimes.
- Individual ownership/tenure systems.
- Resource-use Conflicts -human/human and boundary disputes between and amongst communities such as Wang'aya and Kabar clans.

- Clanism/negative ethnicity.
- Burning.
- River diversions/canalization.
- Poor understanding and enforcement of the existing legislative frameworks such as the wetlands regulations (2009), water rules (2007), EMCA (1999) etc and the interconnectedness between upstream and downstream wetland resource users and their activities
- High poverty levels (Nyando Sub-County poverty incidence stands at 48.7%) while Ombeyi division exhibit poverty incidence of 63% (CBS, 2004).
- High HIV/AIDS prevalence (in 2002, prevalence rate was 29% which has gradually decreased to 18% currently-2010). HIV and AIDS is the biggest health threat in Nyando district. The lower Nyando basin has one of the highest rates of HIV/AIDS in Kenya.
- Nyando District exhibits exceptionally high mortality rates as compared to the national level; infant mortality rate (IMR) in Nyando is 116 per 1000 live births. This is 50% higher than the national figure while under-five mortality rate for the districts is 212 about double than the national average. This implies that about one in every 5 children of Nyando children cannot see their five-year birthday.
- During the consultations and population estimations, communities perceive this area as is critically over-populated (e.g. N.E Kano location harbor a population of 27,000 while Wanga'ya sub-location within this location has a population of about 5,800).
- Low life expectancy: Male life expectancy at birth according to the 2009 Census was 37.7 years only, as compared to the national average of 52.8. Women showed longevity than men, given that their life expectancy was 43 years, which is still very low compared to the national average of 60.4.
- The low economic status of the surrounding communities has also increased the drive to exploit the wetland and to open up land for crop and livestock farming. According to Kenya government statistics, over 70% of the population living around the wetlands live below poverty level (<US\$ 1.00), making them to over-exploit and degrade this fragile wetland ecosystem.
- The wetland and its resources form key livelihood sources to the riparian community of Wang'aya and Kabar. Such livelihoods derived from the wetland include but not limited to; wetland farming including arrow root, which provides economic return as a greater portion of this product is transported to Nairobi-via train for sale.
- The division has a great potential for agriculture and possible interventions may be geared towards improving mango production while understanding the marketing dynamics and linkages to provide better marketing opportunities/outlets for the proceeds for such commodities. Similarly, sugar cane farming is a robust activity in this area and most farmers agree to the fact that the newly established rate of Kshs. 2300 (after all deductions) per ton of cane provides better economic return with subsequent improvement in health and well-being of the household members.
- Specific gender stereotypes and myths still predispose the women in this area on the peripheral arenas rather than mainstream decision-making process within the communities. Such stereotypes were reflected during community meetings with percent of the women participating much lower than men. Close probing the men present during the meeting on why the women were not visible, "it is the women's role to prepare lunch for the children (who were almost coming back for lunch after school) and they do this after shamba work" and this explains the absenteeism of women during this consultative meeting.
- There is general lack of awareness on the regulations and policies governing wetlands and riparian reserves as evidenced by land ownership rights as claimed by community who hold parcel numbers of wetland areas and riparian zones.
- Other Major threats include unsustainable utilization of the wetland resources, burning, encroachment, poverty, poor water harvesting technologies, poor market linkages and opportunities for the many agricultural produce within the area and lack of understanding of an Integrated Wetland-Watershed Management (IWWM) among others.

3.3 THE GENDER DIMENSIONS OF THE THREATS TO THE OMBEYI WETLAND

TABLE 2: GENDERED EFFECTS OF OMBEYI WETLAND DEGRADATION AND THREATS

PROBLEM/THREAT	CAUSES	EFFECTS	AFFECTED GROUP (F-ADULT FEMALE, M-ADULT MALE, B-BOYS, G-GIRLS)
Encroachment for grazing, farming and settlement	Reduced land sizes and/or lack of land; population increase	Reduced wetland size, reduced buffering capacity, biodiversity loss (e.g. fish), and water pollution –low quantity and quality	F and G
Over-harvesting of wetland resources e.g. fish and plants (sedges and papyrus)	Lack of food and money to buy better roofing materials (income-poverty); high HIV/AIDS prevalence causing over-reliance on wetland resources	Depleted resources and biodiversity loss; increased food insecurity particularly indigenous foods e.g. fish and plants	F
Unsustainable sand-harvesting and mining along the rivers that feed Ombeyi wetland by adult men	Income and food poverty (Poverty incidence in Nyando District stands at 48.8%)	Biodiversity loss, sedimentation/water pollution, reduced water volumes	F
Catchment degradation and deforestation mainly by men through felling of indigenous trees for unsustainable charcoal production (income)	Income poverty and lack of awareness of the interconnectedness between forests and wetlands	Less rainfall/water into the wetland; drying of the wetland; biodiversity loss; increased ambient temperatures	F
Land tenure issues/subdivision of the wetland by adult men to their sons (male-line ownership of land rights)	Lack of land and poor enforcement of environmental-related legislations; population increase	Water pollution; less water in wetland due to reduced wetland size; biodiversity loss	F and G
Climate variability	Long periods of dry spell or erratic/torrential rainfall, destroying properties and human displacements	Poor human and livestock health; water borne and water-related diseases such as malaria, typhoid, and bilharzias; rampant crop failures and livestock deaths –thus reducing food security at the household-level	F

As reflected above, the problems which threaten Ombeyi wetland are myriad. These were analyzed by the community while in groups in a Problem-Cause-Effect manner using a problem tree, so called Ishikawa diagram. Generally,

participants agreed that threats facing this wetland include encroachment for various reasons, over-harvesting of the wetland resources, pollution, catchment destruction, poor and unsustainable land use practices, particularly cultivation and farming on and within wetland riparian areas as well as changing climate and/or variability. Table 2 shows the results of the problem analysis and the gendered implications.

3.4 THE PROBLEM: WETLAND DEGRADATION

The stakeholders present agreed that the overall problem (ROOT) was the degradation of the Ombeyi Wetland ecosystem. They then worked backwards to determine the causes and effects of such degradation.

Generally, the causes include;

- Lack of awareness on wetlands wise-use, laws and environmental policies.
- Climate change and variability
- Siltation and Sedimentation.
- Poor farming practices.
- Burning of wetland.
- Over grazing.
- Deforestation.
- Cultivation along the river banks.
- Unsustainable Sand harvesting.
- Over harvesting of wetland products.
- Poverty (income, food, knowledge etc).
- Brick making

Some of these are (inter)linked. For instance, catchment degradation was caused by deforestation, over-grazing and poverty.

3.5 HISTORICAL PROFILES OF KEY PARAMETERS RELATED TO OMBEYI WETLAND DEGRADATION OVER THE PAST 30 YEARS.

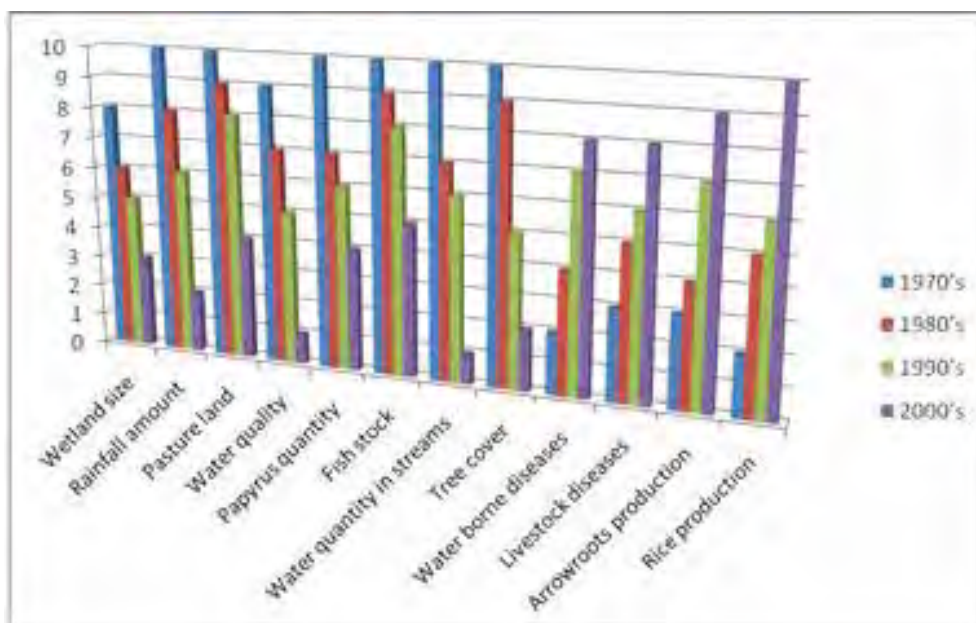
Using a -3-decade historical profile analysis, participants listed some of the key parameters closely linked to the degradation of Ombeyi wetland and the associated catchment (Table 3). Generally wetland resources and functions as well as services accruing from it have decreased over the years. These include Ombeyi wetland size, rainfall intensity, water quality and quantity within the wetland, tree cover and the quantity of papyrus. However, population is on the increasing trend despite increasing water borne and water related diseases and ambient local temperatures. Table 6 summarizes the results of the trend analysis.

TABLE 3: HISTORICAL PROFILES

NO.	PARAMETER / YEAR	1970'S	1980'S	1990'S	2000'S	REMARKS/ CAUSE
1.	Wetland size	8	6	5	3	<ul style="list-style-type: none"> • Reduced due to population pressure • Deforestation
2.	Rainfall amount	10	8	6	2	<ul style="list-style-type: none"> • Due to destruction of water catchment areas
3.	Pasture land	10	9	8	4	<ul style="list-style-type: none"> • Over grazing • Population pressure
4.	Water quality	9	7	5	1	<ul style="list-style-type: none"> • Due to increased activities done on the wetland
5.	Papyrus quantity	10	7	6	4	<ul style="list-style-type: none"> • Used for mat-making industries • Land for cultivation
6.	Fish stock	10	9	8	5	<ul style="list-style-type: none"> • Excessive fishing • Water pollution leading to death
7.	Water quantity in streams	10	7	6	1	<ul style="list-style-type: none"> • Due to destruction of water catchment areas
8.	Tree cover	10	9	5	2	<ul style="list-style-type: none"> • Reduced due to population pressure • Deforestation
9.	Water borne diseases	2	4	7	8	<ul style="list-style-type: none"> • Water pollution • Poor sanitation
10.	Livestock diseases	3	5	6	8	<ul style="list-style-type: none"> • Water pollution • Poor sanitation
11.	Arrowroots production	3	4	7	9	<ul style="list-style-type: none"> • Increased due to proper methods of cultivating it
12.	Rice production	2	5	6	10	<ul style="list-style-type: none"> • Increased due to proper methods of cultivating it • Introduction of new inputs

Graphically, most of these variables, particularly the resources, services and benefits showed a decreasing trend except for soil erosion, population, and human and livestock disease (Fig 4).

FIGURE 4: GRAPHICAL REPRESENTATION OF THE PARAMETERS ANALYZED THAT ARE LINKED TO OMBEYI WETLAND DEGRADATION



3.6 OMBEYI WETLAND ECOSYSTEM MANAGEMENT PLANNING

The facilitators then injected the wetland Management Planning as the process of arriving at goals and objectives for managing a given resource in a defined area.

WHY PLAN?

- There is an increasing demand for agricultural land & other unsustainable utilization practices
- The low economic status of the locals push them towards over dependence on the wetland resources

SOME STEPS

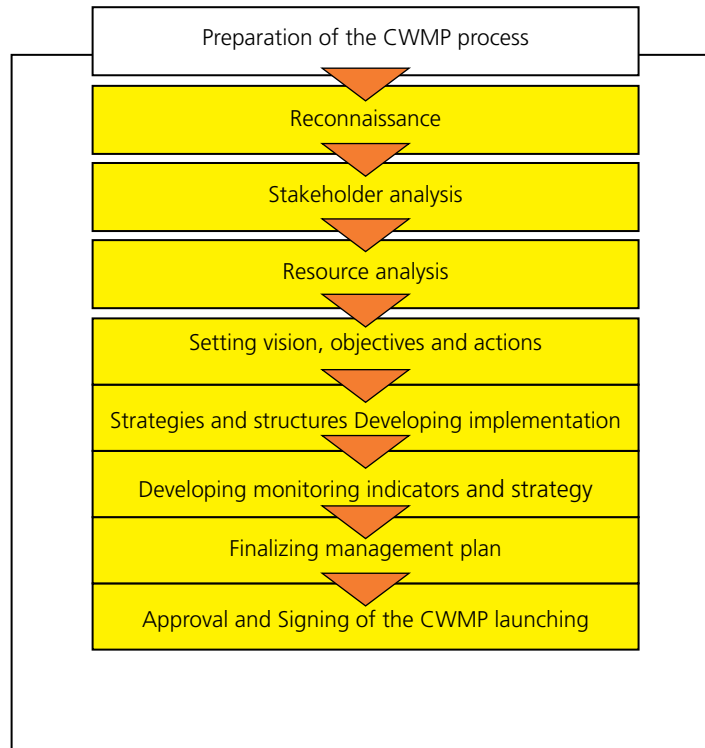
There are simple steps that are vital in developing a community-based wetland management plan (Fig. 5). These include:

- Identify the planning area.
- Do a reconnaissance study-identify and mobilize all stakeholders, general resources (human and equipment).
- Agree on the process, time frame, and output with stakeholders.
- Analyze stakeholder interests, conflicts, existing systems, roles and responsibilities.
- Agree on objectives of Community wetland management program.
- Agree on management options.
- Zone the planning area.
- Develop Wetland Management Plan with a monitoring plan.
- Agree on sanctions.

WHY STAKEHOLDER PARTICIPATION?

- Communities often use resources mostly in uncoordinated ways that can lead to abuse.
- However, they do have detailed knowledge on key issues and problems associated with the resources and their use, and therefore their involvement and participation is important to tap on their indigenous knowledge and perspectives.

FIGURE 5: BASIC STEPS IN DEVELOPING COMMUNITY WETLAND MANAGEMENT PLAN



3.7 OMBEYI WETLAND STAKEHOLDERS' IDENTIFICATION

Facilitators employed participatory approaches. The participatory stakeholder analysis started with the definition of a stakeholder and then followed with identification of the various stakeholders. A Stakeholder is an interested individual, group or institution that may or may not be affected by decision making about the (wetland) resource. Participants then listed the stockholders of Ombeyi as shown in table 4:

TABLE 4: OMBEYI WETLAND STAKEHOLDER IDENTIFICATION

NO.	STAKEHOLDERS	STAKE/MANDATE	POTENTIAL ROLE /INTEREST	MARGINALIZED?	KEY ROLE?
1	Farmers, fishermen, Mat-makers	Food security	Profit Food	No	Yes
2	NEMA	Conservation & management of natural resources	To safe guard & enhance the quality of the environment	No	Yes
3	Ministry of agriculture	Enhance good agricultural practices	Good agricultural products	No	Yes
4	County Government	Land ownership, Policy and laws	Maintain law & order	No	Yes
5	Industries	Continuous supply of their products	To make Profit	No	Yes
6	NGOs e.g. AED	Conservation & management of natural resources	Food security	No	Yes
7	WRMA	Continuous supply of water Control of soil erosion	Quantity & quality of water maintenance	No	Yes
8	CBOs e.g. NORKISI	Food security	More food production	No	Yes

3.8 STAKEHOLDER'S ANALYSIS MATRIX

Based on a simple stakeholder analysis matrix comprising of four categories (A, B, C, D), participants were re-grouped in interactive learning by doing sessions. The stakeholders in each category were defined as:

- A) Those that require special mechanisms if their interests have to be protected.
- B) Development of good working relationship among these stakeholders can ensure an effective coalition of support.
- C) Stakeholders who can affect outcome of the wetland management (Ombeyi) process but whose interest are not the target; they may be a source of significant risk & will need careful monitoring & management.
- D) Stakeholders who require limited monitoring & management but they are of low priority.

Based on this matrix, the following was the categorization of Ombeyi wetland stakeholders in accordance to their influence and relative importance (table 5).

TABLE 5: CATEGORIZATION OF OMBEYI WETLAND STAKEHOLDERS IN ACCORDANCE TO THEIR INFLUENCE AND RELATIVE IMPORTANCE

<p>A) HIGH IMPORTANCE & LOW INFLUENCE</p> <ul style="list-style-type: none"> ▪ Farmers –rice, sugarcane, arrowroots & horticultural farmers; ▪ Mat-makers; ▪ Ministry of Public health ▪ CBOs e.g. norkiso ▪ Some Industries ▪ Fishermen ▪ Women (Pottery and mat-makers) 	<p>B) HIGH IMPORTANCE & HIGH INFLUENCE</p> <ul style="list-style-type: none"> ▪ Ministry of agriculture, fisheries and livestock ▪ NEMA ▪ Ministry of Environment, water and Natural Resources ▪ WRMA ▪ Industries e.g. Miwani sugar factory ▪ KFS and KWS
<p>C) LOW IMPORTANCE & LOW INFLUENCE</p> <ul style="list-style-type: none"> ▪ Bee keepers ▪ Bamboo harvesters ▪ Hunters 	<p>D) LOW IMPORTANCE & HIGH INFLUENCE</p> <ul style="list-style-type: none"> ▪ Politicians – MPs, councilors ▪ Ministry of information

3.9 PARTICIPATORY RESOURCE ANALYSIS – SUSTAINABLE LIVELIHOOD FRAMEWORK (SLF)

The process involved the following key group activities:-

- Identifying wetland resources in Ombeyi wetland
- Ranking the resource use
- Identifying the key wetland uses/benefits from different resources
- Identifying the key wetland resource user groups according to gender
- Analyzing wetland resource use trends in the area over a period of about 40 years using historical profiles and trend lines.

In this case, participants were divided into four groups and identified the resources derived from Ombeyi wetland as shown in table 6:

TABLE 6: RANKING OF OMBEYI WETLAND RESOURCES

RANK/NO.	RESOURCES GENERATED WITHIN COMMUNITY/WETLAND	RESOURCES SOURCED FROM OUTSIDE COMMUNITY
1	Water	Bananas
2	Fish	Dagaa
3	Papyrus	Sisal
4	Reeds	Onions
5	Arrowroots	Maize
6	Rice	Millet
7	Grass	Cassava
8	Clay soil Sand	Ground nuts
9	Firewood	Sugarcane
10	Vegetables	Fuel wood
	Wild animals	
	sugarcane	

From a gender perspective, a participatory resource analysis gave the following (table7):

TABLE 7: WETLAND RESOURCE USE BY GENDER

WETLAND RESOURCE	BENEFIT/PRODUCT/VALUES	RESOURCE USE BY GENDER GROUP
Fish	Food	M,F,Y
Arrowroots	Food , income, herbal medicine	M,F,Y
Ducks ,birds	Food	M,Y
Earthworms	Fish baits	M,Y
Clay soil	Pots	F, Y
Papyrus reeds	Mats, ropes ,baskets, food additive (serves as magadi)	M,F,Y
Rice	Rice jam, chicken feeds, rice grain	M,F,Y
Water	Domestic use, irrigation, industrial use	F, Y
Clay soil	Pots	F, Y
Rice	Rice jam, chicken feeds, rice grain	M,F,Y
Fish	Food	M,F,Y
Arrowroots	Food , income, herbal medicine	M,F,Y
Ducks ,birds	Food	M,Y
Grass	Thatching	M,Y
Frogs	Fish baits, weather forecast	M,F,Y
Bushes	herbal medicine, firewood beekeeping	M,F,Y
Water	Domestic use, irrigation, industrial use	F, Y
Clay soil	Pots	F, Y
Rice	Rice jam, chicken feeds, rice grain	M,F,Y
Fish	Food	M,F,Y
Arrowroots	Food , income, herbal medicine	M,F,Y
Ducks ,birds	Food	M,Y
Grass	Thatching	M,Y
Earthworms	Fish baits	M,Y
Frogs	Fish baits, weather forecast	M,F,Y
Bushes	herbal medicine, firewood beekeeping	M,F,Y

KEY:

M- Male **F-** Female **Y-** Youth

4.0 KEY ISSUES TOWARDS SUSTAINABLE MANAGEMENT OF OMBEYI WETLAND ECOSYSTEM

From the problem analysis, the degradation of Ombeyi wetland ecosystem emanates from six (6) main factors or their derivatives. These include:

Catchment degradation (deforestation)- causing soil erosion and sedimentation/siltation loadings ;

- **Poverty** – Both food, knowledge and income poverty are evidenced in the wetland area some of this partly exacerbated by high HIV and AIDS prevalence rates which reduce the productive capacity of communities and therefore increasing despondency;
- **Inadequate and lack of capacity** – Many community members are ignorant of the existing pieces of legislation governing wise-use of natural resources. Similarly, there is lack of capacity to understand the intricate and delicate linkages between wetlands wise-use and improved community health and well-being;
- **Pollution** – increased pollution loadings as a result of improper crop farming and livestock husbandry as well as other unsustainable practices such as direct washings into the wetland and wetland farming have a deleterious effect on the quality and ecological integrity of the wetland. Both point and non-point sources of pollution generate pollutant loads. For instance, pollution from agricultural (sugarcane) farms, as well as Sugarcane industries such as Miwani;
- **Climate change** and climate variability – most of the participants were somewhat aware of the changing climate and variability, manifested by inadequate rainfall during the long rains and high rainfall intensity (torrential) during the short rainy season as well as extreme drought causing massive crop failure and livestock deaths. These therefore cause over-dependence on the wetland as the main livelihood source for many households within the area, resulting in biodiversity loss.
- **Inadequate scientific data and Monitoring:** inadequate scientific data e.g. biodiversity inventory and lack of consistent water quality and biodiversity monitoring inhibits strategic policy and programme intervention required towards integrated community-science-driven approaches. Similarly, intersectoralities between Population, Health and Environment have not been studied in Ombeyi context despite the evidence between HIV and AIDs and wetland resource dependence. There is therefore need to document statuses through research and innovation using participatory and integrated scientific approaches.

Participatory vision development is a pre-requisite in wetland management planning. In this case community representatives were able to indicate the issues that the vision should contain and come up with a sentence for the same. Basically, four sentences (proposed ‘visions’) from four groups were received and discussed at the plenary so that one vision statement was obtained. Consequently the agreed on and adopted vision for Ombeyi wetland was: “A **sustainably managed Ombeyi wetland for improved community livelihoods**”.

4.1 VISION DEVELOPMENT

Participatory vision development is a pre-requisite in wetland management planning. In this case community representatives were able to indicate the issues that the vision should contain and come up with a sentence for the same. Basically, four sentences (proposed ‘visions’) from four groups were received and discussed at the plenary so that one vision statement was obtained. Consequently the agreed on and adopted vision for Ombeyi wetland was: “A **sustainably managed Ombeyi wetland for improved community livelihoods**”.

4.2 STRATEGIC OMBEYI WETLAND MANAGEMENT OBJECTIVES

The objectives were developed out of the objective tree tool by the community representatives at the group level and discussed to come up with strategic components /areas to be addressed in the management plan. In addition, objectives were derived from the key management issues discussed above (section 4.0). In light of these, the following are the strategic objectives the management plan seeks to address;

- To reduce and halt catchment degradation.
- To eradicate poverty and promote livelihood diversification.
- To promote sustainable land-based practices in order to reduce water pollution.
- Build communities adaptive capacities and resilience in light of a changing climate occasioning vulnerabilities.
- Promote participatory research and technological innovation in sound environmental management and monitoring.

The following were the agreed upon specific objectives towards sustainable management of the wetland:-

- To promote Afforestation and reforestation programmes.
- To improve Environmental education and awareness through value addition, marketing and sharing/lesson learning exchanges.
- To Heighten Compliance and Enforcement of laws and regulations.
- To halt Pollution and improve Water quality.
- To improve Food security.
- To carry out Research and information sharing.
- To promote Sustainable harvesting of wetland products.
- To scale up Monitoring & Evaluation.

The implementation of these objectives would result in the following outcomes

- Improved farming systems.
- Improved wetland quality and products for better income.
- Improved irrigation system to increase income.
- Improved tree and vegetation cover, towards the Constitutional 10% threshold.
- Reduced clearing of wetlands and biodiversity loss.
- Enhanced community awareness on wetlands wise-use.
- Improved water quality and quantity.
- Reduced water related diseases & incidences.
- Improved livestock products.
- Improved access to alternative energy sources.
- Improved livelihood sources.
- Improved levels of household income.

Using a matrix, the objectives culminated into strategic actions/programmes that are implementable as shown in table 8:

TABLE 8: OMBEYI WETLAND IMPLEMENTATION PLAN

OBJECTIVE	ACTIVITY	TIMEFRAME	RESPONSIBLE/ACTORS	INDICATORS	BUDGET(IN MILLION KSHS)
To promote Afforestation and reforestation in the catchment and river banks.	<ul style="list-style-type: none"> ▪ Establish tree nurseries. ▪ Planting of wetland friendly tree species such as bamboo around the wetland. ▪ Undertake Agroforestry practices. ▪ Plant fruit trees and fodder. ▪ Establish woodlots. ▪ On-farm tree planting. ▪ Provide Energy saving/ cleaner production technologies. ▪ Train communities on use and production of biogas. ▪ Train communities on carbon trading/CDM. ▪ Establish CDM projects at community-level. 	2014-2018	KFS, Ombeyi wetland Management committee; NEMA; Ministry of agriculture; Ministry of energy; NGOs such as VI-Agroforestry; Local Communities; County Government; WRMA; Ministry of Environment, Water and NR; Ministry of Interior Coordination	<ul style="list-style-type: none"> • Size/acres planted; • Number of cleaner production technologies initiated/adopted ; • No of Trainings held on biogas production and use at the household level; • Number of households using improved Cooking's Stoves (ICS); • Water quality and quantity data and improvement trends; • Number of Households accessing river/wetland water; • Number of CDM projects; • Other climate related data and trends e.g. rainfall etc 	10.5
To Improve environmental education and awareness by communities.	<ul style="list-style-type: none"> ▪ Undertake training and sensitization on environmental management and the existing laws and regulations. ▪ Organize seminars and workshops for information sharing and education on matters environment and wetlands. ▪ Conduct community Sensitization such as through Walk into-chiefs barazas and other avenues including radio-talk shows and other electronic media such as County News magazine. ▪ Develop, print and distribute IEC materials and Ombeyi wetlands management plan and other environmental management IEC materials e.g. brochures. ▪ Facilitate and infuse wetland management in school programs. ▪ Organize exchange visits for learning and knowledge sharing on Best Available Practices (BAPs) and Technologies (BATs). 	2014- 2018	Ombeyi wetland Management committee; Ministry of education; Ministry of Interior Coordination; NEMA; Ministry of public Health and sanitation; MEWNR; KFS; WRMA; Kisumu County Government;	<ul style="list-style-type: none"> • Number of training /sensitization sessions conducted; • No. of Field visits and number of participants attended/participated; • Number of IEC materials developed/printed and distributed; • Radio call ins; • Evidence of infusion of wetlands management into local school programmes e.g. lessons; • Assessment reports e.g. on Knowledge, Attitudes and Perceptions (KAPs) about wetlands use etc. 	15.0

OBJECTIVE	ACTIVITY	TIMEFRAME	RESPONSIBLE/ACTORS	INDICATORS	BUDGET(IN MILLION KSHS)
To heighten Environmental Compliance and enforcement of laws and regulations.	<ul style="list-style-type: none"> ▪ Develop community by- laws and rules on Ombeyi wetland use. ▪ Create awareness on wetland laws and regulations. ▪ Conduct training on Community based wetland monitoring for compliance. ▪ Establish Community-level structures e.g. sub committees) to deal with enforcement ▪ Heighten Environmental Surveillance and enforcement by government agencies. 	2014-2018	NEMA; Local Wetlands Committee; MEMR, KFS/ KWS; WRUAs; Chiefs/ and sub-chiefs;; WRMA; County Government; KFS; KWS; Fisheries Department	Number of offenders penalized; Existence of community-based wetland management by-laws and rules; Trainings held and number participated; existence of enforcement committee	8.0
To halt water Pollution.	<ul style="list-style-type: none"> ▪ Promote adoption of roof catchment for water harvesting and storage at family/household and institutional levels. ▪ Promote cheap and efficient Water treatment technologies for drinking water and wastewater. ▪ Rehabilitate existing water pans/dams. ▪ River bank protection ▪ Demarcation of wetland boundaries and zonation. ▪ Use water pumps for small irrigation off the wetland. ▪ Soil and water conservation measures at farm level. ▪ Establish modern cattle watering troughs. ▪ Promote wastewater re-use in agriculture and other uses. ▪ Conduct training on wastewater management and re-use. ▪ Establish demo site on eco-friendly wastewater treatment for e.g. Miwani Sugar Effluent (e.g. Constructed wetlands). 	2014- 2018	NEMA; Ministry Env't, Water and NR; Ministry of Agriculture, Fisheries and Livestock; Ombeyi wetlands Management committee; Sugar Companies Kenya Sugar Board; NGOs; NIB; WRMA; Ministry of Public Health; and Sanitation; KFS; County Government	Number of Roof catchment installed and operational; Household survey reports on water treatment and re-use; Number of functional rehabilitated dams/water pans; kilometers/size of river banks protected; Number of water pumps acquired and used by communities for irrigation; No. of Farm forestry initiatives initiated; Existence of eco technology e.g. constructed wetland designed and operational for wastewater treatment; Number trained on wastewater treatment and re-use	40.0

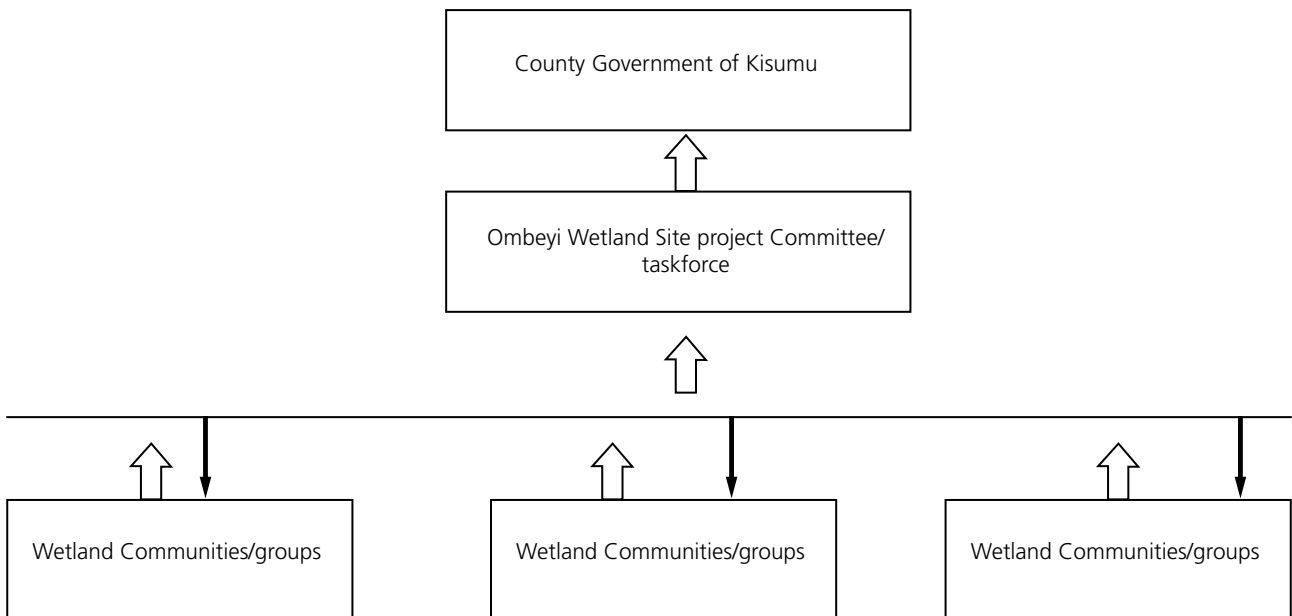
OBJECTIVE	ACTIVITY	TIMEFRAME	RESPONSIBLE/ACTORS	INDICATORS	BUDGET(IN MILLION KSHS)
<p>Improve Food security and household incomes.</p>	<ul style="list-style-type: none"> ▪ Training on quality improvement/value addition on wetland products e.g. mats etc. as well as sustainable wetland farming. ▪ Undertake exchange field visits for learning on various wetland friendly enterprises. ▪ Undertake Livelihood Diversification e.g. apiary, fish-farming, dairy goat farming. ▪ Soil erosion control. ▪ Storm and rainwater water harvesting for crop production. ▪ Undertake horticulture and use of organic fertilizers/sustainable agriculture-wetland farming. ▪ Rain water harvesting. ▪ Develop market. Strategies and establish market linkages for products. ▪ Undertake/promote Greenhouse farming. ▪ Establish Storage systems for rice. ▪ Upgrade livestock. ▪ Farmers training on good crop husbandry. 	<p>2014-2018</p>	<p>NEMA; MOA, Fisheries & Livestock; Community; WRMA; NIB; County Government; Media; Ministry of education; Development Partners;</p>	<p>Training reports and number trained; number of livelihood enterprises initiated; evidence of soil erosion control eg gabions etc; crops planted during dry season and watered; Amount of revenue generated from horticulture and other enterprises; market outlets for commodities; existence of greenhouse farming; evidence of cross-breeds/hybrid livestock; incidences of livestock deaths</p>	<p>45.0</p>
<p>Facilitate Research & Development and information sharing.</p>	<ul style="list-style-type: none"> ▪ Conduct participatory wetland related researches including gendered impacts of climate change and variability on the ecosystem and biodiversity. ▪ Undertake biodiversity inventory and water quality assessments; ▪ Undertake Market researches for wetland products and valuation. ▪ Population, health and Environment (PHE) assessments/studies. ▪ Collaborate with relevant authorities so as to source wetland information on relevant issues. ▪ Value addition to wetland products. ▪ Collect data on plants, forestry, human resource capacity and socio-economics. 	<p>2014-January 2018</p>	<p>Ministry of Education, Science and Technology; NEMA Ombeyi wetland development committee; Ministry of Planning; Research institutions; Universities; NGOs, KWS, WRMA, KEFRI, KEMFRI, KARI; development partners</p>	<p>Research reports; water quality data; biodiversity inventory</p>	<p>9.0</p>

OBJECTIVE	ACTIVITY	TIMEFRAME	RESPONSIBLE/ACTORS	INDICATORS	BUDGET(IN MILLION KSHS)
To Promote sustainable harvesting of wetland products.	<ul style="list-style-type: none"> ▪ Heighten surveillance towards Compliance and enforcement of laws for restoration of the wetland. ▪ Undertake Participatory delineation and Zoning of the wetland into suitable land uses. ▪ Support groups with water pumps to practice horticulture off the wetland. ▪ Train communities on sustainable wetland management. 	2014- 2018	Ombeji wetlands Management committee; NEMA; MOA; KWS, KFS, WRMA; MEWNR; Chiefs/Ministry of Interior Coordination; NIB; ministry of lands (survey department)	Zonation carried out showing different areas zoned; Groups (number) supported; crops grown and income/ revenue accruing from such; reports	3.5
To Enhance participatory monitoring and evaluation (PM &E).	<ul style="list-style-type: none"> ▪ Frequent follow-up and consultation on implementation progress. ▪ Participatory M and E through Meetings and field visits. 	2014- Dec. 2018	Ombeji wetlands management committee; County Government; Ministry of Agriculture, Livestock; NEMA; KWS, Fisheries Department; Ministry of Health	Meeting minutes; proceedings; field reports;	10.0

5.0 INSTITUTIONAL FRAMEWORK FOR MANAGING OMBEYI WETLAND

The institutional structure described herein provides the framework for accountability and a mechanism for conflict management arising from the use of Ombeyi wetland. New institutions and alignments of the old ones may take place during the implementation of this management plan. For instance, the current District Project Technical Committee (DPTC) described in this plan is likely to change to County Project Technical Committee (CPTC) in line with the devolve governance as required by the Constitution of Kenya 2010. In spite of this dynamic, this proposed institutional structure (Fig. 6) sets the stage for reporting and conflict management. Other structures and mechanisms will evolve and may be set up as need a rises.

FIGURE 6: INSTITUTIONAL STRUCTURE/Framework for Managing Ombeyi Wetland



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TABLE 9: OMBEYI WETLAND MANAGEMENT TASK FORCE/COMMITTEE

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11.	Mary Auma	Kore	0727215989
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TASK FORCE EXECUTIVE COMMITTEE OFFICE BEARERS

1. Chairman: Charles Onyango
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3. Treasurer: Millicent Adhiambo



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